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Requisition No.

DRAWINGS & SPECIFICATIONS
for

INSTITUTE OF OCEAN SCIENCES
DFO HANGAR BRIDGE WALKWAY AND ENTRY VESTIBULE

for

DFO
Re-issued For Tender 2018-02-02

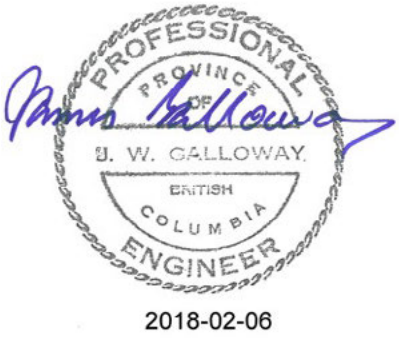
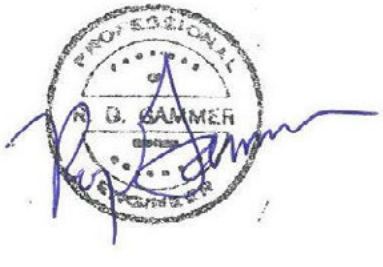
APPROVED BY:

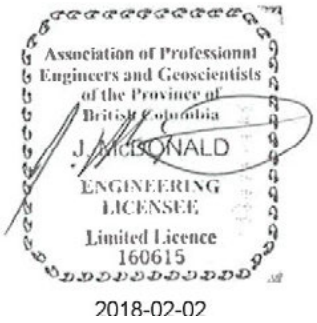
_____ _____
Regional Manager, AES Date

_____ _____
Construction Safety Coordinator Date

Dan Loglisci
Project Manager Date

Real Property Services Branch, Professional and Technical Services, Pacific Region
Room 219 - 800 Burrard Street, Vancouver, B.C. V6Z 0B9

DISCIPLINE	SEAL
Prime Consultant / Architect:	
Structural Engineer: Jim Galloway, WSP	 2018-02-06
Mechanical Engineer: Roy Gammer, WSP	 2018-02-06

DISCIPLINE	**SEAL**
Electrical Engineer: Jad McDonald, WSP	

SPECIFICATION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract consists of renovations to the IOS DFO Hangar, Sidney, BC

1.2 DESCRIPTION OF WORK

.1 The project consists of construction of an elevated walkway and atrium to serve the hangar mezzanine space. Project work includes, but is not limited to the following:

.2 Selected demolition to existing mezzanine exterior wall.

.3 Removal and reinstatement of portions of the existing galvanized mesh fencing to the south of the proposed walkway.

.4 Construction of a vestibule and entry serving the mezzanine office

.5 Construction of an elevated galvanized steel walkway with metal roof.

.1 All structural metal components of walkway and vestibules to be fabricated and hot dipped galvanized off site. All on site assembly of structural metal to be made using specified fasteners.

.2 No on-site welding of components will be allowed without permission of Departmental Representative.

.6 Construction of protected / enclosed steel stair on the north side of the new vestibule connecting to grade

.7 Construction of a protection canopy at the south end of the walkway

.8 Construction of a concrete walk that connects the south end of the walkway with the parking lot area.

1.3 CONTRACT DOCUMENTS

.1 The Contract documents, drawings and specifications are intended to complement each other, and to provide for and include everything necessary for the completion of the work.

.2 Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the work.

.3 Contractor to maintain a complete set of contract documents on site

1.4 DIVISION OF SPECIFICATIONS

.1 The specifications are subdivided in accordance with the current 6-digit National Master Specifications System.

.2 A division may consist of the work of more than 1 subcontractor. Responsibility for determining which subcontractor provides the labour, material, equipment and services required to complete the work rests solely with the Contractor.

.3 In the event of discrepancies or conflicts when interpreting the drawings and specifications, the specifications govern.

1.5 HOURS OF WORK

.1 Construction work will occur during normal working hours.

1.6 SITE MEETINGS

.1 Site meetings between the Departmental Representative and the Contractor will be arranged on a bi weekly basis to review project progress and upcoming work.

.2 Contractor to arrange project meetings and to be responsible for arranging times, location, and recording and distributing meeting minutes.

1.7 COST BREAKDOWN

.1 Before submitting the first progress claim, submit a breakdown of the Contract lump sum prices in detail as directed by the Departmental Representative and aggregating Contract price. Provide in conjunction with payment schedule indicating anticipated monthly billings for the duration of the project.

1.8 CONTRACTORS USE OF PREMISES

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

.2 Contractor to maintain barriers and repair any existing barriers altered or damaged by construction.

.3 Ensure construction site is safe, secure and properly separated from areas accessible to the public. Maintain public and personnel access to buildings in the vicinity of the construction area.

.4 Contractor is responsible for maintaining a clean worksite and for securing all materials against wind.

.5 At all times during construction, ensure that critical systems remain fully functional, including but not limited to the following

.1 Life Safety Systems.

.2 Fire protection.

.6 Minimize service disruptions. Coordinate any required service shutdowns with the Departmental Representative.

.1 All shutdowns to occur outside occupied/operational hours.

.2 Shutdowns are allowed only with the permission of the Departmental Representative. All requests must be submitted in writing.

.7 At completion of operations, the condition of existing work is to be equal to or better than that which existed before new work started.

1.9 OWNER OCCUPANCY.

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

.2 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

.3 Maintain fire and life safety systems and public access to exits during all stages of the Work.

1.10 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.11 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 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 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.

.4 Provide temporary services as directed, to maintain critical building and tenant systems.

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

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

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

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

1.12 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 Plan of Construction Operations (PCO)

.12 Other documents as required as submittals in individual specification sections.

1.13 AS-BUILT DOCUMENTS

.1 The Departmental Representative will provide 2 sets of drawings, and 2 sets of specifications, for "as-built" purposes.

.2 As work progresses, maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings and shop drawings as changes occur.

.3 Refer to Section 01 78 10 Closeout Procedures.

1.14 ADDITIONAL DRAWINGS

.1 The Departmental Representative may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with plans referred to in the Contract documents.

.2 Upon request, Departmental Representative may furnish up to a maximum of 10 sets of Contract documents for use by the Contractor at no additional cost. Should more than 10 sets of documents be required the Departmental Representative will provide them at additional cost.

1.15 FAMILIARIZATION WITH SITE

.1 Before submitting tender, visit site – as indicated in tender documents and become familiar with all conditions likely to affect the cost of the work.

1.16 SUBMISSION OF TENDER

.1 Submission of a tender is deemed to be confirmation of the fact that the Tenderer has analyzed the Contract documents and inspected the site, and is fully conversant with all conditions.

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 SCHEDULES REQUIRED

.1 Construction Schedule

1.2 SCHEDULE FORMAT

.1 Prepare schedule in form of a horizontal bar chart. (Gantt)

.2 Provide a separate bar for each major operation.

.3 Provide horizontal time scale identifying first Working Day of each week.

.4 Identification of listings.

.5 By specific task.

.6 Identify work by phase

.7 Include all milestones and identify critical paths.

1.3 SCHEDULE SUBMISSION.

.1 Submit initial schedule within seven working days after award of Contract.

.2 Submit schedules in electronic format, forward through e-mail - .pdf files.

.3 Departmental Representative will review schedule and return review copy within three days after receipt.

.4 Resubmit finalized schedule within three days after return of review copy.

.5 Submit revised progress schedule with each application for payment.

.6 Distribute copies of revised schedule to:

- .1 Subcontractors.
- .2 Other concerned parties.

.7 Instruct recipients to report to Contractor within five working days, any problems anticipated by timetable shown in schedule.

1.4 SCHEDULING

.1 Show complete sequence of construction by activity, identifying Work of separate stages and final completion of the entire project within the time period required by the Contract documents. Indicate the early and late start, early and late finish, float dates, and duration. Indicate the following:

- .1 Submission of Shop Drawings, product data, MSDS sheets and samples.
- .2 Indicate estimated percentage of completion for each item of Work at each submission.
- .3 Include dates for commencement and completion of each portion of the project.

.4 Indicate the anticipated date of substantial completion.

.5 Indicate final completion date within the time period required by the contract documents.

.6 Indicate projected percentage of completion of each item as of first day of the week.

.7 Indicate progress of each activity to date of submission schedule.

.8 Indicate changes occurring since previous submission of schedule:

.1 Major changes in scope.

.2 Activities modified since previous submission.

.3 Revised projections of progress and completion.

.4 Other identifiable changes.

1.5 PROGRESS REPORTS

.1 Maintain an accurate record of the Construction work. Submit progress report when requested by the Departmental Representative and with each Request for Progress Payment.

.2 Include in reports, the dates of commencement and percentage of work completed for different aspects of the work.

1.6 STAFFING AND OVERTIME

.1 Cease work at any particular point and transfer workers to other designated points, when so directed, should the Departmental Representative judge it necessary to expedite the Work.

.2 Should the Work fail to progress according to the approved progress schedule, work such additional time (including weekends and holidays), employ additional workers, or both, as may be required to bring the Work back on schedule, at no additional cost to Contract.

1.7 CHANGES IN THE SCHEDULE

.1 Whenever proposing a change in the construction schedule, submit proposed revised schedule to the Departmental Representative, together with such analyses thereof as are required to clearly indicate the purpose and anticipated results of such changes.

.2 If, in the opinion of the Departmental Representative, any proposed change in construction scheduled is inadequate to secure completion of the Work within the specified time, or is otherwise not in accordance with the specifications, or if the Work is not being adequately or properly prosecuted in any respect, the Departmental Representative reserves the right to require a revised schedule together with such analyses thereof as are required to indicate the anticipated results of such revision.

.3 Claims for additional compensation or extension of Contract Time on account of such requirements will not be considered.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

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

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

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

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

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

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

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

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

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

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

1.2 HEALTH AND SAFETY PLAN

.1 Submit site specific Health and Safety Plan, MSDS and WHMIS documents requested in Section 01 35 30 - Health and Safety Requirements.

1.3 MATERIAL SOURCE SEPARATION PLAN

.1 Submit site specific Material Source Separation Plan as detailed in Section 01 74 19 Construction Waste and Disposal

1.4 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 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.

.3 Allow 5 days for Departmental Representative's review of each submission.

.4 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.5 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.6 Accompany submissions with electronic transmittal, containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Indicate the specification section and paragraph number that applies to the shop drawing that is being submitted.
  - .1 Ensure that each shop drawing clearly refers to the requirements of the stated specification section.
- .5 Identification and quantity of each shop drawing, product data and sample.
- .6 Other pertinent data.

.7 Submissions include:

- .1 Date and revision dates.
- .2 Project title, number and applicable specification section.
- .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 Engineers Stamp if required by specific specification section.
- .6 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.

.7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationship to adjacent work.

.8 After Departmental Representative's review, distribute copies.

.9 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.10 Submit electronic copies of any test reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of contract award for project.

.11 Submit electronic copies of manufacturer’s instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.12 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.13 Delete information not applicable to project.

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

.15 If upon review by Departmental Representative no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.16 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that DFO approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.5 SAMPLES

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

.2 Deliver samples prepaid, one of each sample to Departmental Representatives office and Prime Consultant's office.

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

.4 Where colour, pattern or texture is criterion, submit full range of physical samples. Electronic samples (PDF) will not be accepted for colour choices.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

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

1.6 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic copy of digital photography in jpg format, standard resolution as directed by Departmental Representative.

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

.3 Number of viewpoints: 4 locations.

.1 Viewpoints and their location as determined by Departmental Representative.

1.7 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Government of Canada:

.1 Canada Labour Code - Part II.

.2 Canada Occupational Health and Safety Regulations.

.2 National Building Code of Canada (NBC):

.1 Part 8, Safety Measures at Construction and Demolition Sites.

.3 Fire Protection Engineering Services, HRSDC:

.1 FCC No. 301, Standard for Construction Operations.

.2 FCC No. 302, Standard for Welding and Cutting.

.4 Province of British Columbia

.1 Workers Compensation Act, RSBC 1996 - Updated 2012.

.5 American National Standards Institute (ANSI):

.1 ANSI/ASSE A10.3-2006, American National Standard - Construction and Demolition Operations- Safety Requirements for Powder-Actuated Fastening Systems.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 35 - Fire Safety Requirements.

1.3 WORKERS COMPENSATION BOARD COVERAGE

.1 Comply fully with Workers' Compensation Act, regulations and orders made pursuant thereto and any amendments up to completion of work.

.2 Maintain Workers' Compensation Board coverage during term of Contract, until and including date that Certificate of Final Completion is issued.

1.4 COMPLIANCE WITH REGULATIONS

.1 DFO may terminate Contract without liability to Canada where Contractor, in the opinion of DFO, refuses to comply with a requirement of Workers' Compensation Act or Occupational Health and Safety Regulations.

.2 It is Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform work as required by Workers' Compensation Act or Occupational Health and Safety Regulations.

1.5 SUBMITTALS

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

.2 Submit following:

.1 Site specific Health and Safety Plan.

.2 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.

.3 Copies of incident and accident reports.

.4 Complete set of Material Safety Data Sheets (MSDS) and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.

.5 Emergency Procedures.

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

.4 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.

.5 Submission of Health and Safety Plan and any revised version to Departmental Representative is for information and reference purposes only. It will not:

.1 Be construed to imply approval by Departmental Representative.

.2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.

.3 Relieve Contractor of his legal obligations for provision of health and safety on project.

1.6 RESPONSIBILITY

.1 Assume responsibility as the Prime Contractor for work under this contract.

.2 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.

.3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.7 HEALTH AND SAFETY CO-ORDINATOR

.1 Health and Safety Co-ordinator must:

.1 Be responsible for completing all health and safety training and ensuring that personnel that do not successfully complete required training are not permitted to enter site to perform work.

.2 Be responsible for implementing, daily enforcing and monitoring site-specific Health and Safety Plan.

.3 Be on site during execution of work.

1.8 GENERAL CONDITIONS

.1 Provide safety barricades and lights around work site as required to provide safe working environment for workers and protection for pedestrian and vehicular traffic.

.2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of work site.

.1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.

.2 Secure site at night time as deemed necessary to protect site against entry.

1.9 PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:

.1 Energized electrical services.

.2 Work at heights.

.3 Federal employees and general public.

.4 Multi-employer work site.

1.10 UTILITY CLEARANCES

.1 The Contractor is solely responsible for all utility detection and clearances prior to starting the work.

.2 The Contractor will not rely solely upon the Reference Drawings or other information provided for utility locations.

1.11 REGULATORY REQUIREMENTS

.1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.

.2 In event of conflict between any provision of above authorities, the most stringent provision will apply. Should dispute arise in determining the most stringent requirement, the Departmental Representative will advise on course of action to be followed.

1.12 FILING OF NOTICE

.1 Complete and file Notice of Project as required by Provincial authorities prior to beginning of Work.

.2 Provide copies of all notices to the Departmental Representative.

1.13 WORK PERMITS

.1 Obtain speciality permit(s) related to project before start of work.

.2 Provide copies of all notices to Departmental Representative.

1.14 HEALTH AND SAFETY PLAN

.1 Conduct site-specific hazard assessment based on review of Contract documents, required work and project site. Identify known and potential health risks and safety hazards.

.2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including but not limited to following:

.1 Primary requirements:

.1 Contractor's safety policy.

.2 Identification of applicable compliance obligations.

.3 Definition of responsibilities for project safety/organization chart for project.

.4 General safety rules for project.

.5 Job-specific safe work, procedures.

.6 Inspection policy and procedures.

.7 Incident reporting and investigation policy and procedures.

.8 Occupational Health and Safety Committee/Representative procedures

.9 Occupational Health and Safety meetings.

.10 Occupational Health and Safety communications and record keeping procedures.

.2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of work.

.3 List hazardous materials to be brought on site as required by work.

.4 Indicate engineering and administrative control measures to be implemented at site for managing identified risks and hazards.

.5 Identify personal protective equipment (PPE) to be used by workers.

.6 Identify personnel and alternates responsible for site safety and health.

.7 Identify personnel training requirements and training plan, including site orientation for new workers.

.3 Develop plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in plan.

.4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.

.5 Submit to Departmental Representative as indicated in **1.5 Submittals.**

.6 Departmental Representative's review: the review of Site Specific Health and Safety Plan by DFO shall not relieve the Contractor of responsibility for errors or omissions in final Site Specific Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

1.15 EMERGENCY PROCEDURES

.1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:

- .1 Designated personnel from own company.
- .2 Regulatory agencies applicable to work and as per legislated regulations.
- .3 Local emergency resources.
- .4 Departmental Representative (site staff).

.2 Include following provisions in emergency procedures:

- .1 Notify workers and first-aid attendant, of nature and location of emergency.
- .2 Evacuate all workers safely.
- .3 Check and confirm safe evacuation of all workers.
- .4 Notify fire department or other emergency responders.
- .5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond workplace.
- .6 Notify Departmental Representative (site staff).

.3 Provide written rescue/evacuation procedures as required for, but not limited to:

- .1 Work at high angles.
- .2 Work in confined spaces or where there is risk of entrapment.
- .3 Work with hazardous substances.
- .4 Underground work.
- .5 Work on, over, under and adjacent to water.
- .6 Workplaces where there are persons who require physical assistance to be moved.

.4 Design and mark emergency exit routes to provide quick and unimpeded exit.

.5 Revise and update emergency procedures as required and re-submit to Departmental Representative.

1.16 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Departmental Representative and in accordance with Canada Labour Code.

.2 Where use of hazardous and toxic products cannot be avoided:

- .1 Advise Departmental Representative beforehand of product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00 - Shop Drawings, Product Data and Samples.
- .2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when tenants have left building.
- .3 Provide adequate means of ventilation in accordance with Section 01 51 00 - Temporary Utilities.

.4 The contractor shall ensure that the product is applied as per manufacturers recommendations.

.5 The contractor shall ensure that only pre-approved products are brought onto the work site in an adequate quantity to complete the work.

1.17 ELECTRICAL SAFETY REQUIREMENTS

.1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.

.1 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with Departmental Representative.

.2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

1.18 ELECTRICAL LOCKOUT

.1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.

.2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by Departmental Representative.

.3 Keep documents and lockout tags at site and list in log book for full duration of Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

1.19 OVERLOADING

.1 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.

1.20 FALSEWORK

.1 Design and construct falsework in accordance with CSA S269.1- 1975 (R2003).

1.21 SCAFFOLDING

.1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797 and B.C. Occupational Health and Safety regulations.

1.22 CONFINED SPACES

.1 Carry out work in confined spaces in compliance with Provincial regulations.

1.23 POWDER ACTUATED DEVICES

.1 Use powder-actuated devices in accordance with ANSI/ASSE A10.3 only after receipt of written permission from Departmental Representative.

1.24 FIRE SAFETY REQUIREMENTS

.1 Fire safety requirements in accordance with Section 01 35 35 Fire Safety Requirements.

.2 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

.4 Portable gas and diesel fuel tanks are not permitted on most federal work sites. Approval from the DR is required prior to any gas or diesel tank being brought onto the work site.

1.25 FIRE SAFETY AND HOT WORK

.1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.

.2 Hot work includes cutting/melting with use of torch, flame, heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.

1.26 FIRE PROTECTION AND ALARM SYSTEMS

.1 Fire protection and alarm systems not to be:

.1 Obstructed.

.2 Shut off.

.3 Left inactive at the end of a working day or shift.

.2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.

.3 Be responsible/liable for costs incurred from fire department, building owner and tenants, resulting from false alarms.

1.27 UNFORSEEN HAZARDS

.1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of work, immediately stop work and advise Departmental Representative verbally and in writing.

1.28 POSTED DOCUMENTS

.1 Post legible versions of following documents on site:

.1 Site Specific Health and Safety Plan.

.2 Sequence of work.

.3 Emergency procedures.

.4 Site drawing showing project layout, location(s) of first-aid station(s), evacuation route and marshalling station and emergency transportation provisions.

.5 Notice of Project.

.6 Floor plans or site plans.

.7 Notice as to where a copy of Workers' Compensation Act and Regulations are available on work site for review by employees and workers.

.8 Workplace Hazardous Materials Information System (WHMIS) documents.

.9 Material Safety Data Sheets (MSDS).

.10 List of names of Joint Health and Safety Committee members or Health and Safety Representative, as applicable.

.1 Name of "qualified co-ordinator" responsible for co-ordination of health and safety activities in accordance with Section 118 of Workers' Compensation Act.

.2 Post all Material Safety Data Sheets (MSDS) on site, in common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.

.3 Postings to be protected from weather and be visible from street or exterior of principal construction site shelter provided for workers and equipment or as approved by Departmental Representative.

1.29 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. The General Contractor/subcontractors will be responsible for any costs arising from such a "stop work order".

1.30 MEETINGS

.1 Attend health and safety pre-construction meeting and all subsequent meetings called by Departmental Representative.

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 CONSTRUCTION FIRE SAFETY

.1 The Contractor shall provide construction fire safety in accordance with the National Fire Code of Canada.

1.2 REPORTING FIRES

.1 The Contractor shall inform the Departmental Representative of all fire incidents at the construction site, regardless of size.

.2 Know location of nearest fire alarm pull station and telephone, including emergency phone number.

.3 Report immediately fire incidents to Fire Department as follows:

.1 Activate nearest fire alarm pull station.

.2 Telephone, by calling **911**

.4 Person activating fire alarm pull station will remain at the front entrance to direct Fire Department to scene of fire.

.5 When reporting fire by telephone, give location of fire, name or number of building and be prepared to verify location

1.3 FIRE SAFETY PLAN

.1 Submit a fire safety plan for the construction site prior to commencement of construction work. The fire safety plan shall conform to the National Fire Code of Canada.

.2 The fire safety plan shall be submitted to the Departmental Representative for review by local fire department. Any comments by local fire department shall be implemented by the Contractor.

.3 The fire safety plan shall be limited to the area of construction only. Contractor is not responsible for amending fire safety plans in existing buildings.

.4 Post the fire safety plan at the entrance to the construction site or near the construction site's health and safety board.

.5 The fire safety plan shall conform to the National Fire Code of Canada, and shall contain, at minimum:

.1 Emergency procedures to be used in case of fire, including

.1 Sounding the fire alarm;

.2 Notifying the fire department;

.3 Instructing occupants on procedures to be followed when the fire alarm sounds;

.4 Evacuating occupants, including special provisions for persons requiring assistance; and

.5 Confining, controlling and extinguishing fires.

.2 The appointment and organization of designated supervisory staff to carry out fire safety duties.

.3 The training of supervisory staff and other occupants in their responsibilities for fire safety.

.4 Documents including diagrams, showing the type, location and operation of building fire emergency systems.

.5 The holding of fire drills (where applicable).

.6 The control of fire hazards in the building.

.7 The inspection and maintenance of building facilities provided for the safety of occupants.

1.4 FIRE WARNING SYSTEM

.1 A fire warning shall be provided to notify construction personnel of a fire emergency in the construction area.

.2 The system used shall be capable of being heard throughout the construction site.

1.5 EXTERIOR FIRE PROTECTION SYSTEMS

.1 Do not use Fire hydrants, standpipes or hose systems for other than fire-fighting purposes unless authorized by the Supervisor, Surface and Mobile.

1.6 FIRE PROTECTION SYSTEM IMPAIRMENT

.1 Notify the Departmental Representative and the North Saanich Fire Chief 48 hours prior to shutting down any active fire protection system, including water supply, fire suppression, fire detection and life safety systems.

.2 Where a fire protection system that provides fire alarm monitoring is impaired in an existing building, a fire watch **shall be** implemented.

.3 Implement all fire protection system impairments in accordance with the National Fire Code of Canada. Fire Orders will be provided at the Pre-Commencement Meeting.

1.7 FIRE EXTINGUISHERS

.1 In addition to other requirements of this specification, supply fire extinguishers, as scaled by the North Saanich Fire Chief, necessary to protect work in progress and contractor's physical plant on site.

.2 Fire extinguishers may be required in the following areas as directed by the North Saanich Fire Chief

.1 Adjacent to hot works;

.2 In areas where combustibles are stored;

.3 Near or on any internal combustion engines;

.4 Adjacent to areas where flammable liquids or gases are stored or handled;

.5 Adjacent to temporary oil fired or gas fired equipment; and

.6 Adjacent to bitumen heating equipment.

.3 Extinguishers shall be sized as 4-A:40-B:C (20 lbs) unless otherwise directed by the North Saanich Fire Chief.

.4 Extinguishers shall be of the dry chemical type unless otherwise required by the hazard being protected.

.5 The Contractor may assume the quantity of extinguishers based on a maximum travel distance between extinguishers of 75 feet.

1.8 ACCESS FOR FIRE FIGHTING

.1 Access for firefighting shall be provided in accordance with the National Fire Code of Canada.

1.9 SMOKING PRECAUTIONS

.1 Smoking is prohibited in all buildings. Observe posted smoking restrictions on entire site. Smoking only in designated areas. Contractor to provide designated area for job.

1.10 RUBBISH AND WASTE MATERIALS

.1 Keep rubbish and waste materials at minimum quantities.

.2 Burning of rubbish is prohibited.

.3 Remove rubbish from work site at end of work day or shift or as directed.

.4 Storage:

.1 Store oily waste in approved receptacles to ensure maximum cleanliness and safety.

.2 Deposit greasy or oily rags and materials subject to spontaneous combustion in approved receptacles and remove specified.

1.11 FLAMMABLE AND COMBUSTIBLE LIQUIDS

.1 Handle, store and use of flammable and combustible liquids in accordance with the National Fire Code of Canada.

.2 Keep flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing Underwriters' Laboratory of Canada or Factory Mutual seal of approval. Obtain written authorization from Port Hardy Fire Chief for storage of quantities of flammable and combustible liquids exceeding 45 litres.

.3 Do not transfer flammable or combustible liquids inside buildings.

.4 Do not transfer flammable or combustible liquids in vicinity of open flames or any type of heat-producing devices.

.5 Do not use flammable liquids having flash point below 38 degrees C such as naphtha or gasoline as solvents or cleaning agents.

.6 Store flammable and combustible waste liquids, for disposal, in approved containers located in safe ventilated area. Keep quantities to a minimum and notify District Fire Chief when disposal is required.

1.12 HOT WORKS

.1 The Contractor shall implement a hot works program in accordance with the National Fire Code of Canada and NFPA 51 Standard for Fire Prevention during Welding, Cutting and Other Hot Work.

.2 Area of hot works:

.1 Hot works shall be carried out in an area free of combustible and flammable content.

.1 All flammable and combustible materials within 15m of the hot works shall be protected in accordance with the National Fire Code of Canada;

.2 A fire watch shall be provided during the hot work and for a period of not less than 60 minutes afterwards.

.2 Where there is a possibility of sparks leaking onto combustible materials in areas adjacent to the areas where the hot work is carried out.

.1 Openings in walls, floors or ceilings shall be covered or closed to prevent the passage of sparks to such adjacent areas, or

.3 Protection of flammable and combustible materials.

.1 Any combustible or flammable material, dust or residue shall be

.1 Removed from the area where hot works is carried out; or

.2 Protected from ignition by non combustible materials.

.4 Fire extinguisher

~~.1~~ A fire extinguisher shall be provided within 3 m of all hot works. Minimum size shall be 20lbs.

1.13 HAZARDOUS SUBSTANCES

.1 Work entailing use of toxic or hazardous materials, chemicals and/or explosives, or otherwise creating hazard to life, safety or health, shall be in accordance with National Fire Code of Canada.

.2 Provide ventilation where flammable liquids, such as lacquers or urethanes are used. Eliminate all sources of ignition. Inform the North Saanich Fire Chief prior to and at completion of such work.

1.14 QUESTIONS AND/OR CLARIFICATION

.1 Direct questions or clarification on Fire Safety in addition to above requirements to the Departmental Representative.

1.15 FIRE INSPECTION

.1 Co-ordinate site inspections by the Fire Chief through Departmental Representative.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

PART 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 74 11 – Cleaning.

.3 Section 02 41 99 – Demolition for Minor Works

1.2 REFERENCES

.1 Definitions:

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

1.3 SUBMITTALS

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

.1 Submit WHMIS MSDS in accordance with Section 01 35 29 - Health and Safety Requirements.

.2 Project Specific Environmental Protection Plan:

.1 Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.

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

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

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

1.4 CONSTRUCTION EQUIPMENT

.1 All equipment to be in good working order, free of leaks that would contaminate the site.

.2 All equipment brought to site is to be clean and well maintained. Do not add fuel, oils or coolants to machinery on site. Provide properly placed drip pans under all fuel, oil and coolant filled machinery when machinery is left on site overnight and on weekends to contain leaks and drips.

1.5 FIRES

.1 Fires and burning of rubbish on site is not permitted.

1.6 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this Contract.

.2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

.3 Prevent extraneous materials from contaminating air and waterways beyond application area.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.7 HAZARDOUS MATERIALS HANDLING AND STORAGE

.1 Hazardous materials including, but not limited to fuels, bitumen, cement, paints, solvent, cleaners, dust suppressants, used fuel and oil filters, and other construction materials shall be stored and handled to minimize loss and allow contaminant and recovery in the event of a spill.

.2 Designate areas for the transfer and temporary storage of hazardous materials and wastes. The areas shall be clearly labelled and appropriately controlled. The designated areas shall be used by the contractor as a transfer and temporary storage area for potentially hazardous materials and wastes.

.3 Maintain proper WHMIS labels and MSDS for all hazardous materials used and stored on site.

.4 Report spills of hazardous materials immediately to the DCC Representative.

1.8 SPILL KITS

.1 Provide and maintain fully stocked spill kits during execution of Work.

.2 Spill kits to contain mats to absorb spills, socks to prevent spread of spills, gloves, large labelled plastic disposal bags.

.3 Spill kits to be packed in sturdy bright yellow labelled nylon bags.

1.9 SPECIAL WASTE

.1 Special wastes generated in the course of the construction activities shall be disposed of in compliance with the British Columbia Hazardous Waste Regulations. As defined by these regulations, special waste includes but is not limited to waste asbestos, oils, grease, lubricants, solvents, batteries, PCB’s, paints, and used spill clean-up materials.

.2 When handling, storing and removing Special Waste, the Contractor shall maintain the following records: Inventories of types and quantities of Special Wastes generated, stored or removed; manifests identifying special waste haulers and disposal destinations; and, disposal certification documents.

.1 Submit documentation in accordance with Section 01 78 00 Closeout Procedures.

1.10 ARCHAEOLOGICAL PROTECTION

.1 All First Nations artifacts and remains of First Nations settlements are protected whether found on the ground surface or buried beneath the surface. All such remains and deposits are not to be disturbed until their significance has been assessed by an archaeologist to the satisfaction of the DCC Representative.

1.11 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

.2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action.

.1 Take action only after receipt of written approval by Departmental Representative.

.3 Departmental Representative may issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 Products

2.1 NOT USED

.1 Not Used.

PART 3 Execution

3.1 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

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

END OF SECTION

Part 1 General

1.1 REFERENCES AND CODES

.1 Perform Work in accordance with National Building Code of Canada (NBC) 2015 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Comply with applicable local bylaws rules and regulations enforced at the location concerned. This includes Transport Canada – Civil Aviation Authority for any work airside.

.3 Provide inspection authorities having jurisdiction with plans and information required for issue of acceptance certificates.

.4 Pay fees and obtain certificates and permits required.

.5 Furnish inspection certificates in evidence that the work installed conforms to the requirements of the authority having jurisdiction.

.6 Conform to the Canada Labour Code II, Canada Occupational Safety and Health regulations.

.7 FCC, Fire Commissioner of Canada.

.1 Standard No. 301, "Construction Operations, June 1982.

.8 WCB, Worker's Compensation Act, B.C., Reg. 185/99.

.9 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes and referenced documents.

1.2 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions and municipal by-laws.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 INSPECTION

.1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative, Consultants or law of Place of Work.

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

1.2 PROCEDURES

.1 Notify appropriate agency and 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.

1.3 REJECTED WORK

.1 Remove defective Work which has been rejected by Departmental Representative as failing to conform to Contract Documents. Defective work may be as a result of poor workmanship, use of defective products, or damage. Replace work whether already incorporated into Work or not. 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 Work that is defective or not performed in accordance with Contract Documents, the Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents.

.4 In case of dispute, decisions as to standard or quality of work rests solely with the Departmental Representative.

1.4 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies are to be engaged by the contractor to inspect portions of the work, as indicated in individual specification sections.

.2 Contractor is to allow for the costs of these inspections.

.3 Provide equipment required for executing inspection and testing by appointed agencies.

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

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

1.5 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

1.6 EQUIPMENT AND SYSTEMS

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

.2 Refer to individual specification sections for definitive requirements.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.2 WATER SUPPLY

.1 Departmental Representative will provide continuous supply of potable water for construction use.

.2 Exercise conservation. Turn off water when not in use.

.3 Provide all equipment and temporary hoses to bring water supply to site, at no additional cost to the contract.

1.3 TEMPORARY POWER AND LIGHT

.1 Electrical power is available for construction purposes at no cost.

.2 Departmental Representative will determine delivery points and quantitative limits. Departmental Representative written permission is required before any connection is made. Connect to existing power supply in accordance with Canadian Electrical Code.

.3 Provide all equipment and temporary lines to bring these services to the work, at no additional cost to the contract.

.4 Exercise conservation whenever using temporary electrical power supply.

1.4 FIRE PROTECTION

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

Part 2 Products

2.1 NOT USED

Part 3 EXECUTION

.1 NOT USED

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.2 SCAFFOLDING

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

.2 Provide and maintain scaffolding, ladders, shoring and platforms necessary for the performance of the work.

.3 Provide scaffolding and support structures as detailed in individual specification sections.

1.3 HOISTING

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

.2 Hoists to be operated by B.C. certified personnel.

.3 Notify Departmental Representative not less than 5 working days prior to any cranes or lifting devices coming on site. PCO indicates that maximum height is 5 meters. Seek permission from the Port Hardy Airport Authority and Departmental representative for any equipment that exceeds 5 meters.

1.4 SITE STORAGE/LOADING

.1 Confine work and operations of employees to areas as directed by Departmental Representative unless otherwise identified in Contract Documents. Do not unreasonably encumber premises with products.

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

1.5 CONSTRUCTION PARKING

.1 Parking is permitted on site in areas directed by Departmental Representative.

.2 Existing roads may be used for access to project site. Maintain construction parking area clean and free of construction-related debris, spillage and soiling.

.3 Make good damage resulting from Contractor use of parking areas and roads, at no additional cost to the Contract.

1.6 EQUIPMENT, TOOL AND MATERIALS STORAGE

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

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

1.7 SANITARY FACILITIES

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

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

1.8 CONSTRUCTION SIGNAGE

.1 No project identification signage allowed

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

.3 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.

.4 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 Not Used

END OF SECTION

General

1.1 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.2 HOARDING and BARRIERS

.1 Provide hoarding around the perimeter of the site to enclose activities and around specified material storage area. Alter and modify as required to accommodate work.

1.3 DUST TIGHT SCREENS

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

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

1.4 ACCESS TO SITE

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

1.5 FIRE ROUTES

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

1.6 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

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

END OF SECTION

Part 1 General

1.1 QUALITY

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

.2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

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

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

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

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

1.2 STORAGE, HANDLING AND PROTECTION

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

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

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

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

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

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

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

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

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

1.3 TRANSPORTATION

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

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

1.4 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. Departmental Representative will establish course of action.

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

1.5 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.

.2 Do not employ anyone unskilled in their required duties.

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

1.6 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.

1.7 CONCEALMENT

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

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

1.8 REMEDIAL WORK

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

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

1.9 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.

1.10 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.

1.11 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.

1.12 PROTECTION OF WORK IN PROGRESS

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

1.13 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT AND DISPOSAL

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

1.2 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris.

.2 Maintain public areas adjacent to the worksite in a tidy condition.

.3 Remove waste materials from site at daily and as directed by the Departmental Representative.

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

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

.6 Dispose of waste materials and debris.

.1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.

.2 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.

.3 Remove hazardous materials away from public areas as they are exposed.

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

1.3 DAILY CLEANING

.1 Conduct cleaning and disposal operations daily. Comply with local ordinances and anti-pollution laws.

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

.3 Maintain cleanliness of adjacent areas during the demolition phase.

1.4 FINAL CLEANING

.1 When all of the Work has been 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.

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

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

.7 Sweep and wash clean paved areas.

.8 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

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 SECTION INCLUDES

.1 Waste goals.

.2 Waste management plan.

.3 Waste management plan implementation.

.4 Disposal of waste.

1.2 DEFINITIONS

.1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.

.2 Construction and Demolition Waste: Solid wastes typically including but not limited to, building materials, packaging, trash, debris, and rubble resulting from construction, re-modelling, repair and demolition operations.

.3 Hazardous: Exhibiting the characteristics of hazardous substances including, but not limited to, ignitability, corrosiveness, toxicity or reactivity.

.4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including, but not limited to, ignitability, corrosiveness, toxicity, or reactivity.

.5 Non-toxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

.6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and re-manufactured into a new product for reuse by others.

.7 Recycle: To remove a waste material from the Project site to another site for re-manufacture into a new product for reuse by others.

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

.9 Return: To give back reusable items or unused products to vendors for credit.

.10 Reuse: To reuse a construction waste material in some manner on the Project site.

.11 Salvage: To remove a waste material from the Project site to another site for resale or reuse by others.

.12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

.13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

.14 Toxic: Poisonous to humans either immediately or after a long period of exposure.

.15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

.16 Volatile Organic Compounds (VOC): Chemical compounds common in and emitted by many building products over time through outgassing:

.1 Solvents in paints and other coatings,

.2 Wood preservatives; strippers and household cleaners,

.3 Adhesives in particle board, fibreboard, and some plywood; and foam insulation,

.4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.

.17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.3 WASTE MANAGEMENT GOALS

.1 Owner has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed. The owners goal is to divert 75% of waste materials from the landfill.

.2 Owner recognizes that waste in any project is inevitable, but indicates that as much of the waste materials as economically feasible shall be reused, salvaged, or recycled.

.3 Waste disposal in landfills shall be minimized.

1.4 MATERIAL SOURCE SEPARATION PLAN

.1 Before project start-up, prepare Materials Source Separation Program. Provide separate containers for re-usable and/or recyclable materials of following:

.1 Construction waste: including but not limited to following types.

.1 Uncontaminated packaging (wood, metal banding, cardboard, paper, plastic wrappings, polystyrene).

.2 Wood pallets (recycle or return to shipper).

.3 Batt insulation.

.4 Metals (pipe, conduit, ducting, wiring, miscellaneous cuttings)

.5 Wood (uncontaminated).

.6 Gypsum board (uncontaminated).

.7 Paint, solvent, oil.

.8 Other materials as indicated in technical sections.

.2 Administration/worker waste (uncontaminated): including but not limited to following types.

.1 Paper, cardboard.

.2 Plastic containers and lids marked types 1 through 6.

.3 Glass and aluminum drink containers (recycle or return to vendor).

.2 Implement MSSP for waste generated on project in compliance with approved methods and as approved by Departmental Representative.

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

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

1.5 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged.

.2 All materials for recycling must be source separated into separate bins to be accepted by the local processing authority.

.3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.4 Protect surface drainage, storm sewers, sanitary sewers, and utility services from damage and blockage.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 PREPARATION

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

3.2 USE OF SITE AND FACILITIES

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

3.3 WASTE MANAGEMENT IMPLEMENTATION

.1 Manager: Contractor to designate an on-site party responsible for instructing workers and overseeing the results of the Waste Management Plan the Project.

.2 Instruction: Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.

.3 Separation facilities: Contractor shall lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.

.4 Hazardous wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations.

3.4 DISPOSAL OF WASTE

.1 Burying of rubbish and waste materials is prohibited.

.2 Disposal of waste into waterways, storm, or sanitary sewers is prohibited.

3.5 CLEANING

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

.2 Clean-up work area as work progresses.

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

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

.1 Contractor's Inspection: Contractor and all subcontractors to 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 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 Certificates required by authorities having jurisdiction have been submitted.

.4 Operation of systems have been demonstrated to the owners personnel

.5 Work is complete and ready for final inspection.

.4 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.

.5 Commencement of warranty period: Date of Departmental Representatives acceptance of substantial performance to be the date for commencement for warranty period.

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

.7 Final Inspection:

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

.2 If work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

.8 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.

1.2 FINAL CLEANING

.1 Clean in accordance with section 01 74 11

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

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 SECTION INCLUDES

.1 Closeout submittals

.2 Operation and maintenance manual format.

.3 Contents each volume.

.4 Recording actual site conditions.

.5 Record (as-built) documents and samples.

.6 Record documents.

.7 Final survey.

.8 Warranties and bonds.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

1.3 CLOSEOUT SUBMITTALS

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

.2 Copy will be returned with Consultant's comments.

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

.4 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, two final copies and one electronic copy (PDF) of operating and maintenance manuals in Canadian English.

.1 One copy of the manual to be provided in digital form on CD rom, in Canadian English.

.5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.6 If requested, furnish evidence as to type, source and quality of products provided.

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

.8 Pay costs of transportation.

1.4 OPERATION AND MAINTENANCE MANUAL FORMAT

.1 Organize data in the form of an 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. Identify contents of each binder on spine.

.4 Cover: Identify each binder with type or printed title “MAINTENANCE MANUAL”"; 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. Bind in with text; fold larger drawings to size of text pages.

.9 Coordinate with commissioning specification to include all related close out documentation, warranty and test reports.

1.5 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;

.1 date of submission;

.2 names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties; and

.3 schedule of products and systems, indexed to content of volume.

.2 For each product or system, 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 clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

.4 Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

1.6 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of black line opaque drawings, and within the Project Manual, provided by Owner.

.2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.

.3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately recorded.

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

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

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

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

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.5 Specifications: legibly 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 inspection certifications, field test records, required by individual specifications sections.

1.7 RECORD DOCUMENTS AND SAMPLES

.1 In addition to requirements in General Conditions, maintain at the site for Departmental Representative, one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to the Contract.

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

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with section number listings in List of Contents of the Project Manual. Label each document "RECORD DOCUMENTS" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

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

END OF SECTION

PART 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 35 43 – Environmental Procedures.

.3 Section 01 56 00 – Temporary Barriers and Enclosures.

.4 Section 01 74 11 – Cleaning.

1.2 REFERENCES

.1 CSA International

.1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

.2 Canadian Environmental Protection Act (CEPA), 1993, C.33.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Indicate method of temporary shoring, including materials, layout, and details.

.3 Indicate sequence of erection and removal of temporary shoring.

1.4 REGULATORY REQUIREMENTS

.1 Conform to applicable code for demolition of structures, safety of adjacent structures, and disposal.

.2 Obtain required permits from authorities.

1.5 SITE CONDITIONS

.1 Take precautions to protect environment and undertake works in conformance with Contract Documents for siltation control and pollution prevention.

.2 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous is encountered, stop work, take preventative measures, and notify Departmental Representative immediately.

