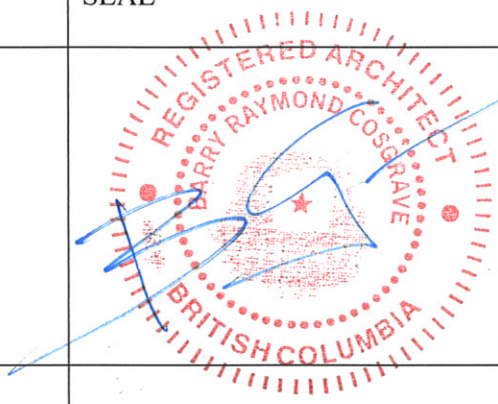
DISCIPLINE	SEAL
ARCHITECTURAL	
ELECTRICAL ENGINEER	 2021-12-07
MECHANICAL ENGINEER	
CIVIL ENGINEER	 2021-12-06

Engineers & Geoscientists BC
Permit to Practice #1000200

END OF SECTION

SPECIFICATION

for

CULTUS LAKE
SALMON RESEARCH LABORATORY
GUARD HOUSE
CULTUS LAKE B.C.

prepared for: Fisheries and Oceans, Real Property

Oct 01, 2021

SPECIFICATION

Division 07 – Thermal and Moisture Protection

Division 8 – Openings

Division 9 – Finishes

Division 10 – Specialties

Division 21 – Mechanical

Division 26 – Electrical

CIVIL

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

Work of this Contract is comprised of the construction of the Guardhouse for the Cultus Lake Salmon Research Laboratory.

1.2 CONTRACT METHOD

.1 Construct Work under a stipulated price contract.

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.

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 DOCUMENTS REQUIRED

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

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

1.6 WORK SCHEDULE

.1 Provide a schedule of work within 5 days of contract award and observe the following requirements:

.1 Work must be completed by March 31 2021

.2 Whenever variation from the schedule in excess of 3 working days occurs or is expected to occur, notify the Departmental Representative and provide a revised schedule

.3 Hours of work will be restricted to conform with municipal noise bylaws when work generates noise.

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.

1.8 SITE CONDITIONS

.1 It will be the responsibility of the contractor to visit the site prior to the Submission of Tenders and make themselves thoroughly acquainted with the conditions at the site and to make whatever inquiries that are necessary to familiarize themselves with all conditions likely to affect the work.

1.9 CONTRACTOR USE OF PREMISES

.1 The contractor's use of site will be limited to the immediate area of the work and areas assigned by the Departmental Representative for site office placement, equipment, material stock piles, sanitary facilities, etc.

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

.3 The contractor will provide sanitary facilities for the work force in accordance with governing regulations and ordinances.

.4 Departmental Representative will designate areas for parking, material storage, recycling storage and a site office. Maintain these areas clean and free of construction related debris. Make good damages resulting from contractors use of these areas at no cost to the contract.

1.10 REFERENCES AND CODES

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

.2 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes and referenced documents.

.3 All work is to be performed in accordance with Worksafe B.C. regulations, Labour Canada regulations, and all applicable municipal statutes and authorities having jurisdiction. In the event of conflict between any provisions the most stringent provision will apply.

.4 Ensure that all employees have received appropriate WHIMIS training and that all necessary MSDS information is available on site.

1.11 PERMITS, FEES AND NOTIFICATIONS

.1 Obtain and pay for electrical permits and fees.

1.12 SUBMITTALS

.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 Where specified, submit drawings stamped and signed by professional engineer registered or licensed in British Columbia.

.3 Submit shop drawings in .PDF format.

.4 Allow 5 working days for Consultant review of shop drawings.

1.13 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.

1.14 RECORD DRAWINGS

.1 As work progresses, maintain accurate records to show all deviations from the contract documents. Record these changes on a clean set of drawings used only for this purpose. Record changes in red ink. At completion, supply the Departmental Representative with one set of drawings and specifications with all changes clearly marked.

1.15 EXECUTION

.1 Execute cutting, fitting, and patching to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

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

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

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

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

1.16 MATERIALS AND EQUIPMENT

.1 Use new materials unless otherwise specified.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

.1 Submit to 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.

1.3 SHOP DRAWINGS AND PRODUCT DATA

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

.2 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 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.

.6 Submit shop drawings under the seal of an engineer licenced in the Province of British Columbia when indicated in individual specification sections.

.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 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 manufacturers instructions for requirements requested in Specification Sections and as requested by Departmental Representative.

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

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

.13 Submit 2 hard copies and electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.14 Delete information not applicable to project.

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

.16 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.

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

.1 This review shall not mean that the Departmental Representative 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.

1.4 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 samples.

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

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

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

1.5 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.

.4 Frequency of photographic documentation: weekly and as follows

.1 Upon completion of: Framing and services before concealment.

1.6 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, and with each progress draw, 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

1 GENERAL

PWGSC Update on Asbestos Use
Effective April 1, 2016, all Public Works and Government Services of Canada (PWGSC) contracts for new construction and major rehabilitation will prohibit use of asbestos-containing materials.

COVID 19
All contractors shall follow Canadian Construction Association COVID-19 - Standardized Protocols for All Canadian Construction Sites.

1.1 REFERENCES

.1 Government of Canada.

.1 Canada Labour Code - Part II (as amended).

.2 Canada Occupational Health and Safety Regulations. (as amended).

.2 National Building Code of Canada (NBC): (as amended).

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

.3 The Canadian Electrical Code (as amended).

.4 Canadian Standards Association (CSA) as amended:

.1 CSA Z797-2018 Code of Practice for Access Scaffold.

.2 CSA S269.1-2016 Falsework for Construction Purposes.

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

.4 CSA Z1006-10 Management of Work in Confined Spaces.

.5 CSA Z462-18 Workplace Electrical Safety Standard.

.5 National Fire Code of Canada 2015 (as amended).

.1 Part 5 – Hazardous Processes and Operations and Division B as applicable and required.

.6 American National Standards Institute (ANSI): (as amended).

.1 ANSI/ASSP A10.3-2013, Operations – Safety Requirements for Powder-Actuated Fastening Systems.

.7 Province of British Columbia:

.1 Workers Compensation Act Part 3-Occupational Health and Safety. (as amended).

.2 Occupational Health and Safety Regulation (as amended).

1.2 RELATED SECTIONS

.1 Refer to the following current NMS sections as required:

.1 Section 01 11 55 – General Instructions.
.2 Section 01 35 35 - Fire Safety Requirements.

1.3 WORKERS' COMPENSATION BOARD COVERAGE

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

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

1.4 COMPLIANCE WITH REGULATIONS

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

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

1.5 SUBMITTALS

.1 Submit to Departmental Representative submittals listed for review in accordance with Section 01 33 00 Submittal Procedures.

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

.3 Submit the following:

.1 Organizations Health and Safety Plan.

.2 Site Specific Safety Plan or Health and Safety Plan (SSSP or HASP)

.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 (SDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.

.5 Emergency Response Procedures.

.4 The Departmental Representative will review the Contractor's Site Specific Safety Plan or Health and Safety Plan (SSSP/HASP) and emergency response procedures, and provide comments to the Contractor within 5 days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative.

.5 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.

.6 Submission of the Site Specific Safety Plan or Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:

.1 Be construed to imply approval by the Departmental Representative.

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

.3 Relieve the Contractor of his legal obligations for the provision of health and safety on the 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 and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.7 HEALTH AND SAFETY COORDINATOR

.1 Assign a competent and qualified Health and Safety Coordinator who shall:

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

.2 Be responsible for implementing, daily enforcing, and monitoring the Site Specific Safety Plan (SSSP) or Health and Safety Plan (HASP)

.3 Be on site during execution of work.

.4 Have minimum two (2) years' site-related working experience

.5 Have working knowledge of the applicable occupational safety and health regulations.

1.8 GENERAL CONDITIONS

.1 Provide safety barricades and lights around work site as required to provide a 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 the 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 or provide security guard as deemed necessary to protect site against entry.

1.9 PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:

.1 Multi-employer work site.

.2 Federal employees and general public.

.3 Energized electrical services.

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 the above authorities, the most

stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

1.12 WORK PERMITS

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

1.13 FILING OF NOTICE

.1 The General Contractor is to file Notice of Project with Provincial authorities prior to commencement of work. (All construction projects require a Notice of Work)

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

1.14 SITE SPECIFIC HEALTH AND SAFETY PLAN

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

.2 Prepare and comply with the Site Specific Safety Plan (SSSP) or Health and Safety Plan (HASP) based on the required hazard assessment, including, but not limited to, the 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.

.11 COVID 19 Protocols and 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 the work.

.3 List hazardous materials to be brought on site as required by work. SDS required for all products.

.4 Indicate Engineering and administrative control measures to be implemented at the 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 the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.

.4 Revise and update Site Specifc Safety Plan (SSSP) and/or Health and Safety Plan (HASP) as required, and re-submit to the Departmental Representative.

.5 Departmental Representative's review: the review of Site Specific Safety Plan and/or Health and Safety Plan by Public Works and Government Services Canada (PWGSC) shall not relieve the Contractor of responsibility for errors or omissions in final Site Specific Safety Plan and/or Health and Safety Plan of responsibility for meeting all requirements of construction and Contract documents and legislated requirements.

1.15 EMERGENCY PROCEDURES

.1 List standard operating procedures and measures to be taken in emergency situations. Include an emergency response and emergency 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.

.5 A route map with written directions to the nearest hospital or medical clinic.

.2 Include the following provisions in the emergency procedures:

.1 Notify workers and the first-aid attendant, of the nature and location of the emergency.

.2 Evacuate all workers safely.

.3 Check and confirm the safe evacuation of all workers.

.4 Notify the fire department or other emergency responders.

.5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.

.6 Notify Departmental Representative.

.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 a 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 the Departmental Representative.

.6 Contractors must not rely solely upon 911 for emergency rescue in a confined space, working at heights, etc.

1.16 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS 2015) regarding use, handling, storage and disposal of hazardous materials, and regarding labelling and provision of Safety Data Sheets (SDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.

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

.1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable SDS and WHMIS 2015 documents as per Section 01 33 00 Submittal Procedures.

.2 In conjunction with Departmental Representative schedule to carry out work during "off hours" when tenants have left the building.

.3 Provide adequate means of ventilation in accordance with Section 01 51 00.

.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 bought onto the work site in an adequate quantity to complete the work.