.1 Proceed only after receipt of written instructions have been received from Departmental Representative.

.3 Notify Departmental Representative before disrupting building access or services.

PART 2 Products

2.1 NOT USED

.1 Not used.

PART 3 Execution

3.1 EXAMINATION

.1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal and recycling

.2 Locate and protect utilities.

.3 Notify and obtain approval of utility companies before starting demolition.

3.2 PREPARATION

.1 Protection of In-Place Conditions:

.1 Prevent movement, settlement, or damage to adjacent structures and utilities. Provide bracing and shoring required.

.2 Keep noise, dust, and inconvenience to site occupants to a minimum.

.3 Protect building systems, services and equipment in operating condition for the duration of the project.

.4 Provide temporary dust screens, covers, railings, supports and other protection as required.

.5 Do Work in accordance with Section 01 35 30 - Health and Safety Requirements.

.6 Conduct demolition in accordance with requirements of Section 01 35 43 Environmental Procedures.

3.2 DEMOLITION/REMOVAL:

.1 Do demolition work in accordance with CSA S350.

.2 Disconnect, cap, plug or divert, as outlined in the construction documents, existing utilities within the property where they interfere with the execution of the work. Do work in conformity with the requirements of the utilities and authorities having jurisdiction. Mark the location of these and any previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.

.1 Immediately notify Departmental Representative and utility company concerned in case of damage to any utility or service designated to remain in place.

.2 Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

3.3 CLEANING

.1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas or to conditions that existed prior to beginning of Work.

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.

.3 Transport material designated for alternate disposal using approved facilities listed in Waste Reduction Workplan and in accordance with applicable regulations.

.1 Disposal facilities must be those approved of and listed in Waste Reduction Workplan.

.4 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

.1 Disposal facilities must be those approved of and listed in Waste Reduction Workplan.

END OF SECTION

PART 1 - GENERAL

1.1 Related Requirements

.1 Section 03 20 00: Concrete Reinforcing.

.2 Section 03 30 00: Cast-in-Place Concrete.

1.2 References

.1 All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.

.2 Canadian Standards Association (CSA International):

.1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA O86, Engineering Design in Wood.

.3 CSA O121, Douglas Fir Plywood.

.4 CSA O325.0, Construction Sheathing.

.5 CSA S269.1, Falsework and Formwork

.3 American Concrete Institute (ACI):

.1 ACI 117, Specification for Tolerances for Concrete Construction and Materials.

.2 ACI 347, Guide to Formwork for Concrete.

1.3 Quality Control

.1 In accordance with Section 01 45 00 – Quality Control.

PART 2 - PRODUCTS

2.1 Design Requirements

.1 Design in accordance with CSA S269.1 and CSA S269.3

2.2 Materials

.1 Formwork materials: to CSA S269.1.

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA O121, CSA 0141, CSA O437 or CSA-O153.

.2 Form ties:

.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

.2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

.3 Form ties to be designed to act as ties and spreaders and to have a minimum working strength of 13 kN (3000 pounds).

.4 Snap ties to snap cleanly at least 25 mm from concrete surface without damage to the concrete.

.5 Cone ties to be internal disconnecting type which snaps cleanly at least 38 mm from concrete surface without damage to the concrete.

.3 Form release agent: non-toxic, low VOC, chemically active agent containing compounds that react with free lime in concrete resulting in water insoluble soaps.

.4 Form stripping agent: colourless mineral oil, non-toxic, low VOC, free of kerosene, with viscosity between 15 to 24 mm^2/s (70 and 110s Saybolt Universal) at 40°C, flashpoint minimum 150°C, open cup.

.5 Grooves, reglets and chamfers: White pine selected for straightness and accurately dressed to size.

.2 Void Form: Cellular cardboard with minimum compressive strength of 62 kPa designed to carry weight of wet concrete and loads associated with placing concrete and also designed to disintegrate and create an air space below the fully hardened concrete.

2.3 Accessories

.1 Weep hole tubes: plastic.

PART 3 - EXECUTION

3.1 Fabrication and Erection

.1 Confirm to CSA A23.1.

.2 Fabricate and erect falsework in accordance with CSA S269.1.

.3 Fabricate and erect formwork in accordance with CSA S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1/A23.2.

.4 Make formwork tight and flush faced to prevent the leakage of mortar and the creation of unspecified fins or panel outlines.

.5 Form sides of footings unless Structural Drawings and Geotechnical report allow use of earth forms.

.6 Obtain Departmental Representative's approval for formed openings, slots and chases not indicated on Structural Drawings.

.7 Use internal form ties.

.8 Do not permit loads from formwork to be transmitted to adjacent existing structure.

.9 Apply a form coating and release agent uniformly to the contact surface of formwork panels before reuse.

.10 Use 25 mm chamfer strips on external corners and 25 mm fillets at interior corners, unless specified otherwise.

.11 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated on Architectural and Structural drawings.

.12 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.13 Anchors and inserts not to protrude beyond surfaces designated to receive applied finishes, including painting.

.14 Clean formwork in accordance with CSA A23.1/A23.2, before placing concrete.

.15 Do not close wall forms before reinforcing steel has been reviewed by Departmental Representative's.

3.2 Joints

.1 Refer to Section 03 30 00 for construction joints, sawcut joints and isolation joints in slab on grade and concrete toppings.

3.3 Concrete Exposed to View

.1 Minimize formwork joints. Locate joints and ties in a uniform pattern with no ties within 300 mm of an edge or joint.

.2 Make panels forming slab soffits and wall / beam faces as large as possible, and arrange symmetrically.

.3 Make form joints in columns level from column to column and consistent with form joints in other parts of the structure. Locate lowest horizontal form joints 2400 mm above finished floor elevation.

.4 Where grooves, reglets or chamfers are shown, locate panel form joints to be hidden behind them.

.5 Provide reglets at all concrete joints.

.6 Seal all joints in formwork and between formwork and concrete.

.7 Place 16 mm bevel strips at member corners to form chamfers unless architectural details show an alternative profile. When beams are supported on columns of the same width, extend chamfer across face of column.

.8 Do not reuse formwork if there is any evidence of surface damage or wear, which could impair the visual quality of the concrete surface.

.9 Reuse forms only on identical sections, using the original tie holes. Clean forms and fill nail holes before reuse.

.10 Use only galvanized nails.

.11 Remove form tie plastic cones. Install concrete plugs where indicated. Recess 6 mm and bond to concrete using a cement slurry with a bonding agent conforming to Section 03 30 00.

3.4 Removal and Reshoring

.1 Conform to CSA A23.1 and to ACI 347.

.2 Re-use formwork and falsework subject to requirements of CSA A23.1/A23.2.

3.5 Field Quality Control

.1 Refer to Section 01 45 00 - Quality Control.

END OF SECTION 03 10 00

PART 1 - GENERAL

1.1 Related Requirements

.1 Section 03 10 00: Concrete Forming and Accessories.

.2 Section 03 30 00: Cast-in-Place Concrete.

1.2 References

.1 All referenced standards shall be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.

.2 Canadian Standards Association (CSA International):

.1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA A23.3, Design of Concrete Structures.

.3 CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.

.4 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.

.3 Reinforcing Steel Institute of Canada (RSIC):

.1 Reinforcing Steel Manual of Standard Practice.

.4 American Concrete Institute (ACI):

.1 SP-66, ACI Detailing Manual.

.5 ASTM International Inc.:

.1 ASTM A1064/A1064M, Standard Specification for Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.2 ASTM A775/A775M, Standard Specification for Epoxy-Coated Reinforcing Steel.

.3 ASTM D3963 / D3963M, Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.

.4 ASTM A1044 / A1044M, Standard Specification for Steel Stud Assemblies for Shear Reinforcement of Concrete.

1.3 Quality Assurance

.1 In accordance with Section 01 43 00 – Quality Assurance.

1.4 Quality Control

.1 Submit in accordance with Section 01 45 00 - Quality Control.

.2 Source Quality Control Submittals:

.1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.
.2 Upon request, inform Departmental Representative of proposed source of reinforcement material to be supplied.
.3 Upon request, provide Departmental Representative with a copy of plant certificate by the Concrete

Reinforcing Steel Institute for epoxy coating of reinforcement.

1.5 Action and Informational Submittals

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

PART 2 - PRODUCTS

2.1 Materials

.1 Reinforcing steel: carbon steel, deformed bars to CSA G30.18., unless indicated otherwise.

.2 Weldable Reinforcing steel: weldable low alloy steel deformed bars to CSA G30.18.

.3 Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M.

.4 Welded steel wire fabric: to ASTM A1064/A1064M. Provide in flat sheets only.

.5 Chairs, bolsters, bar supports, spacers: to CSA A23.1/A23.2.

PART 3 - EXECUTION

3.1 Fabrication

.1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice.

.2 Weld reinforcement in accordance with CSA W186 where indicated.

.3 Ship bundles of bar reinforcement, clearly identified in accordance with bar lists.

.4 Provide standard hooks at ends of all hooked bars.

.5 Substitute different size bars only if permitted in writing by Departmental Representative.

3.2 Field Bending

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure. Use tools which will limit bend radii to the values given in CSA A23.1.

.3 Replace bars which develop cracks or split.

3.3 Placing Reinforcement

.1 Place reinforcing steel in accordance with CSA A23.1/A23.2.

.2 Remove all loose scale, dirt, oil or other coatings which would reduce bond.

.3 Ensure cover to reinforcement is maintained during concrete pour.

.4 Turn ends of tie wire towards the interior of concrete.

.5 Support bars, chairs and spacers:

.1 Provide sufficient support bars, chairs, carriers and side form spacers as necessary to secure against displacement of reinforcement and maintain concrete cover before and during concrete placement. Support devices contacting surfaces exposed to the exterior to be non-corroding. Bars which are not shown on Structural Drawings and whose only function is supporting other reinforcing in lieu of other supporting devices to be considered accessories.

.2 Use bar supports for beams and slabs.

.3 Use side form spacers for walls and columns.

.4 Use plastic or plastic tipped bar supports and spacer with colour to match concrete for exposed concrete surfaces.

.5 Use plastic bar supports, epoxy coated support bars and plastic coated tie wire for epoxy coated reinforcement.

.6 Use precast concrete chairs where supports rest on the ground. Where welded wire fabric is used in slabs-on- grade, place precast concrete chairs at 600 mm on centre each way. Do not attempt to position welded wire fabric by lifting it after concrete is poured.

.6 Do not splice reinforcing at locations other than shown on placing or structural drawings without Departmental Representative's written approval.

.7 Do not cut reinforcement without Departmental Representative's written approval.

.8 Obtain Departmental Representative's field review of all reinforcing materials and placement before pouring concrete.

END OF SECTION 03 20 00

PART 1 - GENERAL

1.1 Related Requirements

.1 Section 03 10 00: Concrete Forming and Accessories.

.2 Section 03 20 00: Concrete Reinforcing.

.3 Section 05 12 23: Structural Steel for Buildings.

1.2 References

.1 All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.

.2 Canadian Standards Association (CSA International):

.1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A283, Qualification Code for Concrete Testing Laboratories.

.3 CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 Quality Assurance

.1 In accordance with Section 01 43 00 – Quality Assurance.

.2 Qualifications

.1 Concrete supplier to have a valid “Certificate of Ready Mixed Concrete Production Facilities” issued by the relevant Ready Mixed Concrete Association.

1.4 Quality Control

.1 Submit in accordance with Section 01 45 00 - Quality Control.

.2 Minimum two weeks prior to starting concrete work, provide valid certificate from plant delivering concrete.

.1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

.3 Minimum four weeks prior to starting concrete work, provide proposed quality control procedures on following items:

.1 Hot weather concrete.

.2 Cold weather concrete.

.3 Finishing.

.4 Protection.

1.5 Administrative Requirements

.1 Pre-installation Meeting: convene pre-installation meeting one week prior to beginning concrete works. Ensure key personnel to attend.

.2 Batch Logs: keep record of each batch delivered to site.

.3 Concrete Delivery Slips: Keep all concrete delivery slips ("driver's tickets") on site until building is completed. Record on delivery slip where concrete was placed, including time and date.

1.6 Action and Informational Submittals

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

.2 Minimum 2 weeks prior to starting concrete work, submit all concrete mix designs, and indicate where each concrete mix is to be used.

.3 Minimum submission requirements for each concrete mix design shall include the following:

.1 Minimum specified compressive strength at 28 day (or at the time specified on drawings).

.2 Maximum aggregate size.

.3 Aggregate type (if not normal density).

.4 Concrete density range, wet and dry (if not normal density).

.5 CSA exposure class.

.6 Cement type (if not type GU).

.7 Percentage and type of supplemental cementing materials.

.8 Maximum water/cementitious materials ratio.

.9 Assumed method of placement of concrete.

.10 Corrosion inhibitor (name and quantity, if applicable).

.11 Plastic or steel fibres (type, name and quantity, if applicable).

.12 Alkali-aggregate resistance.

.13 Architectural requirements (colour of cement and aggregate, if applicable).

.14 Maximum time from batching to placing concrete (if retarding admixtures are used).

.4 On completion of the works, provide written report to Departmental Representative certifying that the concrete in place meets performance requirements established in PART 2 - PRODUCTS

PART 2 - . PRODUCTS

2.1 Design Criteria

.1 To CSA A23.1/A23.2, Alternative 1 – Performance, and as described under Mixes and on Structural Drawings.

2.2 Performance Criteria

.1 Concrete supplier to meet the concrete performance criteria established by Departmental Representative and to provide verification of compliance.

2.3 Materials

.1 Portland cement: to CSA A3001.

.2 Cementitious hydraulic slag: to CSA A3000.

.3 Fly ash: to CSA A3001, Type CI.

.4 Water: to CSA A23.1.

.5 Aggregates: to CSA A23.1/A23.2. Do not use recycled concrete as aggregate.

.6 Admixtures: not to contain chlorides.

.7 Corrosion-inhibiting admixture: calcium nitrite solution.

.8 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2. Minimum compressive strength: 40 MPa at 28 days.

.9 Non premixed dry pack grout: composition of non metallic aggregate and Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 40 MPa at 28 days.

.10 Curing/sealing compound: to CSA A23.1/A23.2 and ASTM C309, Type 1, Class B, water based acrylic, compatible with surface hardener where hardener is used.

.11 Pre-moulded joint fillers: min.12mm bituminous impregnated fiber board to ASTM D1751.

.12 Joint Sealants: to AST C920, class 100/50.

.13 Weep hole tubes: plastic.

.14 Penetrating sealer: water based, clear water repellent, at least equivalent to AT&U Type 1b as specified in Alberta Infrastructure and Transportation Publication B388.

.15 Non slip nosing insert for concrete stairs: fine aluminum oxide strips, 6 mm wide x 10 mm deep.

.16 Control joint filler: semi-rigid two component epoxy or polyuria with 100% solids, Shore A hardness (per ASTM D2240) min. 85, tensile strength at 7 days (per ASTM D638) min 5.0 MPa.

.1 For sawcuts in exterior slabs and in slabs in vehicle accessible areas use only polyurea fillers.

.17 Pre-formed control joint: two piece pre-assembled “T” shaped plastic; detachable top segment, minimum depth of horizontal segment equal to ¼ of slab thickness.

.18 Continuous sliding bearing:

.1 Two layers of polyolefin, or two layers of promine covered with rubber top and bottom, approximately 6 mm in overall thickness.

.2 Deformation under 13.8 MPa at 22°C not to exceed 10% when tested for 24 hours.

.19 Elastomeric bearing pads:

.1 Virgin natural polyisoprene or virgin polychloroprene (Neoprene) conforming to CSA S6.

.20 Sliding bearing assembly:

.1 Galvanized top steel plate (anchored to concrete with min. two 12 mm dia. anchor studs) with a type 304 stainless steel highly polished lower surface, and bottom elastomeric pad with a polytetrafluoroethylene (Teflon) upper surface, wrapped in water tight polyethylene wrapping.

.2 Static and kinetic coefficients of friction not to exceed 5% under working stress.

.3 Assembly to have a working stress capacity of min. 7 MPa on the lower pad.

.4 Elastomeric bottom pad to allow a 2% rotation of upper plate and still maintain a substantially uniform bearing pressure between plate and pad.

.5 Accommodate forces and movements shown on drawings.

.6 Alternative sliding bearing assembly may be proposed for review by Departmental Representative.

.21 Crack Filler: low viscosity epoxy resin

.22 Bond Breaker: 0.25 mm polyethylene or grade D 30 minute building paper perforated with 8 mm holes at 150 mm centres, each way.

2.4 Concrete Mixes

.1 Use ready-mix concrete. Proportion concrete in accordance with CSA A23.1, Alternative 1 - Performance Method for Specifying Concrete.

.2 Set performance characteristics of concrete in plastic state in coordination with all trades involved.

.3 Meet performance criteria of concrete in hardened state as shown on Structural Drawings and provide verification of compliance.

.4 Use water-reducing agent in all concrete.

.5 Do not use admixtures containing chlorides.

PART 3 - EXECUTION

3.1 Preparation

.1 Provide advanced notice as indicated on drawings to allow Departmental Representative's field review of reinforcing prior to placing of concrete/closing of wall forms.

.2 Obtain Departmental Representative's written approval before placing concrete.

.3 Obtain written approval of each foundation bearing surface by the Departmental Representative before placing concrete.

.4 Remove water and disturbed soil from excavations before placing concrete.

.5 Before placing slab-on-grade, confirm that subgrade and backfill meet specifications and are free of frost and surface water.

.6 Provide bondbreaker under unbonded concrete topping. Attach to base slab, lap min. 150 mm and seal.

.7 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

3.2 Installation/Application

.1 Set sleeves, conduits, pipe hangers, weep hole tubes, drains and other inserts and openings as indicated or specified elsewhere.

.2 Refer to Typical Details and Drawing Notes for placing guidelines, maximum size and minimum spacing of sleeves, embedded pipes and conduits.

.3 Check locations and sizes of sleeves and openings shown on Structural Drawings with Architectural, Mechanical and Electrical Drawings. Notify Departmental Representative of any discrepancies.

.4 Provide composite sleeving drawings showing sleeves required by all trades. Obtain Departmental Representative approval for any required sleeves and openings which are not shown on Structural Drawings.

.5 Set special inserts for strength testing as required for non destructive method of testing concrete.

.6 Set anchor rods using templates under supervision of appropriate trade prior to placing concrete. Locate each anchor rod group to within 6 mm of required location.

.7 Refer to Section 03 10 00 for construction joint requirements.

3.3 Placing Concrete

.1 Place concrete in accordance with CSA A23.1.

.2 Delivery and place concrete with minimum re-handling.

.3 If concrete is pumped or placed pneumatically, control discharge velocity to prevent separation or scattering of concrete mix ingredients.

.4 Place concrete in a continuous operation without cold joints. If cold joints develop inadvertently, notify Departmental Representative to obtain instructions for required remedial work.

.5 Where higher strength concrete needs to be puddled in slabs above columns and walls, place adjacent lower strength slab concrete within 30 minutes of pouring the puddled concrete.

.6 Do not overload forms.

.7 Use rubber tipped vibrators for concrete containing epoxy coated reinforcement.

.8 Cast slabs and beams at least two hours after casting the supporting columns and walls.

.9 Cast slabs with a top surface that is level or sloping as required by the Drawings. Allow for cambering where required.

.10 Where cambered steel beams are used, ensure that slab thickness is as specified. Measure from top of steel to control thickness.

.11 Concrete exposed to view:

.1 Exposed surfaces to be dense, even, uniform in colour, texture and distribution of exposed aggregate.

.2 Defects such as honeycombing, voids, loss of fines, visible flow lines, cold joints or excessive bug holes may be cause for rejection at the discretion of the Departmental Representative.

.12 Maintain accurate records of all poured concrete including extent, date and location of each pour, concrete mix used, ambient air temperature, test samples taken and falsework removal date and mark on a set of Structural Drawings.

3.4 Finishing Concrete

.1 Finish concrete to CSA A23.1/A23.2.

.2 Cooperate with any trade applying finishes to concrete surfaces and provide surfaces which will ensure adequate bond. Provide chases and reglets where required.

.3 Finishing Flatwork:

.1 Protect concrete during finishing process. Use evaporation reducer during severe drying conditions.

.2 Provide final finish in accordance with proposed use and as follows:

.1 Screeded and bull floated for: mud slabs and footings/pile caps.

.2 Wood float finish with brooming for: exterior exposed slabs.

.3 Surface Tolerances:

.1 Concrete surface tolerance to CSA A23.1, F-Number method.

.2 Unless otherwise noted, conform to finish tolerance Class A.

.4 Finishing Formed Surfaces:

.1 Completely fill holes left by through-bolts with grout.

.2 Do not patch surfaces until instructed in writing by Departmental Representative.

.3 Concrete exposed to view:

.1 Provide smooth-form finish.

.2 Rub exposed sharp edges with carborundum to produce 3 mm radius edges unless otherwise indicated.

3.5 Concrete Curing and Protection

.1 At a minimum cure and protect concrete in accordance with CSA A23.1

.2 Extend curing and protection period until concrete has reached following strength levels for structural safety:

.1 Columns, walls, piers and footings: 50% of specified 28 day strength

.3 Cure slab surfaces immediately after finishing is completed. Unless otherwise noted or required, use a curing compound compatible with applied finishes.

.4 Concrete exposed to view:

.1 Protect during construction period from wear, damage, marking, discolouration, staining and becoming coated with concrete leakage.

.2 Unless rejected, repair damage and remove marks and stains to the approval of the Departmental Representative.

.5 Do not load concrete until sufficient strength is developed.

3.6 Slabs on Grade

.1 Construction joints and control joints:

.1 Refer to Notes on Structural Drawings for maximum spacing requirements.

.2 Saw cut control joints to depth equal to one quarter of the concrete thickness u/n.

.3 Protect edges of sawcuts from breakage.

.4 Clean out sawcuts in concrete exposed to view or vehicle traffic and fill with control joint filler after concrete is at least 120 days old.

.5 Sawcut top 25 mm at construction joints in exposed concrete for a width of 5 mm and fill with control joint filler after concrete is at least 120 days old. Alternatively, form construction joint with a 5mm thick chamfer strip at top. Depth of the strip to be at least equal to ¼ of slab thickness.

.6 Clean out sawcuts in other concrete and fill with a sand-cement paste one month prior to installing floor coverings.

.2 Cracks in Slabs-on-Grade:

.1 Extensive cracking of slabs-on-grade or cracks in excess of 3 mm in width may be cause for rejection of slab or portion of slab at the Architect's discretion.

.2 Protect edges of cracks in slabs-on-grade from breakage.

.3 Exposed slab on grade: Unless slab is rejected, repair cracks that are over 0.4mm wide:

.1 Fill cracks with a sand-cement grout after concrete is at least 120 days old.

.2 Seven days later, cut out top 20 mm of crack for a width of 5 mm and fill with control joint filler.

3.7 Penetrating sealer

.1 Concrete to receive penetrating sealer to be at least 28 days old.

.2 Surfaces to be treated with the sealer to be dry and free of dirt and other contaminants.

.3 Completely remove all curing compounds before the sealer application.

.4 Follow manufacturer's recommendations for coverage rate and application procedure.

.5 Do not apply in inclement weather or if ambient air temperature or concrete surface temperature is less than 5ºC or more than 38ºC.

3.8 Grouting Under Base Plates and Bearing Plates

.1 Grout under base plates and bearing plates using procedures in accordance with manufacturer's recommendations.

.2 Provide 100% contact over grouted area.

.3 Grout column base plates and beam bearing plates as soon as steelwork is completed.

.4 Do not add load on steelwork until grouting is completed and grout strength has reached at least 20 MPa.

3.9 Existing Structure

.1 Take precautions to protect the existing structure from damage.

.2 Provide temporary shoring and bracing as required.

.3 Retain a Professional Engineer to design the temporary shoring and bracing and to review this work on site.

3.10 Inspection and Testing:

.1 An independent Inspection and Testing Agency (certified under CSA A283 with category to suit testing provided) will be appointed to carry out inspection and testing of concrete and concrete materials and check conformance with applicable Standards and Contract documents.

.2 Assist the Inspection and Testing Agency in its work. Notify as to the Work Schedule and provide safe access to the work area as required. Provide concrete samples.

.3 The Agency will submit reports covering the work inspected and the testing performed. The reports will include the Supplier’s mix design numbers, locations in structure to which the tests relate and comments on abnormal results and conditions. The reports will be provided not later than five working days after the testing is completed.

.4 Sampling, storing, curing and testing of concrete will be in accordance with CSA A23.1/A23.2.

.5 The Agency will review all submittals pertaining to concrete mix designs and certification of plant, equipment and materials.

.6 The Agency will measure slab surface tolerances (flatness and levelness) using the F-Number system in accordance with ASTM E1155M. Measurements to be made a maximum of 72 hours after every slab pour.

.7 Compressive Strength Testing:

.1 One test is required for each 100 cubic meters of placed concrete, but not less than one test for each concrete mix placed each day. At least 3 tests are required for each class of concrete used.

.2 A group of three cylinders for each test will be provided, Location of concrete placement will be recorded for each cylinder set. One specimens will be tested at 7 and one at 28 days. The third specimen will be tested at 56 days if the required strength at 28 days is not achieved.

.3 One additional cylinder will be provided for each concrete mix during cold weather concreting. The specimens will be cured on site adjacent to and under the same conditions as the work they represent, and will be tested prior to form removal.

.4 If standard on site cured cylinders are used to determine concrete strength prior to removal of formwork, they will be kept adjacent to and under the same conditions as the work they represent.

.8 Air Entrainment Testing:

.1 One standard test for air content in plastic concrete will be conducted for each 100 cubic meters of each air entrained concrete mix.

.2 One standard test per ASTM C457 will be conducted to determine air void spacing factor in hardened concrete for each 100 cubic meters each air entrained concrete mix.

.9 Permeability Testing:

.1 One chloride ion permeability test will be conducted for each 100 cubic meters of all class C-1, A-1 and C-XL concrete mixes used for floor and roof slabs and for salt water pools.

.10 Grout Testing

.1 One standard test per ASTM C1107 will be made each day when concrete grout is installed under base plates.

.2 A group of 6 cubes for each test will be provided. 3 cubes will be tested after 7 days, and 3 after 28 days.

.11 Inspection and testing by the Agency will not augment or replace the Contractor's quality control nor relieve him of his contractual responsibility.

END OF SECTION 03 30 00

PART 1 - GENERAL

1.1 Related Requirements

.1 Section 03 30 00: Cast in Place Concrete.

.2 Section 05 31 00: Steel Decking.

1.2 References

.1 All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.

.2 Canadian Standards Association (CSA International):

.1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CSA S16, Limit States Design of Steel Structures.

.3 CSA W47.1, Certification of Companies for Fusion Welding of Steel.

.4 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.

.5 CSA W55, Certification of Companies for Resistance Welding of Steel and Aluminum.

.6 CSA W59, Welded Steel Construction (Metal Arc Welding).

.7 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.

.3 ASTM International Inc.:

.1 ASTM A123/A123M, Standard Specification for Zinc (Hot Dip Galvanized) coating on Iron and Steel Products.

.2 ASTM A36/A36M, Standard Specification for Carbon Structural Steel.

.3 ASTM F3125/F3125M, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 830 MPa and 1040 MPa Minimum Tensile Strength, Inch and Metric dimensions

.4 ASTM A1085/A1085M, Standard Specification for Cold Formed Welded Carbon Steel Hollow Structural Sections (HSS)

.5 ASTM A992, Standard Specifications for Structural Steel Shapes.

.6 ASTM F1554, Standard Specification for Anchor Bolts, Steel 36, 55 and 725 MPa Yield Strength.

.4 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA):

.1 CISC Handbook of Steel Construction.

.2 CISC/CPMA Standard 1-73a, A Quick-drying One-coat Paint for Use on Structural Steel.

.3 CISC/CPMA Standard 2-75, Quick-drying Primer for Use on Structural Steel.

.4 CISC Code of Standard Practice, Appendix I, Architecturally Exposed Structural Steel (AESS).

.5 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International:

.1 SSPC-SP 1, Solvent Cleaning.

.2 NACE No. 3 / SSPC-SP 6, Commercial Blast Cleaning.

.3 NACE No.4 / SSPC-SP 7, Brush Off Blast Cleaning.

.4 NACE No.2 / SSPC-SP 10, Near White Blast Cleaning.

.5 SSPC Technology Guide No.14 – Guide for the Repair of Imperfections in Galvanized, Organic or Inorganic Zinc-Coated Steel Using Organic Zinc Rich Coating.

.6 SSPC Paint Specification No. 20 – Zinc Rich Coating, Type I – Inorganic and Type II - Organic.

1.3 Quality Assurance

.1 In accordance with Section 01 43 00 – Quality Assurance.

.2 Qualifications

.1 Structural steel fabricator to be a member of the Canadian Institute of Steel Construction and to have at least five year experience with structural steel for buildings.

.2 Structural steel fabricator and erector to be certified by the Canadian Welding Bureau under the requirements of CSA W47.1, Division 1 or 2 for fusion welding and/or CSA W55.3 for resistance welding of structural steel components, and to have CWB approved procedure for welding rebar (Grade 400W) to structural steel.

.3 Welders to be CWB approved, working under supervision of a CWB approved firm.

.4 Engage a Professional Engineer licensed in the place where the project is located to be responsible for design, detailing and installation of all connections related to structural steel work where not detailed on the structural drawings.

.5 The Professional Engineer designing connections to hold a Certificate of Authorization, and to carry min. $1,000,000.00 in liability insurance (per occurrence).

1.4 Quality Control

.1 Submit in accordance with Section 01 45 00 – Quality Control.

.2 Source Quality Control Submittals:

.1 Provide all submittals 4 weeks prior to starting fabrication of structural steel.

.2 Mill test reports:

.1 Mill test reports to include ladle analysis and physical test results, and to show chemical and physical properties and other details of steel to be incorporated in project.

.2 The reports to be correlated to the materials or products to which they pertain

.3 In addition to mill testing, each batch of structural steel (including bolts) manufactured outside United States, Canada, Great Britain and EU countries must also be tested in Canada by an ISO 17025 certified testing laboratory. In addition to compliance with all the relevant CSA and ASTM requirements, the testing must show that the maximum boron content in structural steel does not exceed 0.0008%.

.3 Tolerances

.1 Conform to the fabrication and erection tolerances of CAN/CSA S16.

.2 Comply with more stringent tolerances if specified elsewhere to suit interfacing materials or AESS members

1.5 Action and Informational Submittals

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

.2 Shop Drawings:

.1 Provide drawings stamped and signed by the Professional Engineer responsible for steel connections where connections are not detailed on the structural drawings.

.2 Before submitting shop drawings, provide a letter signed and sealed by that Engineer stating that he has been engaged to undertake the responsibility for the above. Also submit a copy of that Engineer's Certificate of Authorization, and proof of his liability insurance.

.3 If additional information is required from Departmental Representative allow a minimum of five working days for review and response to the request for information.

.4 It is advisable to submit erection diagrams for review before preparing shop details. Copies of plans and section details developed by the Engineer will not be accepted as erection diagrams.

.3 Erection drawings:

.1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:

.1 Description of erection methods.

.2 Sequence of erection.

.3 Temporary bracings.

.4 Beam sizes (in addition to beam marks).

.5 Connections where threads must be excluded from shear plane.

.6 Details of all field welded connections

.7 Sliding bearing assemblies.

.8 Members which are considered AESS and their category.

.9 Type and finish of bolts in AESS connections.

.10 Side where bolt heads should be placed in AESS connections.

.11 Weld grinding, finish and profile in AESS field connections.

.2 Provide setting drawings showing dimensions and details for placing steel assemblies which are set in concrete,

.4 Fabrication drawings:

.1 Submit fabrication drawings showing designed assemblies, member sizes, components and connections. Show on drawings:

.1 Material specifications.

.2 Surface preparation.

.3 Shop painting / galvanizing.

.4 Section splices.

.5 Types of shop and field connections.

.6 Net weld lengths.

.7 Precautions which will be taken to exclude threads from shear planes of bearing type bolted connections (where applicable).

.8 Vent holes required for galvanizing process.

.9 Architectural clearance lines and finishes where connections could encroach other works.

.10 Beam and column web holes required for services and reinforcing around them.

.2 Substitution of alternative sections will only be allowed provided the new members have equal or greater capacity and stiffness and their dimensions are approved by Departmental Representative.

.5 When requested, submit sketches and design calculations stamped and signed by the Professional Engineer responsible for connection design.

.6 Provide technical specifications for all sliding bearing assemblies.

.7 On completion of erection, submit a letter signed and sealed by the Professional Engineer responsible for structural steel connections certifying that the work has been completed in accordance with all contract documents.

PART 2 - PRODUCTS

2.1 Design and Detailing Requirements

.1 Design details and connections in accordance with requirements of CSA S16 and CSA S136 to resist forces and to allow for movements indicated. Consider load effects due to fabrication, erection and handling.

.2 Connection design to include consideration of all pass-through forces, including tension, compression, moment and shear. Provide local reinforcement at connection or joint as required.

.3 Follow conceptual connection details if shown on structural drawings. Do not change without Departmental Representative written approval. If welds are defined on drawings, the sizes shown are minimum requirements which might need to be increased to suit connection design.

.4 Increase specified section thickness at no extra cost if required for fabrication (bending) or galvanizing. Alternatively, build up curved sections from plates.

.5 Assume that bolt threads are intercepted by shear plane, unless special measures are indicated on shop drawings to exclude threads from shear plane.

.6 Beams:

.1 Select beam end connections from CISC "Handbook of Steel Construction" when connection for shear only (standard connection) is required.

.2 Typical beam to spandrel beam and beam to column connections to be two sided or end plate connections.

.3 Select or design beam end connections for factored shear indicated on plans.

.4 When shears are not indicated, select or design non composite beam end connections to resist reaction due to maximum uniformly distributed load capacity of the beam in bending.

.5 Where axial forces occur in beams framing to opposite sides of a supporting member, design connections for a pass-through force equal to the smaller axial force. If beam sizes differ, assume the axial force is centred in the smaller beam.

.6 Where axial forces occur in beams framing into columns, connect each beam for the axial force shown.

.7 Where no axial force is shown for beam to column connection, design to resist horizontal tension / compression equivalent to 2% of the factored axial force in column, in addition to all other loads.

.8 Seated beam connections to have top clip angles.

.9 End bearing connections of inclined members to have horizontal bearing plane at supported member.

.10 Extend beams bearing on walls for the full length of bearing plates.

.11 For beams continuous over supports and for beams supporting columns, provide min. 6 mm (1/4”) stiffener plates at each side of web at point of concentrated load, unless thicker stiffeners are required by connection design or different details are shown on drawings.

.7 Columns:

.1 In addition to all other loads, connect columns to base plates to transfer horizontal load equal to 2% of the column vertical load.

.2 In addition to all other loads, connect columns to base plates to transfer tensile load equal to the capacity of all anchor bolts,

.3 Provide seat angles for joist support at sides of columns continuous through floor.

.4 Provide connection for tie joist bottom chord at all columns supporting joists; coordinate with joist supplier.

.5 Provide diagonal or cantilevered angles at sides of columns where required to support deck or slab.

.6 Provide cap plates at tops of columns where required for support of deck, slab, joists, beams or roof anchors.

.8 Holes:

.1 Where holes for services are required through webs of beams or columns, coordinate size and location with Architectural, Mechanical and Electrical drawings, and show on fabrication drawings. Reinforce in accordance with Typical Detail. Alternatively, design reinforcing in accordance with the procedure set forth in the CISC Handbook of Steel Construction, and provide calculations for Departmental Representative review.

.2 Provide 16 mm diameter weep holes in base plates of HSS columns which are not made watertight.

.3 Provide vent holes in HSS sections where required for galvanizing process. Locate so that any water inside HSS will drain away when HSS is in its final position. Maximum size – 16 mm diameter. Fill holes with vent hole plugs after galvanizing.

.4 Provide 19 mm dia. vent holes at centerline of all cast in plates supporting columns.

.9 Provide slotted holes long enough to allow for deflection indicated on drawings plus construction tolerance, assuming bolts are centred in slots. Bolts are to be finger-tight with burred threads to allow for movement during the life of structure without bolts loosening.

.10 Do not oversize anchor rod holes for site tolerances. Use hole sizes suggested in the CISC Handbook of Steel Construction.

.11 Provide closure plates for all exposed and for all exterior tubular members.

.12 Design sliding bearing assemblies to accommodate forces and movements shown on drawings.

2.2 Materials

.1 Structural steel:

.1 Rolled shapes: to CSA G40.21, refer to drawings.

.2 Hollow structural sections: to ASTM A500, ASTM A1085 or CSA G40.21, refer to drawings.

.3 Structural pipe: to ASTM A53.

.2 Anchor rods: CSA G40.21, or ASTM 1554, refer to drawings.

.3 Bolts, nuts and washers: to ASTM F3125, grade A325.

.4 Load indicating washers: to ASTM F959.

.5 Weldable reinforcing steel: to CSA G30.18, deformed bars.

.6 Grating: Galvanized safety grating. Minimum thickness of material 2 mm. Banded ends. Bolted connections. Capacity 4.8 kPa unless noted otherwise on drawings. Maximum deflection 1/180th of span.

.7 Checker plate: to CSA G40.21, Grade 300W. Plate with rolled-in embossments to provide non-slip surface.

.8 Welding materials: to CSA W48 and CSA W59, certified by Canadian Welding Bureau. For members in seismic force resisting system, refer to additional brittleness requirements in CSA S16.

.9 Shop paint: to CISC/CPMA 1-73a.

.10 Shop paint primer: to CISC/CPMA 2-75, solvent reducible alkyd, red oxide, compatible with specified topcoat.

.11 Zinc-rich coating: to SSPC Paint Specification No.20, compatible with top coat (where specified).

.12 Hot dip galvanizing: to ASTM A123/A123M, minimum zinc coating of 600 g/m².

.13 Epoxy coating: pre-mixed, 2 components, high-solids (volume of solids 87 ±3%), self-priming,

.14 Headed studs: to CSA W59, Type B, min. Fy=350 MPa

.15 Joint filler for exposed steelwork: Epoxy resin.

.16 Sliding bearing assembly: Galvanized top steel plate with a type 304 stainless steel highly polished lower surface and bottom elastomeric pad with a polytetrafluoroethylene (Teflon) upper surface, wrapped in water tight polyethylene wrapping. Static and kinetic coefficients of friction not to exceed 5% under working stress. Assembly to have a working stress capacity of min. MPa on the lower pad. Elastomeric bottom pad to allow a 2% rotation of upper plate and still maintain a substantially uniform bearing pressure between plate and pad. Alternative sliding bearing assembly may be proposed for review by Departmental Representative.

.17 Elastomeric bearing pad: Virgin natural polyisoprene or virgin polychloroprene (Neoprene) conforming to CSA S6..

2.3 Fabrication

.1 Fabricate structural steel in accordance with CSA S16 and with reviewed shop drawings.

.2 Continuously seal hollow members exposed to weather by intermittent welds and plastic filler unless continuous welds are indicated on drawings.

.3 Position beams having permissible mill camber so that the camber is up.

.4 Install stud anchors in shop with end welds in accordance with the recommendations of the stud manufacturer. Lengths of studs given on drawings are the lengths after welding. Replace studs that crack in the weld or shank.

.5 HSS members which require galvanizing to either be per CSA G40.21, grade 350W, Class H, or to be stress relieved prior to galvanizing.

.6 Mill column bearing plates as required to provide full contact bearing and develop column bearing strength.

.7 Complete welded shop connections prior to galvanizing.

.8 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left unpainted, place marking at locations not visible from exterior.

.9 Match marking: shop mark bearing assemblies and splices for fit and match.

2.4 Shop Painting

.1 Clean all members to SSPC-SP 1 – Solvent Cleaning, Remove loose mill scale, rust, oil, dirt and foreign matter using any suitable method.

.2 In addition for members receiving shop primer paint: Clean steel to SSPC-SP 7 Brush-Off Blast Cleaning.

.3 Apply galvanizing in the shop to all structural steel.

.1 Exposed anchor rods.

.2 Other steel noted on drawings.

.4 If galvanized steel is to be painted, use only non passivated galvanizing process (without chromate coating).

.5 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5ºC.

.6 Maintain dry condition and 5ºC minimum temperature until paint is thoroughly dry.

.7 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

PART 3 - EXECUTION

3.1 General

.1 Structural steel work: in accordance with CSA S16.

.2 Welding: in accordance with CSA W59.

3.2 Erection

.1 Erect structural steel in accordance with CSA S16 and reviewed erection drawings.

.2 Do not field cut or alter any members without Departmental Representative approval.

.3 Make adequate provision for all loads acting on the structure during erection. Provide erection bracing to keep the structure stable, plumb and in true alignment during construction. Bracing members or connections shown on Structural Drawings are those required for the completed structure, and may not be sufficient for erection purposes. For load bearing masonry construction, maintain bracing until completion of masonry work and floor / roof decks which together provide permanent bracing. Do not remove erection bracings without written approval from the Engineer who designed it.

.4 Steel framing to be plumb at temperature of 20°C. If erection is carried out at temperatures greatly differing from 20°C, make adequate provisions; some members may need to be +erected out of plumb in order to become plumb when the temperature stabilizes at 20°C.

.5 Set column base plates to the elevation required for grouting using steel shims or leveling screws attached to sides of base plates. Do not fasten leveling nuts to anchor rods. Alternatively, for base plates equal or smaller than 350 mm x 350 mm, leveling plates set with grout and level to within 1.5 mm across the plate can be used. Do not erect columns upon plates exceeding this tolerance. Lift base plates for inspection when directed.

.6 Grout under column base plates and beam bearing plates as soon as steelwork is completed. Do not add load on steelwork until grouting is completed and grout strength has reached at least 20 MPa.

.7 Do not make permanent connections until structure has been properly aligned.

.8 Install bolts which are not pre-tensioned to be snug tight.

.9 Install bolts in pre-tensioned connections using turn-of-nut method.

.10 Where slotted connections are shown on structural drawings, finger tighten bolts to a snug fit and burr threads to prevent nuts from working loose.

.11 Apply dry lubricant to threads of all galvanized bolts prior to installation.

.12 Weld beams to bearing plates unless otherwise noted on drawings.

.13 Adjust and finalize connections at wall supporting elements affected by floor beam deflections after concrete is poured.

.14 Provide dissimilar metal separators at connections between aluminum members and structural steel.

.15 Report ill-fitting connections to Departmental Representative before taking corrective measures.

.16 When welding after galvanizing is in place, grind away galvanizing at areas to be welded.

.17 Do not weld in an ambient temperature below -17ºC. Preheat material adjacent to welding areas when ambient temperature is between -17ºC and +4ºC.

.18 Remove slag from all completed welds so that they may be visually inspected.

.19 Seal members by continuous welds where indicated.

.20 Remove field connection aids from all surfaces which will be exposed to view and where interfering with clearances required by other trades.

3.3 Field Painting

.1 Paint in accordance with Section 09 91 00 - Painting

.2 Touch up damaged surfaces with the same paint as the shop coat.

.3 Repair any galvanized or zinc rich painted surfaces which have been damaged or field welded in accordance with SSPC Technology Guide No.14.

.4 Clean and prepare surfaces of bolts, which will receive a finished coat of paint in the same manner as the connected steelwork.

.5 Clean non galvanized steel surfaces which will be in contact with ground to SSPC SP-3 (Power Tool Cleaning) and apply two coats of epoxy paint to achieve dry film thickness between 0.20 mm and 0.35 mm.

3.4 Inspection and testing:

.1 An Inspection and Testing Agency (certified to CSA W178.1 & 2) will be appointed to carry inspection and testing of all structural steel.

.2 Do not commence fabrication until details of inspection have been worked out with the Agency.

.3 Assist the Inspection and Testing Agency in its work. Notify as to the Work Schedule and provide safe access to the work area as required.

.4 The Inspection Agency will submit reports to the Departmental Representative covering the Work inspected and provide details of errors or deficiencies observed.

.5 Work will be inspected in shop and when erected. Store fabricated members in shop so that they are accessible for inspection.

.6 Provide Inspection and Testing Agency with a copy of reviewed shop drawings.

.7 Welding inspection:

.1 Welding inspection will be conducted in shop and in field.

.2 The Inspector will check welders' CWB certification.

.3 The Inspector will review welding procedures for conformance with CWB requirements, manufacturers' requirements and standard practice.

.4 Arrange for the Inspector to be present during welding of and 10% of butt welds in direct tension.

.5 The inspector will visually check all welds at plate girders, all butt welds (including cranks and splices), all welds in moment connections, all welds at crane columns and crane girders, all welds of roof anchors to the base structure, 50% of welds in hanger connections and 20% of all other welds for:

.1 Size, length and profile

.2 Joint preparation, including cleaning and removal of any paint.

.3 Fit up and alignment.

.4 Penetration and fusion.

.5 Slag removal.

.6 Distortion.

.7 Porosity.

.8 Cracks.

.6 Test results will be evaluated in accordance with CSA W59.

.8 Shop inspection will include:

.1 Confirming that all materials meet specifications.

.2 Reviewing mill test reports for conformance with specified material grades.

.3 Checking that mill test reports and producer's certificates are properly correlated to materials and products supplied for the project and that legible markings were made on the material and products by the producers in accordance with the applicable standards. Where this is not possible, Departmental Representative may request sample testing to be carried out as described below.

.4 Checking fabricator's qualification under the requirement of CSA W47

.5 Sampling fabrication procedures for general conformity with Contract requirements.

.6 Reviewing cambering procedure for effect on member capacity.

.7 Checking surface preparation for members to be painted.

.8 Checking shop painting and galvanizing.

.9 General checking:

.1 Dimensions and cross sections in relation to specified member sizes.

.2 Allowable mill sweep and camber.

.3 Locations of all holes, cuts and fittings.

.4 Reinforcement of openings.

.5 Milling of ends for bearing.

.6 Base plate orientation.

.7 Items to be cast in concrete.

.8 Fabrication tolerances.

.9 Splicing (where indicated on drawings).

.10 Cambering.

.11 Surface preparation prior to shop painting.

.12 Compliance with AESS requirements.

.10 Sample testing: When requested, test coupons will be taken and tested in accordance with CSA G40.20 to establish identification. Cut samples from member locations selected by Departmental Representative and provide to the Inspection and Testing Agency. Make good the locations if requested, at no extra cost, by adding new plates and welds acceptable to Departmental Representative. The Agency will have the samples tested for mechanical properties and for chemical composition and will classify the steel as to specification.

.9 Field inspection:

.1 Arrange for the Inspector to start field inspection as soon as each section of the Work is completed, plumbed, bolts tightened and field welding finished.

.2 The Inspector will sample erection procedures for general conformity with Contract requirements.

.3 The Inspector will check general fit-up and tolerances and report any apparent distortions and misalignments.

.4 Minimum 10% of columns and 10% of beams will be checked by instruments for plumbness, alignment and elevation.

.5 Field inspection will include:

.1 Checking individual frame members for twisting, sweep and local damage.

.2 Checking levelness of leveling plates.

.3 Inspection of grouting under base plates and bearing plates.

.4 Checking column bearings on cast in plates.

.5 Checking bearings on steel and masonry.

.6 Inspection of sliding bearings.

.7 Inspection of bolting, shear studs and post installed anchors as described below.

.8 Checking installation of permanent bracings and nominal tension in finished building (where specified).

.9 Checking truss permanent bridging and end connections.

.10 Checking that column connections are adjusted to keep the columns plumb after supported structure has deflected due to dead loads applied to floor and roof deck.

.11 Checking that all adjustable connections at wall supporting members have been finalized after concrete is poured.

.12 Inspection of approved field cutting and reinforcing around openings.

.13 Inspection of field painting.

.14 Inspection of field touch-up.

.6 Bolting inspection:

.1 The Inspector will visually check all bolts in bearing connections. Where erection drawings indicate bolts with threads excluded from the shear plane, he will remove nuts from 1% of all bearing bolts and check that thread is excluded from the shear planes.

.2 The Inspector will check that surfaces in slip- critical connections are free from paint and other deleterious substances

.7 Shear stud inspection:

.1 The Inspector will visually check all stud shear connectors on composite steel beams.

.2 At least on stud in every 150 and all studs which do not have a complete end weld, which are repaired by welding or which show less than the normal reduction in height due to welding will be bent 15 degrees from their axis towards the nearest support, as specified in CSA-W.

.3 Bent studs that show no sign of failure will be accepted and shall remain in the bent position. Studs that crack in weld, base metal or shank will be rejected. Studs with end welds covering less than 85% of the perimeter will be rejected even if they pass the bend test.

.8 Post installed anchor inspection:

.1 The Inspector will sample check drilled concrete and masonry anchors.

.2 The Inspector will provide full time inspection during installation of post installed adhesive anchors subject to sustained tension loads.

.3 The Inspector will randomly select and pull test 5% of all types and sizes of post installed anchors installed on a weekly basis, but not less than one anchor of each type, size and orientation. Pull test to twice the allowable tensile load, or 1.5 times the factored resistance of the anchor given by the manufacturer. Chose anchor locations where proximity to concrete edge does not affect anchor capacity, or use reduced anchor loads per manufacturer's recommendation. Submit reports to Departmental Representative within one week of testing. Reports to indicate each anchor location, test load and mode of failure, if applicable. Notify Departmental Representative immediately if any anchor fails the pull test.

END OF SECTION 05 12 23

PART 1 - GENERAL

1.1 Related RequirementsS

.1 Section 03 20 00: Concrete Reinforcing.

.2 Section 03 30 00: Cast in Place Concrete.

.3 Section 05 12 23: Structural Steel for Buildings.

1.2 References

.1 All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.

.2 Canadian Standards Association (CSA International):

.1 CSA S136, North American Specification for the Design of Cold Formed Steel Structural Members.

.2 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.3 CSA W55, Certification of Companies for Resistance Welding of Steel and Aluminum.

.4 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.

.5 CSA W59, Welded Steel Construction, (Metal Arc Welding).

.3 ASTM International Inc.:

.1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A792/A792M, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.4 Canadian Sheet Steel Building Institute (CSSBI):

.1 CSSBI 10M, Standard for Steel Roof Deck.

.2 CSSBI 12M, Standard for Composite Steel Deck.

1.3 Quality Assurance

.1 In accordance with Section 01 43 00 – Quality Assurance.

1.4 Action and Informational Submittals

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

.2 Product Data:

.1 Submit manufacturer's data sheets for each deck type.

.2 Submit product data confirming capacity of mechanical fasteners to resist uplift, shear and corrosion and compliance.

.3 Shop Drawings:

.1 Show on drawings:

.1 Deck layout.

.2 Deck profile and base steel thickness.

.3 Type of deck metallic coating. Indicate deck which is to be painted on site.

.4 Type and spacing of connections to supports and between sheets.

.5 Projections and openings.

.6 Reinforcement details and accessories.

PART 2 - PRODUCTS

2.1 Design and Detailing Requirements

.1 Design loads, deck depths and core nominal thicknesses are shown on Structural Drawings. Chose deck profile, design connections and detail in accordance with CSA S136, CSSBI 10M and CSSBI 12M and to satisfy requirements of any Fire Rated Assembly Design specified for the Project.

.2 If increased wind uplift loads applicable at roof edges and corners are not specifically noted on Structural Drawings, increase the minimum design wind uplift shown (which is applicable in the zones away from roof edges) in accordance with the User's Guide to NBC – Structural Commentaries (Part 4 of Division B).

.3 Unless otherwise noted on drawings, floor deck to carry weight of wet concrete and appropriate construction load allowance without shoring.

.4 Deflection limitations for roof deck:

.1 1/360 of span under specified live load.

.2 1/240 of span under total load.

.5 Deflection limitations for floor deck:

.1 1/360 of span under live load.

.2 1/480 of span long term (under live load, superimposed dead load, shrinkage and creep).

.6 Make deck sheets continuous over 3 spans wherever possible. Combine triple span and double span sheets to suite multi span deck layouts. Use single span sheets only where single span condition is shown on drawings.

.7 Design reinforcement for roof deck openings up to 450 mm wide across flutes.

2.2 Materials

.1 Galvanized deck: Zinc (Z) coated steel sheet to ASTM A653/A653M, structural quality Grade 230, with Z275, coating or aluminum-zinc alloy (AZ) coated steel sheet to ASTM A792/A792M, structural quality grade 230 with AZ 150 coating.

.2 Fasteners for galvanized deck and prefinished deck: coated or stainless steel, hex head, self-tapping screws with EPDM bonded washers.

.3 Powder-actuated fasteners: Hilti Decking Fastening System.

.4 Cover plates, closures, pour stops, edge strips, flashings and deck reinforcing: steel sheet with minimum base steel thickness of 0.91 mm. Metallic coating same as deck material.

2.3 Types of Decking

.1 Roof deck: with interlocking or overlapping side joints. Centre to centre rib spacing to

be: .1 150 mm for 38 mm deep deck

.2 Where roof deck fastening pattern is specified on drawings, use deck with flute spacing which can accommodate the specified pattern.

.3 Composite floor deck: embossed fluted profile, interlocking or overlapping side laps. Centre to centre rib spacing to be:

.1 150 mm for 38 mm deep deck.

.4 Use only decks with overlapping side joints where side lap connections need to be screwed or where multiple deck layers are specified.

2.4 Fabrication

.1 Conform to CSA S136 and CSA W59.

.2 Fabricate sections from steel sheets by rolling. Form integral ribs which will bear on supports and form interlocking male and female side laps.

PART 3 - EXECUTION

3.1 General

.1 Structural steel work: in accordance with CSA S136, CSSBI 10M and CSSBI 12M.

.2 Welding: in accordance with CSA W59, except where specified otherwise.

3.2 Examination

.1 Verification of Conditions: verify that conditions of substrates previously installed under other Sections or Contracts are acceptable for steel decking installation.

.1 Visually inspect substrate.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.3 Erection

.1 Erect steel deck in accordance with CSA S136, CSSBI 10M, CSSBI 12M, and reviewed shop drawings.

.2 Do not overload structure during erection. Place deck bundles near columns.

.3 Align deck end to end for accurate fit with corresponding sections. Sections to be parallel, even and straight.

.4 Locate deck rib directly over perimeter steel beams spanning parallel to deck and at same elevation as underside of deck.

.5 Lap over supports. Minimum lap 50 mm, maximum lap 100 mm.

.6 For exposed deck end laps, do not extend lower deck sheet past the face of the supports.

.7 Exercise particular care in erection of exposed deck. Sections which are dented, damaged or perforated by welding will be rejected.

.8 Connections

.1 Use connections specified on reviewed shop drawings, to suite uplift, diaphragm shear, requirements of any Fire Rated Assembly Design.

.2 Connect deck to all supporting beams and perimeter beams. Interconnect sheets at side laps.

.3 Use coated or stainless steel fasteners for all prefinished and galvanized deck, as well as for decks at steep slopes. Side laps for prefinished or galvanized deck to be mechanically interlocked.

.4 Predrill holes for screws connecting deck to timber beams. Screws shall tap metal and extend into wood, clamping deck to wood.

.5 Fasten stud shear connectors to composite beams by welding to beams (through deck where necessary) with a full 360 degrees weld capable of developing 120% of the shear values listed in CAN/CSA S16. Fastening procedure to conform to the recommendations of the stud manufacturer. Test the first two studs installed each day in accordance with CSA W59. Maintain record of the studs tested. Replace studs rejected by Inspection and Testing Agency.

.9 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.

.10 Prior to concrete placement, steel deck to be free of soil, debris, standing water, lose mil scale and other foreign matter.

.11 Apply spray paint to deck immediately above the protected zones which are indicated on structural steel members by contrasting shop paint. Do not attach studs nor powder actuated fasteners to these zones. Only acceptable deck fasteners within the protected zones are 19 mm (3/4") puddle welds. If any other fasteners are used, the affected structural steel members will have to be removed and replaced.

.12 Closures and Accessories

.1 Provide all required edge stiffeners, closures, reinforcing sheet steel and flashing.

.2 Reinforce edge of free spanning deck with channel shaped edge strip..

.3 Provide pour stops for concrete slabs over deck. Fasten to deck.

.4 Provide flashing at columns and points of discontinuity to prevent leakage when concrete is placed over deck.

.13 Openings

.1 Structural Drawings do not show all openings required. Refer also to Architectural, Mechanical and Electrical drawings.

.2 Cut all opening required by other trades.

.3 Reinforce roof deck openings up to 450 mm across flutes. Maximum size of unreinforced openings not to exceed 150 mm

.14 Protect existing works. Repair damage to adjacent materials caused by steel decking installation.

.15 Protect installed products and components from damage during construction.

.16 Temporary shoring, if required, not to be removed until concrete attains 75% of its specified 28 day compression strength.

3.4 Inspection and testing:

.1 Departmental Representative will carry out inspection and testing of steel decks and check conformance with Contract documents and reviewed shop drawings.

.2 Notify Departmental Representative when the deck is ready for inspection and provide safe access to the work area.

.1 Consultant will submit reports to, Contractor and Departmental Representative covering the Work inspected and provide details of errors or deficiencies observed.

.2 Inspection will include:

.1 Checking that mill test reports are properly correlated to materials.

.2 Confirming that all materials meet specifications.

.3 Checking deck types, gauge and coating thicknesses.

.4 Checking all fastening, side laps and button punching.

.5 Checking deck reinforcement at holes cut in deck.

.6 Checking installation of sheet metal strips and edge reinforcing.

.7 Checking deck bearing lengths at supporting members.

.8 Checking appearance of exposed steel deck.

END OF SECTION 05 31 00

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 - Cast-in-Place Concrete.

.2 Section 06 10 00 - Rough Carpentry.

.3 Section 07 52 00 - Modified Bituminous Membrane Roofing.

.4 Section 07 62 00 - Sheet Metal Flashing and Trim.

1.2 REFERENCES

.1 ASTM International

.1 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A269-08, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.3 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 CSA International

.1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CSA S16-09, Design of Steel Structures.

.4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).

.5 CSA W59-M03(R2008), Welded Steel Construction (Metal Arc Welding) Metric.

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

.1 Material Safety Data Sheets (MSDS).

.4 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual - current edition.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for sections, plates, pipe, tubing and bolts and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit copies of WHMIS MSDS in accordance with Section 01 35 30 - Health and Safety Requirements

.1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.

.3 Shop Drawings:

.1 Submit drawings for guardrails stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.

.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.4 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Leave protective coverings in place until final cleaning of the building.

Part 2 Products

2.1 MATERIALS

.1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W.

.2 Steel pipe: to ASTM A53/A53M standard weight black galvanized finish.

.3 Welding materials: to CSA W59.

.4 Welding electrodes: to CSA W48 Series.

.5 Bolts and anchor bolts: to ASTM A307. Stainless steel alloy at exposed-to-view exterior applications, galvanized at concealed exterior applications

.6 Screws, lag bolts: purpose-made to suit applications, stainless steel alloy at exposed-to-view exterior applications, galvanized at concealed exterior applications.

.7 Nuts, washers: stainless steel alloy for exterior exposed-to-view applications, galvanized at concealed exterior applications.

.8 Shop coat primer: to CAN/CGSB-1.40.

.9 Ladders: ANSI A14.3.

2.2 FABRICATION

.1 Fabricate in accordance with approved shop drawings.

.2 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

.5 Remove welding slag and spatter. Grind smooth all sharp edges and welds.

.6 Unless otherwise detailed, fabricate pipe railing assemblies generally as follows:

.1 Fit round steel caps, full welded in place, at exposed ends and terminations.

.2 Allow minimum 38 mm to maximum 50 mm clearance between railings and wall surfaces.

.3 Use pipe inserts to join railing sections together at joints.

.4 Fabricate railing and post assemblies in as large a size as possible before hot dip galvanizing to minimize on site welding.

.7 Remove all rust, scale, oil and other foreign substances by wire brush, sand blasting or any other means which provides clean steel surfaces for first class smooth permanent paint finishes and galvanized coatings.

2.3 FINISHES

.1 Galvanizing of scheduled items:

.1 Do galvanizing after assembly fabrication. Do not alter metal fabrications after galvanizing.

.2 Hot dip galvanize items with not less than 600 g/m^2 zinc coating, to CAN/CSA-G164.

2.4 PIPE RAILINGS AND GUARDS

.1 Steel pipe: 38 mm nominal outside diameter, formed to shapes and sizes as indicated.

.2 Fabricate rooftop railing, posts and brackets and saddles for attachment of posts to sleepers set into rooftop assembly. Refer to architectural details for dimensions and configuration.

.3 Railings: Fabricate railings in as long a length as possible. Fabricate railings to accept glass panels and fasteners. Refer to details

.4 Hot dip galvanize railings after fabrication.

2.5 MISCELLEANEOUS

.1 Ledge and Shelf Angles, Channels and Plates Not Attached to Structural Framing: For support of metal decking, joists, and curtain wall framing; hot dipped galvanized finish.

.2 Metal access gate hot dipped galvanized finish

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Departmental Representative of unacceptable conditions immediately

.3 upon discovery. Proceed with installation only after unacceptable conditions have been remedied.

3.2 ERECTION

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles. Refer to details.

.4 Exposed fastening devices to match finish and be compatible with material through which they pass.

.5 Supply components for work by other trades in accordance with shop drawings and schedule.

.6 Make field connections with bolts to CSA S16.

.7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

.8 Touch-up rivets, bolts and burnt or scratched surfaces with primer after completion of installation.

.9 All field connections to be made with specified fasteners. No field welding allowed without specific permission by Departmental Representative.

3.3 INSTALLATION

.1 Install items plumb and level, accurately fitted, free from distortion or defects.

.2 Provide for erection loads, and for sufficient temporary bracing to maintain true

.3 Perform field welding in accordance with AWS D1.1.

.4 Obtain approval prior to site cutting or making adjustments not scheduled.

.5 Install pipe railings in locations indicated.

.6 Core holes in concrete stairs and ramps, install railings.

Grout to fill hole. Trowel surface smooth and flush with adjacent surfaces.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by metal fabrications installation.

END OF SECTION

PART 1 General

1.1 RELATED REQUIREMENTS

.1 05 12 23- Structural Steel for Buildings

.2 08 11 16 – Aluminum Doors and Frames

1.2 REFERENCES

.1 ASTM International

.1 ASTM D1761-12, Standard Test Methods for Mechanical Fasteners in Wood.

.2 ASTM D5456-14b, Standard Specification for Evaluation of Structural Composite Lumber Products.

.2 CSA International

.1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.2 CSA O80 Series-97(R2002)/O80S2-05, Wood Preservation.

.3 CSA O86 Consolidation-14, Engineering Design in Wood.

.4 CSA O112.9-10(R2014), Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).

.5 CSA O121-08(R2013), Douglas Fir Plywood.

.6 CSA O141-05(R2014), Softwood Lumber.

.7 CSA O151-09(R2014), Canadian Softwood Plywood.

.8 CAN/CSA-Z809-08(R2013), Sustainable Forest Management.

.3 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2014.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Where specified, submit drawings stamped and signed by professional engineer registered or licensed in Province of BC, Canada.

1.4 QUALITY ASSURANCE

.1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

.3 Sustainable Standards Certification:

.1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

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

.3 Storage and Handling Requirements:

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

.2 Store and protect wood from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste: remove for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 COORDINATION AND COOPERATION

.1 Cut, trim, drill, frame and make good rough carpentry work for passage of work of other sections except where otherwise specified.

.1 Provide location, centering and bracketing for all trades and wood framing for plumbing, heating, electrical and other trades. Make good all defects and fully complete the rough carpentry.

.2 Provide solid backing where required for mounting accessories, including electrical equipment.

PART 2 Products

2.1 FRAMING STRUCTURAL AND PANEL MATERIALS

.1 Lumber: softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:

.1 CSA O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.3 Pressure treated items: to above stated grades, of species suitable for pressure preservative, sizes detailed/indicated on drawings.

.2 Glued end-jointed (finger-jointed) lumber SPS, is not acceptable for wall framing.

.3 Framing and board lumber: in accordance with National Building Code of Canada (NBCC) and CSA O86, except as follows:

.1 Stud bearing and shear walls: S-P-F species, NLGA Grade No. 1 / No. 2.

.2 Lintels and built-up beams: S-P-F species, NLGA Grade No. 1 / No. 2 minimum or as indicated on structural drawings.

.3 Roof Joists: Western Cedar-Rough sawn, Number 2 and better. Dimensions as indicated

.4 Soffits: Western Cedar-Rough sawn, Number 2 and better. Dimensions as indicated

.4 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:

.1 Board sizes: "Standard" or better grade.

.2 Dimension sizes: "Standard" light framing or better grade.

.3 Post and timbers sizes: "Standard" or better grade.

.4 Pressure treated lumber to the above stated grades.

.5 Douglas fir plywood (DFP): to CSA O121, standard construction.

2.2 ACCESSORIES

.1 Air seal: closed cell polyurethane or polyethylene.

.2 Sealants: in accordance with Section 07 92 00 - Joint Sealants.

.1 Sealants: VOC limit 250 g/L maximum to SCAQMD Rule 1168.

.3 General purpose adhesive: to CSA O112.9.

.4 Nails, spikes and staples: to CSA B111.

.5 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.6 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

.7 Fastener Finishes:

.1 Galvanizing: to ASTM A153/A153M, use galvanized fasteners for exterior work, interior highly humid areas, and non pressure-preservative treated lumber in concealed areas.

.2 Stainless steel alloy fasteners for all pressure treated wood in concealed and exposed areas and non treated wood in exposed locations.

.3 Screws:

.1 Ceramic coated steel alloy socket drive (Robertson) flat head screws of lengths suitable for attachment of Cedar soffit.

.8 Wood Preservative:

.1 Preservative: in accordance with manufacturer's recommendations for surface conditions:

PART 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PREPARATION

.1 Re-treat surfaces of pressure treated lumber exposed by cutting, trimming or boring with liberal brush application of preservative before installation

.2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on

.3 Treat material as follows:

.1 Entry vestibules- Concealed roof framing materials.

.2 Plywood on roof deck.

3.3 MATERIAL USAGE

.1 Roof decking:

.1 Plywood, DFP, sheathing grade, square edge, 12 mm thick.

.2 Rough sawn cedar where indicated.

.2 Roof Joists:

.1 Rough sawn western red cedar- where indicated, sizes as indicated.

.2 S-P-F species, NLGA Grade No. 1 / No. 2. Pressure treated where indicated

.3 Soffit:

.1 Rough sawn western red cedar- sizes as indicated 25mm thick.

3.4 INSTALLATION

.1 Install members true to line, levels and elevations, square and plumb.

.2 Construct continuous members from pieces of longest practical length.

.3 Install spanning members with "crown-edge" up.

.4 Install roof joist connections in accordance with structural drawings.

.5 Install rough bucks, nailers and linings to rough openings as required to provide backing for window and door frames and other work.

.6 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using stainless steel fasteners.

.7 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.8 Countersink bolts where necessary to provide clearance for other work.

3.5 SOFFITS

.1 Attach cedar soffit material with ceramic coated wood screws, spacing as indicated.

3.6 FURRING AND BLOCKING

.1 Co-ordinate and Install proper furring and solid blocking as shown on the drawings and as specified to space-out and/or support:

.1 Structural attachments

.2 Door installation

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal

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

3.8 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by rough carpentry installation.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Glass fibre reinforced walkways

1.2 RELATED SECTIONS

.1 Section 05 12 23 - Structural Steel for Buildings

1.3 REFERENCES

.1 ASTM

.1 ASDM -D 635 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position

1.4 PERFORMANCE REQUIREMENTS

.1 Design items with sufficient strength for handling stresses.

1.5 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

.2 Product Data: Provide data on specified component products.

.3 Shop Drawings: Indicate design load parameters dimensions, adjacent construction, materials, thicknesses, fabrication details, required clearances, field jointing, tolerances, colours, finishes, methods of support. Use the following paragraph for submission of physical samples for selection of finish, colour, texture, etc.

.4 Samples: Submit samples,300 mm x300mm in size illustrating colour, texture, and finish.

.1 Submit physical samples of manufacturers full range of colours for colour selection by Departmental Representative.

.5 Installation Data: Manufacturer's special installation requirements.

.6 Submit shop drawings under the Seal of Structural engineer registered to practice in British Columbia for indicating structural load capacity.

1.6 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Submission procedures.

.2 Maintenance Data: Include instructions for cleaning, stain removal, and surface restoration.

.3 Provide manufacturer’s warranty for inclusion in O&M manual.

1.7 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 5 years experience.

1.8 DELIVERY, STORAGE, AND PROTECTION

.1 Deliver and store products in accordance with Section 01 61 00 - Common Product Requirements

.2 Protect components from damage by retaining shipping protection in place until installation.

Part 2 Products

2.1 General

.1 All FRP items furnished under this Section shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Contract Documents.

.2 Fiberglass reinforcement shall be continuous roving in sufficient quantities as needed by the application and/or physical properties required.

.3 Resin shall have chemical formulations as necessary to provide the corrosion resistance, strength and other physical properties as required.

.4 All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

.5 All grating products shall have a tested flame spread rating of 25 or less per ASTM E-84 Tunnel Test. Gratings shall also have tested burn time of less than 30 seconds and an extent of burn rate of less than or equal to 10 millimeters per ASTM D635.

.6 All mechanical grating clips shall be approved by the manufacturer.

2.2 MOLDED FRP GRATING

.1 Manufacture: Grating shall be of a one piece molded construction with tops and bottoms of bearing bars and cross bars in the same plane. Grating shall have a square mesh pattern providing bidirectional strength. Grating shall be reinforced with continuous rovings of equal number of layers in each direction. The top layer of reinforcement shall be no more than 3.175mm below the top surface of the grating so as to provide maximum stiffness and prevent resin chipping of unreinforced surfaces. Percentage of glass (by weight) shall not exceed 35% so as to achieve maximum corrosion resistance, and as required to maintain the structural requirements.

.2 After molding, no dry glass fibers shall be visible on any surface of bearing bars or cross bars. All bars shall be smooth and uniform with no evidence of fiber orientation irregularities, interlaminar voids, porosity, resin rich or resin starved areas.

.3 Non-slip surfacing: Grating shall be manufactured with a grit top surface.

.4 Bar intersections of full depth bars are to be filleted to a minimum radius of 1.59mm to eliminate local stress concentrations and the possibility of resin cracking at these locations. Intersections of secondary, partial depth bars do not require a fillet.

.5 Fire rating: Grating shall be fire retardant with a tested flame spread rating of 25 or less when tested in accordance with ASTM E 84. Certifications shall be dated within the past two years and test data performed only on the resin shall not be acceptable.

.6 Color: To be selected from manufacturers standard colour range.

.7 Depth: 38mm with a tolerance of plus or minus 1.59mm.

.8 Mesh Configuration: 38mm square mesh bottom, 19mm square mesh top, with a tolerance of plus or minus 1.59mm mesh centerline to centerline. Top surface meets ADA requirements. Panels shall be 1.22m x 3.66m.

2.3 GRATING FABRICATION

.1 Measurements: Grating supplied shall meet the dimensional requirements and tolerances as shown . The Contractor shall verify measurements in field for work fabricated to fit field conditions as required by grating manufacturer to complete the work

.2 Layout: Each grating section shall be readily removable, except where indicated on drawings. Manufacturer to provide openings and holes where located on the contract drawings.

.3 Sealing: All shop fabricated grating cuts shall be sealed to provide maximum corrosion resistance. All field fabricated grating cuts shall be coated similarly by the contractor in accordance with the manufacturer's instructions.

.4 Hardware: For panels installed on structural members, Manufacturer’s proprietary hold-down clips shall be provided, with a minimum of four per piece of grating, or as recommended by the manufacturer.

.5

2.4 FINISHES

.1 Colour: As selected.

.2 Surface Texture:

.1 Slip resistant grit finish

.2 ADA compliant.

Part 3 Execution

3.1 EXAMINATION

.1 Verify existing conditions before starting work.

3.2 INSTALLATION

.1 Install fabrications to manufacturer's written instructions.

3.3 ERECTION TOLERANCES

.1 Maximum variation from true position: 6 mm.

.2 Maximum offset from true alignment: 3 mm.

3.4 CLEANING

.1 Cleaning in accordance with Section 01 74 11

.2 Clean components of foreign material without damaging finished surface.

.3 Clean fabrications in accordance with fabricator's written instructions.

3.5 PROTECTION OF FINISHED WORK

.1 Protect installed work from damage until project completion.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00 - Rough Carpentry.

.2 Section 07 62 00 - Sheet Metal flashing and Trim.

1.2 REFERENCES

.1 ASTM International Inc.

.1 ASTM D6163-00(2008), Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.

.3 Canadian Standards Association (CSA International)

.1 CSA B272-93(R2000), Prefabricated Self-Sealing Roof Vent Flashings.

.4 NBC, National Building Code of Canada (issue date listed in Section 01 41 00 - Regulatory Requirements).

.5 Roofing Contractors Association of British Columbia (RCABC).

.1 RGC, RCABC Guarantee Corporation.

.2 RGC Manual, RGC Roofing Practices Manual published by RCABC.

.6 Underwriters Laboratories' of Canada (ULC)

.1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.3 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 QUALITY ASSURANCE

.1 Do Work in accordance with latest standards published in RGC Manual.

.2 Follow respective membrane manufacturer installation requirements in order to provide required product guarantees wherever such requirements are more stringent that those published in RGC Manual.

.3 Health and safety requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.4 WIND UPLIFT REQUIREMENTS

.1 Provide membrane roofing assemblies that will withstand 25% greater than wind uplift conditions listed in NBC for building location, unless more stringent values are identified on drawings.

1.5 SUBMITTALS

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

.2 Product Data:

.1 Provide copies of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide copies of WHMIS MSDS in accordance with Section 01 35 30 - Health and Safety Requirements and indicate VOC content for all products used in the work.

.1 Indicate precautions for workers when handling roofing materials, sealants and mastics.

.3 Samples: submit samples of accessories proposed for use in Work upon Departmental Representatives request.

1.6 FIRE PROTECTION

.1 Comply with Section 01 35 35 Fire Safety Requirements.

.2 Provide and maintain approved ABC dry chemical-type fire extinguishers in ready and accessible condition with at least one extinguisher always within 6 metres of each torching operation.

.3 Provide "fire watch" for minimum of one hour after termination of torching operations to check for hot spots and signs of smouldering.

.4 Permit only experienced and trained personnel to operate torch equipment.

.5 Maintain fire watch for 1 hour after each day's roofing operations cease.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions and the requirements of Section 01 61 00 Common Product Requirements.

.2 Storage and Handling Requirements:

.1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.

.2 Provide and maintain dry, off-ground weatherproof storage.

.3 Store membrane rolls in heated enclosures prior to use where climatic conditions necessitate and as recommended by membrane manufacturer; bring only enough rolls for immediate use to work area.

.4 Remove only in quantities required for same day use.

.5 Place plywood runways over completed Work to enable movement of material and other traffic.

.6 Store sealants at +5 degrees C minimum.

.7 Lay out base and cap sheets and allow to flatten uncurl before attempting installation.

.8 Avoid prolonged exposure of light and heat sensitive materials to sunlight.

.9 Store combustible materials away from heat and open flame.

.10 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.11 Fold up metal banding, flatten and place in designated area for recycling.

1.8 WHMIS

.1 Comply with WHMIS requirements when handling primers and mastics.

1.9 SITE CONDITIONS

.1 Do not perform work during inclement weather.

.2 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

.3 Do not expose material vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

.4 Consult membrane manufacturer minimum ambient application temperature for cold weather applications and do not carry out roofing work when ambient temperature is less than 0 degrees C.

1.10 PROJECT REQUIREMENTS

.1 Protect surrounding surfaces from damage during roofing work. Where hoisting is necessary, hang tarpaulins to protect walls during delivery of materials from ground to roof level. Protect existing roofing from traffic damage by installing temporary mats or plywood.

.2 Where work must continue over new installed roofing, protect surfaces with plywood sheets. Arrange sheets to avoid tripping hazards. Weigh down sheets to prevent dislocation by wind uplift.

.3 Remove bituminous markings from finished surfaces. In areas where finished surfaces are soiled by bitumen or any other source of soiling caused by roofing work consult manufacturer of surfaces as to recommended cleaning methods and conform to their advice.

.4 Do not store materials on roof in concentrations which exceed roof design live load.

.5 Locate equipment and roofing materials to provide minimum interference and maximum useable space around job site.

1.11 WASTE MANAGEMENT

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.12 INSPECTION

.1 Inspections of roofing work to be performed by inspection agency for,

.1 Preparation of surfaces and;

.2 Roofing membrane and membrane flashing installation.

.2 Pay all costs for inspection, unless noted otherwise.

.3 Notify inspection agency not less than 2 working days prior to commencement of work. If roofing work is stopped because of inclement weather or material shortage, notify inspection agency again prior to start- up of roofing work.

.4 Notify inspection agency not less than 2 working days prior to commencement of work. If roofing work is stopped because of inclement weather or material shortage, notify inspection agency again prior to start- up of roofing work.

.5 Inspection of roofing system will be performed to verify conformance with requirements specified in this Section following RCABC inspection procedures and any additional procedures recommended or required by membrane manufacturer. If defects are revealed, Departmental Representative may request that roofing be subject to further inspection and testing to ascertain full degree of defects. Pay additional costs incurred.

.6 Accompany inspection agency during inspections.

.7 Correct all defects and irregularities, at no cost to Contract.

1.13 WARRANTY

.1 For Work of this Section 07 52 00 - Modified Bituminous Membrane Roofing, 12 months warranty period is extended to:

.1 60 months for membrane roofing and membrane flashing installations remaining in place and maintaining leakproof assemblies.

.2 Warranty to be in form of manufacturers warranty.

.3 120 months for membrane materials being free from manufacturing defects. Defective products to be corrected, replaced or maintained without cost to Canada as necessary to enable such products to perform as warranted.

.4 240 months for pre-manufactured vent pipe flashings/roof jacks to be free of leaks, condensation and defects in materials.

.2 Start warranties at date of Final Certificate of Completion.

1.14 CLOSEOUT SUBMITTALS

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

.1 Warranty certificates.

Part 2 Products

2.1 MATERIALS

.1 Vapour retarder primer: water-based or low VOC solvent-based asphalt emulsion recommended by vapour retarder manufacturer for securing vapour retarder to concrete roof deck and wood parapets .

.2 Vapour retarder

.1 Torch-applied type: to ASTM D6162, containing minimum 15% Styrene-Butadiene-Styrene (SBS) elastomeric polymer, non-woven polyester plus glass grid reinforcement, minimum 2.5 mm thick; thermofusible polypropylene bottom surface, sanded top surface.

.3 Overlayment board: minimum 7 mm thick mineral fortified asphaltic core board formed between 2 saturated glass fibre felt facers.

.4 Flame barrier tape: glass fleece reinforced Styrene-Butadiene-Styrene (SBS) modified bitumen sheet, self-adhesive underside protected by silicone release sheet, sanded top surface.

.5 Roofing membrane sheets, membrane flashing sheets: containing not less than 15% Styrene-Butadiene-Styrene (SBS) elastomeric polymer, non-woven polyester plus glass grid reinforcement.

.1 Roofing membrane sheet 1 (base sheet): to ASTM D6162, minimum 2.5 mm sheet thickness, non-woven polyester plus glass grid reinforcement thermofusible polypropylene both surfaces.

.2 Base flashing sheet: to ASTM D6163, minimum 2.5 mm sheet thickness, glass grid reinforcement, self-adhesive underside protected by silicone release sheet, thermofusible polypropylene top surface.

.3 Roofing membrane sheet 2 (cap sheet), cap flashing sheet, roof edge warning strip: to ASTM D6162, minimum 4.0 mm sheet thickness, non-woven polyester plus glass grid reinforcement, thermofusible polypropylene underside, coloured granular top surface in colour selected by Departmental Representative.

.6 Fasteners

.1 Miscellaneous: #10 size, hot dip galvanized finish roofing nails with 13 mm dia. heads.

2.2 ACCESSORIES

.1 Overflow drains: purpose-made proprietary units consisting of not less than 50 mm dia. copper pipe factory soldered to sheet copper flange suitable for setting into membrane flashings, for emergency overflow drainage of roof water through building parapet beyond face of building.

.2 Plastic cement/mastic: to CAN/CGSB-37.5.

.3 Expansion joint materials

.1 Exposed location: approx 420 mm wide x continuous length pre- fabricated butyl elastomer strip material formulated and intended for roof expansion joint use, compatible with membrane flashings, resistant to ozone corrosion, long-term heat resistant to 90 degrees C, long-term cold resistant to -40 degrees C; to accommodate following building joint movements.

.1 Longitudinal building movement: ± 100 mm

.2 Longitudinal building movement: ± 100 mm

.3 Vertical building movement: ± 75 mm.

.2 Concealed location: not less than 1.0 mm thick Ethylene-Propylene-Diene Terpolymer (EPDM) sheeting vapour retarder.

Part 3 Execution

3.1 PREPARATION

.1 Ensure new decking is clean, dry and properly prepared to receive roofing materials

3.2 MANUFACTURER INSTRUCTIONS

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

3.3 WORKMANSHIP

.1 All materials must be dry (as manufactured) at time of application.

.2 Complete roofing on same day started.

.3 Perform moisture checks using an electronic moisture meter if work underway has become wet. Do not continue roofing until moisture content is reduced to acceptable levels.

.4 Ensure that inspections have been completed and defects corrected before starting each subsequent stage of roofing.

3.4 INSTALLATION

.1 Vapour retarder:

.1 Install over primed and prepared roof deck using torch on method, with all laps sealed.

.2 Overlayment board

.1 Install overlayment board over roof insulation.

.2 Install two layers of insulation board. Offset second layer from first layer by ½ board in each direction.

.3 Fix overlayment board to insulation board in place using foam insulation sufficient to withstand wind conditions listed in NBC for building location.

.4 Overlayment board to present smooth continuous surface ready to accept roofing membrane.

.3 Flame barrier tape

.1 Apply to overlayment board joints in accordance with tape manufacturer recommendations to protect insulation under overlayment board during subsequent torching operations.

.4 Roof Membrane, membrane flashing:

.1 Install 2-ply modified bituminous roof membrane and membrane flashings (strippings) over flame taped overlayment board to comply with RGC requirements and roofing membrane manufacturers recommendations.

.2 Starting at low point of roof, perpendicular to slope, unroll sheets, align and re-roll from both ends.

.3 Each layer to be free of blisters, fishmouths and wrinkles.

.4 Offset joints in cap sheet not less than 300 mm from those in base sheet.

.5 Test laps for complete continuous sealing.

.6 For torch fixing to overlayment board:

.1 Torch apply roofing membrane sheet 1 (base sheet).

.2 Torch apply membrane sheet 2 (cap sheet) over inspected membrane sheet 1 (base sheet).

.7 Membrane flashings:

.1 Install base sheet using self-adhesive properties.

.1 Provide 75 mm minimum side lap and seal.

.2 Install cap sheet using torch method.

.1 Provide 75 mm minimum side lap and seal.

.3 Install membrane flashings without sags, blisters, fishmouths or wrinkles.

.4 Re-finish all lap joints, bitumen overflows and runs of cap sheets. Lap and seal membrane to all components penetrating roof.

.8 Roof edge warning strip

3.5 ROOF SPECIALTIES AND ACCESSORIES

.1 Roof expansion joints

.1 Install continuous strip of EPDM sheeting looped into expansion joint void to accommodate building movement.

.2 Seal EPDM sheeting in place continuously along all edges to ensure continuity of envelope air barrier and vapour retarder systems.

.3 Install continuous sealed strip of butyl elastomer material and seal weathertight into membrane flashings to produce finished roof expansion joints.

3.6 Cleaning

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

.1 Progress cleaning: leave Work area clean at end of each day.

.2 Final cleaning: on completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, equipment and barriers.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Pre-coated Galvanized steel roofing, associated integral flashings, and underlayment.

.2 Waterproof Membranes

1.2 RELATED SECTIONS

.1 Section 06 11 00 – Rough Carpentry.

.2 Section 07 52 00 – Modified Bituminous Membrane Roofing

.3 Section 07 62 00 – Sheet Metal Flashing and Trim.

1.3 REFERENCES

.1 American Society for Testing Materials International

.1 ASTM A653/A653M - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A792/A792M-9a, Standard Specifications for Steel Sheet,55% Aluminum-Zinc Alloy-Coated by the Hot Dip process.

.3 ASTM D523-08,Standard Test Method for Specular Gloss.

.4 ASTM D822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.2 Canadian Standards Associations(CSA International).

.1 Can/ULC-S704-03, Standard for Thermal Insulation, Polyurathane and Polyisocyanurate Boards, Faced.

.3 Roofing Contractors Association of British Columbia(RCABC)

.1 RGC manual, RGC Roofing Practices Manual, Published by RCABC.

.4 TBCBC- The British Columbia Building Code (TBCBC) 2012.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00: Shop drawings, Product Data and samples.

.2 Product Data

.1 Submit manufacturer printed product literature, specifications and datasheets for sheet membranes and for insulation. Include:

.1 Product characteristics

.2 Performance Criteria

.3 Limitations

.3 Provide mill certificates for sheet metal materials indicating country of origin.

.4 Submit Workplace Hazardous Materials Information System (WHMIS)Material Safety Data Sheets (MSDS).

.1 Indicate precautions for workers during handling of primers, mastics and sealant products.

.5 Shop Drawings: Indicate arrangements of sheets and joints, types and locations of fasteners and special shapes and relationship of panels to building roof framing.

.6 Samples

.1 Submit full colour range of metal roofing for use in colour selection.

.2 Submit samples of metal roofing for final finish/colour verification prior to ordering project material. Samples to be cured finish applied to metal.