1.17 ASBESTOS HAZARD

.1 Carry out any activities involving asbestos in accordance with current applicable Federal and Provincial Regulations.

.2 Removal and handling of asbestos will be in accordance with current applicable Provincial / Federal Regulations.

1.18 PCB REMOVALS

.1 Mercury-containing fluorescent tubes and ballasts which contain polychlorinated biphenyls (PCBs) are classified as hazardous waste.

.2 Remove, handle, transport and dispose of as indicated in Division 2 specifications.

1.19 REMOVAL OF LEAD-CONTAINING PAINT

.1 All paint containing TCLP lead concentrations above 5 ppm are classified as hazardous.

.2 Carry out demolition and/or remediation activities involving lead-containing paints in accordance with current applicable Provincial / Territorial Regulations.

.3 Work with lead-containing paint shall be completed as per Provincial and Federal regulations.

.4 Dry Scraping/Sanding of any materials containing lead is strictly prohibited.

.5 The use of Methylene Chloride based paint removal products is strictly prohibited.

1.20 ELECTRICAL SAFETY REQUIREMENTS
(Reference: Worksafe BC OHS Reguation Part 19 – Electrical Safety)

.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 arc flash protection, 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.

1.21 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 the Departmental Representative.

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

1.22 OVERLOADING

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

1.23 FALSEWORK

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

1.24 SCAFFOLDING

.1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797-2009 (as amended) and B.C. Occupational Health and Safety Regulations. (as amended)

1.25 CONFINED SPACES

.1 Carry out work in compliance with current Provincial / Territorial regulations.

1.26 POWDER-ACTUATED DEVICES

.1 Use powder-actuated devices in accordance with ANSI A10.3 (as amended) only after receipt of written permission from the Departmental Representative.

1.27 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.

.3 Hot Work permits are a mandatory requirement for any hot work activities.

1.28 FIRE SAFETY REQUIREMENTS

.1 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.

.2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada. (as amended)

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

1.29 FIRE PROTECTION AND ALARM SYSTEM

.1 Fire protection and alarm systems shall not 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 the fire department, the building owner and the tenants, resulting from false alarms.

1.30 UNFORESEEN HAZARDS

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

1.31 POSTED DOCUMENTS

.1 Post legible versions of the following documents on site:

.1 Site Specific Safety Plan (SSSP) or Health and Safety Plan (HASP)

.2 Sequence of work.

.3 Emergency procedures.

.4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.

.5 Notice of Project.

.6 Floor plans or site plans.

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

.8 Workplace Hazardous Materials Information System (WHMIS 2015) documents.

.9 Material Safety Data Sheets (SDS).

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

.11 All Hazardous Material and Substance Reports including Lab Analysis

.2 Post all Material Safety Data Sheets (MSDS) on site, in a 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 should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

1.32 MEETINGS

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

1.33 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance with health and safety issues identified.

.3 The Departmental Representative may issue a "stop work order" if noncompliance of health and safety regulations is not corrected immediately or within posted time. The General Contractor/subcontractors will be responsible for any costs arising from such a "stop work order".

2 PRODUCTS

.1 Not used.

3 EXECUTION

.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 Call 911 and report the location of the fire.

.4 Person activating fire alarm pull station or phoning will remain on site 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.

.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.

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 Departmental Representative.

1.6 FIRE EXTINGUISHERS

.1 In addition to other requirements of this specification, supply fire extinguishers necessary to protect work in progress and contractor's physical plant on site.

.2 Fire extinguishers may be required in the following areas:

.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 Departmental Representative.

.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.

1.7 ACCESS FOR FIRE FIGHTING

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

1.8 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 smoking area for the project.

1.9 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.

1.10 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 Tahsis 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 Departmental Representative when disposal is required.

1.11 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 Tahsis Fire Chief prior to and at completion of such work.

1.12 QUESTIONS AND/OR CLARIFICATION

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

1.13 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 SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

.3 Section 01 74 19 – Construction Waste Management and Disposal.

.4 Section 03 10 00 – Concrete Forming and Accessories.

.5 Section 03 20 00 – Concrete Reinforcing.

.6 Section 03 30 00 – Cast-In-Place Concrete.

1.2 REFERENCES

.1 Canadian Environmental Protection Act (CEPA), 1999

.2 British Columbia Environmental Management Act (EMA), 2004

.3 Canadian Council of Ministers of the Environment (CCME) – Canadian Environmental Quality Guidelines

1.3 DEFINITIONS

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

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

.3 Deleterious Substance: any substance that, if added to water, makes the water deleterious to fish or fish habitat or any water containing a substance in such quantity or concentration or has been changed by heat or other means, that if added to water makes that water deleterious to fish or fish habitat.

1.4 SUBMITTALS

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

.2 Prior to commencing construction activities or delivery of materials to site, submit a site-specific Environmental Protection Plan, and a site-specific Erosion and Sediment Control Plan for review by the Departmental Representative.

.3 The Departmental Representative will review the Contractor's Environmental Protection Plan, and Erosion and Sediment Control Plan, and provide comments to the Contractor within 14 days of receipt of each plan. Revise plans as appropriate and resubmit plans to Departmental Representative within 7 days after receipt of comments from Departmental Representative.

.4 Departmental Representative's review of Contractor's Environmental Protection Plan, and Erosion and Sediment Control Plan shall not be construed as approval and does not reduce the Contractor's overall responsibility for construction environmental protection.

.5 The Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction. Address topics at level of detail commensurate with environmental issue and required construction tasks.

.6 Project-specific **Environmental Protection Plan (EPP)**. Include:

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

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

.3 Descriptions of environmental protection personnel training program.

.4 Drawings showing locations of proposed material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

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

.6 Spill Prevention and Emergency Response Plan: including procedures, instructions, reports and equipment to be used in event of unforeseen spill of regulated substance. Refer to section on Spills or Releases of Deleterious Substances.

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

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

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

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

.7 The **Erosion and Sediment Control Plan (ESCP)** shall identify the type and location of erosion and sediment controls to be provided and include monitoring and reporting requirements to ensure that control measures are in compliance with the ESCP, Federal, Provincial and Municipal laws and regulations. The Erosion and Sediment Control Plan should address (but is not limited to):

.1 Management of runoff from excavations, pits, trenches, stockpiled materials, roadways;

.2 Protection of marine environment and catchbasins from deleterious substances;

.3 Considerations for leave strips, vegetative buffers and phased excavation approaches;

.4 Temporary drainage ditches, if applicable;

.5 Dewatering procedures.

1.5 FIRES

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

1.6 NOISE CONTROL

.1 Work activities shall be limited to normal business hours to minimize noise disturbance to wildlife and humans.

.2 Equipment and machinery shall be properly maintained to minimize unnecessary noise pollution. Where possible, noise control technology shall be applied on heavy machinery and equipment.

.3 Work shall be completed in accordance with local municipal noise bylaws.

1.7 DISPOSAL OF WASTES

.1 Do not discard or dispose of rubbish and waste materials on site unless approved by Departmental Representative.

.2 Construction wastes must be stored securely and disposed of properly at an approved off-site location. Contractor is not permitted to use the Municipal waste collection system.

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

.4 Provide on-site containers for collection of waste and recyclable materials. Divert recyclable materials from landfill. Departmental may request documented proof of proper disposal and recycling.

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

.6 Handle and transport hazardous and toxic waste in accordance with Transportation and Dangerous Goods Act, 1999.

.7 Dispose of hazardous and toxic waste using facilities licensed to receive hazardous and toxic waste. Do not co-mingle hazardous and toxic waste with regular wastes or recyclable materials.

.8 Provide the Departmental Representative with the name and certification of such facilities.

.9 Provide the Departmental Representative with shipping manifests and bills of lading to verify legal disposal of hazardous and toxic waste materials.

1.8 DRAINAGE, EROSION AND SEDIMENTATION

.1 Provide Erosion and Sediment Control Plan as per above noted submittal requirements.

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

.3 Do not pump water containing deleterious substances into waterways, sewer or drainage systems.

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

.5 Provide flocculation tanks, settling basins, or other treatment facilities as required to ensure that waste water (including potentially contaminated groundwater seepage from excavations) meets Federal, Provincial and Municipal criteria applicable to the method of disposal.

1.9 POLLUTION CONTROL

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

.2 Control emissions from equipment and plant to local authorities' emission requirements.

.3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

.4 Protect the roadways from tracking mud, soil and debris throughout the work.

1.10 SPILLS OR RELEASE OF DELETERIOUS SUBSTANCES

.1 Spills can happen at any time during construction, and there are specific times when the risk is higher such as during the use of paints, corrosive protective coatings, wood preservatives and while working with concrete. Sawdust and wood shavings can potentially enter the marine environment from cutting and drilling during repairs. Potential spills of deleterious substances could result in contamination of the local marine environment, which is a potential violation under the Canadian Environmental Protection Act (CEPA) and the Fisheries Act.

.2 Measures to be implemented to prevent, control, or mitigate spills or release of deleterious substances:

.1 Emergency response procedure for spills of deleterious substances must be in place. In the event of a Level I spill (easily contained and cleaned) the contractor will provide spill response and notify the Departmental Representative that a spill has occurred.

.2 Notify Departmental Representative of all spills, regardless of severity. Submit within 24 hours of the spill, a written spill report containing the following minimum information:

.1 Date, time, location of spill;

.2 Substance spilled;

.3 Approximate volume spilled;

.4 Approximate area of spill;

.5 Type of surface at spill site;

.6 Circumstances resulting in the spill;

.7 Actions taken;

.8 Affected receptors; and

.9 Weather conditions at the time of the spill.

.3 Response equipment is to be on site at all times (i.e. spill kits) and workers trained in their location and use. The resources on hand must be sufficient to respond effectively and expediently to any spill that could occur onsite.

.4 All construction equipment brought onto the site will be clean and properly maintained.

.5 Equipment refueling or lubricating shall occur in a designated area > 30m from the marine environment with proper controls to prevent the release of deleterious substances and shall be conducted away from any surface water drains or collection points.

.6 Any equipment remaining on site overnight shall have appropriately placed drip pans.

.7 The Contractor shall take due care to ensure no deleterious materials including sediment-laden runoff leave the worksite, or enter any surface water or storm water or sanitary sewer at or near the worksite.

.8 Concrete wash water from cast-in-place concrete works (within the first 72 hours) shall not enter any surface water or storm water or sanitary sewer at or near the worksite. Concrete pouring should not be performed if significant precipitation events are expected within 72 hours.