.3 Submit 300 mm length full width metal roof panel of each type proposed for use prior to commencement of work.

.7 Manufacturers instructions.

.1 Submit manufacturer installation instructions.

1.5 QUALITY ASSURANCE

.1 Comply with RCABC published manuals, detail and specifications and with metal roof manufacturer recommendations, unless detailed/indicated or stated otherwise. Comply with more stringent requirements of these two provisions. Do work in accordance with RCABC 10 Year Guarantee Standards, unless stated otherwise.

.2 Engage crew(s) of competent, qualified trade workers, using adequate plant and equipment to perform work of this Section.

1.6 PERFORMANCE REQUIREMENTS

.1 Provide metal roofing that will:

.1 Withstand wind loads, snow loads and rain loads and seismic conditions listed in TBCBC for building location, unless more stringent values are identified on drawings,

.2 Accommodate local temperature extremes,

.3 Accommodate building movement,

.4 Produce watertight installations.

.2 Provide for drainage of any trapped moisture to exterior, discharging moisture in a manner avoiding staining of architectural finishes, collecting in puddles, formation of icicles and dripping onto pedestrians.

1.7 DESIGN REQUIREMENTS

.1 Provide metal roofing system that is:

.1 Continuous from ridge to eaves without horizontal lap or horizontal seam,

.2 Free of through fasteners, except at ridges where all such fasteners must be covered by cap flashings and

.3 Not dependant on sealants for primary exclusion of water.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00: Deliver, store, protect and handle products to site.

.2 Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

.3 Prevent contact with materials which may cause discolouration or staining.

.4 Store materials requiring protection from weather in weatherproof shelters. Avoid exposing light or heat sensitive materials to sunlight for prolonged periods of time.

.5 Do not store materials on roof in concentrations which exceed design live loads.

.6 Protect installed work and materials from damage. Replace damaged materials and damaged roofing panels, at no cost to Contract.

1.9 SITE CONDITIONS

.1 Do not install during periods of precipitation to prevent moisture from becoming trapped in assemblies.

.2 Do not apply roofing to wet, frozen or unsuitable deck surfaces.

.3 Do not expose material vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

.4 Limit access across installed metal roofing to:

.1 Roof Trade

.2 Departmental Representative

.3 Roofing Manufacturing Representative

Part 2 Products

2.1 SHEET METAL MATERIALS

.1 Zinc coated steel sheet: to ASTM A653/A653M, commercial quality, Grade 33 with Z275 designation galvanized zinc coating.

.2 Aluminum-zinc alloy coated steel sheet: to ASTM A792/A792M, commercial quality, Grade 33 with AZM180 designation coating, pre-finished.

.3 Sheet metal materials to be produced by North American mills.

2.2 COMPONENTS

.1 Combination air/vapour retarder/waterproof membrane: minimum 1 mm thick self-adhering composite sheet membrane manufactured and tested for air/vapour barrier use with maximum 0.1 perms water vapour permeance rating; comprised of 0.8 mm thick rubberized asphalt integrally bonded to 0.1 mm thick film of polyethylene; incorporating an edge bead of rubberized asphalt, or sealant at laps to seal at joints, top surface embossed (textured) to provide some slip resistance for workers during installation;

complete with system primer, mastic and sealant recommended by membrane manufacturer to suit substrate and application conditions.

.1 Primer, mastic, sealant: types recommended by membrane manufacturer to suit substrate and weather conditions, to ensure permanently sealed and adhered installations.

.2 Underlay membrane: glass fibre based breathable dry sheathing material acceptable to RCABC and metal roofing manufacturer.

.3 Clips: zinc coated sheet steel purpose-made formed shapes, designed specifically to engage and friction retain metal roofing panels allowing for panel movement.

.4 Standing-seam style metal roof panels:

.1 Description: factory fabricated or site rolled metal roof panels suitable for concealed clip metal roofing installation.

.2 Profile: approx. 300 mm width coverage, minimum 25 mm high interlocking friction locking edge seams not requiring site cinching in order to achieve weatherseal, with formed with intermediate minor ribs to lessen oil-canning between edge seams.

.1 Color to match Cascadia Metals color: Light Zinc PVDF

.3 Material: minimum 0.61 mm (24 ga.) design thickness aluminum-zinc coated sheet steel.

.5 Fasteners

.1 Concealed locations: stainless steel alloy or galvanized steel, type of sizes/strengths required for adequate anchorage of components.

.2 Exposed locations: stainless steel, type of sizes and strengths required to provide adequate anchorage of components, socket head design, complete with self-sealing soft neoprene washers.

.6 Filler strips: closed cell PVC or neoprene foam, over-sized 30-50% to ensure tight fitting installation.

.7 Sealants: types recommended by metal roofing manufacturer and installer to suit applications, compatible with substrates and adequate to provide permanent seal at temperature ranges anticipated, colours selected by Departmental Representative to match adjacent metal roofing/flashing colours where exposed to view.

.8 Touch-up coating: paintable type recommended by panel manufacturer for use in repairing minor surface damage.

2.3 SHOP FABRICATION

.1 Fabricate items in accordance with reviewed shop drawings.

.2 Form sections and pieces square, true and accurate to size, free from distortion and other defects detrimental to appearance and performance.

.3 Fabricate all components in sizes required to produce least number of joints.

.4 Fabricate metal roof panels using commercial production quality progressive die forming equipment capable of producing repeated identical straight, accurate, crisp formed panels free of distortion, buckles and damage to pre-finished surfaces.

.5 Trim, edging, flashings, fascia:

.1 Fabricate using minimum 0.61 mm(24 ga.) design thickness aluminum-zinc coated sheet steel to match roof panels, unless noted otherwise on the drawings

.2 Fabricate flashings required for metal roof areas. Produce in accordance with RCABC standards and details or metal roofing system standards whichever is more stringent. Use standing seam construction throughout.

.3 Hem exposed edges. Fold under minimum 10mm.

2.4 FINISH

.1 Pre-finish aluminum-zinc alloy coated sheet steel with coil stock applied polyvinylidene fluoride gloss paint on epoxy primer prior to profile fabrication with colour coat containing not less than 70% pvdf resin. Include permanent-type treatment to reverse side of coil stock to prevent corrosion of backside surfaces.

.1 Class F2S.

.2 Color: selected by the Departmental Representative

.3 Specular Gloss: 30 units 1/-5 to ASTM D523

.4 Coating thickness: not less that 22 micrometers

.5 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822 as follows:

.6 Outdoor exposure period 2500 hours.

.7 Humidity resistance exposure period 5000 hours.

.8 Solar reflectance (albedo): as part of 'Energy Star' Roof Product Program, the U.S. EPA has established criteria for solar reflectance of coatings applied to low-sloped and high-sloped roofs. Following target figures apply to this project.

.9 Initial albedo level: no less than 0.3 average.

.10 3-year albedo level: no less than 0.2 average.

Part 3 Execution

3.1 EXAMINATION

.1 Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to eaves.

.2 Verify deck is dry and free of snow or ice. Verify joints in wood deck are solidly supported and fastened.

3.2 INSTALLATION

.1 General: install metal roof system in accordance with reviewed shop drawings.

.2 Combination air/vapour retarder/waterproof membrane:

.1 Apply membrane in accordance with material manufacturer's directions to obtain 100% adhered installation, including application of primers to roof deck and adjacent surfaces that will receive membrane.

.2 Arrange joints to shed moisture down roof slopes.

.3 Ice /water shield

.1 Install at perimeter of roof deck as detailed

.4 Underlayment membrane

.1 Canopy roof:

.1 Apply over cedar plank roof deck prior to sheet metal installation

.2 Arrange joints to shed moisture down roof slopes.

.5 Roof panels and flashings:

.1 Install roof panels to comply with RCABC requirements and roofing manufacturer recommendations complete with associated flashings and assembly components.

.2 Form and tailor panels to ensure weathertight installation. Fabricate and install system rain excluders.

.3 Install metal panels, associated flashings and assembly components rigidly secured in place, with laps as required to allow for expansion/contraction, weathertight and to meet performance requirements specified.

.4 Install components progressively, in a manner to prevent damage to finished surfaces.

.5 Install related metal flashings.

3.3 PROTECTION OF FINISHED WORK

.1 Do not permit traffic over unprotected roof surface.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENT

.1 Section 07 52 00 – Modified Bituminous Membrane Roofing

.2 Section 07 61 00 - Sheet Metal Roofing

.3 Section 08 41 13 - Aluminum Framed Entrances and Storefronts

.4 Section 08 44 13 – Glazed Aluminum Curtain Walls

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM A240/A240M-07e1, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

.2 ASTM A653/A653M-07, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM B32-04, Standard Specification for Solder Metal.

.4 ASTM D523-89(1999), Standard Test Method for Specular Gloss.

.5 ASTM D822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.6 ASTM C920-08, Standard Specification for Elastomeric Joint Sealants.

.2 Aluminum Association (AA)

.1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.

.3 American Architectural Manufacturers Association (AAMA)

.1 AAMA 611-98, Voluntary Specifications for Anodized Finishes Architectural Aluminum.

.4 Roofing Contractors Association of B.C. (RCABC)

.1 RGC, RCABC Guarantee Corporation

.2 RGC Manual, RGC Roofing Practices Manual published by RCABC.

.5 NBC, National Building Code of Canada (issue date listed in Section 01 41 00 Regulatory Requirements)

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

.1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Submit duplicate samples of each type of sheet metal material, finishes and colours for Departmental Representative color selection..

1.4 QUALITY CONTROL

.1 Do Work in accordance with latest standards published in RGC Manual for 5 Year Guarantee.

1.5 PERFORMANCE REQUIREMENTS

.1 Provide metal flashings that will withstand wind uplift conditions listed in NBC for building location, unless more stringent values are identified on drawings.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements unless more stringent care is required by respective material manufacturer.

.2 Protect pre finished materials from scratching

.3 Stack pre-formed materials in manner to prevent twisting, bending and rubbing.

1.7 WASTE MANAGEMENT AND DISPOSAL:

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

1.8 WARRANTY

.1 For Work of this Section 07 62 00 - Sheet Metal Flashing and Trim, 12 months warranty period is extended to:

.1 60 months for metal flashing installations remaining in place and maintaining leakproof assemblies.

.2 Warranty to be equivalent to RGC 5 Year Guarantee

Part 2 Products

2.1 MATERIALS

.1 Zinc coated sheet steel: to ASTM A653/A653M, commercial quality, Grade 33, with not less than Z275 designation zinc coating, pre-finished.

.1 Pre-finish: coil stock finished with polyvinylidene fluoride gloss paint on epoxy primer prior to profile fabrication, with colour coat containing not less than 70% pvdf resin. Include permanent-type treatment to reverse side of coil stock to prevent corrosion of backside surfaces.

.1 Specular gloss: 30 units +/- in accordance with ASTM D523.

.2 Coating thickness: not less than 22 micrometres

.3 Resistance to accelerated weathering for chalk rating of 8, colour fade 5units or less and erosion rate less than 20% to ASTM D822 as follows:

.1 Outdoor exposure period 2500 hours

.2 Humidity resistance exposure period 5000 hours

.4 Colours: As selected by Departmental Representative Colors to match existing building

.2 Sheet steel to be produced by North American mills to ensure compliance with above-referenced standards. Submit evidence of North American mill source upon Departmental Representative request.

.2 Anodized Aluminum curtain wall flashings, prefinished panel flashings, spandrels and window sills and flashings to AAMA 611-98

.3 Touch-up paint: type compatible with and matching pre-finish paint/colour.

.4 Flashing nails: annular ringed, with integral rubber sealing washers.

.1 Stainless steel alloy where used at pressure treated wood.

.2 Hot dip galvanized steel where used in untreated wood

.5 Fascia cover screws: self-drilling hexagonal head stainless steel alloy screws each with integral rubber sealing washer, colour to match adjacent fascia cover finish.

.6 Sealants: non-sag polyurethane, one part formulation, to ASTM C 920 Type S, Grade NS, Class 35, Use NT, M, A and O; colours selected by DCC Representative where exposed to view.

.7 Self-adhesive SBS membrane: minimum 1 mm thick self-adhering composite sheet membrane comprised of 0.8 mm thick rubberized asphalt integrally bonded to 0.1 mm thick film of polyethylene, bottom surface protected with silicone release sheet.

.8 Plain stainless steel sheet: to ASTM A240/A240M, Type 302 or Type 304, with No. 2B finish.

2.2 FABRICATION OF FLASHING

.1 Fabricate in accordance with detail drawings and to RGC requirements.

.2 Fabricate typical flashings using not less than 0.61 mm thick pre-finished zinc coated sheet steel, unless detailed/indicated otherwise. Use greater metal thickness at locations of wider span to prevent "oil-canning" and deformation of flashings.

.3 Fabricate flashings accurately with true crisp lines and quality metalwork joinery suitable for exposed installation.

.4 Pre-fabricate corners with mitred joints. Form watertight lock-seams set in sealant for all mitred corner joints.

.5 Maintain 1:6 minimum slope on horizontal surfaces.

.6 Hem exposed edges. Fold under minimum 10 mm.

.7 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.8 Refer to drawings for self-adhesive SBS membrane locations under metal flashings.

2.3 FABRICATION OF PARAPET COVERS

.1 Fabricate in accordance with detail drawings to make watertight transitions onto pre finished panels or curtain walls below parapet flashings.

.2 Bend and form to profiles detailed/indicated.

.3 Fabricate covers using not less than 0.61 mm thick pre-finished zinc coated sheet steel, unless detailed/indicated otherwise. Use greater metal thickness at locations of wider span to prevent "oil-canning" and deformation of covers.

.4 Fabricate covers accurately with true crisp lines and quality metalwork joinery suitable for exposed installation.

.5 Hem exposed edges. Fold under minimum 10 mm.

.6 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

2.4 FABRICATION OF CURTAIN WALL FLASHINGS

.1 Fabricate window flashings and sills from anodized aluminum sheet to AAMA 611-98, minimum .81mm thick.

.2 Fabricate sections as indicated.

.3 Straight window sills to have a minimum 1% slope to leading edge of sill, with drip edge and cleat on underside of sill. Window sills to be complete with back and end dams.

Part 3 Execution

3.1 INSTALLATION

.1 Metal Flashings

.1 Install in accordance with detail drawings and RCABC requirements.

.2 Fit flashings together so that one end of each section is free to move in joint.

.3 Fit flashings secure in place. Make corners square, surfaces true and straight in all planes, and all lines accurate to profiles.

.2 Parapet covers:

.1 Install in accordance with detail drawings.

.2 Fix in place with cover screws

.3 Aluminum curtain wall and pre finished panel flashings: mount as detailed, ensure watertight connections at pressure plates, closures. Caulk with structural caulking where detailed.

CLEANING

.4 Clean flashings to remove handling marks and smudges.

.5 Proceed in accordance with Section 01 74 11 - Cleaning.

.1 Progress cleaning: leave Work area clean at end of each day.

.2 Final cleaning: on completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, equipment and barriers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 07 62 00 - Sheet Metal Flashing and Trim

.2 Section 08 41 13 - Aluminum Framed Entrances and Storefronts

.3 Section 08 44 13 - Glazed Aluminum Curtain Walls

.4 Section 09 91 13 - Painting

1.2 REFERENCES

.1 ASTM International

.1 ASTM C919-08, Standard Practice for Use of Sealants in Acoustical Applications.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).

.2 CAN/CGSB-19.13- M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.

.3 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.

.4 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.

.3 General Services Administration (GSA) - Federal Specifications (FS)

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

.1 Material Safety Data Sheets (MSDS).

.5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1168-[A2005], Adhesives and Sealants Applications.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Manufacturer's product to describe:

.1 Caulking compound.

.2 Primers.

.3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

.3 Samples:

.1 Submit samples of each type of material and colour.

.2 Cured samples of exposed sealants for each colour where required to match adjacent material.

.4 Manufacturer's Instructions:

.1 Submit instructions to include installation instructions for each product used.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

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

.3 Storage and Handling Requirements:

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

1.5 WHMIS

.1 Submit copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOCs during application.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

1.7 SITE CONDITIONS

.1 Environmental Conditions:

.1 Proceed with installation of joint sealants only when:

.1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.

.2 Joint substrates are dry.

.3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.2 Joint-Width Conditions:

.1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Proceed with installation of joint sealants only after contaminants capable of

.4 Where sealants are qualified with primers use only these primers.

Part 2 Products

2.1 SEALANT MATERIALS

.1 VOC limit maximum 250 g/L for sealers used within the building envelope.

.2 Where sealants are qualified with primers, use only these primers

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Polyurethanes: colours selected by Departmental Representative.

.1 Non-sag formulation: 1-part, to CAN/CGSB-19.13, Type 2, MCG-2-25, MCG-2-40.

.2 Self-levelling formulation:

.3 1-part: to CAN/CGSB-19.13, Type 1.

.4 2-part: to CAN/CGSB-19.24, Type 1, Class B.

.2 Preformed compressible and non-compressible back-up materials:

.1 Polyethylene, urethane, neoprene or vinyl foam:

.1 Extruded closed cell foam backer rod.

.2 Sized as required.

.2 Neoprene or butyl rubber:

.1 Round solid rod, Shore A hardness 70.

.3 High density foam:

.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m^3 density, or neoprene foam backer, size as recommended by manufacturer.

.4 Bond breaker tape:

.1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 SEALANT SELECTION

.1 Junctions between floor edges and foundation walls to produce permanent sealed vapour-resistant joints, junctions between new floor edges and existing floor edges to produce permanent sealed joints.

.1 Polyurethane, self-levelling.

.2 Penetrations in exterior walls to fill joints watertight including but not limited to exterior perimeters of door frames, window frames, curtain wall frames; exterior perimeters of wall vents; exterior perimeters of all other wall penetrations.

.1 Polyurethane, non-sag.

2.4 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.

.2 Primer: in accordance with sealant manufacturer's written recommendations.

Part 3 Execution

3.1 SURFACE PREPARATION

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.2 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.3 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.4 MIXING

.1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.5 APPLICATION

.1 Sealant:

.1 Apply sealant in accordance with manufacturer's written instructions.

.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.

.3 Apply sealant in continuous beads.

.4 Apply sealant using gun with proper size nozzle.

.5 Use sufficient pressure to fill voids and joints solid.

.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.

.7 Tool exposed surfaces before skinning begins to give slightly concave shape.

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

.2 Curing:

.1 Cure sealants in accordance with sealant manufacturer's instructions.

.2 Do not cover up sealants until proper curing has taken place.

3.6 CLEANING

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Aluminum doors and frames.

.2 Vision glass.

.3 Perimeter sealant.

1.2 RELATED SECTIONS

.1 Section 01 74 19 - Construction Waste Management and Disposal

.2 Section 07 92 00 - Joint Sealants: System perimeter sealant and back-up materials.

.3 Section 08 71 00 - Door Hardware.

.4 Section 08 80 00 - Glazing

1.3 REFERENCES

.1 AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

.2 AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

.3 ANSI A117.1 - Accessible and Usable Buildings and Facilities.

.4 ASTM A123/A123M-13 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.5 ASTM A653/A653M-13 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.6 ASTM B221M-13 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.7 ASTM B209M-10 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.8 ASTM E283-04, Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

.9 ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls, by Uniform Static Air Pressure Difference.

.10 ASTM E1105-00(2008), Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

1.4 SYSTEM DESCRIPTION

.1 Aluminum entrances and storefront system includes tubular aluminum sections with supplementary internal support framing, shop fabricated, factory finished, vision glass, glass, aluminum panels, related flashings, anchorage and attachment devices.

.2 System Assembly: Site assembled.

1.5 PERFORMANCE REQUIREMENTS

.1 System Assembly: Accommodate without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.

1.6 DESIGN CRITERIA

.1 Design assemblies to meet following requirements:

.2 Withstand local positive and negative wind loads listed in NBC for location of building or identified on structural drawings, whichever more severe.

.3 Withstand seismic conditions for building location listed in NBC.

1.7 SUBMITTALS FOR REVIEW

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets.

.2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).

.1 Indicate precautions for workers when handling and applying sealants.

.3 Shop Drawings: indicate the following information.

.1 Materials and profiles and provide full-size, scaled details of components for each type of frame.

.2 Interior trim and exterior junctions with adjacent construction.

.3 Junctions between combination units.

.4 Elevations of units.

.5 Core thicknesses of components.

.6 Exposed finishes, method of anchorage, number of anchors, supports, reinforcement and accessories.

.7 Locations of exposed caulking.

.8 Glazing provisions.

.9 Use qualified professional structural engineer registered in British Columbia for wind load and seismic designs.

.10 Submit shop drawings under seal of same professional engineer responsible for wind load and seismic designs.

.4 Samples:

.1 Submit the following if requested by the Departmental Representative.

.1 Frame and glazing accessory samples.

.5 Manufacturer’s Instructions:

.1 Submit manufacturers installation instructions.

1.8 CLOSEOUT SUBMITTALS

.1 Make submissions in accordance with Section 01 78 30 - Closeout Submittals.

.2 Provide following for inclusion in Project operating and maintenance manuals:

.1 Certification under seal of same professional engineer responsible for sealing shop drawings that system has been installed in accordance with sealed shop drawings.

.2 Name, address and telephone number of installer.

1.9 QUALITY ASSURANCE

.1 Perform Work in accordance with AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

.2 Conform to requirements of ANSI A117.1.

.3 Installer: Company specializing in manufacturing aluminum glazing systems with minimum three years documented experience.

.4 Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the place where the Project is located.

1.10 DELIVERY, STORAGE, AND PROTECTION

.1 Protect finished aluminum surfaces with wrapping strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.11 WARRANTY

.1 Correct defective Work within a five year period after Substantial Completion.

.2 Warranty: Include coverage for complete system for failure to meet specified requirements.

1.12 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal, paper, plastic, metal, corrugated cardboard, and other packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.3 Divert unused materials, cut offs etc, from landfill appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Dispose of unused sealant materials, paint, primers, at official hazardous material collections site.

.5 Do not dispose of unused sealant materials, paint, primers, into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

Part 2 Products

2.1 SYSTEMS

.1 Description:

.1 System includes thermally broken tubular aluminum sections with self supporting framing, related flashings, anchorage and attachment devices.

.2 Assembled system to permit re-glazing of individual glass units from exterior without requiring removal of structural mullion sections.

.2 Performance Requirements: Performance requirements: provide curtain wall framing to meet following requirements without suffering collapse, permanent deformation of components or breakage of glass.

.1 Withstand own weight plus weight of glass.

.2 Withstand local positive and negative wind loads listed in NBC for location of building or identified on structural drawings, whichever more severe.

.3 Withstand local snow loads listed in NBC for location of building or identified on structural drawings, whichever more severe.

.4 Accommodate thermal expansion and contraction through temperature ranges anticipated at building location.

.5 All components to be resistant to physical and chemical deterioration resulting from atmospheric conditions, contaminates and ultra-violet light exposure.

.6 Withstand seismic conditions listed in NBC for location of building or identified on structural drawings, whichever more severe.

.7 Meet or exceed following environmental performance:

.1 Air infiltration (ASTM E283 test): maximum 0.3L/s.m^2 @ 300 Pa static air pressure differential.

.2 Water (static) resistance (ASTM E331 test): no leakage at 479 Pa static air pressure differential as defined in AAMA 501.

.3 Water (dynamic) resistance (AAMA 501.1 test): no leakage at 479 Pa air pressure differential as defined in AAMA 501.

.4 Condensation resistance factor (AAMA 1503 test): not less than 68 for frame and 67 for glass.

.8 Limit structural deflection to L/175 of span for any framing member at design load, based on CAN3-S157.

.9 Drain water entering joints, condensation occurring in glazing channels or migrating moisture occurring within system, to exterior by weep drainage network.

.10 Provide continuous air barrier and vapour retarder through framing system, primarily in line with inside surface of glass and heel bead of glazing sealant.

2.2 MATERIALS

.1 Extruded Aluminum: ASTM B221/B221M.

.2 Sheet Aluminum: ASTM B209/B209M.

.3 Sheet Steel: ASTM A653/A653M; galvanized in accordance with.

.4 Steel Sections: ASTM A36/A36M; shaped to suit mullion sections.

.5 Fasteners: Stainless steel.

2.3 COMPONENTS

.1 Frame: thermally broken with interior tubular section insulated from exterior; flush glazing stops; drainage holes; internal weep drainage system.

.2 Doors: Aluminum framed flush entrance door: Thermally broken, 44.5 mm thick, Dual moment welded corner construction, Internal stile and rail construction with 127 mm wide top bottom and intermediate rails and stiles, Urethane foam core, Hinges compatible with storefront frame, smooth aluminum panel faces, factory painted, colour to be selected from manufacturers custom range.

.3 Door: Walkway entrance door: Similar to above, configured to accept 12mm laminated glazing.

.4 Flashings: 2.1 mm thick aluminum, finish to match mullion sections where exposed.

2.4 GLASS AND GLAZING MATERIALS

.1 Glass and Glazing Materials: As specified in Section 08 80 00.

2.5 SEALANT MATERIALS

.1 Sealant and Backing Materials: Type as specified in Section 07 92 00.

2.6 HARDWARE

.1 Locking hardware: as specified in Section 08 71 00 - Door Hardware.

.2 Provide door closer, Threshold and hold open compatible with storefront system.

2.7 FABRICATION

.1 Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

.2 Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

.3 Prepare components to receive anchor devices. Fabricate anchors.

.4 Arrange fasteners and attachments to conceal from view.

.5 Prepare components with internal reinforcement for door hardware and door operator hinge hardware.

.6 Reinforce framing members for imposed loads.

2.8 FINISHES

.1 Exterior and Interior exposed aluminum surfaces including storefront door: to AA-M10C21A41 / AA-M45C22A41, AAMA 611 anodized to 215-R1, 0.7 mils minimum thickness, anodized to clear colour.

.2 Ramp entry door and storefront finish: 70% PVFD Fluoropolymer coating to AAMA 2605, factory applied. Colour to be selected from manufacturer’s custom range.

.3 Concealed Steel Items: Galvanized in accordance with ASTM A123 to 610 gm/sq m

.4 Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

Part 3 Execution

3.1 EXAMINATION

.1 Verify dimensions, tolerances, and method of attachment with other work.

.2 Verify wall openings and adjoining air and vapour seal materials are ready to receive work of this Section.

3.2 INSTALLATION

.1 Install wall system in accordance with manufacturer's instructions.

.2 Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

.3 Provide alignment attachments and shims to permanently fasten system to building structure.

.4 Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

.5 Install flashings.

.6 Install hardware using templates provided.

.7 Set thresholds in bed of mastic and secure.

.8 Install glass to glazing method required to achieve performance criteria.

.9 Install perimeter sealant to method required to achieve performance criteria.

.10 Install louver assembly as indicated.

3.3 ERECTION TOLERANCES

.1 Maximum Variation from Plumb: 1.5 mm/m non-cumulative or 1.5 mm/3 m whichever is less.

.2 Maximum Misalignment of Two Adjoining Members Abutting in Plane: 0.8 mm.

3.4 ADJUSTING

.1 Adjust operating hardware for smooth operation.

3.5 CLEANING

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

.2 Remove protective material from pre-finished aluminum surfaces.

.3 Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

.4 Remove excess sealant by method acceptable to sealant manufacturer.

3.6 PROTECTION OF FINISHED WORK

.1 Protect finished Work from damage.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 12 23 – Structural Steel for Buildings

.2 Section 08 41 26 – Glass Entrances

.3 Section 08 80 00 – Glazing

1.2 REFERENCES

.1 Aluminum Association (AA)

.1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.

.2 American Architectural Manufacturers Association (AAMA)

.1 AAMA CW-10-04, Care and Handling of Architectural Aluminum From Shop to Site.

.2 AAMA 501-05, Methods of Test for Exterior Walls.

.3 AAMA 501.2 Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtainwalls, and Sloped Glazing Systems.

.4 AAMA 611-98, Voluntary Specifications for Anodized Finishes Architectural Aluminum.

.3 ASTM International

.1 ASTM A36/A36M-08, Specification for Carbon Structural Steel.

.2 ASTM A653/A653M-09a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM B209-07, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.4 ASTM B221-08, Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.5 ASTM E283-04, Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

.6 ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls, by Uniform Static Air Pressure Difference.

.7 ASTM E331-00(2009), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform Static Air Pressure Difference.

.8 ASTM E1105-00(2008), Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

.4 CSA International

.1 CAN/CSA-S157/S157.1-05, Strength Design in Aluminum/Commentary on CAN/CSA-S157, Strength Design in Aluminum.

.2 CSA W59.2-M1991(R2008), Welded Aluminum Construction.

.5 Society for Protective Coatings (SSPC)

.1 SSPC - Paint 25 - 97(R2004) BCS, Zinc Oxide, Alkyd, Linseed Oil and Primer for Use Over Hand Cleaned Steel Type 1 and Type 2.

1.3 PERFORMANCE REQUIREMENTS

.1 System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall as calculated in accordance with applicable building code and in accordance with ASTM E330.

.2 Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with applicable building code.

.3 For mullion corner and special change of wall plane conditions, limit glazing sealant design movement to 20 percent maximum for elastomeric sealants or 5 percent for acrylic or butyl sealants.

.4 Deflection: Limit mullion deflection to flexure limit of glass or L/175 whichever is less with full recovery of glazing materials.

.5 Deflection of Framing Members: At design wind pressure, as follows:

.1 Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite, or an amount that restricts edge deflection of individual glazing lites to 19 mm, whichever is less.

.2 Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 3.2 mm, whichever is smaller.

.6 System Assembly: Accommodate without damage to system, components or deterioration of seals, movement within system, movement between system and perimeter framing components, dynamic loading and release of loads, deflection of structural support framing, tolerance of supporting components, creep of concrete structural members interstory drift.

.7 Air Infiltration: Limit air infiltration through assembly to 0.015 l/s/sq m of wall area, measured at a reference differential pressure across assembly of 75 Pa as measured in accordance with ASTM E283.

.8 Water Leakage: None, when measured in accordance with ASTM E331 at a differential pressure of 286 Pa.

.9 Expansion / Contraction: System to provide for expansion and contraction within system components caused by a cycling temperature range of 95 degrees C over a 12 hour period without causing detrimental affect to system components.

.10 System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

.11 Air and Vapour Seal: Maintain continuous air barrier and vapour Barrier throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.

.12 Ensure no vibration harmonics, wind whistles, noises caused by thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system occur.

.13 Sealant Design: Design sealant to withstand failure of seals, product deterioration, and other defects.

.1 Design installed sealant to withstand.

.1 Dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall [as measured in accordance with ASTM E330.

.2 Movement from ambient temperature range of 49 degrees C.

.3 Movement and deflection of structural support framing.

.4 Water and air penetration.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for curtain wall components, anchorage and fasteners, glass, and internal drainage details and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada for seismic and wind loads.

.2 Indicate system dimensions, framed opening requirements and tolerances, adjacent construction, anchor details anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details, and field welding required.

1.5 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for glazed aluminum curtain wall for incorporation into manual.

1.6 QUALITY ASSURANCE

.1 Mock-ups:

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

.2 Provide one mock-up for each tower consisting of the first two rows of the curtain wall system installation up to 3038 mm above Top of Plinth. Mock-up to

illustrate mullion framing connections, glazing installation and connections, sealed joints for exterior and interior and corner details.

.3 When accepted, mock-up will demonstrate minimum standard of quality and materials for work of this Section.

.4 Mock-up may remain as part of finished work.

1.7 SOURCE QUALITY CONTROL

.1 Manufacturer qualifications: company specializing in manufacturing the products specified in this section with minimum 5 years documented experience.

.2 Installer qualifications: company specializing in performing the work of this section with minimum 10 years documented experience approved by manufacturer.

.3 Design structural support framing components to CAN/CSA-S157 under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the Province of British Columbia.

.4 Perform welding Work in accordance with CSA W59.2.

1.8 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 Handle work of this Section in accordance with AAMA CW-10.

.2 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.3 Store and protect aluminum glazed curtain wall components from nicks, scratches, and blemishes.

.4 Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

.5 Replace defective or damaged materials with new.

1.9 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal, paper, plastic, metal, corrugated cardboard, and other packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.3 Divert unused materials, cut offs etc, from landfill appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Dispose of unused sealant materials, paint, primers, at official hazardous material collections site.

.5 Do not dispose of unused sealant materials, paint, primers, into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

1.10 AMBIENT CONDITIONS

.1 Install sealants when ambient and surface temperature is above 5 degrees C minimum.

.2 Maintain this minimum temperature during and for 48 hours minimum after installation of sealants.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Four-Sided Toggle Glazed Curtain Wall System with screw spline interface; single pane glass, factory prefinished framing. With perimeter glazing members, louvres, related flashings, and anchorage. Vertical glazed aluminum curtain wall system includes supplementary support framing, and interior supporting thermally broken aluminum mullions, drainage holes, deflector plates and internal flashings to accommodate internal weep drainage system; internal mullion baffles to eliminate "stack effect" air movement within internal spaces.

.2 Assembled system to permit re-glazing of individual glass units from exterior without requiring removal of structural mullion sections.

2.2 MATERIALS

.1 Extruded aluminum: Alloy and temper recommended by glazed aluminum curtain wall manufacturer for strength, corrosion resistance, and application of required finish and not less than 1.8 mm wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.

.2 Sheet aluminum: to ASTM B209.

.3 Sheet Steel: ASTM A653/A653M; galvanized with Z275 zinc coating.

.4 Steel Sections: ASTM A36/A36M weldable structural quality, shaped to suit mullion sections.

.5 Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

.6 Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.

.7 Bituminous paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 0.762 mm thickness per coat.

.8 Sealant: For sealants required within fabricated curtain wall system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

.9 Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated and imposed loads.

2.3 COMPONENTS

.1 Mullion profile: Horizonal and vertical millions; 153 mm x 64 mm.

.2 Glazing System: Front glazed and retained mechanically with toggles on four sides, refer to Section 08 80 00 for glazing material type.

.3 Reinforced mullion: Extruded aluminum cladding with internal reinforcement of shaped steel structural section.

.4 Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

.5 Flashings: 1.2 mm thick aluminum, finish to match curtain wall mullion sections where exposed, secured with concealed fastening method.

.6 Louvres: Refer to Section 05 50 00.

.7 Screening: supply insect screen of size at exhaust and at intake air louvre inside surface, Size; to suit application.

.8 Doors: Refer to Section 08 41 26 Glass Entrances.

2.4 FABRICATION

.1 Fabricate system components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

.2 Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof

.3 Prepare components to receive anchor devices. Install anchors.

.4 Arrange fasteners and attachments to ensure concealment from view.

.5 Prepare system components to receive exterior doors, and hardware specified in Section 08 41 26.

.6 Reinforce framing members for external imposed loads.

.7 Visible manufacturer's identification labels not permitted.

2.5 FINISHES

.1 Exterior and Interior exposed aluminum surfaces: to AA-M10C21A41 / AA-M45C22A41, AAMA 611 anodized to 215-R1, 0.7 mils minimum thickness, anodized to clear colour.

.2 Shop and touch-up primer for steel components: SSPC 25 Paint red oxide.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for aluminum curtain wall installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Verify dimensions, tolerances, and method of attachment with other work. Inform

.3 Departmental Representative of unacceptable conditions immediately upon discovery.

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

3.2 INSTALLATION

.1 Install curtain wall system in accordance with manufacturer's instructions.

.2 Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

.3 Use alignment attachments and shims to permanently fasten system to building structure. Clean weld surfaces; apply protective primer to field welds and adjacent surfaces.

.4 Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances and align with adjacent work.

.5 Glazing: Glass shall be outside glazed and held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners spaced no greater than 228.6 mm on center.

.6 Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.

.7 Install sill flashings.

.8 Install associated flashings.

.9 Install perimeter sealant to method required to achieve performance criteria. Backing materials, and installation criteria in accordance to manufacturers written instructions.

3.3 SITE TOLERANCES

.1 Maximum variation from plumb: 1.5 mm/m non-cumulative or 12 mm/30 m, whichever is less.

.2 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.

.3 Maximum sealant space between curtain wall and adjacent construction: 13 mm.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by glazed aluminum curtain wall installation.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Hardware for aluminum doors.

.2 Thresholds

1.2 RELATED SECTIONS

.1 Section 08 11 16 - Aluminum Doors and Frames.

1.3 REFERENCES

.1 American National Standards Institute (ANSI).

- .1 ANSI/BHMA A156.1-2006, American National Standard for Butts and Hinges.
- .2 ANSI/BHMA A156.2-2003, Bored and Preassembled Locks and Latches.
- .3 ANSI/BHMA A156.3-2001, Exit Devices
- .4 ANSI/BHMA A156.4-2000, Door Controls - Closers.
- .5 ANSI/BHMA A156.5-2001, Auxiliary Locks.
- .6 ANSI/BHMA A156.6-2005, Architectural Door Trim.
- .7 ANSI/BHMA A156.13-2002, Mortise Locks and Latches Series 1000.
- .8 ANSI/BHMA A156.16-2002, Auxiliary Hardware.
- .9 ANSI/BHMA A156.18-2006, Materials and Finishes.

.2 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA).

- .1 CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction): standard hardware location dimensions.

.3 NBC, National Building Code of Canada

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00: Submission procedures.

.2 Samples:

- .1 Provide hardware samples requested by Departmental Representative.
- .2 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.

.3 Shop Drawings:

- .1 Provide product data sheets to describe fully to Departmental Representative all products of this Section.
- .2 Include descriptions of materials, composition, cautions, installation requirements.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

.1 Submittals in accordance with Section 01 78 10: Submission procedures.

.2 Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

.3 Special tools:

.1 Provide 2 sets of wrenches for each type of door closer and lock set installed, for project maintenance use.

.2 At completion of installations and adjustments turn over to Departmental Representative all tools supplied by hardware manufacturers with hardware items installed for later use in hardware maintenance. Seal tools together with respective hardware data/installation sheets supplied with hardware in clear plastic bags.

1.6 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 10 years documented experience.

1.7 DELIVERY, STORAGE, AND PROTECTION

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements, unless more stringent care is required by respective material manufacturer.

.2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.3 Store door hardware in locked, clean and dry area.

.4 Include hardware templates and full installation/adjustment information.

.5 Supply hardware complete with all factory supplied mounting fasteners required for installation.

1.8 WASTE DISPOSAL AND MANAGEMENT

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

1.9 WARRANTY

.1 For Work of this Section 08 71 00 - Door Hardware, 12 months warranty period is extended to:

.1 60 months for door closers of this Section will be free from manufacturing defects.

.2 Manufacturing defects will be deemed to occur if any of following conditions are noted.

.1 Defects of material and factory workmanship.

.2 Fluids leaks.

.2 Defective products to be corrected, replaced or maintained without cost to Canada as necessary to enable such products to perform as warranted.

.3 Start warranties at date of Final Certificate of Completion.

Part 2 Products

2.1 MANUFACTURERS

.1 Hardware items to be of the best grade, free from defect and of first line quality production suitable for this level of project.

.2 Use one hardware manufacturer product only for each similar hardware item.

.3 Acceptable manufacturers:

.1 Hinges: McKinney, Stanley, Ives.

.2 Locks: Schlage, Sargent, Corbin/Russwin.

.3 Closers: LCN, Sargent, Corbin/Russwin.

.4 Exit Device: Von Duprin, Sargent, Corbin/Russwin

.5 Door stops, Overhead: Glynn Johnson, Sargent, Corbin/Russwin.

.6 Other wall and floor stops: CBH, Gallery, Ives

.7 Thresholds and weatherstrip: Draft Seal, Pemko, National

.8 Pocket track: Kris Track, de Jong, K N Crowder

.9 Pocket Lock: KN Krowder, Baldwin, Emtek

.10 Electric strikes/power supply: Von Duprin, Sargent, Corbin.

2.2 HARDWARE - GENERAL

.1 General: Refer to paragraph. **3.6 Hardware Schedule** for further description and finishes of following items.

.2 Locks and latches:

.1 Bored and pre-assembled locks and latches: to ANSI/BHMA A156.2, series 2000 pre-assembled lock, grade 1, designed for functions scheduled.

.2 Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, grade 1, designed for functions scheduled.

.3 Escutcheons: designs scheduled.

.4 Normal strikes: box type, lip projection not beyond jamb.

.5 Cylinders: keyed into keying system directed by Departmental Representative.

.6 Finishes: scheduled.

.3 Butts and hinges:

.1 Butts: to ANSI/BHMA A156.1, 5-knuckle, sizes x finishes scheduled, concealed bearing for scheduled doors, NRP for scheduled doors.

.4 Exit devices: to ANSI/BHMA A156.3 and as scheduled.

.5 Door closers and accessories:

.1 Door controls (closers): to ANSI/BHMA A156.4, designated by letter C, sizes as required by NBC and to provide following requirements.

.2 Maximum degree of opening required.

.3 Size to door.

.6 Architectural door trim: to ANSI/BHMA A156.6, designated by letter J and as scheduled.

.1 Push/pull units.

.7 Thresholds: as scheduled, one length per door opening without joins or splices.

.8 Weatherstripping/sound seals: durable, non-absorbing material, resistant to deterioration caused by aging, types and materials scheduled, one length per door head and side application without joins or splices.

2.3 KEYING

.1 Obtain final keying from Departmental Representative before ordering.

.2 Prepare keying schedule in co-operation with Departmental Representative.

.3 Assist in taking building off construction key system.

.4 Key locks into master key (MK) and grand master key (GMK) systems directed by Departmental Representative.

.5 Key alike (KA) and key different (KD) locks directed by Departmental Representative.

.6 Use a bonded locksmith for all keying work. Stamp all keys "Do Not Copy".

2.4 FINISHES

.1 Finishes: Identified in Door Schedules.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

3.2 INSTALLATION

.1 Install hardware in accordance with manufacturer's instructions.

.2 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.

.3 Use templates provided by hardware item manufacturer.

.4 Use only manufacturer supplied fasteners. Failure to comply may void manufacturer warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

3.3 ADJUSTING

.1 Adjust hardware for smooth operation.

3.4 PROTECTION OF FINISHED WORK

.1 Do not permit adjacent work to damage hardware or finish.

3.5 CLEANING

.1 Proceed in accordance with section 01 74 11 Cleaning.

.2 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer instructions.

3.6 HARDWARE SCHEDULES

.1 Hinges

.1 By aluminum door manufacturer.

.2 Locks, Deadbolts and Privacy

.1 B1 – Cylinder Type x length x cam to suit 626

.3 Closers

.1 C1 Institutional, non sized, compression spring buffer arm x delayed action 689.

.1 Include through bolts and grommet nut fasteners.

.2 Suitable for mounting on Aluminum Door

.4 Auxilliary hardware

.1 D4- Push plates, push/pull units.

.5 Thresholds, seals door bottoms, astragal:

.1 E1- Thresholds: as scheduled, one length per door opening without joins or splices. Max height 6.4mm.

Hardware Set 01 for Walkway entry door.

Hinges-	By aluminum door manufacturer.
1 ea. lock cylinder	B1
I ea. Threshold	E1
1 Door pull	D4
1 Exiting device	Coordinate with aluminum door manufacturer
Electric strike	Refer to electrical

Hardware set 2 Entry door

Hinges-	By aluminum door manufacturer.
1 ea. lock cylinder	B1
1ea. Threshold	E1
1 Door pull	D4
1 Exiting Hardware	Coordinate with aluminum door manufacturer.

Part 1 GENERAL

1.1 RELATED SECTIONS

.1 Section – 08 41 13 - Aluminum Framed Entrances and Storefronts.

1.2 REFERENCES

.1 CAN/CGSB-12.8M – "Insulating Glass Units".

.2 IGMAC (Insulating Glass Manufacturers Association of Canada) - Sealed Insulating Glass: Glass to Elastomer Edge, Glass to Mastic Edge, Special Glasses.

.1 Glazing Systems Specification Manual -National Version – 2010

.3 Laminators Safety Glass Association - Standards Manual.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for Glazing materials and sealants. Include product characteristics, performance criteria, physical size, finish and limitations.

.3 Submit 2 copies of WHMIS - Material Safety Data Sheets.

.1 Indicate VOC for glazing materials during application and curing.

1.4 PERFORMANCE REQUIREMENTS

.1 Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with applicable code.

.2 Limit glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.

1.5 QUALITY ASSURANCE

.1 Perform Work in accordance with IGMAC for glazing installation methods.

.2 Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.6 WARRANTY

.1 For Work of this Section 08 80 00 - Glazing, 12 months warranty period is extended to:

.1 120 months for insulating glass units of this Section to be free from manufacturing defects.

.2 Manufacturing defects will be deemed to occur if any of following conditions are noted.

.1 Appearance of condensation between panes.

.2 Obstruction of vision within unit perimeter.

.3 Measurable deterioration (more than 10%) of specified thermal transmission or shading coefficient performance ratings.

.4 Chipping, cracking or breakage of glass panes occurring due to manufacturing defects or under specified service conditions.

.5 Migration of edge spacer.

.2 Defective products to be corrected, replaced or maintained without cost to Canada as necessary to enable such products to perform as warranted.

.3 Start warranties at date of Final Certificate of Completion.

Part 2 PRODUCTS

2.1 SEALED INSULATING GLASS MATERIALS

.1 Insulating Glass (type SG-1): CAN2-12.8M double pane; outer pane of clear tempered glass; inner pane of clear glass with argon filled cavities. Stainless steel spacer bar. Glazing units to be compatible with aluminum storefront.

.2 Low E coating: PPG Solarban 60 coating on the #2 surface.

.3 Insulated glass unit assembly to provide following minimum performance requirements. Following is based on 6 mm thick Low E glass in 25 mm thick insulating unit with 13 mm thick Argon gas filled space and 6 mm thick clear inner glass.

.1 Transmittance:

.1 Ultra-violet (UV) light: 19%

.2 Visible daylight: 70%

.3 Total solar energy: 33%

.2 Reflectance:

.1 Visible light: 11%

.2 Total solar energy: 30%

.3 U-values (Imperial):

.1 Winter night time: 0.29

.2 Summer day time: 0.28

.4 Shading coefficient factor: 0.44

.5 Solar heat gain coefficient: 0.38

.6 Light-to-solar gain (LSG): 1.84

2.2 FLAT GLASS MATERIALS

.1 Safety Glass to CAN/CGSB-12.1M

.1 Comprised of 2 layers of clear heat strengthened glass 6mm thick, laminated with a plastic interlayer.

.2 Interlayer: Plastic, 0.76 mm thick.

2.3 GLAZING ACCESSORIES

.1 Setting blocks: neoprene, EPDM or silicone, 80-90 durometer hardness to ASTM D2240, to suit each application.

.2 Spacer shims: neoprene, EDPM or silicone, 50-60 durometer hardness to ASTM D2240, Sized to suit each application

.3 Glazing tape: Glazing tapes: pre-formed macro-polyisobutylene tape with continuous integral neoprene shim (to prevent "pumping out" of tape under glass load conditions), paper release, black colour, width x thickness to suit installations.

.4 Glazing gaskets, wedges and splines: forming part of respective framing system.

.1 Refer to Section 08 41 13 Aluminum Framed Storefront and Entrances.

.5 Primers, sealers, cleaners: to glass manufacturer standards and compatible with framing system material/finish.

.6 Glazing sealant: purpose-made for glazing use, compatible with insulating glass units.

.7 Structural sealant: one or two component, neutral-curing silicone sealant intended for structural bonding of glass, metal and other materials.

.8 Weather sealant: polyurethane, non-sag, 1-part formulation, colours selected by DCC Representative.

Part 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions and data sheets.

3.2 GENERAL GLAZING REQUIREMENTS

.1 Clean sealing surfaces at perimeter of glass and sealing surfaces of rabbets before applying glazing tapes and sealant. Use solvent and cleaning agents recommended by manufacturer of sealing materials. Wipe dry.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Set glass on setting blocks, spaced as recommended by glass manufacturer. Place at least one block at quarter points from each corner.

.4 Centre glass in glazing rabbet to maintain required clearances at perimeter on all 4 sides.

.5 Use glazing sealant for heel beads to seal glazing vapour tight to frames.

3.3 INSTALLATION

.1 Install insulating glass units into aluminum curtain wall framing in accordance with reviewed shop drawings and framing system manufacturer requirements.

.2 Install laminated glass units in entrance vestibule in accordance with drawing details and manufacturer's requirements.

.1 Joints to be structural silicone sealed

3.4 CLEANING

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

.2 Remove glazing materials from finish surfaces.

.3 Remove labels after Work is complete.

.4 Remove labels.

.5 Clean glass and mirrors using approved non-abrasive cleaner in accordance with manufacturer's instructions.

.6 Clean glass, window frames and adjacent surfaces, interior and exterior, just prior to project completion. Do not use steel scrapers, scratched glass will be rejected.

3.5 PROTECTION OF FINISHED WORK

.1 After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

Part 1 GENERAL

1.1 SECTION INCLUDES

.1 Surface preparation and field application of paints and coatings.

1.2 RELATED SECTIONS

.1 Section 05 12 23 – Structural Steel for Buildings

.2 Section 05 50 00 – Architectural Metal Fabrications.

.3 Section 06 10 00- Rough Carpentry

1.3 REFERENCES

.1 ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.

.2 ASTM D2016 - Test Method for Moisture Content of Wood.

.3 NPCA (National Paint and Coatings Association) - Guide to U.S. Government Paint Specifications.

.4 MPI (The Master Painters Institute) - Architectural Painting Specification Manual

1.4 SUBMITTALS

.1 Samples: Submit two samples, 200x200 mm in size illustrating selected colours and textures for each colour selected.

1.5 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

.2 Applicator: Company specializing in performing the work of this section with minimum five years documented experience.

.3 Acceptable manufacturers, materials, workmanship and all items affecting the work of this section is to be in accordance with The Master Painters Institute (MPI) "Architectural Painting Specification Manual".

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, protect and handle products to site.

.2 Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

.3 Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, colour designation, and instructions for mixing and reducing.

.4 Store paint materials at minimum ambient temperature of 7 degrees C and a maximum of 32 degrees C, in ventilated area, and as required by manufacturer's instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

.1 Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

.2 Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

.3 Minimum Application Temperatures for Latex Paints: 7 degrees C for interiors; 10 degrees C for exterior; unless required otherwise by manufacturer's instructions.

.4 Provide lighting level of 860 lx measured mid-height at substrate surface.

1.8 EXTRA MATERIALS

.1 Section 01 33 00: Submission procedures.

.2 Provide 4 L of each colour, type, and surface texture to Owner.

.3 Label each container with colour, type, texture, room locations, and in addition to the manufacturer's label.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.,) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

.2 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.3 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.4 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground the following procedures shall be strictly adhered to:

.1 Retain cleaning water for water-based materials to allow sediments to be filtered out.

.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.

.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.

.4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.

.5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.5 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

.6 Set aside and protect surplus and uncontaminated finish materials: . Deliver to or arrange collection for verifiable re-use or re-manufacturing.

.7 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

Part 2 PRODUCTS

2.1 MANUFACTURERS

.1 Manufacturers: all paint and varathane used shall be listed in the Master Painters Institute approved product List – most recent edition, and have a rating of E3 minimum.

.2 Paint materials for paint systems shall be products of a single manufacturer.

2.2 MATERIALS

.1 Coatings: Ready mixed, except field catalyzed coatings, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.

.2 Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verify that surfaces substrate conditions are ready to receive work as instructed by the product manufacturer.

.2 Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

.3 Test shop applied primer for compatibility with subsequent cover materials.

.4 Do not apply finishes unless moisture content of surfaces are below the paint manufacturer’s recommended maximums.

3.2 PREPARATION

.1 Correct defects and clean surfaces which affect work of this section. Remove existing coatings that exhibit loose surface defects.

.2 Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand, power tool, wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

3.3 APPLICATION

.1 Apply products in accordance with manufacturer's instructions.

.2 Do not apply finishes to surfaces that are not dry.

.3 Apply each coat to uniform finish.

.4 Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

.5 Sand wood and metal lightly between coats to achieve required finish.

.6 Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

.7 Allow applied coat to dry before next coat is applied.

3.4 CLEANING

.1 Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.5 SCHEDULE - EXTERIOR SURFACES

.1 Exterior metal assemblies to be powder-coated where indicated. Including but not limited to:

.1 Handrails

.2 Structural columns

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Removable fabric screens to run along either side of walkway guards.

1.2 RELATED SECTIONS

.1 Section 05 12 23 Structural Steel for Buildings.

1.3 REFERENCES

.1 AATCC (American Association of Textile Chemists and Colorists).

.1 169-2009 Weather Resistance of Textiles: Xenon Lamp Exposure.

.2 ASTM International

.1 D2261 - 13(2017)e1-Standard Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine)

1.4 MAINTENANCE DATA

.1 Prior to substantial performance, provide Departmental Representative with manufacturer's instructions covering care and maintenance of fabric screens to be included in maintenance manual as per General Requirements.

.2 Provide warranty information for inclusion in maintenance manual.

1.5 SUBMITTALS

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

.2 Provide samples representing manufacturer's full range of colours for selection by Departmental Representative.

.3 Shop drawings

.1 Indicate configuration, dimension and attachment details of screens.

PART 2 PRODUCTS

2.1 FABRIC

.1 Woven acrylic fabric with water/stain repellency manufactured specifically for the fabrication of awnings. Suitable for marine environment.

.2 100% solution dyed with fluorocarbon finish. Both sides alike.

.3 116.8 centimeter width, 314 grams per square meter.

.4 Highly resistant to ultraviolet rays and color degradation.

.5 Stain and mildew resistant.

.6 Water repellant.

.7 Colorfastness to light to AATCC 169-2009

.8 Washable with bleach solution without damage to fabric.

.9 Tear strength to ASTM D2261 - 13(2017)e1

.10 10 year manufacturer's warranty.

2.2 ACCESSORIES

.1 Thread- All thread used in the fabrication of screens to be approved by the manufacturer for use with fabric, and manufactured to resist degredation for the rated lifetime of the fabric.

.2 Fasteners and fittings- Stainless steel construction.

.3 Grommets- Brass construction.

2.3 WALKWAY SCREENS

.1 Refer to drawings for extent and dimensions of walkway screens.

.2 Form top and bottom hems by a triple fold securely sewn with edges and panels seams 1 inch overlapped lock stitched.

.3 Provide button snaps round perimeter of screen every 300mm on center, or as required to stretch fabric tightly onto the frame.

PART 3 EXECUTION

3.1 MANUFACTURE

.1 Manufacture screens in accordance with details and as specified.

3.2 EXAMINATION

.1 Verify that framework is ready for screen installation.

.2 If surfaces are not ready, inform Departmental Representative, and proceed with installation only after deficiencies have been rectified.

.3 Start of installation indicates acceptance of framework.

3.3 INSTALLATION

.1 Install grommets in screen where indicated.

.2 Install male portion of button snaps to metal framework at spacings to allow screens to be stretched tightly onto frames.

.3 Install screens onto frame. Stretch screens tight in both directions. Install screens without visible folds or wrinkles

3.4 SCHEDULE

.1 Refer to drawings for screen locations.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Provide means supply and install.

.2 Work means material and labour.

.3

1.2 GENERAL SCOPE

.1 Provide the work indicated in the contract documents and as required to provide complete, tested and fully operational systems including all work not normally indicated but necessary for a complete and operational installation.

.2 The Contractor is expected to be experienced and competent and knowledgeable about the trades and applicable codes, ordinances and industry standards and shall perform the work accordingly, on schedule and fully coordinated with all other trades.

.3 The Contract Documents for this Division are an integral part of the complete contract documents for the project and will be interpreted in conjunction with all other Divisions.

.4 Within ten [10] days of award of the Contract provide to the Departmental Representative a price breakdown to the Departmental Representative's satisfaction.

1.3 CODES, REGULATIONS AND STANDARDS

.1 The work of this Section shall conform to the edition of codes, regulations and standards in effect at the time of award of Contract, and conform to the requirements of the Authorities Having Jurisdiction.

1.4 LIABILITY

.1 Be responsible for layout of work and for any damage caused by improper execution of work.

.2 Be responsible for condition of materials and equipment supplied and protect all work until work completed and accepted.

1.5 PERMITS AND FEES

.1 Obtain all required permits and pay all fees as applicable to the work of this Section. Comply with all Federal, Provincial, Municipal and other legal regulations and bylaws applicable to the work.

1.6 DRAWINGS AND MEASUREMENTS

.1 Except where precisely indicated, the contract documents are diagrammatic and generally indicate the scope of work and general arrangement and establish minimum quality and performance requirements. Where there are conflicting requirements the Contractor shall allow for and provide the better quality and/or greater quantity unless the conflicting requirements are interpreted otherwise in writing by the Departmental Representative.

.2 Consult the Architectural drawings for exact locations of fixtures and equipment.

1.7 WARRANTY

.1 Provide the Owner with a written warranty that the equipment installed and the work performed under this contract will remain in serviceable condition for one (1) year from the date of final acceptance. Warranty shall include parts and labour.

1.8 WORKMANSHIP

.1 Workmanship shall be in accordance with well-established practice and with standards accepted and recognized by the Departmental Representative and the Trade.

.2 The Departmental Representative may reject any work not conforming to the Contract Documents or to accepted standards of performance, quietness of operation, finish or appearance.

.3 Employ only tradesmen with valid Provincial Trade Qualification Certificates to perform only work permitted by their certificates.

1.9 ASBESTOS

.1 All material/products provided shall be free of asbestos.

.2 If existing asbestos is discovered which will be affected by the work of the Contract, immediately notify the Departmental Representative. All work related to existing asbestos shall be handled in accordance with the requirements of WorkSafeBC (Workers' Compensation Board of British Columbia).

1.10 SEISMIC RESTRAINT

.1 Provide seismic restraints for the piping specified in this Section to meet the requirements of the National Building Code, to be in general conformance to SMACNA Guidelines, to minimize damage to the systems from a seismic event, to prevent systems from causing personal injury during a seismic event.

1.11 MISCELLANEOUS METAL

.1 Be responsible for all miscellaneous steel work relative to this Section of the Specifications, including but not limited to:

.1 Hanging, supporting, anchoring, guiding and related work as it applies to piping.

1.12 COORDINATION

.1 Examine all contract drawings to verify space and headroom limitations for the required work. Coordinate the work with all trades and modify without changing the design intent to facilitate a satisfactory installation. Make no changes involving extra cost to the Owner without the Departmental Representative's prior written approval.

.2 Work out jointly all interference problems on the site and coordinate all work before fabricating, or installing any material or equipment. No consideration of payment will be made for additional work due to fabrication or installation of materials before a coordination issue was identified and resolved.

.3 Coordinate deliveries with the General Contractor.

1.13 CUTTING, PATCHING, DIGGING CORING AND CANNING

.1 Lay out all cutting, patching, digging and coring and canning required to accommodate the mechanical services. Coordinate with other Divisions. Be responsible for correct location and sizing of all openings required under this Section.

1.14 EXISTING SERVICES

.1 Arrange work to avoid shutdowns of existing services. Where shutdowns are unavoidable, obtain the Owner's approval of the schedule of shutdowns.

.2 Shutdowns of existing services will be carried out by the Owner's maintenance staff.

.3 To avoid interrupting of existing services, temporary relocations and/or bypasses of piping may be required.

.4 Before interrupting any services complete all preparatory work as far as reasonably possible and have all necessary materials on site and prefabricated (where practical) and work continuously to keep the length of interruption to a minimum.

1.15 DEMOLITION, SALVAGE AND RE-USED EQUIPMENT

.1 All piping, ducting and equipment which becomes redundant and is no longer required due to the work shall become the property of the Contractor and shall be completely removed from the site.

.2 Where existing equipment is being relocated and re-used, check and report on the condition before removal to the Departmental Representative. Any damage by the work of this contract is the responsibility of the Departmental Representative.

1.16 PAINTING AND IDENTIFICATION

.1 Apply a coat of rust inhibiting primer to all exposed, bare steel provided under this Section.

1.17 RECORD DRAWINGS

.1 Provide a set of drawings with an up-to-date, accurate record marked in red of the installation of mechanical services where they vary from the drawings.

.2 Dimension the locations and inverts of buried or concealed services before they are concealed.

.3 Submit the drawings to the Departmental Representative. Make noted changes and corrections.

1.18 SUBSTANTIAL PERFORMANCE

.1 The work will not be considered to be ready for use or substantially complete until the following requirements have been met:

.1 All reported deficiencies have been corrected.

.2 Record Drawings ready for review.

.2 Work under this Section which is still outstanding when substantial performance is certified will be considered deficient and hold-back will be established to be withheld until Total Performance and will be equal to at least twice the Consultant’s cost estimate of completing that work.

Part 2 PLUMBING SYSTEMS

2.1 GENERAL

.1 All work and equipment shall be in accordance with the Canadian Plumbing Code and the Authorities Having Jurisdiction.

.2 Tests shall be as follows:

.1 Storm drains - hydraulic, 3 m for 8 hours.

2.2 PIPING

.1 Drainage Piping

.1 Below ground:

.1 Polyvinyl Chloride (PVC) Drain Waste and Vent Pipe and Pipe Fittings, conforming to CSA B181.2. Joints: solvent weld to ASTM D2564.

.2 Above ground:

.1 Schedule 40 Galvanized Steel Pipe and Pipe Fittings conforming to ASTM A53, with plain ends.

.2 Joints: mechanical joint clamps. Neoprene or butyl rubber compression gaskets to ASTM C564 or CAN/CSA-B70 with stainless steel bands.

.2 Cleanouts at grade: PVC, full size with threaded cap.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS & SUMMARY

.1 The General Conditions, Supplements and Amendments shall govern this Section (read in conjunction with Instructions to Tenderers / Bidders). This section covers items common to all Electrical sections and is intended only to supplement the requirements of Division 01.

.2 Reference to “Electrical Divisions” shall mean all sections of Divisions 26, 27, 28, 33 & 34 in the Master Format or the Canadian Master Specifications.

.3 The word "Provide" shall mean "Supply and Install" the products and services specified. "As Indicated" means that the item(s) specified are shown on the drawings.

.4 Provide materials, equipment and plant, of specified design, performance and quality; and, current models with published certified ratings for which replacement parts are readily available. Provide project management and on-site supervision to undertake administration, meet schedules, ensure timely performance, ensure coordination, and establish orderly completion and the delivery of a fully commissioned installation.

.5 The most stringent requirements of this and other electrical sections shall govern.

.6 All work shall be in accordance with the PROJECT Drawings and Specifications and their intent, complete with all necessary components, including those not normally shown or specified, but required for a complete installation.

.7 Provide seismic restraints for all required fixtures, devices, equipment, pathway, and wiring systems as required by the BC Building Code.

.8 Connect to equipment specified in other Sections and to equipment supplied and installed by other Contractors or by the Owner. Uncrate equipment, move in place and install complete; start-up and test. Include all field assembly of loosely/separately packaged accessories

.9

1.2 CODES AND STANDARDS

.1 Comply with all laws, ordinances, rules, regulations and codes of all authorities having jurisdiction relative to this project.

.2 The project will be constructed to the current adopted edition of applicable standards, including:

.3 CSA C22.1, Canadian Electrical Code (CEC)

.4 British Columbia Building Code (BCBC)

.5 National Fire Code of Canada (NFCC)

.6 ASHRAE 90.1, Standard for Energy Efficient Design of New Buildings

.7 Provincial Fire Marshall Regulations

.8 WorkSafe BC Regulations

.9 Applicable NFPA Regulations

1.3 REFERENCES

.1 Install in accordance with CSA C22.1 (current adopted edition) – except where specified otherwise.

.2 Refer to CSA C22.1 Appendix A "Safety Standards for Electrical Equipment" for applicable codes and the related revisions

.3 Refer to CSA C22.1 for related 'Reference Publications'

.4 Refer to NBCC Table 1.3.1.2 for applicable codes and the related revisions.

.5 Comply with Local Electrical Bulletins and by-laws relating to the Authority having Jurisdiction.

.6 Install overhead and underground systems in accordance with CSA C22.3 No.1 (current adopted edition) – except where specified otherwise.

.7 Preferred Voltage Levels for AC Systems, 0-50,000V in accordance with CAN3-C235 (current adopted edition)

1.4 PERMITS

.1 Submit to the Electrical Inspection Authority having jurisdiction the necessary number of drawings and specifications for review and approval prior to commencement of the project.

.2 Pay all associated fees and obtain all permits, licenses etc. to complete the project.

.3 Obtain a Certificated of Acceptance from the Inspection Authority having jurisdiction upon completion of the project and include in the O&M manual.

1.5 SCOPE OF WORK

.1 Scope of work includes:

- Provide electrical connections to new automatic door operators, and equipment.
- Provide new exterior lighting and receptacles on new exterior board walk.
- Provide new exterior bollards
- Provide card access control for exterior board walk.
- Provide rough in for future CCTV system

1.6 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235- current edition

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.7 SUBMITTALS

.1 Submittals to be in accordance with Division 01.

.2 Shop Drawings:

.1 The term “shop drawing” means drawings, diagrams, illustrations, schedules, performance characteristics, brochures and other data which are to be provided by the contractor to illustrate details of a portion of the work.

.2 Prior to submitting the shop drawings to the Departmental Representative, the contractor shall review the shop drawings to determine that the equipment complies with the requirements of the specifications and drawings.

.3 Submit shop drawings, product data and samples for all electrical equipment and materials in accordance with Division 01. The submission shall be reviewed, signed and processed as described in Division 01.

.4 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.

.5 Where applicable, include wiring, line and schematic diagrams. Include wiring drawings or diagrams showing interconnection with work of other Sections.

.6 Manufacturer of products shall conform to revised shop drawings.

.3 Content

.1 Shop drawings submitted title sheet.

.2 Data shall be specific and technical.

.3 Identify each piece of equipment including specific options selected for each type to be included in the project.

.4 Information shall include all scheduled data.

.5 Advertising literature will be rejected.

.6 The project and equipment designations shall be identified on each document.

.7 The shop drawings/product data shall include:

.1 Dimensioned construction drawings with plans and sections showing size, arrangement and necessary clearances, with all equipment weights and mounting point loads.

.2 Mounting arrangements.

.3 Control explanation and internal wiring diagrams for packaged equipment.

.4 A written description of control sequences relating to the schematic diagrams.

.5 Copies of factory tests, where applicable.

.4 Format

.1 Shop Drawings to be submitted in PDF format; larger submittals may be submitted on flash drives or uploaded to an FTP site set up the contractor.

.5 Coordination

.1 Where electrical equipment requires support or backing by other trades or mechanical connections, the shop drawings shall also be circulated through the other "services" contractor(s) prior to submission to the Departmental Representative.

.6 Keep one [1] copy of shop drawings and product data, on site, available for reference.

.7 Quality Control: in accordance with Division 01 - Quality Control

.1 Provide CSA certified equipment and material. Where CSA certified equipment and/or material is not available, submit such equipment and/or material to the authority having jurisdiction for special approval before delivery to site.

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

.3 Submit, upon completion of Work, the electrical "load balance" report.

.8 Permits and Fees:

.1 Submit to Electrical Inspection Department, Local Fire Authorities and Supply Authority the necessary number of drawings and specifications for examination and approval prior to commencement of work. Obtain all required permits and pay all fees.

.2 Arrange for inspection of all Work by the authorities having jurisdiction. On completion of the Work, furnish final unconditional certificates of approval by the inspecting authorities.

1.8 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Division 01 - Quality Control

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial and/or Territorial Act.

.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

.3 Site Meetings: in accordance with Division 01 - Construction Progress Schedule

.1 Site Meetings: as part of Manufacturer's Field Services: schedule site visits, to review Work, at stages listed below:

.1 At time of initial shop drawing submission to confirm any existing conditions and to coordinate with the project schedule and any cross discipline requirements.

.2 After delivery and storage of products, and when preparatory Work is complete but before installation begins.

.3 During progress of Work at key schedule points as determined.

.4 At commissioning.

.5 Upon completion of Work, after cleaning is carried out.

.4 Health and Safety Requirements: do construction occupational health and safety in accordance with Division 01 - Health and Safety Requirements.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

.4 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.5 Store and protect equipment and materials from nicks, scratches, and damage. Protect from dust where applicable.

.6 Replace defective or damaged materials with new.

1.10 SYSTEM START-UP

.1 Refer to Division 01 and Section 26 08 00 – Commissioning and Demonstrations and as follows.

.2 Instruct Departmental Representative and operating personnel in the operation, care and maintenance of equipment.

.3 Arrange and pay for services of manufacturer's factory service Engineer to supervise start-up of installation, check, adjust, balance and calibrate components, where required in these specifications.

.4 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.

1.11 OPERATING INSTRUCTIONS

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

.2 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.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.12 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Division 01 - Construction/Demolition Waste Management and Disposal and with the Waste Reduction Work plan.

.2 Avoid using landfill waste disposal procedures when recycling facilities are available.

.3 Place materials defined as hazardous or toxic waste in designated containers.

1.13 DRAWINGS AND MEASUREMENTS

.1 Drawings are generally diagrammatic and are intended to indicate the scope and general arrangement of work and are not detailed installation drawings. Do not scale the drawings. Obtain accurate dimensions from the Architectural and Structural drawings.

.2 Consult the architectural drawings and details for exact locations of fixtures and equipment. Obtain this information from the Departmental Representative where definite locations are not indicated.

.3 Take field measurements, where equipment and material dimensions are dependent upon building dimensions.

.4 Where imperial units have been indicated in brackets [ ] following the requirements in SI units, the conversion is approximate and provided for convenience. The SI units shall govern.

1.14 PROJECT COORDINATION

.1 Check drawings of all trades to verify space and headroom limitations for work to be installed. Coordinate work with all trades and make changes to facilitate a satisfactory installation. Make no deviations to the design intent involving extra cost to the Owner, without the Departmental Representative's written approval.

.2 The drawings indicate the general location and route to be followed by the electrical services. Where details are not shown on the drawings or only shown diagrammatically, the services shall be installed in such a way as to conserve head room and interfere as little as possible with the free use of space through which they pass. Service lines shall run parallel to building lines. All services in the ceiling shall be kept as tight as possible to beams or other limiting members at high level. All electrical services shall be coordinated in elevation to ensure that they are concealed in the ceiling or structural space provided unless detailed otherwise on drawings.

.3 Work out jointly all interference problems on the site and coordinate all work before fabricating, or installing any material or equipment. Where necessary, produce interference/coordination drawings showing exact locations of electrical systems or equipment within service areas, shafts and the ceiling space. Distribute copies of the final interference/coordination drawings to the Departmental Representative and all affected parties.

.4 Ensure that all materials and equipment fit into the allotted spaces and that all equipment can be properly serviced and replaced, if and when required. Advise the Departmental Representative of space problems before installing any material or equipment. Demonstrate to the Departmental Representative on completion of the work that all equipment installed can be properly, safely serviced and replaced, if and when required.

1.15 PROVISION FOR FUTURE EQUIPMENT AND CONSTRUCTION

.1 Leave clear spaces designated for future equipment or building expansion where indicated. Plan for the installation under this contract and ensure clear accessible, unhindered access to the space is allowed for.

.2 Were contract documents don't clearly indicate the future expansion requirements, but known services are required, provide written "request for information" to the Departmental Representative before making assumptions as to intent.

1.16

1.17 SPRINKLER PROOF REQUIREMENTS

.1 All equipment and wiring systems shall be sprinkler proof standard where sprinkler fire protection systems are installed.

.2 In rooms where electrical equipment is installed surface mounted, electrical equipment contained in these rooms to be protected by non-combustible driphoods, shields, and gasketed doors as applicable to inhibit water ingress into electrical equipment. Exposed conduits connected to equipment to utilize watertight connectors. Top entry to be avoided where possible

.3 In particular all unit substations, transformers, switchgear, motor control and panelboard shop drawings shall be certified 'sprinkler proof' design.

1.18 EQUIPMENT RESTRAINT

.1 Related Section: 26 05 05 Seismic Restraint.

.2 It is the entire 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.

1.19 PHASED CONSTRUCTION

.1 See Architectural specifications and drawings for construction phasing. Make all allowances to phase the work in accordance with the project phasing.

.2 All trades in this Division shall make allowance for the implications of having to totally complete all work in the new addition before proceeding with work in the existing building.

1.20 WARRANTY

.1 Use of installed equipment during construction shall not shorten or alter the warranty period as specified in the Division 01.

.2 Take note of any extended warranties specified in other sections of this Division or in Division 27.

.3 Furnish a written warranty stating that all work executed under this Division will be free from defects of material and workmanship for a period of one (1) year from the date of substantial performance and include in O&M manual.

.4 Promptly investigate any electrical or control malfunction, and repair or replace all such defective work and all other damages thereby which becomes defective during the time of the warranty.

1.21

.1

1.22 RESPONSIBILITIES

.1 Provide temporary lighting, power and systems for construction services and remove after construction is complete.

.2 Ensure that equipment does not transmit noise and/or vibration to other parts of the building, as a result of poor installation practice.

.3

.4 Protect equipment and material from the weather, moisture, dust and physical damage.

.5 Cover equipment openings and open ends of conduit, piping and pullboxes as work progresses. Failure to do so will result in the Trade being required to adequately clean or replace materials and equipment at no extra cost to the Owner.

.6 Refinish damaged or marred factory finish to factory finish.

.7 The specifications and drawings form an integral part of the Contract Documents. Neither the drawings nor the specifications shall be used alone. Work omitted from the drawings but mentioned or reasonably implied in the specifications, vice versa, shall be considered as properly and sufficiently specified and shall be provided. Misinterpretation of any requirement of either plans or specifications shall not relieve this Contractor of the responsibility of properly completing his trade to the approval of the Departmental Representative.

1.23 STANDARD OF ACCEPTANCE

.1 Standard of Acceptance means that the item named and specified by manufacturer and/or catalogue number forms part of specification and sets standard regarding performance, quality of material and workmanship and when used in conjunction with a referenced standard, shall be deemed to supplement the standard.

.2 Where a manufacturer’s equipment is listed, the manufacturer's listed equipment was used in preparing the base design. Tenders may be based on the listed equipment or preapproved alternate manufacturer’s equivalent products, provided that they meet every aspect of the base design and every aspect of the drawings and specifications.

.3 Where other than the listed manufacturer’s equipment is selected or approved, include for the cost of any resulting work (both under this Division and other Divisions) and any necessary redesign of installation or structure. Submit redesign drawings for review with Shop Drawings. Maintain installation, access and servicing clearances. Equipment/materials shall not exceed the available space limitations. Redesign drawings shall be to scale and of a standard equal to the Project Drawings.

.4 A visible manufacturer's nameplate shall indicate manufacturer's name, model number, serial number, capacity data, electrical characteristics and approval stamps.

.5 All materials shall be new, of the quality specified and shall confirm to the standards of the Canadian Standards Association. Where equipment or materials are specified by

technical description only, they shall be of the best quality for the listed application in which it is to be installed.

.6 All work shall be executed in a neat and workmanlike manner by qualified tradespersons. Electrical contractor shall keep a competent foreman and necessary assistants all satisfactory to the Departmental Representative on the project during the progress of the work.

1.24 ADDITION OF ACCEPTABLE MANUFACTURERS

.1

.2 Alternate approvals will be given by written addendum only. No other substitution will be permitted after closing of tenders.

.3 Alternate approvals granted before the closing of tenders will be limited to a manufacturer's system and/or series only. This limited approval will not preclude substitute equipment/material from complying with specific features included with equipment/material specified. Determine that the alternate product meets the specification intent before basing a tender on the product

.4 Where alternate equipment/materials are selected, allow for effects on other parts of the work of this Trade and other Trades. Where substantial changes in arrangement are required, submit shop drawings of the proposed changes with Plan and Section views and show effects on work of other Trades. Alternate equipment/materials shall not exceed the available space limitations. Maintain installation, access and servicing clearances. No extra will be allowed due to the use of alternate equipment/materials.

.5 Where two or more items of equipment and/or material, of the same type, are required, provide products of a single manufacturer.

.6 Install and test all equipment and material, in accordance with the detailed recommendations of the manufacturer.

1.25 CASH ALLOWANCES

.1 N/A

1.26

.1

.2

.3

1.27 PROJECT CLOSE-OUT REQUIREMENTS

.1 Refer to detailed specifications in each section for detailed requirements. Record drawings to be submitted to Departmental Representative and all life safety systems must be operational, verified and tested and demonstrated to Departmental Representative prior to issuance of Substantial Performance Certificate.

1.28 SUBSTANTIAL PERFORMANCE REQUIREMENTS

.1 Before the Departmental Representative is requested to make a site review for substantial performance of the work:

.1 Commission all systems and prove out all components, interlocks and safety devices.

.2 Submit a letter certifying that all work is complete for the intended use, operational, clean and all required submissions have been completed.

.3 A complete list of incomplete or deficient items shall be provided. If, in the opinion of the Departmental Representative, this list indicates the project is excessively incomplete, a substantial completion review will not be performed.

.2 The work will not be considered to be ready for use or substantially complete until the following requirements have been met:

.1 All reported deficiencies have been corrected.

.2 Operating and Maintenance Manuals completed.

.3 "As Built" Record Drawing ready for review.

.4 Systems Commissioning has been completed and has been verified by Departmental Representative.

.5 All demonstrations to the owner have been completed.

.3 Departmental Representative's Letters of Assurance will not be issued until the following requirements have been met:

.1 All items listed in .1 above have been completed or addressed.

.2 Certificate of Penetrations through separations.

.3 Provincial or City Electrical Inspection - Certificate of inspection.

.4 Seismic Engineers letter of Assurance and final inspection report.

.5 Certificate of Substantial Performance.

.6 Signed off copy of Departmental Representative's final site

.7 review report. Emergency and Exit Lighting test letter.

1.29 DEFICIENCY HOLDBACKS AND DEFICIENCY INSPECTIONS

.1 Work under this Division which is still outstanding when substantial performance is certified will be considered deficient and a sum equal to at least twice the estimated cost of completing that work will be held back.

.2 It is expected that outstanding work will be completed in an expeditious manner and the entire holdback sum will be retained until the requirements for Total Performance of Division 26, 27, 28, 33 (electrical) work have been met and verified.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with Division 01 and as follows.

.2 Material and equipment to be CSA certified. Where CSA certified material or equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval.

.3 Where equipment or materials are specified by technical description only, they are to be of the best quality available for the application for which it is to be installed.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Provide all power and control wiring, conduit, wire, fittings, disconnect switches, motor starters, for all mechanical equipment unless otherwise specified.

.2 Bond all motors to conduit system with separate bonding conductor in flexible conduit or bonding conductor in the flexible conduit.

.3 Connections shall be made with watertight flexible conduit with watertight connectors.

.4 Control wiring and conduit standards are specified in the Electrical Divisions. Refer to Section 26 24 21 – Mechanical Equipment Controls and the Mechanical Divisions for scope of work and particular details.

2.3 WARNING SIGNS

.1 Provide warning signs, as specified or to meet the requirements of Departmental Representative.

.2 Use decal signs, minimum 175 x 250 mm size

2.4 EQUIPMENT IDENTIFICATION

.1 Identify all electrical equipment including but not limited to starters, disconnects, remote ballasts and controls with nameplates and labels as follows:

.2 Nameplates:

.1 Lamicoid 3 mm thick plastic engraving sheet, white face, black core, self adhesive unless specified otherwise. Provide white face, red core for all essential distribution equipment.

.2 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

.3 Typical Labelling:

.1 Panelboard & CDP – 5 lines

.1 Line 2 – Panel/CDP designation – Size 4 lettering

.2 Line 3 – eg 225A, 120/208V, 3 phase 4W – Size 2 lettering

.3 Line 4 – Feeder: eg 4#3 – 35mm C – Size 2 lettering

.4 Line 5 – Origin eg: Main Elect. Room – Size 2 lettering

.2 Distribution Circuit Breakers – 4 lines

.1 Line 2 – Main Circuit Breaker – Size 4 lettering

.2 Line 3 – Feeder: eg 4#3 – Size 2 lettering

.3 Line 4 – Origin: eg K1 Sub-station – Size 2 lettering

.3 Label colours unless otherwise indicated:

.1 Normal Power: white letters on black base.

.4 Wording on nameplates to be approved prior to manufacture.

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

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

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

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

.3 Labels:

.1 Identify each outlet, starter, disconnect and all items of fixed equipment with the appropriate panel and circuit number origin by means of a small but good quality vinyl, self-laminating label such as T & B E-Z Code WSL, Dymo Letratag or Brother P-Touch equivalent printable markers. Embossed Dymo or any labels with edges and corners that are prone to lift will be rejected. Confirm location of labels with Departmental Representative before installing. Circuit number to agree with Record Drawings.

.4 Provide plastic covered panel directory with circuits and areas served typed in, and mounted on inside of door. Directory to conform to Record Drawings.

2.5 WIRING IDENTIFICATION

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

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to CSA C22.1.

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

2.6 CONDUIT, CABLE AND PULLBOX IDENTIFICATION

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

.2 Code with 25 mm plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor and at 15 m intervals.

.3 colour coding to be as follows unless otherwise specified (note, not all systems may be present in this project):

SYSTEM	MAJOR BAND	MINOR BAND	CHARACTERS
High Voltage	Yellow	Purple	Nominal V
347/600V Normal	Yellow	Green	

347/600V Vital	Dark Blue	Red	
347/600V Delayed Vital	Dark Blue	L. Blue	
347/600V Conditional	Dark Blue	Yellow	
347/600V UPS	Dark Blue	Orange	
120/208V Normal	Yellow		
120/208V Vital	Light Blue	Red	
120/208V Delayed Vital	Light Blue	Light Blue	
120/208V Conditional	Light Blue	Yellow	
120/208V UPS	Light Blue	Orange	
Ground	Dark Green		GR
Fire Alarm	Red		FA
Emg Voice Paging	Red	Blue	EP
Fire Fighters Telephone	Red	Green	FFT
Computer/Data	Green	Blue	COM
Telephone	Green		TEL
General Intercom	Green	Yellow	IC
Low Level Paging	Green	White	PA
Commercial TV	Brown		TV
AV/TV Systems	Brown		AV/TV
Security Systems	Red	Black	SEC
Building Alarm	Purple	White	BA
CCTV	Purple	Yellow	CCTV
Door Intercom	Purple	White	DI
Door Lock Release	Purple	Black	ED
Master Clock System	Yellow		CS
BAS (Digital)	Orange	Green	BCD
BAS (110V)	White	Black	BCH
BAS (LV)	White	Blue	BCL
PLC (Digital)	White	Brown	PLC
Low Voltage Control	White	Yellow	LVC

2.7 FINISHES

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

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

.3 Clean and prime paint exposed hangers, racks, fastenings to prevent rusting. Finish painting shall be provided by Division 09.

.4 Paint outdoor electrical equipment "equipment green" finish.

.5 Paint indoor switchgear and distribution enclosures light gray unless otherwise indicated in particular specification sections for specialised or emergency power equipment.

2.8 ACCESS PANELS (DOORS)

.1 Unless otherwise noted, access doors shall be minimum: 450mmx450mm for body entry; 300mmx300mm for hand entry.

.2 Access doors in fire separations of 3/4 hour rating, and higher, and firewalls shall have a compatible fire rating and a ULC label with tamper-proof latch, self closing.

.3 Standard of Acceptance: Zurn, Wade, Acudor, Can-Aqua, Milcor, Maxam, Van-Met.

2.9 ANCHOR BOLTS AND TEMPLATES

.1 Supply anchor bolts and templates for installation by other Divisions.

2.10 FASTENING TO BUILDING STRUCTURE

.1 General:

.1 Do not use inserts in base material with a compressive strength less than 13.79 MPa [2000 psi].

.2 All inserts supporting conduit racks shall have a factor of safety of 5. All other inserts shall have a factor of safety of 4.

.2 Types:

.1 Cast-in-place type:

.1 Channel type - Burndy, Canadian Strut, Unistrut, Cantruss or Hilti Channel.

.2 Wedge type galvanized steel concrete insert, Grinnell Fig. 281 for up to 200 mm pipe size.

.3 Universal type malleable iron body insert, Grinnell Fig. 282 for up to 200 mm pipe size.

.2 Drilled, mechanical expansion type:

.1 Hilti HSL or UCAN LHL heavy duty anchor for use in concrete with compressive strength not less than 19.6 MPa.

.2 Hilti Kwik-Bolt or UCAN WED stud anchor for concrete. (Do not use in seismic restraint applications).

.3 Hilti HDI or UCAN IPA drop-in anchor for concrete.

.4 Hilti or UCAN Sleeve Anchor (medium and light duty) for concrete and masonry.

.5 Hilti ZBP or UCAN Zamac pin bolt (light duty) for concrete and masonry.

.3 Drilled, adhesive type:

.1 Hilti HVA or UCAN Adhesive Anchor consisting of anchor rod assembly with a capsule containing a two-component adhesive, resin and hardener.

.2 Hilti HY150 consisting of anchor rod with a 2 part adhesive system.

.3 For use in concrete housekeeping bases (in vertical downward position) where the distance to the edge of the concrete base could cause weakness if a mechanical expansion type anchor were used.

.4 Rod assemblies shall extend a minimum of 50 mm into the concrete slab below the housekeeping bases.

.3 Note:

.1 All drilling for inserts shall be performed using the appropriate tool specifically designed for the particular insert. The diameter and depth of each drilled hole shall be to the exact dimensions as specified by the insert manufacturer.

.2 Refer to manufacturer's recommendations for tightening torques to be applied to inserts.

.3 Where specifically called for, drills shall include a dust vacuum system, Hilti SAV Dust Vacuum System.

2.11 EQUIPMENT SUPPORTS

.1 Provide stands and supports for equipment and materials supplied.