.9 The Contractor shall ensure that no sawdust or shavings enter the marine environment. In the event that sawdust and shavings enter the marine environment, they shall be collected promptly and disposed of appropriately.

.10 The rinse, cleaning water or solvents for glues, paints, wood preservatives and other potentially harmful or toxic substances shall be controlled so as to prevent leakage, loss of discharge into the storm drain system or into the marine environment.

.11 Prevent discharges containing asphalt, grout, concrete or other waste materials from reaching storm drains or the marine environment. This includes, but is not limited to:

.1 Minimizing the washing of sand or gravel from new asphalt, debris from drilling or cutting or other materials into storm drains and the marine environment by sweeping.

.2 Application of fog seals, tack coats or other coatings, if required, during periods when rainfall is unlikely to occur during application.

.3 Cleaning equipment off site.

.4 Protection of drainage structures with sediment controls as required.

1.11 HAZARDOUS MATERIALS

.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 Labour Canada

.2 Store hazardous or toxic substances in a designated area.

.3 Manage transport and dispose of hazardous materials in an approved legal manner in accordance with hazardous waste regulations.

.4 Provide Departmental Representative with waste manifest for disposal of hazardous materials.

1.12 SITE CLEARING, PLANT PROTECTION AND RESTORATION

.1 All disturbed areas are to be restored to their original condition or better after construction.

.2 Disturbance of vegetated areas is to be minimized as much as possible.

.3 Disturbed areas of bare soil are to be re-seeded as soon as possible post-construction.

.4 For trees that are to remain onsite, protect roots to drip line during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.5 Delineate exclusion zones around the bases of trees to remain. Erect temporary fencing, use flagging tape or employ other protective measures as appropriate.

.6 Advise Departmental Representative prior to completing any alteration of existing trees and/or working within the drip line of trees to remain. If tree alteration and/or work within the drip line is unavoidable, Contractor shall engage a certified arborist to provide guidance for minimizing damage to the tree.

.7 When excavating through roots, excavate by hand and make clean cuts through roots using a sharp axe or saw. Cuts shall be sealed with appropriate wound dressing.

.9 Tree felling shall be completed by someone qualified to do so as per the Canada Occupational Health and Safety Regulations (SOR/86-304, Canada Labour Code) and under the direction of a certified arborist or Departmental approved equivalent.

1.13 IMPORT OF FILL MATERIAL

.1 Definitions

.1 Soil includes:

(a) unconsolidated mineral or organic material;

(b) fill; and

(c) sediment deposited on land.

.1 Fill Characterisation and Documentation:

.2 All imported fill material, regardless of type, shall be tested for the level of contamination prior to arrival on-site.

.3 Contractor is responsible to arrange and pay for testing of import fill material.

.4 Environmental characterization of fill material must be conducted in accordance with the British Columbia, Ministry of Environment, Technical Guidance Document #1 – Site Characterization and Confirmation Testing.

.5 Only fill material meeting the CCME Canadian Soil Quality Guidelines for Residential/Parkland (RL/PL) Land Use may be used onsite.

.6 Samples shall be tested at a minimum for Metals, PAH and Hydrocarbons.

.7 The Contractor shall submit documented proof to the Departmental Representative that all imported fill material for this project meets the applicable guidelines prior to being brought onsite.

.8 Documented proof shall be in the form of a signed cover letter and signed test analysis results, from an independent testing firm accredited according to the Standards Council of Canada, the Canadian Association of Laboratory Accreditation Inc. (ISO/IEC 17025), and British Columbia Ministry of Environment.

.9 The cover letter shall:

.1 Clearly state that all imported material meets the stated guidelines,

.2 Include the name and location of all material sources,

.3 Identify the nature of current and historic activities conducted at the source.

.10 The test analysis reports shall:

.1 Clearly show the test results for each type of material tested and compared against the applicable CCME Guidelines, as per the above-noted requirements, in an easily-read tabular format.

.2 Include tests results conducted within 3 months of the date of submittal.

.3 Include the name and location of all material sources.

.11 All material brought to the site that does not meet the above-noted CCME Guidelines will be removed from the property immediately at the Contractor’s cost.

1.14 ARCHAEOLOGICAL RESOURCES

.1 If archaeological deposits waste are discovered, stop work immediately and notify Departmental Representative.

.2 Archaeologically significant material, if found on the property, remains the property of the Crown and shall not be removed from the site.

.3 Management of the archaeological materials will be coordinated through Departmental Representative.

1.15 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, Erosion and Sediment Control Plan or Soil Management Plan.

.2 Contractor: After receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.

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

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

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.

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

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

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

1.5 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

1.6 MOCK-UPS

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

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

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

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 Departmental Representative may allow Mock-ups to remain as part of the work.

1.7 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 Temporary water will be available on site.

1.3 TEMPORARY POWER AND LIGHT

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

.1 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.

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

.3 Exercise conservation whenever using temporary electrical power supply.

1.4 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside building must be vented to outside or be flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.

.5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.

.5 Ventilating:

.1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate temporary sanitary facilities.

.5 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Maintain strict supervision of operation of temporary heating and ventilating equipment to:

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

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

1.5 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 any 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 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.

1.4 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, and where directed by Departmental Representative.

1.5 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.

1.6 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. 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 ACCESS TO SITE

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

1.3 FIRE ROUTES

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

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

.6 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.

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

.8 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.

.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 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.

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

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.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 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 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.

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

.7 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.

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 and as directed by Departmental Representative.

.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 in locations as directed by Departmental Representative.

.2 Unless specified otherwise, materials for removal becomes Contractor's property.

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

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

.5 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 owner’s 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 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 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 Submit preliminary copy for consultant review.

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

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

.5 Two weeks prior to Substantial Performance of the Work, submit to the Consultant, four final copies 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.

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

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

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

.9 Pay costs of transportation.

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 Provide both .PDF electronic copy and hard copy submissions.

.10 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.

.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.

.7 Submit copy of record drawings and specifications to the Departmental Representative.

1.7 WARRANTIES AND BONDS

.1 Separate warranties and bonds with individual tab sheets keyed to the table of contents listing in the maintenance manual.

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 REFERENCE STANDARDS

.1 CSA Group (CSA)

.1 CSA A23.1-14 /A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CAN/CSA O86-14, Engineering Design in Wood.

.3 CSA O121-08 (R2013), Douglas Fir Plywood.

.4 CAN/CSA O325.0-16, Construction Sheathing.

.5 CSA S269.1-16, Falsework and Formwork.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit copy of WHMIS SDS in accordance with Section 01 35 43 - Environmental Procedures and 01 35 30 - Health and Safety Requirements.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

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

.3 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer’s recommendations in clean, dry, well-ventilated area.

.2 Store and protect formwork from damages.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA O86 and CSA O121.

.2 Form liner:

.1 Plywood: Douglas Fir to CSA O121

.3 Form release agent: Proprietary, non- volatile material not to stain concrete or impair subsequent application of finishes or coatings to surface of concrete, derived from agricultural sources, non- petroleum containing, non-toxic, biodegradable and low VOC.

.4 Falsework materials: to CSA S269.1.

.5 Sealant: to Section 07 92 00 - Joint Sealing.

Part 3 Execution

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels, and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Obtain Departmental Representative approval for use of earth forms framing openings not indicated on drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

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

.5 Align form joints and make watertight.

.1 Keep form joints to minimum.

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

.7 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

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

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

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

3.2 REMOVAL AND RESHORING

.1 Leave formwork in place for following minimum periods of time after placing concrete.

.1 2 days for footings and abutments.

.2 Remove formwork when concrete has reached 70 % of its 28 day design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

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

3.3 CLEANING

.1 Progress Cleaning:

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

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

END OF SECTION

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 REFERENCE STANDARDS

.1 American Concrete Institute (ACI)

.1 SP-66-04, ACI Detailing Manual 2004.

.2 ASTM International (ASTM)

.1 ASTM A123/A123M — 17 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A143/A143M-07 (2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.3 ASTM A641/A641M-09a(2014), Standard Specification for Zinc–Coated (Galvanized) Carbon Steel Wire.

.4 ASTM A1064/A1064M-17, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.3 CSA Group (CSA)

.1 CSA A23.1-14 /A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA A23.3-14, Design of Concrete Structures.

.3 CSA G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement.

.4 CSA G40.20/G40.21-13 (R2014), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CSA W186-M1990 (R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings: Convene pre-installation meeting one week prior to beginning concrete works.

.1 Ensure site supervisor, departmental representative, concrete producer and speciality contractor - finishing, forming attend.

.1 Verify project requirements.

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 proprietary materials used in Cast-In-Place Concrete and additives. Include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Submit copy of WHMIS Safety Data Sheet (SDS) in accordance with Section 1 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

.3 Shop Drawings:

.1 Submission of shop drawings is not required.

.4 Quality Assurance Submittals:

.1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.

.2 Mill Test Report: upon request, submit to Departmental Representative certified copy of mill test report of reinforcing steel, minimum 2 weeks prior to beginning reinforcing work.

.3 Upon request submit in writing to Departmental Representative proposed source of reinforcement material.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 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 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

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

.2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA G30.18, unless indicated otherwise.

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

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

.5 Deformed steel wire for concrete reinforcement: to ASTM A1064/A1064M.

.6 Welded steel wire fabric:

.1 Plain in accordance ASTM A1064/A1064M, fabricated from as drawn steel wire into flat sheets; sizes as indicated on Drawings.

.2 Provide in flat sheets only.

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

.8 Tie wire: 1.5 mm diameter annealed wire

.9 Mechanical splices: subject to approval of DEPARTMENTAL Representative

.10 Plain round bars: to CSA G40.20/G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2, Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada and SP-66.

.2 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.

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

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 2 weeks prior to beginning reinforcing work.

.2 Upon request inform Departmental Representative of proposed source of supplied material.

Part 3 Execution

3.1 FIELD BENDING

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

.2 When field bending authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars, which develop cracks or splits.

3.2 PLACING REINFORCEMENT

.1 Cutting or puncturing vapour retarder is not permitted; repair damage and reseal vapour retarder before placing concrete.

.2 Place reinforcing steel as indicated on placing drawings in accordance with CSA A23.1/A23.2.

.3 Use plain round bars as slip dowels in concrete.

.1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.

.2 Apply thick even film of mineral lubricating grease when paint is dry.

.4 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

.5 Maintain cover to reinforcement during concrete pour.

3.3 CLEANING

.1 Progress Cleaning:

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

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 10 00 – Concrete Forming Accessories

.2 Section 03 20 00 – Concrete Reinforcing.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.

.2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.3 ASTM C494/C494M-16, Standard Specification for Chemical Admixtures for Concrete.

.4 ASTM C 881/C881M-15, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

.5 ASTM C1017/C1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

.6 ASTM C C1059/C1059M-13, Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete.

.7 ASTM D412-16, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

.8 ASTM D624-2012, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

.9 ASTM D1751-04 (2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.10 ASTM D1752-04a(2013), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.3 CSA Group

.1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A283-06-R2016, Qualification Code for Concrete Testing Laboratories.

.3 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005),

1.3 ABBREVIATIONS AND ACRONYMS

.1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement types:

- .1 GU, GUb and GUL - General use cement.
- .2 MS and MSb - Moderate sulphate-resistant cement.
- .3 MH, MHb and MHL - Moderate heat of hydration cement.
- .4 HE, HEb and HEL - High early-strength cement.
- .5 LH, LHb and LHL - Low heat of hydration cement.
- .6 HS and HSb - High sulphate-resistant cement.

.2 Fly ash types:

- .1 F - with CaO content maximum 8%.
- .2 CI - with CaO content 15 to 20%.
- .3 CH - with CaO minimum 20%.

.3 GGBFS - Ground, granulated blast-furnace slag.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation meetings convene for a pre-installation meeting one week prior to beginning concrete works.

- .1 Ensure site supervisor, concrete producer, speciality contractor - finishing, forming, key personnel and Departmental Representative attend.
  - .1 Verify project requirements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

- .1 Submit manufacturer’s instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit copies of WHMIS SDS in accordance with Section 01 35 30 - Health and Safety Requirements and 01 35 43 - Environmental Procedures

.3 Site Quality Control Submittals:

- .1 Provide test reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters found.
- .2 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
- .3 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete delivered to site of Work and discharged after batching.

.4 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Reduction Workplan and Waste Management Plan highlighting recycling and salvage requirements.

1.6 QUALITY ASSURANCE

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

.2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.

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

.3 At least 2 weeks prior to beginning Work, inform Departmental Representative of source of fly ash.

.1 Changing source of fly ash without written approval of Departmental Representative is prohibited.

.4 Minimum 2 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:

.1 Falsework erection.

.2 Cold weather concrete.

.3 Curing.

.4 Finishes.

.5 Formwork removal.

.6 Joints.

.5 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.2 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.

.1 Modifying maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2. is prohibited.

.2 Deviations submitted for review by Departmental Representative.

.3 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2

1.8 SITE CONDITIONS

.1 Placing concrete during rain or weather events that could damage concrete is prohibited.

.2 Protect newly placed concrete from rain or weather events in accordance with CSA A23.1/A23.2.

.3 Cold weather protection:

.1 Maintain protection equipment, in readiness on Site.

.2 Use such equipment when ambient temperature below 5°C, or when temperature may fall below 5°C before concrete cured.

.3 Placing concrete upon or against surface at temperature below 5°C is prohibited.

.4 Hot weather protection:

.1 Protect concrete from direct sunlight when ambient temperature above 27°C.

.2 Prevent forms of getting too hot before concrete placed. Apply accepted methods of cooling not to affect concrete adversely.

.5 Protect from drying.

Part 2 Products

2.1 DESIGN CRITERIA

.1 Alternative 1 - Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 MATERIALS

.1 Portland Cement: GU to CSA A3001.

.1 Reduction in cement from Base Mix to Actual Supplementary Cementing Materials (SCMs) Mix, as percentage.

.2 Blended hydraulic cement: Type GUb to CSA A3001.

.3 Portland-limestone cement: Type GUL to CSA A3001.

.4 Supplementary cementing materials: with minimum 20% fly ash replacement, by mass of total cementitious materials to CSA A3001.

.5 Water: to CSA A23.1.

.6 Aggregates: to CSA A23.1/A23.2. Do not use recycled aggregate unless approved by Departmental Representative.

.7 Admixtures:

.1 Air entraining admixture: to ASTM C260.

.2 Chemical admixture: to ASTM C494. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.3 Admixtures shall not contain chlorides.

.8 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.

.1 Compressive strength: 40 MPa at 28 days.

.9 Curing compound: to CSA A23.1/A23.2 and ASTM C309, Type 1-chlorinated rubber.

2.4 MIXES

.1 Alternative 1 - Performance Method for specifying concrete: to Departmental Representative performance criteria to CSA A23.1/A23.2.

.1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.

.2 Provide concrete mix to meet following plastic state requirements:

.1 Uniformity: uniform density, air content, and slump.

.2 Workability: free of segregation, surface blemishes, loss of mortar, and colour variations..

.3 Finishability: to CSA A23.1/A23.2.

.3 Provide concrete mix to meet the Alternative 1 as per CSA A23.1/A23.2.

.4 Provide concrete mix to meet the following hard state requirements:

.1 Mix: Type 1

.1 Durability and class of exposure: N.

.2 Compressive strength at 28 day age: 30 MPa minimum.

.3 Intended application: Typical unless noted otherwise.

.4 Aggregate size: 20mm maximum.

.5 Provide quality management plan to ensure verification of concrete quality to specified performance.

.6 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

Part 3 Execution

3.1 PREPARATION

.1 Obtain Departmental Representative’s written approval before placing concrete.

.1 Provide 24 hours minimum notice prior to placing of concrete.

.2 Provide 5 days notice for coordination of inspection of reinforcing as required by the Departmental Representative’s

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

.3 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitate placing with minimum of re-handling, and without damage to existing structure or Work.

.4 Pumping of concrete is permitted only after approval of equipment and mix.

.5 Disturbing reinforcement and inserts during concrete placement is prohibited.

.6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Protect previous Work from staining.

.8 Clean and remove stains prior to application for concrete finishes.

.9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, workability, air content, temperature and test samples taken.

.10 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 INSTALLATION/APPLICATION

.1 Do cast-in-place concrete work to CSA A23.1/A23.2.

.2 Sleeves and inserts:

.1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.

.2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.

.3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.

.4 Confirm locations and sizes of sleeves and openings shown on drawings.

.5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Anchor bolts:

.1 Set anchor bolts to templates in coordination with appropriate trade prior to placing concrete.

.2 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

.3 Set bolts and fill holes with epoxy grout.

.4 Grout under base plates and machinery using procedures in accordance with manufacturer s recommendations which result in 100% contact over grouted area.

.5 Finishing and curing:

.1 Finish concrete to CSA A23.1/A23.2 and as indicated on the architectural drawings

.2 Use procedures as reviewed by Departmental Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface not damaged.

.3 Use curing compounds compatible with applied finish on concrete surfaces.

.4 Finish concrete floor to CSA A23.1/A23.2. Class A.

.5 Concrete floor to have finish hardness minimum to CSA A23.1/A23.2

.6 Provide steel trowel finish unless otherwise indicated.

.7 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.

.6 Dampproof membrane:

.1 Install dampproof membrane under concrete slabs-on-grade inside building.

.2 Install in conformance with architectural drawings.

.3 Lap dampproof membrane minimum 150 mm at joints and seal.

.4 Seal punctures in dampproof membrane before placing concrete.

.5 Use patching material minimum 150 mm larger than puncture and seal.

3.3 SURFACE TOLERANCE

.1 Concrete tolerance to CSA A23.1 Straightedge Method to tolerance of 8mm in 3000mm

3.4 FIELD QUALITY CONTROL

.1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.1 Concrete pours.

.2 Slump.

.3 Air content.

.4 Compressive strength at 7 and 28 days.

.5 Air and concrete temperature.

.2 Inspection and testing of concrete and concrete materials carried out testing laboratory approved by Departmental Representative for review to CSA A23.1/A23.2.

.1 Ensure testing laboratory certified to CSA A283.

.2 Provide the Departmental Representative with a copy of all concrete test results

.3 Contractor will retain the testing laboratory and pay for all of the tests.

.3 Contractor will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.4 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.

.5 Inspection or testing by Consultant not to augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.

3.5 CLEANING

.1 Progress Cleaning – Leave work area clean at end of each day.

.2 Waste Management: separate waste materials for recycling and reuse in accordance with 01 74 19 - Waste Management and Disposal.

.1 Divert unused concrete materials from landfill to local facility and/or quarry after receipt of written approval from Departmental Representative.

.2 Provide appropriate area on job site where concrete trucks and be safely washed.

.3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved Departmental Representative.

.4 Disposal of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location to pose health or environmental hazard is prohibited.

.5 Prevent admixtures and additive materials from entering drinking water supplies or streams.

.6 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.

.7 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00 Rough Carpentry.

1.2 REFERENCES

.1 ASTM International

.1 ASTM A123/A123M-0], Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.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 A792/A792M-09a, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 CSA International

.1 CAN/CSA S136-07, North American Specification for the Design of Cold Formed Steel Structural Members.

.4 Canadian Sheet Steel Building Institute (CSSBI)

.1 CSSBI 50M-06, Lightweight Steel Framing Manual.

.2 CSSBI Fact Sheet #3 June 1994, Care and Maintenance of Prefinished Sheet Steel Building Products.

.3 CSSBI Technical Bulletin Vol. 7, No. 2 February 2004, Changing Standard Thicknesses for Canadian Lightweight Steel Framing Applications.

.4 CSSBI S5-04, Guide Specification for Wind Bearing Steel Studs.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for structural metal studs 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 the Province of British Columbia, Canada.

.2 Indicate design loads, member sizes, materials, design thickness exclusive of coatings, coating specifications, connection and bracing details, screw sizes and spacing, and anchors.

.3 Indicate details for attachment of wooden roof joist assembly to steel stud wall assembly.

.4 Indicate locations, dimensions, openings and requirements of related work.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements

Part 2 Products

2.1 MATERIALS

.1 Steel: to CAN/CSA S136, fabricated from ASTM A653/A653M, Grade 230 steel.

.2 Zinc coated steel sheet: quality to ASTM A653/A653M, with Z275 designation coating.

.3 Aluminum-zinc alloy coated steel sheet: quality to ASTM A792/A792M, with AZM180 designation coating.

.4 Screws: pan head self-drilling, self-tapping sheet metal screws, corrosion protected with minimum zinc coating thickness of 0.008 mm, length to suit application, but not less than 5.0mm longer than twice3 the thickness of the steel.

.5 Anchors: concrete expansion anchors or other suitable drilled type fasteners.