.2 Lay out concrete bases and curbs required under Electrical Divisions. Coordinate with Concrete Divisions.

.3 Concrete bases shall be a minimum of 100 mm thick, or as noted and shall project at least 150 mm outside the equipment base, unless otherwise directed. Bases and curbs shall be keyed to the floor and incorporate reinforcing bars and/or steel mesh. Chamfer edges of bases at 45 degrees.

.4 Equipment with bedplates shall have metal wedges placed under the edges of the bedplates to raise them 25mm above the base after levelling. The wedges shall be left permanently in place. Fill the space between the bedplate and the base with non-shrink grout - Embeco or In-Pakt.

.5 Construct equipment supports of structural steel. Securely brace. Employ only welded construction. Bolt mounting plates to the structure.

.6 Support ceiling hung equipment with rod hangers and/or structural steel.

2.12 MISCELLANEOUS METAL

.1 Be responsible for all miscellaneous steel work relative to Electrical Divisions of the Specifications, including but not limited to:

.1 Support of equipment.

.2 Hanging, support, anchoring, guiding and relative work as it applies to wiring raceways and electrical equipment.

.3 Earthquake restraint devices - refer also to “Seismic Restraint” sections

.4 Bridle rings - secure to structure or steel supports.

.2 All steel work shall be prime and undercoat painted ready for finish under the related Division.

2.13 MAINTENANCE MATERIALS AND CABINET

.1 Provide maintenance materials in accordance with Division 01 and specified in appropriate Sections.

.2 Provide a finished painted sheet steel “spare equipment cabinet”. Cabinet to have a continuous hinge and complete with shelves and hasp to suit padlock. Minimum size 600mm x 900mm x 200mm deep. Mount on wall in the Electrical Room. Provide a plastic covered typewritten list of spare parts and affix to the inside of the door.

2.14 OPERATION AND MAINTENANCE DATA

.1 Refer to Section 01 78 00 – Closeout Submittals for Operation and Maintenance Manual requirements.

.2 Refer to Section 26 05 03 – Operation and Maintenance Manual for detailed submittal requirements.

.3 Provide operation and maintenance data for incorporation into maintenance manual specified in Division 01 and as follows.

.4 Include in operations and maintenance data:

.1 Details of design elements, construction features, component function and maintenance requirements, to permit effective operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

.2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature not acceptable.

.3 Wiring and schematic diagrams.

.4 Names and addresses of local suppliers for items included in maintenance manuals.

.5 Include in the manual the following major sections:

.1 Title page (in plastic cover).

.2 Comprehensive description of the operation of the systems, including the function of each item of equipment within the system.

.3 Detailed instructions for the normal maintenance of all systems and equipment installed including procedures and frequency of operational checks and service and troubleshooting instructions.

.4 Local source of supply for each item of equipment.

.5 Wiring and control diagrams.

.6 Spare parts list.

.7 Copies of guarantees and certificates.

.8 Manufacturer's maintenance brochures and shop drawings.

2.15 PROJECT RECORD DRAWINGS

.1 Provide project record documents as specified in Division 01 as further called for in this Division.

.2 The contractor shall keep a complete set of white prints at the site office, including all addendums, change orders, site instructions, clarifications and revisions for the purpose of record drawings. As the work on site proceeds, the contractor shall clearly record in Red all as-built conditions which deviate from the original contract documents. Record drawings to include cable runs (complete with number of cables and ID number) and locations of all telecommunications equipment.

.3 Prior to substantial performance, the Contractor shall submit completed red-line record drawings to the Departmental Representative. The Contractor shall certify, in writing that the as-built record drawings are complete and that they accurately indicate all electrical services and electrical pathway, including exposed as well as concealed items.

.4 Preparation of record drawings in AutoCAD shall be performed by the Contractor based on the red-line record drawings submitted by the Contractor.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

.1 Ensure manufacturers nameplates and CSA labels to be visible and legible after equipment is installed.

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit and protruding 50 mm.

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

.3 Install roof jacks where conduit and cables penetrate roofs. Apply sealant after installation. Install roof stand offs where conduit or teck is installed on roof.

.4 All cables and conduits to be installed concealed in finished areas.

3.4 LOCATION OF OUTLETS

.1 Do not install outlets back-to-back or in the same stud space in wall; allow minimum 400mm horizontal clearance between boxes.

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

.3 Locate light switches on latch side of doors unless otherwise indicated.

.4 Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

3.5 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 indicated verify before proceeding with installation. Confirm the height of devices in handicapped facilities before installation.

.3 Adjust mounting heights to accessible heights to meet the BC Building Code where applicable.

.4 Refer to detail on drawings; in the absence of a drawing detail or drawing note, use the following (note, not all devices may be present in this project):

Device	Height		Comment
Local switches	1200mm		

Device	Height		Comment
Wall receptacles/data	300mm		General
Wall receptacles/data	200mm		Above top of continuous baseboard heater
Wall receptacles/data	175mm		Above top of counters or counter splash backs – coordinate with Architectural detail
Wall receptacles/data	900mm		In mechanical rooms
Wall receptacles/data Health Care	450mm to 900mm		Confirm before installation
Exterior receptacles	600mm		
Panelboards	2000mm		Panelboards: as required by Code or as indicated.
Wall mtd telephone	1500mm		
Card Readers/T'Stat	1200mm		Confirm before installation
Fire alarm stations	1300mm		ULC S524 requires not less than 1200mm or more than1400mm.
Wall Mounted Luminaires	2140mm		
Fire alarm horns/audio	2300mm		ULC S524 requires not less than 1800mm to centre. In any event not closer than 50mm to the ceiling
Fire alarm visual devices	2000mm		ULC S524 requires not more than 2000mm to centre. In any event not closer than 150mm to the ceiling
Fire alarm Annunciator	1800mm Top		ULC S524 requires not more than 1800mm above finished floor.
End of line resistors	1800mm		
Television outlets			As receptacles –coordinate with equipment location
Wall mounted speakers & clocks	2300mm		Coordinate with equipment location
Door bell pushbuttons	1500mm		Coordinate with location
Emergency Lighting (wall mounted)			300mm below ceiling or 2300mm max.
Exit Lights			300mm below ceiling or 450mm max. above door.

3.6 COORDINATION OF PROTECTIVE DEVICES

.1 Refer to Section 26 11 10 – Short Circuit Protective Device Coordination and Arc Flash Analysis.

.2 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to the required values and settings to provide a fully coordinated system. Adjust and

modify the protective devices to the recommendations of the Analysis to minimize available incident energy in arc flash situations and maximize the coordination of the protective devices.

3.7 FIELD QUALITY CONTROL

.1 Load and Balance:

- .1 Measure voltage and phase & neutral currents 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 and neutral currents to dry-core transformers and motor control centres, operating under normal load,
- .3 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.2 Conduct and pay for the following tests:

- .1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
- .2 Circuits originating from branch distribution panels.
- .3 Lighting and its control to ASHRAE 90.1 – 10 requirements; this commissioning shall be conducted by the manufacture and the engineer shall receive a letter from the manufacturer detailing the commissioning and it's certification.
- .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
- .5 Systems: fire alarm system and communications.
- .6 Main ground resistance (at all grounding locations).
- .7 Insulation resistance testing:
  - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
  - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
  - .3 Check resistance to ground before energizing.

.3 Provide Departmental Representative with at least one week's notice prior to testing.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Reports:

- .1 Provide written reports in a timely manner upon completion of the testing and load balance. Indicate test hour and date.

3.8 CLEANING

.1 Do final cleaning in accordance with Division 01.

.2 At time of final cleaning, clean lighting reflectors, lenses and other lighting surfaces that have been exposed to construction dust and dirt.

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

.4 Clean and prime paint exposed non-galvanised hangers, racks, fastenings to prevent rusting. Coordinate finish painting with Division 09.

.5 Clean Communication Rooms and equipment located therein with vacuum or similar compressed air/pressurized duster system.

3.9 WORKMANSHIP

.1 Workmanship shall be in accordance with well-established practice and standards accepted and recognized by the Departmental Representative and the Trade.

.2 The Departmental Representative shall have the right to reject any item of work that does not conform to the Contract Documents and accepted standards of performance, quietness of operation, finish and appearance.

.3 Employ only tradesmen holding valid Provincial Trade Qualification Certificates. Tradesmen shall perform only work that their certificate permits. Certificates shall be available for inspection by the Departmental Representative.

3.10 PROTECTION OF WORK

.1 Protect equipment and materials, stored or in place, from the weather, moisture, dust and physical damage.

.2 Mask machined surfaces. Secure covers over equipment openings and open ends of equipment and conduit, as the installation work progresses.

.3 Equipment having operating parts, bearings or machined surfaces, showing signs of rusting, pitting or physical damage will be rejected.

.4 Refinish damaged or marred factory finish.

.5 All communication rooms shall be dust free at the time of installation of cabling and equipment. Communication rooms shall remain dust free during construction.

3.11 PROTECTION OF ELECTRICAL EQUIPMENT

.1 Protect exposed live equipment during construction for personnel safety.

.2 Shield and mark live parts, e.g. "LIVE 120 VOLTS".

.3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

3.12 CONCEALMENT

.1 Conceal wiring and conduit in partitions, walls, crawlspaces and ceiling spaces, unless otherwise noted.

.2 Do not install wiring and conduit on outside walls or on roofs unless specifically directed.

3.13 SERVICE PENETRATIONS IN RATED FIRE SEPARATIONS

.1 All fire stopping materials shall be of one manufacturer; pre-approved manufactures are Hilti and STI.

.2 All cabling, wiring, conduits, cable trays, etc. passing through rated fire separations shall be smoke and fire stopped to a ULC or cUL tested assembly system, in accordance with CAN4-S115-95, that meets the requirements of the Building Code in effect.

.3 The scope includes new services which pass through existing rated separations and also all existing services which pass through a new rated separation or existing separations whose rating has been upgraded.

.4 Firestop System installation must meet requirements of ASTM E 814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

.5 Install firestopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions. The Applicator shall be approved, licensed and supervised by the manufacturer in the installation of firestopping and are to follow the requirements of a rated system; installer to be FM 4991 Approved Contractor, UL Approved Contractor or Hilti Accredited Fire Stop Specialty Contractor.

.6 Contractors are expected to submit system information detailing firestopping product, backing, penetrant, penetrated assembly, Fire (F) and Temperature (T) rating, and ULC or cUL system number during shop drawing stage.

.7 Provide fire stopping material and system information in the maintenance manuals and via labels at major penetrations that are likely to be re-penetrated.

.8 All penetrations for communication cabling are to be firestopped using re-penetrable EZ Path System (Specified Technologies Inc - STI) or re-penetrable Hilti Firestop Systems designated and installed for each specific application.

.9 Allow openings for 100% capacity of raceway or 200% capacity of J-hooks (if applicable).

.10 Provide Firestopping approval certificate in including a Building Code / By-Law Schedule B & C-B signed by a BC registered Professional Engineer. Submit a letter certifying that all work is complete and in accordance with this specification.

.11 A manufacturer's direct representative (account manager, fire protection specialist, not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details. Manufacturer’s fire protection specialist to work with Engineer to determine frequency of site walk-throughs to be submitted to construction manager and Departmental Representative.

.12 Inspection of through-penetration firestopping by the manufacturer shall be performed in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops” or other recognized standard and a field report shall be issued by the manufacturer to the Departmental Representative.

.13 Electrical Contractor to provide for a 10% deconstruction test by the Engineer during walk-through.

3.14 SERVICE PENETRATIONS IN NON-RATED SEPARATIONS

.1 All cabling, wiring, conduits, cable trays, etc. passing through non-rated fire separations and non-rated walls and floors shall be tightly fitted and sealed on both sides of the separation with caulking or silicon sealant to prevent the passage of smoke and/or transmission of sound.

3.15 CONDUIT SLEEVES

.1 Provide conduit sleeves for all conduit and wiring passing through rated walls and floors. Sleeves to be concentric with conduit or wiring.

.2 Except as otherwise noted conduit sleeves are not required for holes formed or cored in interior concrete walls or floors.

.3 Conduit sleeves shall extend 50 mm above floors in unfinished areas and wet areas and 6 mm above floors in finished areas.

.4 Conduit sleeves shall extend 25 mm on each side of walls in unfinished areas and 6 mm in finished areas.

.5 Conduit sleeves shall extend 25mm beyond exterior face of building. Caulk with flexible caulking compound.

.6 Sleeve Size: 12 mm clearance all around, between sleeve and conduit or wiring.

.7 Paint exterior surfaces of ferrous sleeves with heavy application of rust inhibiting primer.

.8 Packing of Sleeves:

.1 Where sleeves pass through foundation walls and perimeter walls the space between sleeve and conduit shall be caulked with waterproof fire retardant non-hardening mastic.

.2 Pack future-use sleeves with mineral wool insulation and then seal with ULC approved fire stop sealant for rated fire separations.

3.16 ACCESSIBILITY AND ACCESS PANELS

.1 Install all equipment, controls and junction boxes so as to be readily accessible for future modification, adjustment, operation and maintenance as appropriate.

.2 Provide access panels where required in building surfaces. Do not locate access panels in panelled or special finish walls, without prior approval of the Departmental Representative.

.3 Access panels in U.L.C. fire separations and fire walls shall have a compatible fire rating and U.L.C. label. Acquire approval in writing from the local fire authority if required.

.4 Access panels shall be painted with a primer coat if applicable and then with a finish coat, colour and type to the Departmental Representative's approval.

.5 Locate equipment and junction boxes in service areas wherever possible.

3.17 EQUIPMENT INSTALLATION

.1 Provide means of access for servicing equipment.

.2 CSA identification and equipment labels to be clearly visible after installation.

3.18 CUTTING, PATCHING, DIGGING, CANNING, CORING & CONCRETE

.1 Lay out all cutting, patching, digging, canning and coring required to accommodate the electrical services. Coordinate with other Divisions. The performance of actual cutting, patching, digging, canning and coring is specified under other Divisions.

.2 The Electrical Contractor shall be responsible for all cutting, patching, digging, canning and coring required to accommodate the electrical services.

.3 The Electrical Contractor shall be responsible for correct location and sizing of all openings required under Electrical Divisions, including piped sleeves.

.4 Verify the location of existing and planned service runs and structural components within concrete floor and walls prior to core drilling and/or cutting.

.5 Openings through structural members of the building shall not be made without the approval of the Departmental Representative.

.6 Openings in Concrete:

.1 Be responsible for the layout of all openings in concrete, where openings are not left ready under previous contract.

.2 All openings shall be core drilled or diamond saw cut.

.3 Refer to structural drawings for permissible locations of openings and permissible opening sizes in concrete floors and walls.

.4 Refer to structural drawings for locations of steel reinforcing.

.5 Be responsible for repairing any damage to steel reinforcing.

.7 Openings in building surfaces other than concrete:

.1 Lay out all openings required.

.8 Poured concrete for duct encasements, pole bases, transformer pads and housekeeping pads shall be provided by other Divisions, coordinated and supervised by the Electrical Divisions.

.9 Precast concrete items such as transformer pad bases, pull boxes and light pole bases to be provided and installed by the Electrical Divisions unless otherwise specified.

.10 Excavation and backfilling will be provided by other Divisions. This Division to supervise the work and provide all layouts and parameters.

3.19 PAINTING

.1 Clean exposed bare metal surfaces supplied under the Electrical Divisions removing all dirt, dust, grease and millscale. Apply at least one coat of corrosion resistant primer paint to all supports and equipment fabricated from ferrous metal.

.2 Paint all hangers and exposed sleeves, in exposed areas, with a rust inhibiting primer, as they are installed.

.3 Repaint all marred factory finished equipment supplied under the Electrical Divisions, to match the original factory finish.

END OF SECTION

PART 1 GENERAL

1.1 RELATED WORK

.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 SCOPE

.1 Electrical operations and maintenance manuals (hereinafter referred to as O&M manuals) shall be prepared by a firm specializing in this type of work.

.2 Specialty firm to be responsible for:

.1 The supply and preparation of four sets of O&M manual binders and tabs as specified in the index below.

.2 The preparation of all written system descriptions and schematics (neatly drafted) for each tab section identified as article 1.4. Format as directed by the Owner, utilizing proportional typewritten format, with schematics in appendices at the end of each section. System description shall include an overview of basic design philosophy, description of future expansion capability, general construction of components, electrical characteristics not readily deduced from the contract documents, basic system configuration and interfaces with other systems existing or new.

.3 Securing and assembling all necessary literature describing operational and maintenance procedures for all equipment into the O&M manual binders, including Preventative Maintenance data as described below. Preventative maintenance data and maintenance suggestions to be compiled in tabular format in applicable section to provide a comprehensive overview of maintenance procedures.

.4 Preparing in coordination with Electrical Divisions and equipment manufacturer's technical specialist, scheduled maintenance sheets and check lists. Scheduled maintenance sheets shall include safety in maintenance data plus detailed daily, monthly and yearly scheduled maintenance information. Format as directed by the Owner.

.5 Preparation of safety in maintenance suggestions and procedures.

.6 Summarized daily, monthly and yearly maintenance charts.

.7 Prestonia No. 2047-10 plastic sheet protectors for all drawings larger than 210 mm × 275 mm. Locate drawing title block on lower right hand corner.

.3 Division 26 shall be responsible for:

.1 Supply of four (2) copies of all information as described below:

.1 Final shop drawings.

.2 All wiring diagrams.

.3 List of all major trades, sub-trades and suppliers including names of equipment supplied and by whom, addresses, phone numbers, facsimile numbers and contact persons.

.4 Obtaining all data necessary to compile a complete comprehensive Preventative Maintenance program. Data gathered shall be neatly handwritten on forms provided by the Owner. Data to be collected for all systems described in the index below.

.5 Spare/replacement parts lists for all of the above. Copies of the electrical contractor's data collection sheets available during tendering period when requested.

.6 Test results and verification reports as outlined in other sections of this specification.

.7 Warranties as outlined in this and other sections of the Specifications.

1.3 ELECTRONIC FORMAT

.1 In addition to the specified hardcopy, provide an electronic copy in pdf format. Electronic copy to be produced on a CD-ROM in the latest version of Acrobat.

.2 CD-ROM to be reproducible by owner as required to carry out his duties.

.3 Electronic copy to consist of a single pdf file divided into chapters to allow a quick and easy access to the different sections of the manual.

.4 All log sheet, maintenance tables, preventative maintenance sheets, intended to be completed by the Owner are to be completely interactive allowing the Owner to complete all pertinent information and save, print or modify these forms as required.

.5 Provide a proposed layout to the Departmental Representative for approval prior to the construction of the O&M manuals.

.6 Electrical contractor to submit complete system description and schematics by 50% complete stage of construction. O&M manuals to be submitted to the Owner 90% complete three (3) months prior to substantial completion review.

.7 Electrical O&M manuals to be assembled in 210 mm × 275 mm capacity, expanding spine catalogue binders complete with plated piano hinges, bound in heavy fabric, hot stamped lettering on front and spine. Electrical contractor to provide sufficient quantity to allow all binders to hold system data while in full closed position (not expanded).

.8 Electrical contractor to provide sample of art work and fabric cover (before having binders constructed) to the Owner.

.9 In addition to the specified hardcopy, provide an electronic copy in pdf format. Electronic copy to be produced on a CD-ROM in the latest version of Acrobat.

.1 CD-ROM to be reproducible by owner as required to carry out his duties.

.2 Electronic copy to consist of a single .pdf file divided into chapters to allow a quick and easy access to the different sections of the manual.

.3 All log sheet, maintenance tables preventative maintenance sheets, intended to be completed by the Owner are to be completely interactive allowing the Owner to complete all pertinent information and save, print or modify these forms as required.

.4 Provide a proposed layout to the Departmental Representative for approval prior to the construction.

END OF SECTION

PART 1 GENERAL

1.1 RELATED WORK

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

1.2 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 and VBBL requirements.

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

Project shall comply with the local bylaw where applicable.

.4 The above requirements shall not restrict or supplant the requirements of any local

.5 bylaws, codes, or other certified agencies which may have jurisdiction over all or part of the installation.

1.3 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.

.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.

.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.

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 restraints shall be provided on suspended and shelf mounted transformers along with associated equipment and assemblies connected to them at the points of vertical support (4 points). The restraint wires shall be oriented at approximately 90 degrees to each other (in plan), and tied back to the ceiling slab or its structure at approximately 45 degrees to the slab or basic structure. The restraints shall be selected for a 1 g earthquake loading, i.e. each wire shall have a working load capacity equal to the weight of the transformer. The anchors in the structure shall be selected for a load equal to the weight of the transformers at a 45 degree pull.

.3 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.

.4 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.

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

.4 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.

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

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

.7 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.

.8 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.

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

.10 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 Representative 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. Design anchors and bolts for seismic force applied horizontally through the center of gravity to a seismic force of 0.5g. For equipment which may be subject to resonances, use a nominal 1.0 g seismic force.

.2 Provide flexible conduit connections between floor mounted equipment to be restrained and its adjacent associated electrical equipment.

3.4 LIGHT FIXTURES

.1 Fixtures 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 taught 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 taut cables.

.3 Fixtures which are hung independently of ceiling systems shall have minimum of one 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 RELATED SECTIONS

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

1.2 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 and as coordinated with Division 07 prior to proceeding with the work. Supply and install all necessary sleeves, caulking and flashing and make the penetrations watertight. For pene-trations 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.

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

.2 Unless otherwise directed, paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1-1955.

.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.

1.4 VIBRATION AND NOISE CONTROL

.1 Mounting

.1 Vibrating electrical equipment, such as transformers and standby diesel engine generators, shall be mounted using vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution of equipment so as to produce the manufacturers' recommended uniform deflection. Such equipment shall be restrained at each isolator pad using bolts into the floor slab with neoprene washers and clearance holes to prevent short circuiting.

.2 Connections

.1 Connections to rotating, vibrating, or other noise-producing equipment such as motors, generators and transformers shall be by means of flexible conduit and flexible stranded conductors so as to minimize transmitted noise and vibration. Where equipment is mounted by means of resilient supports and is subject to physical displacement under such conditions as energizing a motor, the flexible conduit connections shall be formed into a loop of sufficient length to permit freedom of travel.

.3 General

.1 In other than Mechanical or Electrical Rooms or closets, electrically held relays, contactors and starters shall be provided with vibration isolation mounts and sound enclosures.

.2 All parts of all fluorescent lighting fixtures and remote ballast boxes or racks shall be securely fastened and, if necessary, fitted with neoprene spaces to minimize ballast noise amplification.

END OF SECTION

PART 1 GENERAL

1.1 RELATED WORK

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

1.2 BRANCH WIRING

.1 Adhere to the circuit numbers indicated on the drawings. Provide all branch circuit wiring using materials and methods described herein and in consultation with the Departmental Representative.

.2 Calculate volt drop of all feeders and branch circuit wiring and increase wire sizes based on actual wire run to meet the minimum requirements of the Canadian Electrical Code.

.3 Install a green insulated bonding conductor in all conduits; do not rely on metallic conduit for bonding continuity. Size bonding conductor as per the Canadian Electrical Code.

.4 Phase all panelboard buses throughout the building such that the left, centre, and right hand buses represent phase A, B, and C respectively. Identify all indicating meters to this sequence.

.5 Provide all conduits and wiring including flexible connections, outlet boxes complete with wiring devices and surface raceways for all casework and millwork as shown on the drawings, unless otherwise noted. Arrange conduit so that it will be completely concealed along the entire run to the outlet.

.6 Where wiring devices are indicated on free-standing benches or tables, locate conduit so that it will be concealed along the entire run to the outlet. Location of conduit floor penetrations shall be to the approval of the Departmental Representative. Conduits will not be permitted to run in concrete floor or topping or below slab on grade.

.7 Prior to cutting of millwork for outlets/devices, prepare a "mock-up" at each location using paper cutouts to indicate the outlet/device layout. The paper cutouts shall be of the same overall size as the outlet/device that they represent and be complete with identification. The Contractor shall attach the paper cutouts to the millwork such that they are easily removable and in positions that are as generally indicated on the drawings. After each piece of millwork has all paper cutouts mounted, advise the Departmental Representative and relocated as directed by the Departmental Representative prior to performing cutting of millwork.

.8 Wire to all electrical appliances indicated on the drawings. The word appliance is intended to include cooking equipment not of 'plug-in' nature, laundry equipment, stills, hot water tanks, and other special equipment throughout the building for which outlets are indicated on the drawings or noted in the equipment schedule. Use flexible conduit or liquid-tight flexible conduit for connection from outlets to appliances.

.9 Unless otherwise noted, appliances will be supplied and set in place in the rooms by others. Check with the trades involved and with the Owner to determine correct orientation of the appliances, the final and exact location and electrical requirements of each outlet (both control and supply) before proceeding with the installation.

.10 Prior to rough-in of outlet boxes confirm final furniture layout with the Departmental Representative.

.11 Prior to installation of switch outlets, confirm door swing on Architectural Drawings. Where switch cannot be located on latch side of door, install the outlet box a minimum of three feet from the door swing, do not install switch behind door.

.12 Wiring circuits for electronic equipment, such as computers, printers and Communications equipment shall have a separate dedicated neutral for each and every circuit.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

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

.2 CSA C22.2No.65, Wire Connectors.

.2 National Electrical Manufacturers Association (NEMA)

PART 2 PRODUCTS

2.1 MATERIALS

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

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

.3 Bushing stud connectors: to EEMAC 1Y-2/NEMA to consist of:

.1 Connector body and stud clamp for round copper conductors.

.2 Clamp for round copper conductors.

.3 Stud clamp bolts.

.4 Bolts for copper conductors and bar.

.5 Sized for conductors or bars as indicated.

.4 Clamps or connectors for armoured cable, aluminum sheathed cable, flexible conduit as required to: CAN/CSA-C22.2No.18.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2No.65.

.2 Install fixture type connectors and tighten. Replace insulating cap.

.3 Install bushing stud connectors in accordance with EEMAC 1Y-2/NEMA.

END OF SECTION

PART 1 GENERAL

1.1 RELATED WORK

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

.2 Refer to Division 27 & 28 for particular Communications, Electronic Safety & Security wiring systems and types.

1.2 TERMS OF REFERENCE

.1 Typically use insulated 98% conductivity copper conductor wiring enclosed in EMT (steel) conduit for the general wiring systems unless otherwise indicated. Refer to "Site Services" Section for allowable site conduits as an alternative to steel.

.2 Teck cable may only be used where specifically indicated on the drawings or in the specifications. Where permitted, Teck wiring up to 750 system volts to be PVC jacketed armoured cable, multi-copper conductor type Teck90 1000 volt having a PVC jacket with FT-4 flame spread rating.

.3 Flexible armoured cabling (BX) shall not be used for the general wiring system other than final drops to light fixtures in ceilings.

.4 Provide all control wiring except mechanical equipment controls as specified in Section 26 24 21Mechanical Equipment Controls and the Mechanical Divisions.

.5 Refer to Equipment Schedule(s) for detailed responsibilities.

.6 Non-metallic sheathed wiring is not to be used on this project.

1.3 PRODUCT DATA

.1 Provide product data in accordance with Division 01

PART 2 PRODUCTS

2.1 WIRING & CABLES – GENERAL

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

.2 Insulation to be 600 volt RW75XLPE (X link) for the general building wiring in conduit.

.3 Use RWU75XLPE for underground installations.

.4 Site services sub-circuits, including site lighting, to be minimum #10 AWG for power and #12 AWG for controls. Increase wiring size for lengthy and/or loaded circuits so that system will not exceed the maximum voltage drop as recommended by the Canadian Electrical Code CSA 22.1.

.5 Main feeders to be conduit and copper insulated wiring. Provide bond wiring for all conduits. Increase conduit size as required.

.6 Armoured (AC-90) cable may only be utilized for recessed tee bar luminaire drops from ceiling mounted outlet boxes. "Tite Bite" connectors and their counterparts of other manufacturers shall not be used. Use anti-short connectors. Cable from luminaire to

luminaire is discouraged. Allow nominally 900mm extra cable looped and supported in the ceiling space to permit fixture relocations of one tile space.

.7 TBS75 #14 AWG stranded shall be used in all switchgear assemblies. Current transformer secondary wiring shall be #12 AWG stranded. Current transformer leads shall incorporate ring type tongues for termination purposes

.8 Conductors to be colour-coded. Conductors #10 AWG and smaller shall have colour impregnated into insulation at time of manufacture. Conductors size #8 AWG and larger may be colour-coded with adhesive colour coding tape, but only black insulated conductors shall be employed in this case, except for neutrals which shall be white wherever possible. Where colour-coding tape is utilized, it shall be applied for a minimum of 50 mm at terminations, junctions and pullboxes and condulet fittings. Conductors shall not be painted.

2.2 LOW VOLTAGE CONTROL CABLES

.1 Type LVT: soft annealed copper conductors, with thermoplastic insulation, outer covering of thermoplastic jacket. Minimum size #18 AWG. FT-6 Rated.

.2 Unless otherwise specified wiring to be multicore individually identified and colour coded with grey sheath enclosed in conduit or (EMT).

2.3 WIRE & BOX CONNECTORS

.1 Pressure type wire connector current carrying parts to be copper and sized to fit conductors used.

.2 Fixture type splicing connector current carrying parts to be copper sized to fit conductors 10 AWG or less.

.3 Bushing stud connectors to EEMAC 1Y-2 and suitable for stranded copper conductors

.4 Clamps or connectors for armoured cable, flexible conduit, as required.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install all cables and wiring.

.2 Conductor length for parallel feeders to be identical. Provide permanent plastic nametag indicating load fed.

.3 Group Teck, Armoured, MI & Sheathed cables on channels wherever possible.

.4 Lace or clip groups of feeder conductors at all distribution centres, pullboxes, and termination points.

.5 Wiring in walls should typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls should be avoided unless indicated.

.6 All grounding and bonding conductors and straps to be copper. All bonding conductors to have green insulation jacket.

.7 Colour coding to be strictly in accordance with Section 26 05 00 – Common Work Results.

.8 Provide sleeves where cables enter or exit cast concrete or masonry.

.9 Power wiring up to and including #6 AWG shall be spliced with nylon-insulated expandable spring-type connectors. Large conductors shall be spliced using split-bolt or other compression type connectors wrapped with cambric tape then PVC tape.

.10 Wires shall be sized for 2% maximum voltage drop to farthest outlet on a loaded circuit. Increase home run cable size to meet these requirements.

.11 All 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.

.12 Install all control cables in conduit.

.13 Provide numbered wire collars for all control wiring. Numbers to correspond to control drawing legend. Obtain wiring diagram for control wiring of other Divisions.

3.2 VOLTAGE REGULATION

.1 The drawings are diagrammatic and indicate the general routing of conduit runs and not exact routing, either horizontally or vertically.

.2 Branch circuit conductor sizes shall be #12 AWG or larger based on the Canadian Electrical Code CSA 22.1 Section 8, which allows a maximum 3% voltage drop for branch circuits.

3.3 WIRE & BOX CONNECTORS

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65

.2 Install fixture type connectors and tighten. Replace insulating cap.

.3 Install bushing stud connectors in accordance with EEMAC 1Y-2

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

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

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Secure equipment to hollow and solid masonry, tile and plaster surfaces with lead anchors or 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.

.7 Suspended support systems.

- .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.10 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.

.12 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 WORK

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

PART 2 PRODUCTS

2.1 OUTLET AND CONDUIT BOXES IN GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm [4”] square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped. Do not use sectional boxes.

.4 Blank cover plates for boxes without wiring devices.

.5 347V outlet boxes for 347V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped shall be equal to Spyder Technology multi-gang boxes.

.7 Standard of acceptance is Thomas and Betts - Iberville.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi-gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. Larger 102 mm square x 54mm deep outlet boxes (No. 52151 or 52171) to be used when more than one conduit enters one side. Provide extension and plaster rings as required.

.2 For larger boxes use GSB solid type as required.

.3 Boxes for surface mounted switches, receptacles, communications, telephone to be 100mm square No. 52151 or 52171 with Taylor 8300 series covers.

.4 Lighting fixture outlets: 102 mm square outlet boxes (No 52151, 52171 or 72171) or octagonal outlet boxes (No 54151 or 54171).

.5 103 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster and/or tile walls.

.6 Standard of acceptance is Thomas and Betts - Iberville.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi-gang type MDB boxes for devices flush mounted in exposed block walls.

.2 Standard of acceptance is Thomas and Betts - Iberville.

2.4 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

.2 Standard of acceptance is Thomas and Betts - Iberville.

2.5 SURFACE CONDUIT BOXES

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

.2 Standard of acceptance is Thomas and Betts - Iberville.

2.6 FITTINGS – GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of foreign materials.

.3 Conduit outlet bodies for conduit up to 35 mm Use pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

.5 Standard of acceptance is Thomas and Betts - Iberville.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Typical outlet box mounting heights are indicated in Section 26 05 00 or refer to wiring device and communication specification sections and to architectural layouts for particular mounting heights of outlet boxes where indicated.

.2 Support boxes independently of connecting conduits.

.3 Ceiling outlet boxes to be provided for each surface mounted fixture or row of fixtures installed in other than T bar ceilings with removable tiles.

.4 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.5 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers not to be used.

.6 All outlet boxes to be flush mounted in all areas, excluding mechanical rooms, electrical rooms, and above removable ceilings.

.7 Adjust position of outlets in finished masonry walls to suit masonry course lines. Coordinate cutting of masonry walls to achieve neat openings for all boxes. All cutting of masonry work for installation of electrical fittings to be done using rotary cutting equipment.

.8 No sectional or handy boxes to be installed.

.9 When installed in wood walls, plastic outlet boxes shall only be used with permission of the Departmental Representative.

.10 Provide vapour barrier wrap or boots behind outlets mounted in exterior walls. Maintain integrity of the vapour barrier and insulation to prevent condensation through boxes.

.11 Coordinate location and mounting heights of outlets above counters, benches, splash-backs and with respect to heating units and plumbing fixtures. Coordinate with architectural details.

.12 Outlets installed back to back in party stud walls to be off-set by one stud space.

.13 Back-boxes for all communications systems equipment to be provided in accordance with specific manufacturer's recommendations and as specified in the communications sections of these specifications.

.14 Separate outlets located immediately alongside one another to be mounted at exactly the same height above finished floor. Similarly, outlets mounted on a wall in the same general location at varying heights to be on the same vertical centre-line unless otherwise noted.

.15 Where outlet boxes penetrate through a fire separation, ensure that the boxes are externally tightly fitted with an approved non-combustible material to prevent passage of smoke or flame in the event of a fire.

.16 Conduit for floor mounted boxes shall terminate with a locknut and bushing in base of the fitting. Seal around conduit and the conduit itself after installation of conductors with heavy density fiberglass.

END OF SECTION

PART 1 GENERAL

1.1 RELATED WORK

.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 SCOPE

.1 Drawings do not show all conduits. Those shown are in diagrammatic form only.

.2 Conceal all conduits where possible in finished areas. Conduits may be surface mounted either only where indicated or in service areas accessible only to authorized personnel.

.3 If a finished area is concrete (existing) or concealment is not practical, obtain ruling from Departmental Representative where exposed wiremold may be substituted.

.4 Note particular requirements for routing of conduits where detailed.

.5 Provide polypropylene pull cord in all “empty” conduits.

PART 2 PRODUCTS

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No.45 Galvanized Steel.

.2 Epoxy coated conduit: to CSA C22.2 No.45 with zinc coating and corrosion resistant epoxy finish inside and outside.

.3 Electrical Metallic Tubing (EMT): to CSA C22.2 No.83.

.4 Rigid PVC conduit: to CSA C22.2 No.211.2.

.5 Flexible metal conduit: to CSA C22.2 No.56 liquid-tight flexible metal conduit.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 41mm and smaller. Use two hole steel straps to conduits larger than 41mm.

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

.3 Channel type supports for two or more conduits.

.4 10mm threaded rods to support suspended channels.

2.3 CONDUIT FITTINGS

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

.2 Provide factory "ells" where 90 degree bends are required for 27mm and larger conduits.

.3 EMT couplings and connectors shall be steel, or Regal Die-cast zinc alloy. Couplings used on conduit containing fire-rated cable shall be steel. Regular die-cast alloy fittings and couplings are not acceptable. Provide plastic bushings (insulated throat) for all

connectors for 27mm EMT or larger. Provide water-tight connectors in damp or wet locations and for surface equipment (e.g. Panelboards, MCC's, etc.) in rooms that are fire sprinkler protected.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable linear expansion.

.2 Water-tight expansion fittings: with integral bonding jumper, suitable for linear expansion and 21mm deflection in all directions.

.3 Weatherproof expansion fittings for linear expansion at entry to panel as required.

2.5 RIGID P.V.C. CONDUIT

.1 Conduit: rigid non-metallic conduit of unplasticized polyvinyl chloride as manufactured C.G.E. "Sceptre".

.2 Fittings: threaded male or female solvent weld connectors and solvent weld couplings, as supplied by conduit manufacturer.

.3 Solvent: as recommended by conduit manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

.1 Generally use electrical metallic tubing (EMT) in the building interior and in above grade slabs except where subject to mechanical injury or where otherwise indicated.

.2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass. Set out the work and coordinate with other services prior to installation. Maintain access to junction and pull boxes.

.3 Where practical conceal conduits.

.4 Any exposed conduit in finished areas to be free of unnecessary labels and trademarks.

.5 All conduit ends to be reamed to ensure a smooth interior finish that will not damage the insulation of the wiring.

.6 Ensure bonding continuity in all conduit systems.

.7 Surface conduits are acceptable in mechanical and electrical service rooms and in unfinished areas or where indicated.

.8 Use rigid galvanized steel (RGS) threaded conduit where the installation is subject to mechanical injury. In any event, use RGS conduit for surface installations up to 1.5m [5'] above the finished floor.

.9 Field threads on rigid conduit shall be sufficient length to draw conduits ends together.

.10 Unless otherwise noted and where practical, all conduits to be routed through the ceiling space rather than in, or below, slabs or floor structures to facilitate future changes.

.11 Conduits in walls should typically drop (or loop) vertically from above to better facilitate future renovations. Generally conduits from below and horizontal conduits in walls and concrete structures should be avoided unless indicated.

.12 All branch circuit conduit and communication conduits to be minimum 27 mm diameter unless otherwise indicated.

.13 Generally use Rigid PVC conduits in or below ground level slab unless otherwise noted. Transition to RGS conduit in exposed locations: eg where conduits emerge from ground level slab.

.14 Conduits are not permitted in terrazo or concrete toppings.

.15 Cap turned up conduits to prevent the entrance of dirt of moisture during construction.

.16 Locate conduits more than 75mm parallel to steam or hot water lines with a minimum of 25mm at crossovers.

.17 Bend conduits cold, so that conduit at any point is not flattened more than 1/10th of its original diameter. Conduits bent more than this or kinked to be replaced.

.18 Provide polypropylene pull cord in empty conduits to facilitate pulling wiring in future.

.19 Where conduits become blocked, the use of corrosive agents is prohibited. Remove and replace blocked section.

.20 Damaged conduits to be repaired or replaced.

.21 Dry conduits out thoroughly before installing wiring. Swab out conduit and thoroughly clean internally before wires and cables are pulled.

.22 Conduits shall not pass through structural members except as indicated.

.23 Conduit sizes indicated on drawings are minimum only. Increase sizes as required to suit alternative wiring types, to comply with Code or for ease of conductor installation.

.24 Conduits and ducts crossing building expansion joints shall have approved conduit expansion fittings to suit the type of conduit used.

.25 Seal conduits with approved sealant where conduits are run between heated and unheated areas.

.26 Seal openings with approved sealant where conduits, cables, or cable trays pierce fire separations.

.27 Where conduits pass through walls, they shall be grouped and installed through openings. After all conduits are installed, wall openings shall be closed with material compatible with the wall construction and/or to meet any fire separation integrity.

.28 Where drawings show conduit designations, these conduits shall be identified at each point of termination with Thomas & Betts "Ty-Rap" No. TY532M labels.

.29 Use "Condulet" fittings for power and telephone type conduit terminations in lieu of standard boxes where box support is not provided.

.30 Provide necessary roof jacks or flashing where conduits pass through roof or watertight membranes. Apply approved sealant to maintain membrane integrity.

.31 Use flexible metal conduit for connection to recessed luminaires without a prewired outlet box.

.32 Use liquid tight flexible metal conduit for connection to motors sprinkler monitoring devices, and other vibrating equipment and transformers.

.33 Use explosion proof flexible connection for connection to explosion proof motors.

.34 Install conduit-sealing fittings in hazardous areas, isolation rooms and clean rooms. Fill with compound.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with minimum 1.5m clearance.

.3 Conduits to be run in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended and/or surface channels.

.5 Surface conduits will not be accepted in finished areas unless detailed.

3.3 CONDUITS IN CAST IN PLACE CONCRETE

.1 Locate conduits to suit reinforcing steel. Install in centre third of slab.

.2 Do not place conduit in concrete slabs in which slab thickness is less than four times conduit diameter. Place conduits larger than this size under the floor or slab. Conduits to have minimum 25 mm concrete cover. Conduits to be completely encased in concrete

.3 Organize conduit in slabs to minimize crossovers. Obtain approval and minimum concrete cover required from structural engineer prior to installing conduits in slabs.

.4 Protect conduits from damage where they stub out of concrete.

.5 Tie down conduit to prevent shifting. All joints are to be made up tight to ensure ground continuity. To prevent concrete entry, seal EMT set screw fittings with tape, pack outlet boxes and cap conduit terminations both in boxes and stub-ups. Apply Polykin #940 tape to the conduit 150 mm at the point of leaving slab.

.6 Carefully check and mark out set-backs of conduit(s) to be installed in floor slabs and to be stubbed up to equipment or motors. Verify conduit size and stub-up locations for mechanical and equipment from shop drawings or detail drawings. Brace all stub-ups. Stub-ups shall be RGS.

.7 Install sleeves in advance of concrete pour where conduits pass through slab or wall.

.8 Where conduits pass through waterproof membrane provide oversized sleeve before membrane installation. Use cold mastic between sleeve and conduit.

3.4 CONDUITS IN POURED SLABS ON GRADE

.1 Use Rigid PVC conduit in the gravel or select fill base below concrete slabs. Provide mechanical protection around exposed stub-ups through slab and extend up to 150 mm beyond concrete. Transition to RGS conduit immediately above the slab.

.2 In the event that rigid steel conduit is installed in contact with earth it shall be protected by Polykin #940 tape. Extend taping 300 mm above finished grade.

.3 Conduits 27mm and larger to be run below slab and encased in 75mm concrete envelope. Provide 50mm of sand over concrete envelope below floor slab.

3.5 EXPANSION JOINT CONDUIT FITTINGS

.1 Provide conduit expansion joint fittings at concrete expansion joint.

3.6 RIGID P.V.C. CONDUIT

.1 Use in accordance with the Canadian Electrical Code and Building Codes and as noted below:

.2 Use as raceways for following applications

.1 In poured slab on grade concrete floors and walls and for underground runs exterior to the buildings unless otherwise noted.