.6 Bolts, nuts, washers: hot dipped galvanized to ASTM A123/A123M, 600 g/m^2 zinc coating.

.7 Touch up primer: zinc rich, to CAN/CGSB-1.181.

2.2 STEEL STUD DESIGNATIONS

.1 Colour code: to CSSBI Technical Bulletin Vol.7, No. 2.

2.3 METAL FRAMING

.1 Steel studs: to CAN/CSA S136, fabricated from metallic coated steel, depth as indicated.

.1 Minimum steel thickness of 0.84 mm.

.2 Stud tracks: fabricated from same material and finish as steel studs, depth to suit.

.1 Bottom track: single piece.

.2 Top track: single piece track **or** double track **or** slotted single top track. (double track or slotted single top track to accommodate deflection).

.3 Bridging: fabricated from same material and finish as studs, 38 x 12 x 1.09 mm minimum thickness.

.4 Angle clips: fabricated from same material and finish as studs, 38 x 38 mm x depth of steel stud, 1.37 mm minimum thickness.

.5 Tension straps and accessories: as recommended by manufacturer and as indicated in shop drawings, whichever is more stringent.

2.4 HOLD DOWNS

.1 As indicated on Architectural drawings.

2.5 SOURCE QUALITY CONTROL

.1 Ensure mill reports covering material properties are reviewed by Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for precast concrete 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 GENERAL

.1 Do structural metal stud framing work to CSSBI S5.

3.3 ERECTION

.1 Erect components to requirements of reviewed shop drawings.

.2 Anchor tracks securely to structure at 800 mm on centre maximum, unless lesser spacing prescribed on shop drawings.

.3 Erect studs plumb, aligned and securely attached with 2 screws minimum.

.4 Seat studs into bottom tracks and top track Gap between end of stud and web of track not to exceed 4.0 mm. Secure studs with two (2) screws minimum (in top and bottom tracks), or in accordance with manufacturer’s recommendations and approved shop drawings.

.5 Install studs at not more than 50 mm from abutting walls, openings, and each side of corners and terminations with dissimilar materials.

.6 Brace steel studs with horizontal internal bridging at 1200 mm maximum.

.1 Fasten bridging to steel clips fastened to steel studs with screws.

.7 Frame openings in stud walls to adequately carry loads by use of additional framing members and bracing as detailed on shop drawings.

.8 Attach wood joist assembly to steel stud wall assembly with metal clip angles.

3.4 HOLDDOWNS

.1 Install where indicated on architectural drawings.

.2 Fasten to studs in accordance with manufacturers recommendations and engineered shop drawings.

.3 Fasten to concrete slab with 13mm epoxy set threaded rod. Set at a minimum of 89mm from concrete edge.

3.5 ERECTION TOLERANCES

.1 Plumb: not to exceed 1/500th of member length.

.2 Camber: not to exceed 1/1000th of member length.

.3 Spacing: not more than +/- 3 mm from design spacing.

.4 Gap between end of stud and track web: not more than 4 mm.

3.6 CUTOUTS

.1 Maximum size of cutouts for services as follows:

Member Depth	Across Member Depth	Along Member Length	Centre to Centre Spacing (mm)
92	40 max.	105 max.	600 min.
102	40 max.	105 max.	600 min.
152	65 max.	115 max.	600 min.

.2 Limit distance from centerline of last unreinforced cutout to end of member to less than 300 mm.

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 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 structural metal stud installation.

END OF SECTION

PART 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 41 00 - Structural Metal Stud Framing.

.2 Section 06 41 11 - Architectural Woodwork and Finish Carpentry.

.3 Section 07 21 13 - Board and Blanket Insulation.

.4 Section 07 44 56 - Mineral Fiber Reinforced Cementitious Siding

1.2 REFERENCES

.1 ASTM International

.1 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A153/A153M-16 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.3 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.4 ASTM D1761-12, Standard Test Methods for Mechanical Fasteners in Wood.

.5 ASTM D5055-13e1, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

.6 ASTM D5456-14b, Standard Specification for Evaluation of Structural Composite Lumber Products.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-11.3-[M87], Hardboard.

.2 CAN/CGSB-71.26-[M88], Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.

.3 CSA International

.1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.2 CSA O86 Consolidation-14, Engineering Design in Wood.

.3 CSA O112.9-10(R2014), Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).

.4 CSA O121-08(R2013), Douglas Fir Plywood.

.5 CSA O141-05(R2014), Softwood Lumber.

.6 CSA O151-09(R2014), Canadian Softwood Plywood.

.7 CSA O325-07(R2012), Construction Sheathing.

.8 CSA O437 Series-93(R2011), Standards on OSB and Waferboard.

.4 Forest Stewardship Council (FSC)

.1 FSC-STD-01-001-(version 4-0), FSC Principle and Criteria for Forest Stewardship.

.5 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2014.

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113-A2011, Architectural Coatings.

.2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.

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 or FSC or SFI.

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 and panel materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan and Waste Reduction Workplan in accordance with Section 01 74 19 - Construction 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 attachment of wood assemblies to metal stud assemblies and accessories, including millwork, and washroom accessories.

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.

.2 Glued end-jointed (finger-jointed) lumber SPS, are not acceptable for exterior wall and shear wall framing.

.3 Framing and board lumber: in accordance with National Building Code of Canada (NBCC) and CSA O86 to the species and grade indicated on the structural drawings.

.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.

.5 Plywood, OSB and wood based composite panels: to CSA O325.

.6 Douglas Fir plywood (DFP): to CSA O121, standard construction and in accordance with structural drawings.

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 Subflooring adhesive: to CAN/CGSB-71.26, cartridge loaded.

.4 General purpose adhesive: to CSA O112.9.

.5 Nails, spikes and staples: to CSA B111.

.6 Bolts: 15.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.7 Self-drilling wood screws specifically designed for use with pressure treated woods in exterior and high corrosion environments. Screws to be factory coated with a multi-layer corrosion protection system consisting of an 8-10 micron yellow zinc base layer, a chemical bonding corrosion conversion chemical layer and encapsulated in a corrosion resistant ceramic coating. Number 17 tip, #8 size, minimum 88.9mm length for strapping installation.

.8 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.

.9 Wood Preservative:

.1 Preservative: in accordance with manufacturer's recommendations for surface conditions.

.10 Fastener Finishes:

.1 Galvanizing: to ASTM A153/A153M, use galvanized fasteners for exterior work, and interior highly humid areas.

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 MATERIAL USAGE

.1 Roof Decking:

.1 19mm Douglas Fir plywood (DFP).

.2 Wall sheathing:

.1 12mm Douglas Fir plywood (DFP).

.3 Rainscreen Strapping:

.1 Treated plywood strips, sheathing grade, 16mm thick.

.4 Electrical equipment mounting boards:

.1 19 mm Plywood, DFP G1S grade, or, square edge.

3.3 WOOD TREATMENT

.1 Treat surfaces of material with wood 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 plywood.

.3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

.4 Treat material as follows:

.1 Wood furring for mineral fiber reinforced cementitious siding installation on outside surface of exterior walls.

.2 Plywood/wood in contact with concrete, set into concrete.

.3 Plywood/wood used around window and door openings.

.5 Following water-borne preservative treatment, dry material to maximum moisture content of 19%.

.6 Re-treat surfaces of pressure treated components exposed by cutting, trimming and boring using surface-applied wood preservative compatible with original treatment.

.1 Re-treat surfaces before installation.

.2 Apply by dipping or by brush to completely saturate and maintain wet film on surfaces for minimum 3 minute soak on lumber and one minute soak on plywood, unless recommended otherwise by original treatment plant.

3.4 INSTALLATION

.1 Install wood joist framing, and sheathing as indicated in Architectural details.

.2 Install rough bucks, nailers and linings to rough openings as required to provide backing for windows, door frames and other work.

.3 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.

.4 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.5 Screw exterior sheathing to steel studs with self-tapping screws.

.6 Screw rain screen strapping into sheathing and steel studs, through exterior semi rigid insulation, using coated self-drilling wood screws.

.7 Countersink bolts where necessary to provide clearance for other work.

3.5 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 Joist system.

.2 Anchoring and mounting cabinets.

.3 Hardware.

.4 Electrical equipment.

.5 Fittings and fixtures not supplied with backing attachments.

.6 Washroom accessories.

3.6 CLEANING

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

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

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

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 – Construction Waste Management and Disposal.

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

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by work performed under this section.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Kitchenette cabinet and countertops.

.2 Bathroom vanity and countertop.

.3 Wall hung desk.

.4 Cabinet hardware.

.5 Interior window sills.

1.2 RELATED SECTIONS

.1 Section 01 45 00 - Quality Control.

.2 Section 09 91 23 - Interior Painting.

1.3 REFERENCES

.1 BHMA A156.9-2010 - Cabinet Hardware.

.2 NPA A208.2-2009 - Medium Density Fibreboard (MDF) for Interior Applications.

.3 AWMAC - Architectural Woodwork Standards (AWS) – 1st Edition, 2009.

.4 CAN/CSA O141-91(R1999), Softwood Lumber.

.5 NEMA LD3-2005 - High Pressure Decorative Laminates (HPDL).

.6 Green Seal Environmental Standards

.1 Standard GC-03-97, Anti-Corrosive Paints.

.2 Standard GS-11-93, Architectural Paints.

.3 Standard GS-36-00, Commercial Adhesives

.7 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1113-04, Architectural Coatings.

.2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

1.4 SUBMITTALS

.1 Section 01 33 00: Submission procedures.

.2 Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.

.3 Product Data: Provide data for hardware accessories.

.4 Provide samples of solid surface and plastic laminate materials for selection by Departmental Representative.

.1 Provide samples from manufacturers standard colour range.

1.5 QUALITY ASSURANCE

.1 Perform cabinet construction to AWMAC Custom quality.

1.6 DELIVERY, STORAGE, AND PROTECTION

.1 Deliver, store and handle materials in accordance with manufacturers recommendations.

1.7 ENVIRONMENTAL REQUIREMENTS

.1 During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

Part 2 Products

2.1 LUMBER MATERIALS

.1 Lumber: To the requirements of AWMAC, Custom grade.

.2 Hardwood Lumber: plain sawn, maximum moisture content of 6%; with plain sawn grain, of quality suitable for transparent finish.

2.2 SHEET MATERIALS

.1 Sheet Materials: To the requirements of AWMAC custom grade.

.2 Softwood Plywood: Veneer core; Douglas fir of grade to suit application; sanded faces.

.1 Plywood resin to include no added urea formaldehyde.

.3 Maple plywood: 7-ply all hardwood veneer core plywood with no voids, to AWMAC/AWI Custom Grade requirements, no added urea-formaldehyde.

.1 Top veneers (facers): White Maple, plain-sliced/flat-cut, 'A Grade' to AWS Manual 4.2a.16.2 requirements and selected for uniform consistent colour across face.

2.3 WINDOW SILL AND MISCELLANEOUS TRIM MATERIALS

.1 Window Sill- Maple plywood

.2 Window bull nose material- Solid Maple

2.4 LAMINATE MATERIALS

.1 High Pressure Laminate: NEMA LD3, high pressure laminate, solid chosen from manufacturers standard colour range, satin finish.

.1 Post form laminates for counter tops where indicated

2.5 ACCESSORIES

.1 Adhesive: Type recommended by laminate and solid surface material manufacturer to suit application.

.1 Adhesives to SCAQMD Rule 1168-05.

.2 Plastic Edge Trim (PVC): Extruded flat shaped; smooth finish; self locking serrated tongue; of width to match component thickness; colour as selected. Minimum 3 mm thickness.

2.6 HARDWARE

.1 Hardware: BHMA A156.9.

.2 Shelf Standards and Rests: Formed steel channels and rests, cut for fitted rests spaced at 25 mm centres; satin finish.

.3 Shelf Brackets: Formed steel brackets, formed for attachment with lugs; satin finish.

.4 Drawer and Door Pulls: Extruded aluminum pull, U-shaped satin finish; 100 mm centres.

.5 Cabinet and Locker Locks: Keyed cylinder, two keys per lock, master keyed.

.6 Cabinet Catches: Magnetic.

.7 Drawer Slides: Galvanized steel construction, ball bearings separating tracks, full extension type.

.8 Hinges: European type, satin finish.

2.7 PLASTIC LAMINATE CASEWORK

.1 Cabinet Construction: Flush overlay, adjustable shelving plywood core.

.2 Exposed Surfaces:

.1 Drawers, Drawer Fronts and open shelving: High pressure laminate.

.2 Edges: PVC.

.3 Semi-exposed Surfaces (Cabinet interiors):

.1 Surfaces (other than drawer bodies) Thermofused melamine.

.2 Shelves: Melamine.

.3 Edges: PVC.

.4 Drawer Sides and Backs: edgebanded.

.5 Drawer Bottoms: Melamine.

2.8 COUNTERTOPS

.1 Washroom and Kitchenette:

.1 Post form laminate countertops with integral backsplash.

.2 Desk:

.1 Laminate over 19mm plywood.

.2 3mm PVC edging.

.3 Supports- Plywood, laminate clad. Refer to details.

2.9 FABRICATION

.1 Shop prepare and identify components for matching during site assembly.

.2 Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

.3 When necessary to cut and fit on site, provide materials with ample allowance for site cutting and scribing.

.4 Apply plastic laminate finish in full, uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.

.5 Fabricate solid surface countertops with integral backsplash and front and side edging as detailed. Pre-cut for sink openings.

Part 3 Execution

3.1 INSTALLATION

.1 Install Work to AWMAC Custom Grade.

.2 Set and secure casework in place; rigid, plumb, and level.

.3 Use fixture attachments in concealed locations for wall mounted components.

.4 Use concealed joint fasteners to align and secure adjoining counter tops.

.5 Secure cabinet to floor using appropriate angles and anchorages.

3.2 WINDOW SILLS

.1 Install in accordance with details and to AWMAC/AWI Custom Grade requirements unless more stringent requirements are specified in this Section.

.2 Job site conditions for installation to be in accordance with AWS Manual requirements at time of installation.

.3 Install items in accordance with details using finishing nails throughout.

.4 Countersink all fixings and fill flush with wood filler.

.5 Site measure, cut and install items using longest practical length pieces to avoid splice joints.

.6 Use one length per location to avoid splice joints.

.7 Co-ordinate application of 1st coat of finishes prior to installation.

3.3 ADJUSTING

.1 Test installed work for rigidity and ability to support loads.

.2 Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

.1 Do cleaning in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 06 10 00 - Rough Carpentry.

.2 07 28 00 - Air and Vapour Barriers.

.3 07 44 56 - Mineral Fiber Reinforced Cementitious Siding.

1.2 REFERENCES

.1 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM C665-12 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.2 ASTM C578 – 18, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

.3 ASTM C665 - 2011, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

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

.1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit copy of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's insulation products and adhesives.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

Part 2 Products

2.1 INSULATION

.1 Semi Rigid Mineral fibre board: to CAN/ULC-S702

.1 Board insulation for exterior wall: Non-combustible, lightweight, water repellent, rigid insulation board with rigid upper surface to ASTM C612 Type IVB.

.1 Fire performance:

.1 Non-combustibility: To CAN/ULC S114.

.2 Maximum use temperature: 650 ºC.

.3 Surface Burning Characteristics: To CAN/ULC S102.

.1 Flame spread: 0.

.2 Smoke developed: 5.

.2 Thermal resistance (RSI value/25.4 mm at 24 º C: 0.76 m^2K/W to ASTM C518.

.3 Water vapour permeance: 1555 ng/Pa.s.m^2 minimum.

.4 Moisture absorption: 1 % maximum to ASTM C1104/C1104M.

.5 Fungi resistance: Zero mould growth to ASTM C1338.

.6 Corrosive resistance:

.1 Steel to ASTM C665: Pass.

.2 Stainless steel to ASTM C795: Conforms.

.7 Recycled content: 40 % minimum.

.8 Acoustical performance sound absorption co-efficients to ASTM C423.

.2 Density:

.1 Outer layer: 100 kg/m^3 to ASTM C612.

.2 Inner layer: 60 kg/m^3 to ASTM C612.

.3 Surfaces:

.1 High density, water repellent outer layer.

.2 Lower density high performance thermal inner layer.

.4 Thickness: as indicated.

.5 Size: as detailed.

.2 Pre-formed semi rigid Mineral Wool insulation in batt form, unfaced, friction fit, to ASTM C665.

.1 Thermal resistance and sizes as indicated.

.3 Under Slab Insulation:

.1 Insulation Board: Extruded polystyrene (XPS) insulation to ASTM C578 – 15b and CAN/ULC-S701, Type VI, thickness as indicated, square edges.

.4 Slab perimeter insulation:

.1 Concrete faced insulation board;

.1 Rigid Cellular Polystyrene Insulation bonded to an 8mm broomed finish latex modified concrete finish.

.2 Tongue and groove edge treatment.

.3 Held in place with galvanized mounting clips attached to slab foundation with screw fasteners.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 EXAMINATION

.1 Prior to commencement of work ensure:

.1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.3 UNDER SLAB INSULATION INSTALLATION

.1 Install over compacted aggregate under vapour barrier in prior to concrete slab placement.

.1 Fit insulation board tightly together with the minimum of joints.

3.4 SLAB PERIMETER INSULATION:

.1 Install at perimeter of foundation with galvanized clips according to manufacturers instructions.

3.5 EXTERIOR SEMI RIGID INSULATION INSTALLATION

.1 Install over sheathing. Fasten with screws driven through building paper and rain screen strapping. Fasten through wall sheathing into studs where possible.

3.6 BATT INSULATION INSTALLATION

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces and for sound attenuation.

.3 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints.

.4 Offset both vertical and horizontal joints in multiple layer applications.

.5 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.7 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Sheet and sealant materials for controlling vapour diffusion.

.2 Sheet air barriers.

1.2 RELATED SECTIONS

.1 Section 06 10 00 Rough Carpentry.

.2 Section 07 92 00 Joint Sealant.

.3 Section 07 21 13 Board and Blanket Insulation.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM):

.1 ASTM E 1745-09 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

.2 ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.

.2 CAN/CGSB 37-GP-56M, Standard for Modified Bituminous Sheet Membranes.

.3 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.3 ASTM C1193 - Standard Guide for Use of Joint Sealants.

.4 ASTM E96 - Test Methods for Water Vapour Transmission of Materials.

1.4 DEFINITION

.1 Vapour barrier: A material or assembly of materials that resists water vapour diffusion through it.

1.5 SUBMITTALS

.1 Section 01 33 00: Submission procedures.

.2 Product Data: Provide data indicating material characteristics, performance criteria and limitations.

.3 Manufacturer's Installation Instructions: Indicate preparation and installation requirements, techniques.

1.6 WHMIS

.1 Comply with WHMIS requirements when handing and using sealant materials.

1.7 INSPECTION TESTING

.1 Coordinate inspection of vapour barrier elements prior to vapour barrier system being covered up by other trades.

Part 2 Products

2.1 SELF ADHESIVE MEMBRANE

.1 Modified Bituminous Membrane: Self-adhesive Asphalt and polymer modifiers of styrene-butadiene-styrene (SBS) type, reinforced with tri-laminated woven polyethylene, rated for high temperature applications, slip resistant surface 1 mm thick; 910 mm wide roll. To ASTM D1970/D1970M-20.

2.2 VAPOUR BARRIER

.1 Wall assembly:

.1 Film Type: CAN2-51.33M, Translucent polyethylene film, 0.15 mm (6mils) thick for walls.

.2 Under Slab:

.1 Purpose made reinforced polyethylene vapour barrier manufactured from virgin materials with a permeance of less than 0.01 perms.

.2 Permeance tested in accordance with ASTM E1745.

.3 Strength to ASTM E1745 Class A.

.4 Thickness: 15 mils minimum.

2.3 AIR BARRIERS

.1 Spun bonded polyolefin or polypropylene, suitable for installing over exterior sheathing.

2.4 ACCESSORIES.

.1 Primer: Water based surface conditioner as recommended by self-adhesive membrane manufacturer.

.2 Seam tape- proprietary moisture resistant pressure sensitive adhesive tape as recommended by under slab vapour barrier manufacturer.

Part 3 Execution

3.1 EXAMINATION

.1 Verify condition of substrate and adjacent materials.

3.2 PREPARATION

.1 Remove loose or foreign matter which might impair adhesion.

.2 Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials or substances that may impede installation.

3.3 VAPOUR BARRIER UNDER-SLAB

.1 Install the barrier in accordance with this section and Manufacturer’s instructions.

.2 Install vapour barrier as a continuous, airtight floor moisture barrier system under the entire concrete slab. The barrier shall be sealed with manufacturers flexible sealant at all edges, seams and penetrations to provide a water and air tight seal.