.2 Wiring installed in areas subject to intermittent or continuous moisture but not surface mounted.

.3 Rigid PVC conduit shall not be surface mounted or exposed within buildings.

.3 Do not use in return air plenums or for exit light circuits and emergency lighting.

.4 Provide insulated ground wire in all rigid PVC conduits in accordance with the Canadian Electrical Code.

.5 Where rigid PVC conduit is set in poured concrete, solvent joints must be completed and allowed to set as per manufacturer's instructions before pour.

.6 Bend rigid conduit in strict accordance with manufacturer's directions. Distorted bends will not be accepted.

END OF SECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

.1 Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies

1.3 REFERENCES

.1 Test Requirements: Test Requirements: CAN/ULC-S115-11, "Standard Method of Fire Tests of Through Penetration Fire Stops".

.2 Test Requirements: CAN/ULC-S102-M, “Standard Test Method for Surface Burning Characteristics of Building Materials”.

.3 Underwriters Laboratories of Canada (ULC) of Scarborough runs CAN/ULC-S115-11 under their designation of ULC-S115-11 and publishes the results in their "FIRE RESISTANCE RATINGS DIRECTORY" that is updated annually. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually. UL tests that meet the requirements of ULC-S115-11 are given a cUL listing and are published by UL in their “Products Certified for Canada (cUL) Directory.

1. UL Fire Resistance Directory:
   - .1 Firestop Devices (XHJI7)
   - .2 Fire Resistance Ratings (BXRH7)
   - .3 Through-Penetration Firestop Systems (XHEZ7)
   - .4 Fill, Voids, or Cavity Material (XHHW7)
   - .5 Forming Materials (XHKU7)

.4 International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments (referred to as Firestop Custom Details in BC).

.5 Inspection Requirements: ASTM E 2174, “Standard Practice for On-site Inspection of Installed Fire Stops.”

.6 Test Requirements: ASTM E 90, “Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements”

.7 Test Requirements: ASTM E 2178, “Standard Test Method for Air Permeance of Building Materials”.

.8 Test Requirements: ASTM E 84, “Standard Test Method for Surface Burning Characteristics of Building Materials.”

.9 Test Requirements: ASTM E 2178, “Standard Test Method for Air Permeance of Building Materials”

.10 ASTM G-21, "Standard Test for Determining Resistance of Synthetic Polymeric Materials to Fungi".

.11 British Columbia Building Code – most recent version.

.12 NFPA 101 - Life Safety Code – most recent version.

1.4 QUALITY ASSURANCE

.1 A manufacturer's direct representative (account manager, fire protection specialist, not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

.2 Firestop System installation must meet requirements of ASTM E 814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

.3 Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

.4 Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

.5 For those firestop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's firestop custom detail derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Firestop custom detail drawings must follow requirements set forth by the International Firestop Council.

.6 Manufacturer's fire protection specialist to work with Departmental Representative to determine frequency of site walk-throughs to be submitted to construction manager and Departmental Representative.

1.5 SUBMITTALS

.1 Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions to comply with Section 01 30 00 general requirements.

.2 Submit qualified tested firestop system detail for each firestop application on the project.

.3 Manufacturer's firestop custom detail identification number and drawing details when no UL system is available for an application. Firestop custom detail must include both project name and contractor's name who will install firestop system as described in drawing.

.4 Submit material safety data sheets provided with product delivered to job-site.

1.6 INSTALLER QUALIFICATIONS

.1 Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

.2 The work is to be installed by a contractor with at least one of the following qualifications:

FM 4991 Approved Contractor

UL Approved Contractor

Hilti Accredited Fire Stop Specialty Contractor

.3 Installer shall have not less than 3 years' experience with fire stop installation

1.7 PROJECT CONDITIONS

.1 Do not use materials that contain flammable solvents.

.2 Scheduling

.1 Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

.2 Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

.3 Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

.4 Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

.5 During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 PRODUCTS

2.1 FIRESTOPPING, GENERAL

.1 Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

.2 Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

.3 Provide a round enclosed fire rated cable management device whenever cable bundles penetrate fire rated walls. The cable management device shall contain integrated intumescent firestop wrap strip materials sufficient to maintain the hourly rating of the barrier being penetrated. The cable management device shall contain a smoke seal fabric membrane or intumescent firestop plugs sufficient to achieve the L-Rating requirements of the barrier type.

.4 Provide non-curing, re-penetrable, intumescent firestop materials around communications cable trays or ladder racks penetrating through a fire rated wall. The firestop system assembly shall be able accessible and re-installed from one side of the wall. The firestop material shall allow up to 300mm of unreinforced annular space.

.5 Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

.1 F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.

.6 Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

.1 F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

.2 T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

.3 W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.

.7 Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

.1 L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.

.8 Mold Resistance: Provide penetration firestoppping with mold and mildew resistance rating of 0 as determined by ASTM G21.

2.2 ACCEPTABLE MANUFACTURERS

.1 Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

.1 Hilti (Canada) Corporation,

.2 Specified Technologies Inc. (STI)

.3 Provide products from the above acceptable manufacturers; alternatives approved via a submittal confirming products meet the tested standards listed in section 1.05.

2.3 MATERIALS

.1 Use only firestop products that have been UL 1479 or ASTM E 814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

.2 Re-penetrable, round cable management devices for use with new or existing cable bundles penetrating gypsum or masonry walls:

.1 Hilti Speed Sleeve (CP 653) or equivalent with integrated smoke seal fabric membrane.

.2 Hilti Firestop Sleeve (CFS-SL SK) or equivalent

.3 Hilti Retrofit Sleeve (CFS-SL RK) or equivalent for use with existing cable bundles.

.4 Hilti Cable Collar (CFS-CC) or equivalent surface mounted retrofit solution.

.5 Hilti Gangplate (CFS-SL GP) or equivalent for use with multiple cable management devices.

.6 Hilti Gangplate Cap (CFS-SL GP CAP) or equivalent for use at blank openings in gangplate for future penetrations.

.3 Pre-installed firestop devices for use with non-combustible and combustible pipes (closed and open systems), conduit, and/or cable bundles penetrating concrete floors and/or gypsum walls:

.1 Hilti Cast-In Place Firestop Device (CP 680-P) or equivalent for use with combustible penetrants.

.2 Hilti Cast-In Place Firestop Device (CP 680-M) or equivalent for use with non-combustible penetrants.

.3 Hilti Speed Sleeve (CP 653) or equivalent for use with cable penetrations.

.4 Hilti Firestop Drop-In Device (CFS-DID) or equivalent for use with non-combustible and combustible penetrants.

.4 Sealants, foams or caulking materials for use with non-combustible items including rigid steel conduit and electrical metallic tubing (EMT):

.1 Hilti Intumescent Firestop Sealant (FS-ONE) or equivalent

.2 Hilti Fire Foam (CP 620) or equivalent

.3 Hilti Flexible Firestop Sealant (CP 606) or equivalent

.4 Hilti Elastomeric Firestop Sealant (CFS-S SIL GG) or equivalent

.5 Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including PVC jacketed, flexible cable or cable bundles, and plastic pipe:

.1 Hilti Intumescent Firestop Sealant (FS-ONE) or equivalent

.6 Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles:

.1 Hilti Intumescent Firestop Sealant (FS-ONE) or equivalent

.2 Hilti Fire Foam (CP 620) or equivalent

.3 Hilti Flexible Firestop Sealant (CP 606) or equivalent

.4 Hilti Elastomeric Firestop Sealant (CFS-S SIL GG) or equivalent

.7 Non curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles:

.1 Hilti Firestop Putty Stick (CP 618) or equivalent

.2 Hilti Firestop Plug (CFS-PL) or equivalent

.8 Wall opening protective materials for use with U.L. listed metallic and specified non-metallic outlet boxes:

.1 Hilti Firestop Putty Pad (CFS-P PA) or equivalent

.2 Hilti Firestop Box Insert or equivalent

.9 Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways:

.1 Hilti Firestop Mortar (CP 637) or equivalent

.2 Hilti Firestop Block (CFS-BL) or equivalent

.3 Hilti Fire Foam (CP 620) or equivalent

.4 Hilti Firestop Board (CP 675T) or equivalent

.10 Non curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways:

.1 Hilti Firestop Block (CFS-BL) or equivalent

.2 Hilti Firestop Board (CP 675T) or equivalent

.11 For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected:

.1 Hilti Firestop Block (CFS-BL) or equivalent

.2 Hilti Firestop Plug (CFS-PL) or equivalent

.12 Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E 814 which is equal to the time rating of construction being penetrated.

PART 3 EXECUTION

3.1 PREPARATION

.1 Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

.1 Verify penetrations are properly sized and in suitable condition for application of materials.

.2 Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

.3 Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

.4 Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

.5 Do not proceed until unsatisfactory conditions have been corrected.

3.2 COORDINATION

.1 Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

.2 Pre-construction firestop meeting with all stakeholders, including sub trades, code consultants, specifiers, manufacturers fire protection specialist and/or field engineer, to determine responsibility for handling such issues as FT rated partitions, firestop custom details, compatibility, complete submittals, mixed penetrations, ect.

3.3 INSTALLATION

.1 Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

.2 Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration materials.

.1 Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

.2 Protect materials from damage on surfaces subjected to traffic.

3.4 FIELD QUALITY CONTROL

.1 Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

.2 Keep areas of work accessible until inspection by applicable code authorities.

.3 Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops” or other recognized standard.

.4 Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

.5 Install a warning card that is clearly visible adjacent to any openings that may be re-penetrated, have multiple penetrants, penetrate a FT rated partition, or any other critical area as deemed by the Departmental Representative. This card should contain the following information:

.1 Warning that the opening has being fire stop protected

.2 Indicate the fire stop system used (ULC or cUL) or the firestop custom detail number

.3 F rating or FT rating

.4 Fire stop product(s) used

.5 Person to contact and phone number in case of modification or new penetration of fire stop system

.6 Provide Firestopping approval certificate in including a Building Code / By-Law Schedule B & C-B signed by a BC registered Professional Consultant. Submit a letter certifying that all work is complete and in accordance with this specification.

END OF SECTION

PART 1 GENERAL

1.1 RELATED WORK

.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 SCOPE

.1 Provide demonstration and instruction sessions to familiarize the Owners operation and maintenance personnel with electrical systems that have been extended into the new area 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 CONSTRUCTION AND ACCEPTANCE PHASES

.1 Within 60 to 90 days of commencement of construction, the Electrical Contractor (EC) will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the EC. Information gathered from this meeting will allow the EC to revise the Commissioning Plan.

.2 Other meetings will be planned and conducted by the EC as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Sub trades. The EC will plan these meetings and will minimize unnecessary time being spent by Sub trades.

.1 Provide additional requested documentation to the Departmental Representative and utilize to develop start-up and functional testing procedures.

.2 Contractors shall (along with the Consultant) clarify the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

.3 Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the pre-functional checklists. Submit manufacturer's detailed start-up procedures and the full start-up plan and procedures to Departmental Representative for review.

.4 During the start-up and initial checkout process, execute and document the electrical-related portions of the pre-functional checklists for all commissioned equipment. Perform and clearly document all completed start up and system operational checkout procedures, providing a copy to the Departmental Representative.

.5 Address current deficiency list items before functional testing.

.6 Perform functional performance testing under the supervision of the Departmental Representative for specified equipment in this section.

.7 Correct deficiencies (differences between specified and observed performance) as interpreted by the EC, GC, and the Departmental Representative and retest the equipment.

.8 Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

.9 Provide training of the Owner's operating personnel as specified.

.10 Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

.11 Execute deferred functional performance testing, witnessed by the Departmental Representative, according to the specifications.

.12 Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any testing.

1.5 SITE TOURS

.1 Provide a series of walk through Contractor guided tours of new area to allow operators to familiarize themselves with the buildings electrical systems.

.2 Coordinate timing of tours with the Departmental Representative. Allow for tours at approximately the following times.

.1 90% complete stage. Three weeks prior to Interim Acceptance of the work.

.2 At Interim Acceptance of the Work.

1.6 DEMONSTRATION AND INSTRUCTION SEMINARS

.1 Assist the Owner to present Operator Training Seminar(s) noted in this specification and including content specified by Division 01 - General Requirements.

PART 2 PRODUCTS

2.1 NOT APPLICABLE

PART 3 EXECUTION

3.1 REPORTING

.1 The EC will provide regular reports to the General Contractor (GC) with increasing frequency as construction and commissioning progresses.

.2 The EC will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

.3 A final Commissioning Report is compiled which summarizes the procedures, findings, conclusions, and recommendations of the commissioning process.

3.2 SUBMITTALS

.1 The EC will provide appropriate sub-contractors with a specific request for the type of submittal documentation the EC will require to facilitate the commissioning work.

.2 The EC will review submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures.

.3 The EC may request additional design and operations narrative from the Departmental Representative.

3.3 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

.1 The following procedures apply to all equipment to be commissioned.

.2 Pre-functional Checklists are developed and completed for all major equipment and systems being commissioned. The checklist captures equipment nameplate and characteristics data, confirming the as-built status of the equipment or system. These checklists also ensure that the systems are complete and operational, so that the functional performance testing can be scheduled.

.3 The EC shall assist the commissioning team members responsible for start-up of any equipment in developing detailed start-up plans for all equipment. The primary role of the EC in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed.

.1 The EC creates the pre-functional checklists, based primarily on the manufacturer's start-up and initial checkout procedures. Each start-up item will have a date and initial line for completion by the contractor during start-up. The Contractor determines which Sub is responsible for executing and documenting each of the line item tasks.

.2 The full start-up procedures and the approval form may be provided to the GC and A/E team for review.

.4 Calibration of all sensors shall be included as part of the pre-functional checklists performed by the Contractors.

.5 Execution of Pre-functional Checklists and Start-up.

.1 Subs and vendors schedule start-up and checkout with the GC and EC.

.2 The EC shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as approved by the Departmental Representative).

.3 For lower-level components of equipment the EC shall observe a sampling of the pre-functional and start-up procedures. The sampling procedures are identified in the commissioning plan.

.4 The Subs and vendors shall execute start-up and provide the EC with a signed and dated copy of the completed start-up and pre-functional checklists.

.5 Only individuals that have direct knowledge and witnessed that a line item task on the pre-functional checklist was actually performed shall initial or check that item off.

.6 Deficiencies, Non-Conformance and Approval in Checklists and Start-up.

.1 The Subs shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the EC within two days of test completion.

.2 The EC reviews the report and recommends approval to the GC. The EC shall work with the Subs and vendors to correct and retest deficiencies or uncompleted items. The EC will involve the GC and others as necessary.

3.4 FUNCTIONAL PERFORMANCE TESTING

.1 This sub-section applies to all commissioning functional performance testing for all divisions.

.2 The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.

.3 Before test procedures are written, the EC shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. The EC shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Prior to execution, the EC shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The EC may submit the tests to the Departmental Representative for review. The EC shall review owner-contracted or factory testing which the EC is not responsible to oversee and shall determine what further testing may be required to comply with the Specifications. Redundancy of testing shall be minimized.

.4 The test procedure forms developed by the EC shall include the following information:

.1 System and equipment or component name(s).
.2 Equipment location and ID number.
.3 Date.
.4 Project name.
.5 Participating parties.
.6 Reference to the specification section describing the test requirements.
.7 A copy of the specific sequence of operations.
.8 Instructions for setting up the test.
.9 Special cautions, alarm limits, etc.
.10 Specific step-by-step procedures to execute the test.
.11 Acceptance criteria of proper performance with a Yes / No check box.

.12 A section for comments.
.13 Signatures and date block for the EC.

.5 Test Methods
.1 Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The EC will determine which method is most appropriate.
.2 Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
.3 Multiple identical pieces of non-life-safety or non-critical equipment may be functionally tested using a sampling strategy. The sampling strategy will be developed by the EC and approved by the GC. If, after three attempts at testing the specified sample percentage, failures are still present, then all remaining units are tested at the contractors' expense.

.6 The Subs shall provide sufficient notice to the EC regarding their completion schedule for the pre-functional checklists and start-up of all equipment and systems. The EC will schedule functional tests through the GC and affected Subs. The EC shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

.7 The EC will have the burden of responsibility to solve, correct and retest problems is with the GC, Sub trades/contractors.

.8 Functional Performance Testing requirements:
.1 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. Perform test prior to energizing electrical system.
.2 Perform simulated operation tests with metering, instruments disconnected from permanent signal and other electrical sources. Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources and electrical supplies. Perform tests to obtain correct calibration.
.3 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.

.4 Power distribution system including phasing, voltage, grounding and load balancing. Test and verify all torqueing settings.

.5 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 Test and operate all miscellaneous moving and working parts in all systems including motor starters, disconnects, interlocks, breakers, GFIs, Arc Flash Breakers, H/O/A switches, buttons, contactors etc. to ensure system is operating as designed.

.5 Test each receptacle for reverse wiring, switch wiring control, occupancy or time clock control and ground fault operation (including ensuring downstream loads to do not shut off on GFCI operation).

.6 The lighting control system shall be tested and certified by the manufacturer's representative as per ASHRAE 90.1 requirements. Provide documentation of certification in maintenance manual and submit copy to the Departmental Representative.

.7 The emergency lighting system shall be tested for maintained luminance to a minimum of 30min. Provide written document verifying the operation of the system after the test.

.8 Access control, CCTV and intrusion systems shall have each device verified for address, functionality and intercommunication with other systems. The manufacturer shall assist the electrical contractor and Departmental Representative with the entire system verification and provide documentation detailing each device tests with pass/fail for each device.

3.5 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

.1 The EC shall witness and document the results of all functional performance tests using forms developed for that purpose. Prior to testing, these forms are provided to the Departmental Representative for review and approval.

.2 The EC will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the Departmental Representative on a standard form.

.3 Corrections of minor deficiencies identified may be made during the tests at the discretion of the EC. In such cases the deficiency and resolution will be documented on the procedure form.

.4 Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the EC will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the GC.

.5 As tests progress and a deficiency is identified:

.1 When there is no dispute on the deficiency and the responsibility to correct it:

.1 The EC documents the deficiency and the Sub's response and intentions the testing continues. The Sub corrects the deficiency and notifies the EC that the equipment is ready to be retested.

.2 The EC reschedules the test and the test is repeated.

.2 If there is a dispute about a deficiency or who is responsible:

.1 The deficiency shall be documented on the non-compliance form and a copy given to the Departmental Representative and GC.

.2 Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the Departmental Representative.

.3 The EC documents the resolution process.

.4 Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency and notifies the EC that the equipment is ready to be retested. The EC reschedules the test and the test is repeated until satisfactory performance is achieved.

.6 Cost of Retesting.

.1 The cost for the Sub to retest a pre-functional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.

.2 The time for the Departmental Representative to direct any retesting required because a specific pre-functional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be back charged to the GC, who may choose to recover costs from the party responsible for executing the faulty pre-functional test.

.7 The EC notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the EC. The EC recommends acceptance of each test to the Departmental Representative. The Departmental Representative gives final approval on each test, providing a signed copy to the EC and the GC.

3.6 OPERATION AND MAINTENANCE MANUALS

.1 Prior to substantial completion, the EC shall review the O&M manuals, documentation and redline as-builts for systems that were commissioned to verify compliance with the Specifications. The EC will communicate deficiencies in the manuals to the Departmental Representative. This work does not supersede the A/E team's review of the O&M manuals according to the A/E contract.

.2 The EC is responsible to compile, organize and index all commissioning data by equipment into labelled, indexed and tabbed, three-ring binders and deliver it to the GC. Three copies of the manuals will be provided. The manuals shall include the Commissioning Plan, Final Commissioning Report, System Type, Design Intent narrative, Start-up and Pre-functional checklists, Functional performance tests, trending and analysis, approvals and corrections, training plan, records, and approvals.

3.7 SYSTEM 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.

.2 The GC shall be responsible for training coordination and scheduling and for ensuring that training is completed.

.3 Some systems may require two independent seminars, one for the maintenance staff and on seminar for the user groups. Accommodate split seminars as required.

.4 The EC shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

.1 Each Sub and vendor responsible for training will submit a written training plan to the EC for review and approval prior to training. The plan will cover the following elements:

.1 Equipment (included in training)
.2 Intended audience
.3 Location of training
.4 Objectives
.5 Subjects covered (description, duration of discussion, special methods, etc.)
.6 Duration of training on each subject
.7 Instructor for each subject
.8 Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
.9 Instructor and qualifications

.1 Branch Circuits:

.1 Power receptacle system
.2 Miscellaneous wiring devices
.3 Miscellaneous equipment
.4 Heat tracing and electric heat

.2 Grounding and Bonding System

.1 System Overview
.2 Location and routing
.3 System tests and labelling
.4 Special grounding/bonding testing results

.5 Lighting:

.1 Interior/Exterior Lighting:

.1 Description of each luminaire with respect to lamp and ballast or any other special features:

.1 Troubleshooting procedures
.2 Maintenance procedures
.3 Re-lamp schedules.
.4 Spare parts.

.2 Emergency Lighting Battery Units and Exit Lights:

.1 Troubleshooting procedures
.2 Maintenance procedures

.3 Spare parts.

.3 Lighting Controls:

.1 Line voltage switching:

.1 Dimming

.2 Occupancy Sensor operation and adjustments.

.3 Daylight Sensors operation and adjustments,

.2 Low voltage switching:

.1 Relay replacement.

.2 Master control unit programming.

.3 Programming Adjustments.

.4 Sensor operation and calibration

.3 Photo-cell/time clock operation

.4 Occupancy Sensor operation and adjustments.

.5 Daylight Sensors operation and adjustments,

.6 Troubleshooting procedures

.7 Maintenance procedures

.8 Spare parts

.6 Communication and Security Systems:

.1 Communications Systems

.1 System Overview

.2 Cable types, routing and communication room locations.

.3 Wireless access points and mapping

.4 Grounding and Bonding system

.5 Warranty

.6 Interface with other systems

.7 Troubleshooting procedures

.8 Maintenance procedures

.2 Access Control System:

.1 System Overview

.2 Programming of individual devices, access privileges, schedules, zones and groups.

.3 Addition and deletion of staff/cards onto the system.

.4 Interface with other systems.

.5 Sequence of operations

.6 Interface with door hardware

.7 Maintenance Procedures

.7 Closed Circuit Television (CCTV)

.1 Rough in only

.8 Intrusion Detection System

.1 System Overview

.2 Programming of schedules, zones and groups.

.3 Addition and deletion of devices onto the system.

.4 Interface with other systems.

.5 Interface with door hardware

.6 Maintenance Procedures

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

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

1.2 REFERENCES

.1 ASHRAE 90.1 American Society of Heating, Refrigeration and Air Conditioning Engineers. – most recent version.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Control system: by one manufacturer and assembled from compatible components.

.2 Photocell equal to Sensor Switch SBOR series.

.3 Line voltage switches as per Section 26 27 26.

.4 The lighting control system shall be tested and certified by the manufacturer's representative as per ASHRAE 90.1-10 requirements. Provide documentation of certification in maintenance manual and submit copy to the Engineer.

.5 Preapproved equal manufactures shall be Lutron, Leviton and Hubbell.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install system and components in accordance with manufacturer's recommendations and as shown on the drawings to provide a fully functional system as shown on the drawings and contained herein. Not all system components for a fully functional system may be detailed in this specification; provide all necessary components for a fully functional system.

.2 Install cabling and connect to each component in accordance with the manufacturer's recommendations.

.3 Adjust each component in the system to function as shown on the drawings and in conjunction with the Owners' directions.

.4 Connect to other systems such as DDC and Security as shown on the drawings; verify operation of lighting system of connections to the other systems.

.5 Measure and adjust all occupancy sensors, vacancy sensors, daylight sensors and photocells. Unless otherwise noted, wall mounted occupancy sensors shall be set to manual on and auto off.

.6 Where daylighting controls are installed, the lighting levels during full day light and at night shall be measured and light levels adjusted to provide even illumination in both scenarios. Retest after adjustments and re-adjust as necessary.

.7 Ensure all switching and controls requirements of ASHRAE 90.1 have been met; bring any variances to the Engineer.

3.2 FIELD QUALITY CONTROL

.1 On completion of installation the manufacturer representative shall carry out site inspection and verification. Verification to comply with the ASHRAE 90.1 requirements, the design as shown on the drawings in addition to the Manufacturer's own requirements. Provide copy of verification report to the Engineer. Corrections are to be implemented to comply with manufacturer's report.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 CSA International – most recent version

.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).

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers, 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 with temperature compensation for 40 degrees C ambient.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.5 Circuit breakers with interchangeable trips as indicated.

.6 Circuit breakers to have minimum 10kAIR symmetrical RMS interrupting capacity rating at 208V and 15kAIR at 600 V.

.7 Moulded case circuit breakers shall be of one manufacturer and match distribution equipment manufacturer.

2.2 THERMAL MAGNETIC BREAKERS

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

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.

3.2 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

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

PART 2 PRODUCTS

2.1 GROUND FAULT CIRCUIT INTERRUPTER RECEPTACLE

.1 Self-contained with 15A, 120V circuit interrupter and receptacle complete with

- .1 Solid state ground-sensing device
- .2 Facility for testing and reset
  - .1 Cover plate as specified in Section 26 27 26 - Wiring Devices
  - .2 CSA Class A certified
  - .3 Equal to Hubbell No. GF-5252I – check

2.2 CIRCUIT BREAKER-TYPE GROUND FAULT INTERRUPTER

.1 Single- or Two- pole ground fault circuit interrupter for 15/20/30/40A, 120/ 208V, 1-phase operation as indicated on drawings and/or panelboard schedules and complete with test and reset facilities.

.2 Sensitivity 10 mA.

.3 2-pole units to have indication and provision for remote indication.

.4 Circuit breakers to have thermal and magnetic trip units and to be integral to the panelboard.

.5 Circuit breakers to be of similar construction and of same manufacturer as the non-ground fault units in the same panelboard.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Do not ground neutral on load side of ground fault relay.

.2 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

.3 All exterior-mounted receptacles, pool pumps, and pool lighting circuits shall be protected by ground fault circuit interrupters.

.4 Provide self-contained GFCI type receptacles where indicated.

.5 For the protection of persons using, pools containing electrical devices, etc., supply and install Ground Fault Circuit Interrupter (GFCI) breakers in the branch wiring to all electrical equipment associated with these "wet" areas.

.6 If the manufacturer of the panelboard being used throughout this project has available a Type A GFCI, designed to replace normal circuit breakers in the panel boards, such a device may be used. Alternately, a separate approved GFCI shall be used.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 08 00 Commissioning and Demonstrations.

.2 Arrange and pay for field testing of ground fault equipment by contractor before commissioning service.

.3 Submit report of tests to Departmental Representative and a certificate that system as installed meets criteria specified herein.

.4 Demonstrate simulated ground fault tests.

END OF SECTION

PART 1 GENERAL

1.1 RELATED WORK

.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 REFERENCES

.1 CAN/CSA C22.1, Canadian Electrical Code, Part I - most recent version

.2 CAN/CSA C22.2 No.9.0, General Requirements for Luminaires.

.3 IESNA Illuminating Engineering Society of North America - Lighting Handbook – most recent version

.4 ASHRAE 90.1 – American Society of Heating, Refrigerating and Air-Conditioning Engineers – most recent version.

1.3

.1

.2

.3

1.4 INTENT

.1 Provide lighting fixtures and accessories for all outlets as listed in the Fixture Schedule and as shown on drawings.

.2 Lighting fixtures shall be structurally well designed and constructed, using new parts and materials of the highest commercial grade available.

.3 Bond all lighting equipment to grounding system.

.4 Verify all ceiling types and finishes before ordering fixtures and provide fixtures suitable for mounting in or on ceilings being installed in each area, as specified. Where fixture types specified are not suitable for ceiling being installed, obtain written instructions from the Departmental Representative before ordering fixtures.

.5 Fixtures of the same or similar type shall be supplied by the same manufacturer.

.6 Electrical contractor shall supply and install all luminaries complete with lamps, mounting brackets, lenses, ballasts (dimming or otherwise), drivers and all necessary accessories in accordance with luminaire types shown on drawings and listed in luminaries schedule unless otherwise noted.

.7 Supply and install complete and proper support and hangers for all luminaires in ceiling space where required for proper support of outlet boxes and luminaire hanger assemblies.

PART 2 PRODUCTS

2.1 LED DRIVERS

.1 LED drivers shall be fully dimmable, Energy Star compliant, maximum THD of 20%, power factor to be greater than .95, have high voltage regulation and have internal surge protection.

.2 LED lit luminaires shall meet the LM-79 and LM-80 test protocols (70% output at 50,000 hours), a minimum efficacy of 90 watts per lumen and shall meet or exceed ENERGY STAR SSL standards to ensure lumen and color consistency between luminaires.

2.2 WIRE GUARDS

.1 All fixtures in storage rooms and service rooms shall have wire guards.

2.3 FIXTURES

.1 Provide fixtures as indicated on the fixture schedule.

.2 All fixtures shall comply with CSA Standard C22.2 No.9. Accessories and components shall comply with relevant CSA Standards applicable to accessory or components.

.3 Recessed down light luminaires shall be of the approved pre-wired type with junction box forming an integral part of luminaires assembly with access facility to the satisfaction of the electrical inspection authority. Supply and install all necessary plaster rings, supports, etc. required for complete and proper installation.

.4 Except where otherwise noted in the Fixture Schedule, depth of recessed fluorescent fixtures shall not exceed 150 mm, including mounting yokes, or bridges and the distance from the back face of the diffuser or lens to the centre of the lamp shall be not less than 75 mm. Design of reflector and lamp position shall be to provide high efficiency, even brightness and lack of lamp lines.

.5 Fluorescent fixtures shall be constructed of not less than code gauge steel. All metal parts shall be thoroughly cleaned and finished in high reflectance baked white enamel over corrosion-resistant primer. Reflecting surfaces and exposed surface shall have not less than two coats of baked white enamel with reflectance of not less than 85%.

.6 All fixture diffusers, lens panels, lens frames, etc., shall be securely and adequately supported and shall be removable without the use of tools for cleaning.

.7 Where recessed fluorescent and LED luminaires are to be mounted in drywall ceilings or type of ceilings requiring frames, supply drywall frames for the recessed luminaires and turn frames over to the general contractor for installation.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

.1 Confirm all ceiling depths against the final architectural ceiling plans and sections to ensure that recessed fixtures can be installed in all ceiling conditions and advise the

Departmental Representative immediately of any discrepancies prior to ordering of the fixtures or proceeding with the work.

3.2 INSTALLATION - GENERAL

.1 Lighting fixtures shall be installed as indicated on architectural reflected ceiling plans, Electrical Drawings, and per approved shop drawings.

.2 Verify locations and spacing of lighting fixtures with reflected ceiling plans and notify Departmental Representative of any variance or conflict between the plans and field conditions. Do not proceed until conflict has been resolved.

.3 Work shall be coordinated with other trades. Lighting fixture locations shall have priority over locations of ducts, diffusers, sprinklers, smoke detectors, and other non-structural obstructions.

.4 All fixtures shall be supported directly from the building structural members or from bridging attached to the structural members by rod hangers and inserts. Provide all necessary hardware and blocking to ensure that fixtures hang true.

.5 Lighting fixtures shall be adequately supported and braced to satisfy seismic codes. Refer to Section 26 05 05 Seismic Restraints.

.6 Mount wall fixtures at elevations specified or as shown on Architectural or Electrical Drawings. Where no elevation is shown, confirm mounting height with the Departmental Representative prior to rough-in.

3.3 INSTALLATION AND SUPPORTS

.1 Provide complete and proper support for all fixtures, fixture hangers, etc., including headers in ceiling space, where required, for proper support of outlet boxes and fixture hanger assemblies.

.2 Support fixtures as shown on the drawings, level, plumb and true with the structure and other equipment in a horizontal or vertical position as intended. Wall or side bracket mounted fixture housings shall be rigidly installed and adjusted to give a neat flush fit to the surface on which it is mounted.

.3 All hangers, supports, fastenings or accessory fittings shall be protected against corrosion. Care shall be taken during the installation to assure that insulation and corrosion protection is not damaged.

.4 Self-aligning seismically rated ball joint hangers shall be used for rod suspended fixtures. Ceiling canopies or hood assemblies intended to cover the suspension attachments shall be installed to fit tightly to the ceiling without restricting the alignment of the hanger. Support fixtures by hangers and mounting arrangements which will not cause the fixture frame, housing, sides or lens frame to be distorted; or prevent complete alignment of several fixtures in a row.

.5 The suspension length of all ceiling mounted suspended types of lighting fixtures as listed in the Fixture Schedule shall be the overall length from the ceiling to the lowest point of the fixture body, reflector or glassware in its hanging position.

.6 Metal inserts, expansion bolts or toggle bolts in concrete slabs for stems which do not carry wiring must be accurately located in relation to the outlet boxes, to allow perfect alignment and spacing of suspension stems.

.7 Where fixtures are surface mounted on the underside of an inverted tee bar ceiling, the fixture shall be supported either directly from the building structure by means of rod hangers and inserts or by means of metal angle headers, supported from the tee bar framing structure above the tile. Fixtures shall be supported from the quarter points.

.8 Wiring from outlet boxes to fluorescent fixtures and wiring through fluorescent fixture channels shall be rated for 90 degrees C.

.9 All recessed fixtures to be installed so that they are removable from below to gain access to outlet box or prewired fixture box. Connect all recessed fixtures to boxes with flexible conduit and approved fixture wire. Provide approved drywall enclosures in insulated ceilings. Volume of enclosure to comply with Electrical Code.

.10 Install fixture lenses as late as possible to protect from dirt and dust. Remove and clean or replace lenses to the satisfaction of the Departmental Representative.

.11 Provide and install all conduit, boxes, wire and make emergency power connection to all units and to unit controllers. Refer to architectural reflected ceiling plans for locations prior to conduit installation. Obtain all specialty backboxes, switches, controllers, etc. from contractor and coordinate installation as required.

.12 Where ballasts are to be remotely located, they shall be racked together and labelled with size 3 lamicoid. Label shall bear the ballast number which has a corresponding location on an adjacent floor plan reference drawing. Labels and floor plans shall be provided by electrical contractor. Floor plans shall measure 280mm x 430mm and shall be framed and laminated.

END OF SECTION

PART 1 GENERAL

1.1 RELATED WORK

.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 SCOPE

.1 Provide a complete new card access system to match existing card access system. as shown on the Drawings. System shall include card reader, door contacts, request to exit device, electronic locking hardware, alarm monitoring workstations, power supplies, cable, alarm management software, and miscellaneous components as required. Provide all components necessary to form a fully operational system.

.2 Division 26 is to provide all necessary conduit rough in materials and labor to support the access control system components.

.3 Program the access control system to meet the door interlocking and monitoring requirements of the Owner as shown on the drawings and described herein.

.4 The access control system card readers shall be based upon RFID proximity technology.

.5 Integrate the new areas with existing system and match existing operations as per the requirements of the Owner.

1.3 GENERAL REQUIREMENTS

.1 All new system components are to match existing system components. Contractor shall confirm on site all system component used prior to bid submission.

.2 Security contractors and technician shall be certified and in good standing by the manufacturer of the system used.

.3 Systems to be complete with all necessary components to provide functions required; not every item is necessarily mentioned. System to be supplied and installed by an established communications contracting firm that is approved by the Owner and vendor.

.4 Before proceeding with installation, successful system installer to submit to the Departmental Representative for approval a complete detailed proposal as outlined in Section 26 05 00 - Common Work Results.

.5 All wiring for systems to be PVC insulated, FT6 rated, shielded, twisted pair, multi conductor or coaxial, as called for or as required. All wiring for systems to be plenum rated where required. System wiring to be terminated by Security Contractor.

.6 Selection of type of cable to be at discretion of system installer. The system, when complete, must perform to the complete satisfaction of the Departmental Representative and must be free of all interference from cross-talk, hum, switch and relay noise, etc. All wiring to be terminated on terminal strips or blocks, and to be neatly installed, laced and tagged where required. All terminals in terminal panels and junction boxes to be made with solderless connectors to terminal blocks with a separate terminal for each conductor.

.7 The contractor shall be fully trained and factory certified on all security systems as required by this document.

.8 All hardware required to make programming changes to the system(s) shall be included with the system.

.9 Each system shall have sufficient power supply to operate the system and the manufacturers' recommended power for the system shall be less than 80% of the power supply rated power output.

.10 All systems shall include sufficient back up power supply to operate all devices simultaneously without drawing more than 80% of the capacity of the power supply. The back-up power system shall have sufficient capacity to operate the entire system for a minimum of 24 hours under normal operating conditions. (All batteries to be minimum 7 amp hour)

.11 All systems shall be locally managed and may require the ability to be remotely controlled and configured.

1.4 WARRANTY

.1 System installer to include with his base tender price a guarantee stating:

.1 A full warranty will be provided for a period of one (1) year.

.2 Service to be provided on system within 24 hours of call origination during the warranty period.

.3 During warranty period system installer at his expense to repair and replace all such defective work and other work to new system damaged thereby which fails or becomes defective during term of warranty, provided that such failure is not caused by improper usage or physical damage.

.4 Warranty date to commence from date of Final Acceptance of this work.

1.5 SYSTEM REQUIREMENTS

.1 System to control access of specified door(s) based on programmed time schedule, through use of personnel ID cards, or operator requests and provide hard copy of events.

.2 System must provide live muster reporting.

.3 Hardware and software to be provided to facilitate following functions:

.1 to secure door(s).

.2 to monitor door status.

.3 to release door(s) under fire conditions.

.4 to release door(s) when valid ID card is presented to card reader.

.5 to place door(s) in a secure or unsecured mode automatically from software time schedule.

.6 to place door(s) in a secure or unsecured mode via the terminal keyboard.

.7 to manually release door(s) for exiting.

.8 to verify valid ID cards, unlock door, display entry on LCD monitors and provide hard copy of event.

.9 to monitor personal safety alarms.

.10 to monitor security alarms.

.11 to prioritize alarm conditions.

.12 to graphically display alarm points, door status and monitor points accurately.

.13 to graphically allow the operator to manipulate input and output points via a mouse from both a text screen and a graphics screen.

.14 to produce high quality ID badges.

.4 Authorized personnel will be supplied with a valid ID card to gain access through specified security doors during controlled hours.

.5 Individual points will be controllable via the local intelligent field panel unit to place in a secure or non-secure mode. All points shall be able to be grouped to be controlled on an "if then" basis where one event will trigger another. Each input and output to be able to be controlled in this way on a system-wide basis.

.6 System shall continuously scan all monitoring devices for change of state information. All doors are to be monitored for tamper (trouble) 24 hours each day. System shall have the capability to provide locked/unlocked status in addition to door position status on controlled doors.

.7 All exit doors with magnetic locks to be released under fire alarm conditions. Coordinate exact requirements with fire alarm supplier.

.8 Coordinate software programming requirements, time schedules, ID's, operators and display with Owner prior to system programming.

.9 System software to allow the use of an expiry date and a start date on all cardholders on the system. Cards will only work between those dates.

.10 System software to be able to cause actions based on inputs/outputs and time schedules. Software to be able to handle if/the statements, or logic, and logic and priorities.

.11 Software application program to lock and unlock specified door(s) via valid ID cards, manual requests, by software time schedules, exit pushbuttons, security sensor bars, or key switches and provide status of each specified door.

1.6 TRAINING

.1 Provide complete and comprehensive training and demonstration sessions for the Owner and staff.

.2 Instruct personnel in operation, adjustment, and maintenance of equipment and systems, using provided operation and maintenance data as the basis for instruction.

PART 2 PRODUCTS

2.1 ACCCEPTABLE MANUFACTURERS

.1 To match existing site system Kantech, coordinate with Owner.

2.2 PROXIMITY CARDS

.1 Contractor to supply 20 access cards and program as required as directed by the Owner.

2.3 PROXIMITY CARD READERS

.1 Reader is to match existing card readers.

.2 Reader is to utilize proximity technology; no physical contact during a card swipe will be permitted.

.3 Minimum read range of 78mm

.4 Mounted on mullions or single-gang electrical boxes.

.5 LED for visual feedback, Piezo for audio feedback

.6 Compatible with all Wiegand access control systems.

.7 Industry standard Wiegand (26 to 56 bit) output.

.8 All card readers shall be provided with sealed single gang boxes for wall mounting.

.9 Standard of Acceptance: HID RP40 and RP15 multiCLASS Readers.

2.4 SECURITY WIRING

.1 All wiring and cable installed and connected to any piece of equipment which forms part of the security system to be electrically supervised and shall indicate a fault or tampering (open, ground) and provide a unique display of circuit trouble in the system on the display screen.

.2 Conduit must be used for security cabling within the secured space.

.3 All security control panels shall be located in a secure, accessible location within the protected space (i.e. – panels and equipment shall not be mounted in electrical or data rooms that are not within the protected space).

.4 All cable and equipment supplied, and all installation methods used, shall be as specified by the equipment manufacturer.

.5 A proposed wiring layout shall be submitted for approval before start of work.

.6 No splices shall be permitted in the wiring except where a connection is made to a device. All connections shall be made using “B” clips, stakons or approved equivalent (no marrettes).

.7 All wiring shall be concealed unless otherwise authorized by the Departmental Representative.

.8 All cables shall be permanently identified and listed on as-built drawings as follows:

.1 Cable number

.2 Source

.3 Destination

.9 Electrical panel circuit number shall be clearly identified on all system panels.

.10 All work shall be installed in a neat and workmanlike manner. The contractor is responsible for clean-up and disposal of all garbage and debris caused as a result of their work. There are no extras for removal work.

2.5 LABELLING

.1 All equipment units (field panels, access control units, etc.) to have lamicoid description label. Description to be in code as directed by Owner.

.2 All wire and cable to be labelled with suitable identification code affixed to cable jacket near terminations. Label to be permanently affixed, vinyl, plastic or similar material.

2.6 WIRE AND CABLE

.1 Wiring for door control system may be smaller than #14 AWG copper providing voltage drop is not greater than 5% when devices are in operation.

.2 Multi-conductor cables to be complete with outer PVC jacket.

2.7 DOOR CONTROL POWER SUPPLY

.1 Door control power supply to provide 24V DC with automatic battery charging output circuit to maintain standby batteries. Power supply to have integral transient over voltage protection and surge suppression complete with ground fault detection and alarm. Power supplies to be located in field control panels or in separate cabinets beside field control panel.

.2 Battery backup system to be complete with batteries sized to maintain operation of all doors in system for not less than ten (10) minutes. System to be complete with fusing and transfer relays.

.3 Door control power supply is to provide power to the following:

.1 Door security control including all door hardware, card readers, LED's control circuits and security detection equipment. Power supplies to come complete with fire alarm release relay capable of accepting a dry contact input and an under voltage release time delay 0 to 60 seconds relay to open doors if emergency power fails to come on line.

.2 Power supplies to be rated at 125% of total capacity of load connected.

.3 Power supplies must be ULC listed for the type of service.

PART 3 EXECUTION

3.1 INSTALLATION

.1 All interface and connection boxes in Public and Reception zones shall be fitted with a tamper detection switch, wired to the control panel as a unique input point

.2 Home-run all devices as unique points to the field controller panel - do not gang or group devices unless otherwise authorized by Canada. Double doors may be wired as one point.

.3 EOL devices shall be installed at the device – not in the ISC

.4 Conduit must be utilized to protect security cabling.

.5 All ISC’s and power supplies shall be located in a secure, accessible location within the telecommunications rooms protected space (i.e. – panels and equipment shall not be mounted in rooms that are not within the protected space).

.6 All cable and equipment supplied, and all installation methods used, shall be as specified by the equipment manufacturer.

3.2 DOCUMENTATION

.1 The contractor shall return the following documentation to Owner:

.1 As-built drawings showing location of all devices, controls, splice points, demarcation connection, panels and keypads. All zones shall be clearly identified on the drawings. Electrical panel circuit breaker shall be clearly identified and noted on both the panel cover and as-built drawings.

.2 One each: Installation, Training, and Operations Manuals

.3 Acceptance Test Plan and sign-off sheets.

.4 Manufacturer's cut sheets for all devices.

.5 Electrical inspection permit and report.

.6 Training session attendance sheet.

3.3 TESTS AND ADJUSTMENTS

.1 Upon completion of system installation, tests to be conducted by the system installer to determine system conformity to the requirements of the specification. Tests to be conducted in presence of owner and/or his representative who may suspend or discontinue tests at any time performance is considered unsatisfactory. Resumption of testing to cover the previously untested elements and any completed elements at the discretion of the Owner.

.2 Entire system and its components (every device, sub-system, and interconnection to other systems) to be tested for proper operation and function.

.1 Test for all alarm annunciation and proper recording.

.2 Test cable system in accordance with requirements for telecommunications systems in Section 27.

.3 Test for failure modes.

.4 Test for simultaneous alarms on multiple systems.

.5 Test and ensure data logging functionality and that all test results are recorded.

.3 All equipment or wiring provided by system installer which tests prove to be defective or operating improperly to be corrected or replaced promptly at no additional cost to the Owner.

3.4 TRAINING

.1 System installer to conduct training program for designated maintenance and operating personnel. This program to include but not be limited to the following:

.1 Operation: designated personnel to be trained to accomplish and understand all aspects of system operation.

.2 Maintenance: designated personnel to be trained to perform routine maintenance on the system.

.3 Training period schedule to be established by Owner. Training periods to take place after building completion and prior to system use.

.4 Total training time required is 4 hours.

.5 Contractor shall provide the Owner with a training attendance sign-off sheet. This sheet shall identify the site, time and date as well as a listing of all those in attendance.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

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

1.2 REFERENCE DOCUMENTS

.1 National Fire Protection Association (NFPA)

.1 NFPA 70, Article 517, National Electric Code.

.2 NFPA 101, Life Safety Code.

.2 Electronic Industries Association (EIA)

.1 REC 12749, Power Supplies.

.2 RS 16051, Sound Systems.

1.3 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, Canadian Electrical Code, Part 1- Safety Standard for Electrical Installations.

.2 Underwriters' Laboratories (UL)

.1 UL 294, Standard for Safety for Access Control System Units.

.2 UL 1076, Standard for Safety for Proprietary Burglar Alarm Units and Systems.

.3 Underwriters Laboratories of Canada (ULC)

.1 ULC-S317, Installation and Classification of Closed Circuit Video Equipment (CCVC) Systems for Institutional and Commercial Security Systems.

1.4 DESIGN PERFORMANCE REQUIREMENTS

.1 Provide a complete rough-in for an IP based CCTV monitoring system as indicated on the Drawings and as specified herein.

PART 2 PRODUCTS

2.1 Not applicable

PART 3 EXECUTION

3.1 Not applicable

END OF SECTION

PART 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 Submittal Procedures.

.2 Section 01 35 30 Health and Safety Requirements.

.3 Section 01 35 43 Environmental Procedures.

.4 Section 01 45 00 Quality Control.

.5 Section 01 56 00 Temporary Barriers and Enclosures.

.6 Section 01 74 19 Construction/Demolition Waste Management and Disposal.

.7 Section 02 41 99 Demolition for Minor Works.

.8 Section 31 11 23 Aggregate Base Courses.

1.2 REFERENCES

.1 Master Municipal Contract Documents (MMCD), Platinum Edition Volume II - 2009, British Columbia. Contractor to maintain a copy on-site at all times.

.2 Geotechnical Site Assessment, Proposed Reconstruction of Port Hardy Airport Terminal, prepared by AMEC Environment and Infrastructure, December 11, 2014

.3 American Society for Testing and Materials International (ASTM)

.1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422-632002, Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698-00ae1, 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 D1557-02e1, 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 D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.5 Canadian Standards Association (CSA International)

.1 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.1 CSA-A3001-03, Cementitious Materials for Use in Concrete.

.2 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.6 BC Ministry of Transportation and Highways Specification I-11, Fracture Count for Coarse Aggregate

.7 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.

1.3 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock: solid material in excess of 1.00m^3, and which cannot be removed by means of heavy duty mechanical excavating equipment available on site. 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 and ASTM C136 : Sieve sizes to CAN/CGSB-8.1 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.

1.4 EXCAVATION AND DISPOSAL

.1 Contractor to submit to Departmental Representative for review and approval, location of proposed disposal facility prior to disposal of any material.

1.5 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 name of testing laboratory retained by Contractor for materials testing for review and approval by Departmental Representative.

.2 Submit to Departmental Representative testing inspection results report as described in PART 3 of this Section.

.3 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

1.6 QUALITY ASSURANCE

.1 Do not use soil material until written report of soil test results are reviewed and approved by Departmental Representative.

.2 Health and Safety Requirements:

.1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.7 WASTE MANAGEMENT AND DISPOSAL

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

.2 Divert materials from landfill to local facility for reuse.

1.8 EXISTING CONDITIONS

.1 Carefully examine existing mapping of site utilities prior to excavation.

.2 Buried services:

.1 Before commencing work verify location of buried services on and adjacent to site by either soil hydrovactor excavation or hand-digging methods.

.2 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

.3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.4 Prior to beginning excavation Work, establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during Work.

.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 removing or re-routing.

.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, 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.

PART 2 Products

2.1 MATERIALS

.1 Gravel to be composed of inert, durable material, reasonably uniform in quality and free from soft or disintegrated particles. In absence of satisfactory performance records over a five year period for particular source of material, soundness to be tested according to ASTM C88 or latest issue. Maximum weight average losses for course and fine aggregates to be 30% when magnesium sulphate is used after five cycles.

.2 All crushed gravel when tested according to ASTM C136 and ASTM C117 to have a generally uniform gradation and conform to MMCD gradation limits and 60% of the material passing each sieve must have one or more fractured faces. Determination of amount of fractured material shall be in accordance with BC Ministry of Transportation and Highways Specification I-11, Fracture Count for Coarse Aggregate, Method 'A', which determines fractured faces by count. The Plasticity Index for crushed gravel to not exceed 6.0.

.3 Granular base and sub-base to MMCD (Master Municipal Contract Documents 2009, British Columbia), Section 31 05 17 – Aggregates and Granular Materials.

.4 Granular pipe bedding to MMCD ((Master Municipal Contract Documents 2009, British Columbia), Section 31 05 17 – Aggregates and Granular Materials.

.5 Drain rock to MMCD ((Master Municipal Contract Documents 2009, British Columbia), Section 31 05 17 – Aggregates and Granular Materials.

.6 Structural fill to be in approved by a geotechnical engineer and DCC Representative. Structural fill should consist of clean imported granular fill containing less than 5% silt and clay sizes.

.7 Portions of the excavated site material may be suitable for re-use as structural fill. Clean granular material, if any, encountered on the site should be stockpiled separately for review by the geotechnical engineer.

PART 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control drawings, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 PREPARATION/PROTECTION

.1 Protect existing features in accordance with 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 as directed by Departmental Representative.

.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.

.5 Protect existing buried services.

3.4 STRIPPING OF TOPSOIL

.1 Begin topsoil stripping of areas as indicated after area has been cleared of brush, weeds, grasses and removed from site.

.2 Strip topsoil to depths as indicated.

.1 Do not mix topsoil with subsoil.

.3 Stockpile in locations as directed by Departmental Representative.

.1 Stockpile height not to exceed 2 m and should be protected from erosion.

.4 Retain topsoil for reinstatement.

3.5 STOCKPILING

.1 Stockpile fill materials in areas designated by Departmental Representative.

.1 Maximum stockpile height: 3m.

.2 Stockpile granular materials in manner to prevent segregation.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.6 SHORING, BRACING AND UNDERPINNING

.1 Contractor is responsible for the protection and temporary support of all project excavations.

.2 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 30 - Health and Safety Requirements and WorkSafe BC.

.1 Where conditions are unstable, Contractor to retain and pay costs for geotechnical engineer to review condition and provide recommendations

3.7 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Provide for Departmental Representative review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut- offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.

.1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.

.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved runoff areas or containment facilities and in manner not detrimental to public and private property, or portion of Work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

3.9 EXCAVATION

.1 All or any existing underground utilities are not necessarily shown on the Contract Drawings. Existing Underground utilities shall be located and all utility companies contacted, prior to installing any new underground services.

.2 Test holes may be required to be excavated to determine exact depths of existing utilities. Any discrepancy in elevation or location shall be referred to the Departmental Representative prior to construction.

.3 Advise Departmental Representative at least 7 days in advance of excavation operations. Excavate to lines, grades, elevations and dimensions as indicated.

.4 All trenches to conform to WorkSafeBC Guidelines and Regulations and MMCD standard drawing G4.

.5 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation offsite.

.6 Excavation must not interfere with bearing capacity of adjacent foundations and slabs. Contractor to notify Departmental Representative immediately where undermining of slabs of foundations occurs. Contractor responsible for devising and executing a remediation plan for filling all voids associated with undermining of slabs and foundations.

.7 Keep excavated and stockpiled materials safe distance away from edge of trenches as directed by Departmental Representative.

.8 Restrict vehicle operations directly adjacent to open trenches.

.9 Do not obstruct flow of surface drainage or natural watercourses.

.10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.1 Subgrade for foundations and paved areas to be reviewed and approved by geotechnical engineer prior to placement of fill materials.

.2 Any soft/loose areas identified should be excavated and replaced with structural fill placed and compacted in 200mm lifts to 100% Standard Proctor Maximum Dry Density, or as directed by Geotechnical Engineer.

.11 Correct unauthorized over-excavation as follows:

.1 Fill with MMCD granular base material to not less than 100% Standard Proctor Density.

.12 Maintain subgrade surface in condition conforming to this section until succeeding material is applied or until subgrade is accepted by the Departmental Representative, including any dewatering required.

.13 Hand trim, make firm and remove loose material and debris from excavations.

.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

.2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

3.10 ROADWAY EXCAVATION, EMBANKMENT AND COMPACTION

.1 Complete all roadway excavation in conformance in conformance to the following MMCD sections: Section 31 24 13 – Roadway Excavation, Embankment and Compaction, Section 31 22 16 – Reshaping Granular Roadbeds, and Section 31 22 16.1 – Reshaping Existing Subgrade

3.11 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated.

.2 Place bedding and surround material in unfrozen condition.

3.12 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:

.1 Departmental Representative has inspected and approved installations.

.2 Departmental Representative has inspected and approved of construction below finish grade.

.3 Inspection, testing, approval, and recording location of underground utilities.

.4 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Backfill materials:

.1 Boulevards and easements: for areas not subject to vehicle or building loading and outside ditch lines, backfill with approved native material Compact to 95% modified proctor density.

.2 Roads, foundations, buildings, driveways, concrete walks: backfill with imported granular material. Place backfill material in uniform layers not exceeding 200 mm compacted to 100% Standard Proctor Maximum Dry Density thickness up to grades indicated. Compact each layer before placing succeeding layer.

.5 When site excavated material granular backfill is proposed for use as trench backfill the contractor shall employ a professional geotechnical engineer with experience in geotechnical engineering for performance of in-place density and sieve testing. The site material shall fall within one of the granular backfill material specifications as per MMCD Section 31 05 17.

.6 Install drainage system in backfill as indicated.

3.12 RESTORATION

.1 Existing underground utilities may need to be lowered or rose to suit the final design grades in accordance with minimum and maximum cover requirements for each utility.

.2 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 19 - Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by Departmental Representative.

.3 Replace topsoil as indicated.

.4 Reinstate boulevard to elevation which existed before excavation.

.5 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.

1.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

PART 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 Submittal Procedures

.2 Section 01 61 00 Common Product Requirements.

.3 Section 31 23 33.01 Excavating, Trenching and Backfilling

.4 Section 32 12 16.01 Asphalt Paving – Short Form

1.2 REFERENCES

.1 ASTM International

.1 ASTM C117-04, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN- m/m³).

.5 ASTM D1557-09, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³) (2,700kN-m/m³).

.6 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.7 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

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

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

.4 Master Municipal Contract Documents (MMCD), Platinum Edition Volume II - 2009, British Columbia. Contractor to maintain a copy on-site at all times.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

1.4 ACTION AND INFORMATION SUBMITTALS

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

.2 Product Data:

.1 Submit proposed source and sieve analysis of all aggregate materials 2 weeks prior to commencing work.

PART 2 Products

2.1 MATERIALS

.1 Granular base and sub-base to MMCD (Master Municipal Contract Documents 2009, British Columbia), Section 31 05 17.

PART 3 Execution

3.1 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction, sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PLACEMENT AND INSTALLATION

.1 Place granular base after sub-base and subgrade surface is inspected and approved in writing by Departmental Representative.

.2 Placing:

.1 Construct granular base to depth and grade in areas indicated.

.2 Ensure no frozen material is placed.

.3 Place material only on clean unfrozen surface, free from snow and ice.

.4 Begin spreading base material on crown line or on high side of one-way slope.

.5 Place material using methods which do not lead to segregation or degradation of aggregate.

.6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

.7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.8 Remove and replace that portion of layer in which material becomes segregated during spreading.

.3 Compaction Equipment:

.1 Ensure compaction equipment is capable of obtaining required material densities.

.2 Compacting:

.1 Compact to density not less than 95% Modified Proctor Density.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified density.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Departmental Representative.

.5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

.4 Proof rolling:

.1 For proof rolling use standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.

.2 Obtain written approval from Departmental Representative to use non-standard proof rolling equipment.

.3 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.4 Where proof rolling reveals areas of defective subgrade:

.1 Remove base, sub-base and subgrade material to depth and extent as directed by Departmental Representative.

.2 Backfill excavated subgrade with common material and compact .

.3 Replace sub-base material and compact.

.4 Replace base material and compact in accordance with this Section.

.5 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by Departmental Representative and replace with new materials in accordance with this section at no extra cost.

.6 At the discretion of the Departmental Representative, nuclear densometer testing may be utilized for compaction testing rather than proof rolling. Location and frequency of densometer tests to be approved by the Departmental Representative.

3.3 TESTING

.1 Contractor to retain and pay for services of testing laboratory acceptable by the Departmental Representative for inspection and nuclear densometer testing of aggregate materials.

.2 Tests specified to be carried out by Contractor under the Departmental Representative's supervision.

.3 Contractor shall notify Departmental Representative in advance of planned testing.

.4 Contractor to pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Departmental Representative.

.5 Provide Departmental Representative with 2 copies of testing and commissioning reports as soon as they are available.

3.4 SITE TOLERANCES

.1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.5 PROTECTION

.1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 19 – Construction Waste Management and Disposal.

.3 Section 31 23 33.01 – Excavating Trenching and Backfilling

.4 Section 32 11 23 – Aggregate Base Courses.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft^3 (2,700 kN-m/m^3)).

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.5 – M91 (March 1999), Low Flash Petroleum Spirits Thinner.

.2 CAN/CSGB-1.74 – 2001, Alkyd Traffic Paint.

.3 Master Municipal Contract Documents (MMCD), Platinum Edition Volume II - 2009, British Columbia. Contractor to maintain a copy on-site at all times.

1.3 SAMPLES AND SUBMITTALS

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

.2 Submit asphalt mix design to Departmental Representative for review at least 1 week prior to commencing work.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Divert unused aggregate materials from landfill to facility for reuse as approved by Departmental Representative.

.4 Dispose of unused paint and paint thinner materials at official hazardous material collections site as approved by Department Representative.

.5 Do not dispose of unused paint thinner material into sewer system, into streams, lakes, onto ground or in other location where it will pose health environmental hazard.

.6 Divert unused asphalt from landfill to facility capable of recycling materials.

PART 2 Products

2.1 MATERIALS

.1 Prime coat: N/A

.2 Tack coat: CAN/CGCB – 16.2, Grade SS-1

.3 Asphalt cement: CGSB – 16.3-M 90, Grade 80-100

.4 Asphalt concrete: MMCD Upper Course #1 and 2

.5 Traffic paint: yellow and white to CAN/CGSB-1.74.

.6 Paint thinner: to CAN/CGSB-1.5.

PART 3 Execution

3.1 FOUNDATIONS

.1 Roadway foundations to be constructed in conformance to MMCD Section 31 24 13 – Roadway Excavation, Embankment and Compaction.

.2 Foundations for roadways and parking lots comprise:

.1 compacted granular subbase, thickness to match existing.

.2 compacted granular base, thickness to match existing.

.3 Compaction: compact each lift of granular material to 100% standard Proctor density. Maximum lift thickness: 200 mm.

3.2 PAVEMENT THICKNESS

.1 Pavement thickness for roadways and parking lots is to conform to the following gradation:

.1 Patching and in-fill to be consistent with thickness of existing paving.

.2 PAVEMENT REPAIR

.1 Repair all areas of paving damaged by excavation and construction up to edge of construction.

3.3 PAVEMENT CONSTRUCTION AND TESTING

.1 Construction of asphalt concrete to MMCD 32 12 16 – Hot-Mix Asphalt Concrete Paving.

.2 Surface preparation to MMCD 32 12 16 – Hot-Mix Asphalt Concrete Paving.

.3 Cold milling to MMCD 32 01 16.7 – Cold Milling.

.4 Contractor to retain and pay for services of geotechnical engineer and testing laboratory acceptable by the Departmental Representative for inspection and nuclear densometer testing of backfill materials and asphalt paving.

.1 Testing to include asphalt thickness and compaction at intervals acceptable to the Departmental Representative.

3.4 TRAFFIC MARKINGS

.1 Reinstate any parking space divisions and traffic markings removed or damaged by any of the Work.

.2 Paint parking space divisions and other pavement markings in accordance with manufacturers recommendations and as indicated.

.3 Use paint thinner in accordance with manufacturer's requirements.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 03 20 00 Concrete Reinforcing

.2 Section 03 30 00 Cast-In-Place Concrete

.3 Section 31 23 33.01 Excavating, Trenching and Backfilling.

.4 Section 32 11 23 Aggregate Base Courses.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C117-04, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.

.4 ASTM D1557-12e1, Modified Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³(2,700 kN-m/m³)).

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-3.3-99(March 2004), Kerosene, Amend. No. 1, National Standard of Canada.

.2 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.3 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound

.3 Canadian Standards Association (CSA International)

.1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-G30.5-M1983 (R1998), Welded Steel Wire Fabric for Concrete Reinforcement

.4 Master Municipal Contract Documents (MMCD), Platinum Edition Volume II - 2009, British Columbia. Contractor to maintain a copy on-site at all times.

1.3 SUBMITTALS

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

.1 Submit concrete mix designs 2 weeks prior to construction.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

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

PART 2 Products

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in- Place Concrete and:

.1 Hand-formed and hand-placed concrete:

- Slump: 80mm
- Air entrainment: 5-8%
- Max. aggregate size: 20mm
- Min. cement content: 335 kg/m^3
- Min. 28 day strength: 32 MPa

.2 Extruded concrete:

- Slump: 0-25mm
- Air entrainment: 6-9%
- Max. aggregate size: 10mm
- Fineness modulus: 2.1 to 2.4
- Min. cement content: 335 kg/m^3
- Min. 28 day strength: 32 MPa

.2 Reinforcing steel: in accordance with Section 03 20 00 - Concrete Reinforcing.

.1 Welded steel wire fabric to CSA CSA-G30.5-M1983 (R1998)

.3 Joint filler and Curing Compound: in accordance with Section 03 30 00 - Cast- in-Place Concrete.

.4 Joint sealer to CAN/CGSB-19.24-M90, Type 1, Class B

.5 Granular base: material to following requirements:

.1 Granular base to MMCD (Master Municipal Contract Documents 2009, British Columbia), Section 31 05 17.

.6 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water-soluble soap.

.7 Fill material:

.1 Granular material as specified on contract drawings

.8 Curing compound: to be spray applied, liquid type conforming to ASTM C309 containing a fugitive dye, applied in accordance with manufacturer's recommendations, or other during methods such as sheet material and burlap mats, subject to Departmental Representative approval.

PART 3 Execution

3.1 CONCRETE PAVING

.1 Complete concrete paving subject to vehicular loading in accordance with MMCD 32 13 13 – Portland Cement Concrete Paving.

3.2 GRADE PREPARATION

.1 Do grade preparation work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Construct embankments using excavated material free from organic matter or other objectionable materials.

.1 Dispose of surplus and unsuitable excavated material in approved location off site.

.3 Place fill in maximum 300 mm layers and compact to at least 95% Modified Proctor Density in compliance with ASTM D1557.

3.3 GRANULAR BASE

.1 Obtain Departmental Representative's approval of subgrade before placing granular base.

.2 Place granular base material to lines, widths, and depths as indicated.

.3 Compact granular base in maximum 300 mm layers to at least 95% Modified Proctor Density in compliance with ASTM D1557.

3.4 FORMWORK

.1 Use flexible forms for all curves less than 60m radius

.2 Set forms to line and grade as shown on Contract Drawings free from waves or irregularities in line or grade

.3 Adequately brace forms to maintain specified tolerances after concrete is placed.

.4 Treat forms lightly with approved form release agent and remove surplus agent.

3.5 CONCRETE

.1 Obtain Departmental Representative approval of granular base prior to placing concrete.

.2 Do not place concrete when air temperature appears likely to fall below 5 degrees Celsius within 24 hours unless specified precautions are taken and approved.

.3 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.4 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to center line.

.5 Provide edging as indicated with 10 mm radius edging tool.

3.6 TOLERANCES

.1 .1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

3.7 EXPANSION AND CONTRACTION JOINTS

.1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 3 m.

.2 Install expansion joints at intervals of 9 m.

.3 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

3.8 ISOLATION JOINTS

.1 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.

.2 Use 13mm pre-molded hardboard joint material to form isolation joints joint filler in isolation joints.

.3 Seal isolation joints with sealant noted on drawings.

3.9 CURING

.1 Cure concrete by adding moisture continuously in accordance with CSA- A23.1/A23.2 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound as directed by Departmental Representative.

.2 Where burlap is used for moist curing, place two pre-wetted layers on concrete surface and keep continuously wet during curing period of at least 7 days.

.3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

3.10 BACKFILL

.1 Allow concrete to cure for 7 days prior to backfilling.

.2 Backfill to designated elevations with material as directed by Departmental Representative.

.1 Compact and shape to required contours as indicated.

3.11 TESTING

.1 Refer to Section 01 45 00 – Quality Control for geotechnical testing requirements and Section 31 05 00 - Common Works Results – Earthworks, Exterior Improvements, and Utilities.

3.12 CLEANING

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

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Trees, Shrubs and Groundcover Planting; Section 32 93 10.

1.1 EXAMINATION

.1 In all cases where rough grading and the establishment of the subgrade has been carried out by others, the Contractor shall verify such subgrade on the site and report all discrepancies in writing to the Departmental Representative before commencement of work.

.2 Failure to do so will imply acceptance by the Contractor of surfaces and conditions and no claim made thereafter for damages for extras resulting from such surfaces and conditions will be accepted.

.3 Generally, subgrades by others are established to a depth of ten (l5 cm) below finished grades, unless specified otherwise.

.4 Such subgrade will constitute a rough, machine-finished surface. Where such subgrade averages five (5) cm plus or minus the specified subgrade, all work required to adjust the subgrade shall be the responsibility of the Contractor.

.5 Preparation of the existing subgrade, if not established by others, to receive landscape work, shall be executed by the contractor as specified hereinafter.

1.2 INSPECTION

.1 The Contractor shall give timely notice, in writing, that all work has been completed.

.2 Inspection for acceptance will be conducted within fifteen (l5) days after completion.

.3 Inspection for partial acceptance will be conducted only where partial acceptance applies.

.4 Where the Contractor requests inspection for partial acceptance of sodding work, he shall notify the Departmental Representative in writing.

.5 Partial acceptance will be given when sodding work has been delayed due to circumstances beyond the control of the Contractor or when further work would conflict with good horticultural practice and jeopardize the performance of work and materials.

.6 Sodded areas will be accepted by the Departmental Representative at the end of the maintenance period provided that:

.1 Sodded areas are properly established.

.2 Turf is free of bare and dead spots.

.3 No surface soil is visible when grass has been cut to height of 50 mm.

.4 Sodded areas have been cut twice.

1.3 GUARANTEE

.1 All sodded areas shall be guaranteed for a period of one (l) year from date of substantial completion. All areas which show deterioration, bare spots, or are thin due to faulty materials and/or workmanship, shall be resodded at the Contractor's expense.

1.4 MAINTENANCE

.1 The maintenance of sodded areas shall continue for 30 days after substantial completion.

.2 Such maintenance shall include all measures necessary to establish and maintain grass in a vigorous growing condition, including, but not limited to:

.3 Mowing: At regular intervals as required to maintain grass at a maximum height of six (6) No more than one-third (l/3) of blade shall be cut at any one mowing. Edges of grass areas shall be neatly trimmed and hand clipped where necessary. Heavy clipping shall be removed immediately after mowing and trimming.

.4 Watering: When required, and with sufficient amounts to ensure germination and prevent grass and underlying soil from drying out.

.5 Include all required supplementary fertilizer applications necessary to establish a vigorous growing stand of grass.

.6 Weed Control: Shall be carried out when required to keep sodded areas reasonably free of weeds. When herbicides are used, they shall be applied in accordance with manufacturer's recommendations and local regulations. Any damage resulting from Contractor's use of herbicides shall be remedied at his own expense.

.7 Erosion: Eroded areas resulting from Contractor's faulty workmanship and/or materials, heavy rainfall or overwatering shall be repaired and resodded at the Contractor's expense.

.8 Resodding: Repair areas which show root growth failure, deterioration, bare or thin spots, or which have been damaged by any means, including maintenance or replacement operations.

.9 Immediately after sodding, erect barricades and warning signs to protect sodded areas from traffic until grass is established, unless otherwise specified.

1.5 HANDLING/STORAGE

.1 Nursery Sod

.1 Sod shall be: No.1 Premium Grade. The supplier shall provide with each shipment of turf grass sod a label or statement certifying the quality grade and varieties of grass in the sod, and that the sod meets the requirements of the British Columbia Landscape Standard 2012 Edition, Section 8.

.2 Schedule deliveries in order to keep storage at job site to minimum without causing delays.

.3 Deliver, unload and store sod on pallets.

.4 Deliver sod to site within 24 hours of being lifted and lay sod within 36 hours of being lifted.

.5 Deliver sod rolled or flat to prevent tearing or breaking. Broken or irregular pieces are unacceptable.

.6 During wet weather allow sod to dry sufficiently to prevent tearing during lifting and handling.

.7 During dry weather protect sod from drying and water sod as necessary to ensure its vitality and prevent dropping of soil in handling. Dry sod will be rejected.

.2 Growing Medium

.1 Growing medium shall not be fine graded, or otherwise handled while in a frozen or muddy condition.

Part 2 Materials

2.1 FERTILIZER

.1 The Contractor shall be prepared to provide all necessary fertilizers to eliminate any chemical deficiencies of the growing meium as indicated by the testing recommendations.

2.2 NURSERY SOD

.1 Class 1 Lawn, No. 1 Premium Grade as identified in the British Columbia Landscape Standard – 2012 Edition section 8.

2.3 WATER

.1 Water used in this work shall be furnished by the Owner and will be suitable for irrigation and free from ingredients harmful to plant life. Watering equipment required for the work shall be furnished by the Contractor.

Part 3 Execution

3.1 FINISHED GRADE

.1 Sub-grade shall be scarified to a minimum depth of ten (l0) cm to provide an even, loose textured surface.

.2 Fine grade subgrade, eliminating uneven areas and low spots. Remove debris and stones in excess of 5 cm. Remove subsoil that has been contaminated with oil, gasoline or building materials.

.3 Fine grade growing medium to finish grades conforming to the contours, elevations, and pitches indicated on the drawings, eliminating rough and low areas to ensure positive drainage. Finish grade at the building shall be minimum fifteen (l5) cm below any wood siding, vents or windows, and shall slope away from the building at a minimum 2% grade for at least 2 metres.

.4 No fill shall be placed over debris, organic matter, snow, ice, or frozen ground.

.5 Roll growing medium with 50 kg roller to compact and retain finish surface grades flush with adjacent curbs and walks.

.6 The Contractor shall be responsible for maintaining finish grades in all planting areas and fine grading of each area shall be executed with care. All reasonable precautions, such as

wetting down, covering, or other effective measures must be taken to prevent dust from becoming airborne.

.7 All excavation required below subgrade for planting beds shall, in all cases, be the Contractor's responsibility.

.8 All excavated materials from planting beds shall be removed from the site unless they be approved for use as fill materials on the site where filling is required.

.9 The growing medium under all sodded areas shall be spread evenly over the approved subgrade to the specified depth and compacted to 80-85% Standard Proctor Density. The minimum depth of growing medium under sodded areas shall be fifteen (l0) cm.

3.2 INSPECTION

.1 Sodding shall be inspected by the Departmental Representative after the sodding installation has been completed.

3.3 WORKMANSHIP

.1 Keep site well drained.

.2 Clean up immediately soil or debris spilled onto pavement or concrete and dispose of deleterious materials.

.3 Leave site in neat and acceptable condition. Remove all excess materials from the site.

3.4 SODDING OPERATION

.1 The installation of sodded areas shall include:

.1 Before sod is laid, correct all soft spots and inequalities in grade of prepared bed. Rake growing medium immediately prior to sodding. Stagger sod joints and butt tightly, in such a manner that no pieces are overlapping. Lay sod smooth and flush with adjoining grass areas and paving and top surfaces of curbs unless shown otherwise on the drawings, that no voids occur.

.2 Place sod so that watering can be applied without interfering with other work. Water within 3 hours of application and obtain moisture penetration through sod and into top ten (l0) cm of topsoil.

.3 After sod and soil has dried sufficiently to prevent damage, the area shall be rolled with a roller providing 7,000 kg pressure per square metre to ensure a good bond between sod and growing medium and to remove minor depressions and irregularities.

3.5 GENERAL REQUIREMENTS

.1 All sodding shall be done on ground which is free of frost, snow or standing water.

.2 The Contractor shall be responsible for providing and maintaining warning signs for all sodded areas until the acceptance unless specified otherwise. Remove protection after grass areas are accepted.

.3 Sodding grass areas shall be carried out during periods which are most favourable or the establishment of a healthy stand of grass.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Sodding; Section 32 92 23.

1.2 EXAMINATION

.1 Report to the Departmental Representative, in writing, of any conditions or defects encountered on the site during or before construction upon which the work of this section depends and which may adversely affect its performance.

.2 Do not commence work until such conditions or defects have been investigated and corrected.

.3 Commencement of work shall imply acceptance of surfaces and conditions and no claim for damages for extras resulting from such conditions or defects will be accepted thereafter, except in cases where such conditions cannot be known prior to or during the course of construction.

1.3 QUALIFICATIONS AND SUPERVISION

.1 All planting work described in this section shall be executed by experienced personnel under the direction of a skilled foreman.

.2 The Contractor shall be responsible for insuring that all plants to be supplied conform with all Provincial and Federal laws, rules, regulations and inspections.

1.4 SUBSTITUTIONS

.1 All plants shall be supplied as specified on the drawings. Substitution will be permitted only upon submission of proof that any plant as specified is not obtainable. All proposed substitutions must be approved in writing by the Departmental Representative, prior to commencement of work, and must be made at no additional cost to the Owner. Unauthorized substitutions will be corrected at the Contractor's expense using the specified plants or other substitute plants authorized by the Departmental Representative.

1.5 INSPECTION

.1 Within ten (l0) days following acceptance of the bid, the Departmental Representative shall be notified of the source of the materials required.

.2 All materials may be subject to inspection and approval before they are installed. Inspection and approval by the Departmental Representative of plants at the place of growth shall be for quality, size and varieties only, and shall not in any way impair the right of rejection for failure to meet other requirements during progress of the work.

.3 The Contractor shall give timely notice to the Departmental Representative when such materials are available for inspection.

1.6 ACCEPTANCE DATE

.1 Inspection for acceptance shall be completed by the Departmental Representative within l5 days of receipt of written notification from the Contractor that the work is complete.

.2 Any work not satisfactory as specified shall be rectified by the Contractor. This process of inspection and correction shall continue until the Departmental Representative is satisfied that the work is l00% complete.

.3 The date of the written acceptance report by the Departmental Representative shall be the acceptance date.

.4 In the case of partial acceptance, the acceptance date shall apply only to those portions of the work for which partial acceptance have been given.

.5 Where the Contractor requests partial acceptance, he shall give timely notice in writing to the Departmental Representative.

.6 Partial acceptance will only be given when planting work has been delayed due to circumstances beyond the control of the Contractor or when further work would conflict with good horticultural practices and would jeopardise the performance of the work and the plants.

.7 Final inspection of all planting will be made at the end of the specified guarantee period.

.8 At the time of inspection, all plants shall be alive and in a healthy, satisfactory, growing condition.

1.7 GUARANTEE

.1 All plant materials shall be guaranteed for a period of one (l) year after the date of substantial completion.

1.8 REPLACEMENTS

.1 During the guarantee period and during the normal planting season, any plant required under this contract that is dead or not in satisfactory growth, as determined by the Owner, shall be removed from the site and replaced immediately; these and any plants missing due to the Contractor's negligence, and any plant materials which do not meet the requirements of the specifications, shall be replaced as soon as conditions permit, but during the normal planting season. At the end of the guarantee period, inspection will be made by the Owner or his representative, together with the Contractor. All costs of replacements shall be borne by the Contractor.

.2 All replacements shall be plants of the same kind as specified in the plant list and of a size equal to the grown size of similar plants on site. They shall be furnished and planted in accordance with the drawings and specifications.

.3 Any damage to plant materials from any source whatsoever shall be reported in writing to the Departmental Representative.

.4 The cost of replacements resulting from theft, vandalism, carelessness or neglect on the part of others, or any causes due to circumstances beyond the control of the Contractor, shall be borne by the Owner.

1.9 MAINTENANCE

.1 The Contractor is responsible for maintenance to immediately follow, and coincide with, and be continuous with the planting operations, and shall continue until 30 days after substantial completion.

.2 Such maintenance shall include all measures necessary to establish and maintain all plants in an acceptable, vigorous and healthy growing condition, including, but not limited to:

.1 Cultivating and weeding of planting beds : When herbicides are used for weed control, they shall be applied in accordance with manufacturer's recommendations. Damage resulting from Contractor's use of herbicides shall be remedied at his own expense.

.2 Watering: When required and in sufficient quantities to saturate the root system. All plant material should be watered in thoroughly prior to winter season.

.3 Pruning: Including the removal of dead, or broken branches and treatment of pruning wounds.

.4 Disease and insect control when required: When chemicals are used for such control, they shall be used in accordance with manufacturer's recommendations and government regulations.

.5 Maintain all accessories in good condition such as tree wrappings, tree guys, stakes, etc., including adjustment of tree guys; replace all accessories when required.

.3 At time of inspection for acceptance all planting beds shall be freshly cultivated, free of weeds, leaves, broken branches and rubbish and shall be in a neat and tidy condition.

1.10 DELIVERY OF MATERIALS

.1 All manufactured materials, such as fertilizers shall be delivered to and stored on the site in standard containers clearly indicating contents, weight, analysis and the name of the manufacturer.

.2 Where such materials are supplied in bulk, written statements shall be submitted to the Departmental Representative, indicating the same information as if supplied in standard containers.

.3 All plant material shall be delivered in an enclosed truck or truck covered with a heavy duty plastic tarp securely enveloping all plants. Failure to do so may result in rejection of some or all delivered plants due to wind stress and damage.

1.11 STORAGE OF MATERIALS

.1 All materials which are subject to deterioration resulting from weather or any other causes, shall be stored on the site in a dry, weatherproof place in such a manner that their effectiveness will not be impaired.

.2 All plant materials which cannot be planted immediately upon arrival on site, shall be well protected with soil or similar material to prevent drying out and shall be kept moist until commencement of planting. Plants shall not remain unplanted for longer than three days after delivery.

1.12 HANDLING OF PLANTS

.1 All plants shall be well protected against damage and drying out from the time of digging until they are planted on the site.
.2 All plant material which cannot be planted immediately upon arrival on the site shall be well protected with soil or similar materials to prevent drying out and shall be kept moist until commencement of planting.
.3 Plants with broken or abraded trunks or branches are not acceptable.
.4 Root balls, trunks, branches and leaves shall be protected from sun and wind desiccation.

Part 2 Materials

2.1 BARK MULCH

.1 Submit sample to Departmental Representative prior to shipping to site.

.2 Mulch shall consist of composted bark, compost and manure and shall be free from small branches, leaves, stones, dirt, vegetative material and must pass l00% a 2.5 cm screen.

.3 Mulch to be installed to standards indicated in the British Columbia Landscape Standard – 2012. Edition, section 10.

2.2 WATER

.1 Water used in this work shall be furnished by the Owner and will be suitable for irrigation and free from ingredients harmful to plant life. Hose and other watering equipment required for the work shall be furnished by the Contractor.

2.3 PLANT MATERIALS

.1 All plant materials shall meet the horticultural standards of the Canadian Nursery Trades Association with respect to grading and quality.

.2 They shall be nursery grown under proper cultural practices as recommended by the Canadian Nursery Trades Association.

.3 Nomenclature of specified plants shall conform to the International Code of Nomenclature of Cultivated Plants and shall be in accordance with the approved scientific names given in the latest edition of Standardised Plant Names. The names of varieties not named therein are generally in conformity with the names accepted in the nursery trade.

.4 Plants shall be true to type and have a growth habit which is normal for the species. They shall be structurally sound; well-branched, healthy, vigorous, and free of disease, insect infestations, rodent damage, sun scald, frost cracks, and other abrasions or scars to the bark. Standard trees shall have straight trunks and full, symmetrical well branched heads. Plants shall be densely foliated when in leaf and have a healthy, well developed root system. Pruning wounds shall vigorous bark on all edges and all parts shall be moist and show live, green cambium tissue when cut. Where more than one plant of the same species or cultivar is specified, they shall be uniform in appearance.

.5 All plant materials shall conform to the measurements specified in the plant list except that plants larger than specified may be used only upon approval from the Departmental Representative. The use of such plants shall not increase the contract price. If larger plants are used, the ball of earth shall be increased in proportion to the size of the plant.

.6 All plants shall be measured when the branches are in their normal position. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to root base or from branch tip to branch tip.

Part 3 Execution

3.1 PLANT INSTALLATION

.1 Planting shall be done during periods suitable with respect to weather conditions and locally accepted practice. Plants shall be set plumb and at the same relation to grade as originally grown, after settlement has taken place.

.2 Plant materials shall be faced to give the best appearance.

.3 Soil shall be firmly tamped in place in such a manner that the plant retains its vertical position. Particular care shall be taken to ensure that no air pockets remain under or around the roots. The planting soil shall be thoroughly watered immediately after tamping. All non-porous or non-biodegradable containers shall be removed.

3.2 PRUNING

.1 Plants shall be pruned after planting. The amount of pruning shall be limited to the minimum necessary to remove dead or injured branches and to compensate for the loss of roots as a result of transplanting operations. Pruning shall be done in such a manner as to preserve the natural character of the plants. Leaders shall not be removed. Only clean, sharp tools shall be used. All cuts shall be clean and flush, leaving no stubs. Cuts, bruises or scars on the bark shall be traced back to living tissue and removed. The affected areas shall be shaped so as not to retain water.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No. 211.1, Rigid Types EBI and DB2/ES2 PVC Conduit.

.2 CSA C22.2 No. 211.3, Reinforced Thermosetting Resin Conduit (RTRC) and Fittings (Bi-national standard, with UL 1684).

PART 2 PRODUCTS

2.1 PVC DUCTS AND FITTINGS

.1 Rigid PVC duct: to CSA C22.2 No. 211.1, Type DB2/ES2, with fabricated fittings, for direct burial, Trade size 5 or 6. Nominal length: 3 m plus or minus 12 mm.

.2 Rigid PVC split ducts.

.3 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make complete installation.

.4 Rigid PVC 90 degrees and 45 degrees bends.

.5 Rigid PVC 5 degrees angle couplings.

.6 Expansion joints as required.

2.2 SOLVENT WELD COMPOUND

.1 Solvent cement for PVC duct joints.

2.3 FIBREGLASS DUCTS

.1 Fibreglass reinforced thermoset duct: to CSA C22.2 No. 211.3, Trade size 5 or 6, watertight type.

.2 Couplings, reducers, plugs, caps, adaptors, and supports to make complete installation.

.3 Expansion joints as required.

2.4 PLASTIC POLYETHYLENE PIPE

.1 Rigid plastic polyethylene pipe with approved couplings and fittings required to make complete installation.

2.5 CABLE PULLING EQUIPMENT

.1 6 mm stranded nylon pull rope tensile strength 5 kN.

2.6 MARKERS

.1 Concrete type cable markers: as indicated, with words: "Cable", "Joint" or "Conduit" impressed in top surface, with arrows to indicate change in direction of duct runs.

.2 Cedar post type markers: 89 x 89mm square, 1.5 m long, pressure treated with clear, copper napthenate or 5% pentachlorophenol solution, water repellent preservative, with nameplate fastened near post top, on side facing duct.

.1 Nameplate: aluminum anodized 89 x 125 mm, 1.5mm thick mounted on cedar post with mylar label 0.125 mm thick with words "Cable" "Joint" or "Conduit" with arrows to indicate change in direction.

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 duct in accordance with manufacturer's instructions.

.2 Clean inside of ducts before laying.

.3 Ensure full, even support every 1.5 m throughout duct length.

.4 Slope ducts with 1 to 400 minimum slope.

.5 During construction, cap ends of ducts to prevent entrance of foreign materials.

.6 Pull through each duct steel mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter.

.7 Pull stiff bristle brush through each duct immediately before pulling-in cables.

.8 In each duct install pull rope continuous throughout each duct run with 3m spare rope at each end.

.9 Install markers as required.

END OF SECTION