.3 Lap seams a minimum of 150 mm sealed in the overlapping areas sealed manufacturers proprietary polyethylene tape.

.4 Continue the barrier vertically up all columns, pipes and interior concrete grade beams for a distance of at least 200 mm.

.5 Tape and seal the floor barrier around columns and pipes.

.6 Tape and seal at all perforations, penetrations and at structural elements.

3.4 AIR BARRIER

.1 Install one layer of air barrier to the exterior of the sheathing prior to cladding installation.

.2 Install air barriers to produce both continuous water shedding barrier over sheathing, down onto metal wall flashings.

.3 Install air barrier horizontally, starting from bottom of wall with each subsequent course shingle lapped over previous course to shed moisture down building/sheathing paper surface.

.4 Overlap subsequent courses minimum 200 mm over previous courses and provide minimum 100 mm overlaps at course ends laps.

.5 Attach air barrier to sheathing using sufficient quantities of staples to hold paper in place until covered by subsequent construction.

.6 Seal vertical lap joints of each layer using continuous applications of tape.

.7 Repair rips and tears in air barrier using continuous strips of tape. Repair large holes using patches of building/sheathing paper stapled in place with all edges tape sealed.

3.5 SELF ADHESIVE MEMBRANE

.1 Apply primer as recommended by membrane manufacturer.

.2 Apply membrane at door and window openings.

.3 Install membrane waterproofing in accordance with manufacturer's instructions.

.4 Roll out membrane. Minimize wrinkles and bubbles.

.5 Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.

3.6 VAPOUR BARRIER

.1 Install on interior wall and ceiling after installation of insulation.

.2 Install preformed polyethylene vapour barrier box behind all electrical boxes in exterior wall. Staple and seal flanges to film vapour barrier.

.3 Attach a 600 mm wide vertical strip of poly film on exterior wall at all locations where interior partitions will intersect.

.4 Install vapour barrier using as large a sheet as possible to minimize seams.

.5 Attach with staples.

.6 Prior to installing vapour barrier, provide a continuous bead of acoustical sealant to perimeter of opening being covered and bed vapour barrier in sealant.

.7 Provide a bead of sealant:

.1 Between all laps in vapour barrier.

.1 All laps must occur over solid blocking.

.2 At all penetrations of vapour barrier.

.3 At perimeter of vapour barrier.

.8 Use of tape as a primary seal for vapour barrier is not acceptable.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Cementitious cladding.

.2 Wooden trims and soffit material.

1.2 RELATED SECTIONS

.1 Section 07 21 13 - Board and Blanket Insulation.

.2 Section 07 28 00 - Air and Vapour Barriers

.3 Section 07 62 00 – Sheet Metal Flashings and Trims: wall flashings.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM C1186-08, Standard Specification for Flat Fiber-Cement Sheets.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.

.2 CAN/CGSB-19.17-M90, One-component, Acrylic Emulsion Base Sealing Compound.

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

.4 Material Safety Data Sheets (MSDS).

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer installation instruction sheets indicating nailing and cutting requirements.

.2 Submit manufacturer MSDS for siding and panels.

.1 Indicate precautions for workers when cutting siding and panels.

.3 Samples:

.1 Submit 300 long samples of siding proposed for use in Work, if requested by Departmental Representative.

.2 Submit 300 x 300 mm size samples of shingle panels proposed for use in Work, if requested by Departmental Representative.

.3 Submit full range pre-finish colour charts for Departmental Representative colour selection use.

.4 Manufacturer’s instructions:

.1 Submit manufacturers installation instructions

1.5 QUALITY ASSURANCE

.1 Mock ups

.1 Install at least 10 m^2 area of siding in location directed by Departmental Representative to indicate installation techniques and workmanship. Include application of sealant in mock-ups.

.2 Notify Departmental Representative at least 2 working days in advance to review mock-ups.

.3 Allow 2 working days for Departmental Representative to inspect mock-ups.

.4 Approved mock-ups will establish minimum acceptable standard for remaining work.

.5 Approved mock-ups may form part of Work.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

.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 Labour Canada.

1.8 WASTE MANAGEMENT AND DISPOSAL

.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, 12 months warranty period is extended as follows:

.1 360 months that siding and panels will be free from defects in materials and workmanship.

.2 180 months that pre-finish applied to siding and to panels will be free from paint peeling, cracking and chipping.

.3 Warranties to be in form acceptable to Departmental Representative.

1.10 CLOSEOUT SUBMITTALS

.1 Provide warranty certificates for inclusion in O&M manual

Part 2 Products

2.1 MATERIALS

.1 Siding: to ASTM C1186, asbestos-free composite product intended for exterior use, insect resistant, fire resistant and non-combustible.

- .1 Dimensions: 3657 mm long planks, 210 mm wide for 178 mm exposure.
- .2 Thickness: 8 mm.
- .3 Exposed face: wood texture embossed.
- .4 Finish: Pre-finished factory-applied 3 coat baked on paint system. Each board factory protected with plastic film prior to shipping. Colour as selected by Departmental Representative from submitted samples.

.2 Shingle type panels: to ASTM C1186, asbestos-free composite product intended for exterior use, insect resistant, fire resistant and non-combustible.

- .1 Dimensions: Length and width to suit.
- .2 Thickness: 6 mm.
- .3 Exposed face: wood texture faux shingle.
- .4 Finish: Pre-finished factory-applied 3 coat baked on paint system. Each board factory protected with plastic film prior to shipping. Colour as selected by Departmental Representative from submitted samples.

.3 Trim: Comb face wood trim boards compatible with cementitious panels and as detailed.

- .1 Dimensions as indicated.
- .2 Exposed Face: comb face.
- .3 Finish: Factory pre-primed.

.4 Soffit: Tongue and groove material. 88.9mm wide x 19mm nominal size.

- .1 Paint grade.
- .2 Smooth finish.

.5 Nails:

- .1 Stainless steel alloy or hot dip galvanized steel; style, type, head and lengths recommended by siding/panel manufacturer for permanent attachment of siding/panels to substrates applicable.
- .2 Style and head of nails acceptable to Departmental Representative to minimize nail appearance where nails cannot be concealed.

.6 Screws:

- .1 Ceramic coated steel alloy socket drive (Robertson) flat head deck screws of lengths recommended by panel manufacturer for permanent attachment of panels to substrates applicable.
- .2 “Trim Head” reduced screw head size, specifically designed for attachment of exterior trim. Stainless steel construction.

.7 Sealants:

.1 Paintable: acrylic latex to CAN/CGSB-19.17, colours capable of being concealed by paint.

.2 Non-paintable: polyurethane to CAN/CGSB-19.13, colours to match siding/panel paint colours.

.8 Touch-up paint: siding/panel manufacturer formulation for exact touch-up/repair of pre-finished siding/panels.

.9 Accessories: Aluminum bug screen closure

.1 Rigid aluminum screen.

.2 Custom fabricated for bottom of rain screen assembly.

.3 Custom fabricated for soffit venting.

Part 3 Execution

3.1 MANUFACTURERS 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 INSTALLATION

.1 Use maximum size material at each location to prevent or minimize joints.

.2 Cut material using sharp shears, saws and tools recommended by siding/panel manufacturer. Make cuts that will produce true even joints free of chips and splinters.

.3 Remove factory protective film immediately after installation of each board to ensure full protection of pre-finish coating during siding/panel handling and installation.

.4 Siding:

.1 Install to match approved site mock-ups.

.2 Refer to drawings for placement of shingle or lap type cladding locations.

.3 Blind nail or screw in place.

.4 Stagger end joints in adjacent coursing so as not to be apparent in finished installation.

.5 Provide and install siding starter strips required for start of siding installations.

.6 Install horizontal and true to line of building with even aligned coursing across all wall planes.

.5 Corner Trim

.1 Install corner and window trims as detailed. Use stainless steel trim head screws of appropriate length for attachment.

.6 Soffit

.1 Install tongue and groove materials and screening on soffit areas as detailed.

.7 Caulking:

.1 Install to match accepted mock-ups.

.2 Install sealants to produce weathertight and fine-finished installations.

.3 Apply sealant in continuous beads, using caulking gun and proper size nozzle.

.4 Use sufficient pressure to fill voids and joints solid.

.5 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.

.6 Tool exposed surfaces before skinning begins.

.1 Siding/panel butt joints: finish sealant flush and smooth to minimize joint appearance.

.2 All other joints: finish sealant to give slightly concave shape.

.7 Wipe off excess sealant without damaging siding/panel pre-finish paint coating.

3.3 CLEANING

.1 Do cleaning in accordance with Section 01 74 11 - Cleaning.

.2 Progress Cleaning:

.1 Remove dirt and marks caused by installation.

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

.4 Waste Management: separate waste materials for recycling.

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

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by mineral fibre reinforced panel installation.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Precoated galvanized steel roofing, associated integral flashings, and underlayment.

1.2 RELATED SECTIONS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 07 21 13 - Board and Blanket Insulation

.3 Section 07 28 00 - Air and Vapour Barriers

.4 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 Roofing Contractors Association of British Columbia(RCABC)

- .1 RGC manual, RGC Roofing Practices Manual, Published by RCABC.

.3 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:

- .1 Indicate arrangements of sheets and joints, types and locations of fasteners and special shapes and relationship of panels to building roof framing.

.2 Use qualified professional structural engineer registered in the Province of British Columbia for wind load and seismic designs.

.3 Submit shop drawings under the sea of the same qualified professional structural engineer responsible for wind load and seismic designs.

.4 Submit engineered shop drawings for snow guards.

.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 Manufacturer's instructions.

.1 Submit manufacturer installation instructions.

1.5 CLOSEOUT SUBMITTALS

.1 Provide following for inclusion in operating and maintenance manuals described in section 01 78 00- Closeout submittals.

.1 Certification under seal of same professional engineer responsible for sealing shop drawings that sheet metal roofing has been installed in accordance with sealed shop drawings.

1.6 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.

1.7 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.

1.8 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 dependent on sealants for primary exclusion of water.

.4 Provide a complete, engineered, snow guard system.

.1 Submit shop drawings for the complete system under the seal of a Structural Engineer registered in British Columbia, for wind and snow loads.

1.9 DELIVERY, STORAGE, AND HANDLING

.1 In accordance with 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.

1.10 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 Roofing Trade.

.2 Departmental Representative.

1.11 INSPECTION, GUARANTEE, WARRANTY

.1 Provide manufacturer’s standard warranty for roofing materials and installation

.2 Guarantee to start at date of substantial Performance of Work.

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 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 consultant from standard manufacturer range.

.1 Standard manufacturer range to be submitted for selection.

.3 Specular Gloss: 30 units 1/-5 to ASTM D523

.4 Coating thickness: not less than 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.

2.3 COMPONENTS

.1 Underlay membrane/slip sheet: glass fibre based breathable dry sheathing material to RCABC requirements and to metal roofing manufacturer’s recommendations.

.2 Clips: zinc coated sheet steel purpose-made formed shapes, designed specifically to engage and friction retain metal roofing panels allowing for panel movement.

.3 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.

.3 Material: minimum 0.61 mm (24 ga.) design thickness aluminum-zinc coated sheet steel.

.4 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.

.5 Filler strips: closed cell PVC or neoprene foam, over-sized 30-50% to ensure tight fitting installation.

.6 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 Consultant to match adjacent metal roofing/flashing colours where exposed to view.

.7 Touch-up coating: paintable type recommended by panel manufacturer for use in repairing minor surface damage.

.8 Roof jacks: pre-fabricated purpose-made assemblies, integral nailing flange, suitable for Project roof pitches, with companion lead settle caps.

2.4 SNOW GUARDS

.1 Provide a complete, engineered, snow guard system.

.1 System to be designed to be clamped to the standing seams of the metal roof system, no fastening through the roof panels will be allowed.

.2 Coordinate the snow retention system with the roof panel system.

.3 Snow guard system colour to match that of the roof panels.

.4 All loads incurred by snow retention system are transferred to the roof panel system and must be designed to accept these additional loads.

.5 Submit shop drawings for the complete system under the seal of a Structural Engineer registered in British Columbia, for wind and snow loads.

.2 Description: proprietary, engineered devices to retain snow from sliding off roof eaves.

.3 Fabrication of a typical snow guard system will include

.1 Snow guard blocks/flags: extruded and milled 6061-T6 aluminum.

.2 Tubing: 25 mm o.d. x 3 mm wall thickness 6005-T5 aluminum.

.3 Threaded couplings: 125 mm long 6061-T6 aluminum.

.4 End caps: Type 302 stainless steel.

.5 End collars: 6061 T-6 aluminum shaft collars.

.6 Fasteners: Type 302 or Type 304 stainless steel.

.7 Finish: powder coated, in colour selected by the Consultant to match roofing.

2.5 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.

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 Underlayment membrane

- .1 Apply over self-adhered membrane installation.
- .2 Arrange joints to shed moisture down roof slopes.

.3 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 Use metal roofing manufacturer proprietary fastener clips to anchor roof panels to sheathing.
- .3 Form and tailor panels to ensure weathertight installation. Fabricate and install system rain excluders.
- .4 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.
- .5 Install components progressively, in a manner to prevent damage to finished surfaces.
- .6 Install related metal flashings.
- .7 Incorporate roof jacks of correct sizes to suit plumbing vents. Finish each installation with correct size of settle cap.

.4 Snow Guards

- .1 Install snow guards in accordance with manufacturer’s recommendations and submitted engineered shop drawings.

3.3 PROTECTION OF FINISHED WORK

.1 Do not permit traffic over unprotected roof surface.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 07 61 00 – Sheet Metal Roofing.

.2 Section 07 44 56 - Fibre Reinforced Cementitious Siding.

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 D523-89(1999), 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.

.5 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 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)

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 colour selection.

1.4 QUALITY CONTROL

.1 Do Work in accordance with latest standards published in RGC Manual.

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 Waste and Disposal.

Part 2 Products

.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. Colours to match 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 Touch-up paint: type compatible with and matching pre-finish paint/colour.

.3 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

.4 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.

.5 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.

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 RAINWARE

.1 Gutters: continuous die formed pre-finished aluminum sheet fabrications, not less than 0.80 mm metal thickness. Dimensions; 100 mm width x 100 mm depth.

.2 Downspouts: pre-finished aluminum sheet fabrications, profiles and sizes detailed/indicated, not less than 0.48 mm metal thickness. 4” diameter, round profile. Complete with flanged gutter output tube.

.3 End caps, downspout outlets, straps, support brackets, downspout strainers: pre-finished aluminum sheet profiles to suit gutters and downspouts.

.4 Anchorage devices: hot dip galvanized steel or stainless steel alloy screws and washers.

.5 Gutter supports: designed to fit into, engage and support gutters; non-corroding plated finish stamped metal or aluminum alloy casting fabrications.

.6 Downspout supports: stamped pre-finished aluminum sheet straps.

.7 Finishes: aluminum sheet coil stock finished with high molecular weight polyester (hmp) gloss paint on epoxy primer prior to profile fabrication, colours selected by Departmental Representative.

Execution

2.4 INSTALLATION

.1 Metal Flashings

.1 Install in accordance with detail drawings.

.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 Rainware:

.1 Install gutters, rainwater leaders and accessories.

.2 Provide gutter supports at intervals required to prevent gutter deformation caused by ladder loads against any point along gutters.

.3 Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

.4 Slope gutters 5 mm/1000 mm minimum.

.5 Seal metal joints watertight.

.6 Install rainwater leaders plumb and tight to building face.

.1 Fix in place to resist loosening and pulling away using round-headed screws through washers through straps at top, bottom and at 915 mm intervals in between.

.2 Fix downspouts and elbow connections using round-headed screws. Make all connections secure and watertight without damaging pre-finished surfaces.

.3 Arrange downspouts to drain into concrete anchor blocks.

2.5 CLEANING

.1 Clean flashings to remove handling marks and smudges.

.2 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 28 00 Air and Vapour barriers

.2 Section 07 62 00 Sheet Metal Flashing and Trim

.3 Section 09 90 00 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)

.1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.

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

.1 Material Safety Data Sheets (MSDS).

.5 Green Seal Environmental Standards

.1 Standard GS-36-00, Commercial Adhesives

.6 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 Waste 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 Sealant materials to conform to the requirements of :

.1 Green Seal Environmental Standards

.1 Standard GS-36-00, Commercial Adhesives

.2 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.2 VOC limit maximum 250 g/L for sealers used within the building envelope.

.3 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 Silicones one part: to CAN/CGSB-19.13.

.3 Acrylics one part: to CGSB 19-GP-5M.

.4 Acrylic latex: one part, non sag siliconized acrylic polymer to CAN/CGSB-19.17. Paintable when cured

.5 Acoustical sealant: to ASTM C919.

.6 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 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 Interior perimeters of door frames and trims, window and curtain wall frames to make junctions filled, smooth and invisible suitable for subsequent "painting out" with interior wall finishes.

.1 Acrylic latex.

.3 Junctions between counter tops and walls to produce permanent sanitary and watertight seal; junctions between plumbing fixtures and walls, floors and counter tops/vanities to produce permanent sanitary and watertight seal. Co-ordinate with plumbing trade to avoid omission/duplication.

.1 Mildew-resistant silicone.

.4 Lap joint and perimeter sealant for polyethylene vapour barriers

.1 Acoustical sealant

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 Non-rated thermally insulated steel frames.

.2 Non-rated thermally insulated steel doors.

1.2 RELATED SECTIONS

.1 Section 08 71 00 - Door Hardware: Hardware, silencers, and weather-stripping.

.2 Section 09 90 00 - Painting: Field painting of frames.

1.3 REFERENCES

.1 ASTM A653/A653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM E152 - Methods of Fire Tests of Door Assemblies.

.3 CSDFMA (Canadian Steel Door and Frame Manufacturers Association).

.4 DHI - Door Hardware Institute: The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.

.5 NFPA 80 - Fire Doors and Windows.

.6 NFPA 252 - Fire Tests for Door Assemblies.

.7 SDI-100 - Standard Steel Doors and Frames.

.8 UL 10B - Fire Tests of Door Assemblies.

.9 ASHRAE 90.1 2013- Energy Standard for Buildings Except Low Rise Residential Buildings

1.4 SUBMITTALS

.1 Section 01 33 00: Submission procedures.

.2 Product Data: Indicate frame configuration and finishes. Indicate door configurations, location of cut-outs for hardware reinforcement.

.3 Shop Drawings: Indicate frame elevations, reinforcement, anchor types and spacings, location of cut-outs for hardware, and finish. Indicate door elevations, internal reinforcement, closure method, and cut-outs for glazing, louvers, and finishes.

1.5 QUALITY ASSURANCE

.1 Conform to requirements of CSDFMA SDI-100.

1.6 PROJECT CONDITIONS

.1 Coordinate the work with frame opening construction, door, and hardware installation.

PART 2 Products

2.1 DOORS

.1 Exterior doors: Air infiltration to comply with ASHRAE Standard 90.1 2010 & 2013 requirements of less than .4 CFM/$FT^{2.}$

.2 Insulated Core Doors: minimum, 1.2 mm surface sheets, and top and bottom end channels; cores filled with insulation.

.3 Reinforcement for hardware:

.1 Locks: minimum 1.52 mm steel.

.2 Butts: minimum 3.42 mmsteel.

.3 Flush Bolts: minimum 3.42 mm steel.

.4 Door Closures: minimum 1.9 mm steel.

2.2 FABRICATION DOOR FRAMES

.1 Fabricate frames in accordance with CSDMA specifications and following requirements:

.2 Fabricate frames as welded unit.

.3 Fabricate frames with hardware reinforcement plates welded in place.

.4 Reinforce frames wider than 1 200 mm with roll formed steel channels fitted tightly into frame head, flush with top.

.5 Prepare frames for silencers. Provide three single silencers for single doors and mullions of double doors on strike side. Provide two single silencers on frame head at double doors without mullions.

.6 Provide drywall returns on all frames.

.7 Attach channel spreaders at bottom of frames for shipping.

2.3 FABRICATION - DOORS

.1 Fabricate hollow metal doors and panels in accordance with requirements of "Canadian Manufacturing Standards for Steel Doors and Frames" produced by the Canadian Steel Door and Frame Manufacturer's Association and as indicated on Drawings. Fabricate doors with hardware reinforcement welded in place.

.2 Exterior doors to be insulated.

.3 Longitudinal seams: Mechanically interlocked, continuously welded, filled and sanded with no visible edge seams. Top and bottom of doors closed with end channels recessed and spot welded in place.

.4 Glazing Stops: 0.9 mm rolled steel channel shape, butted corners; 16 mm high profile; prepared for countersink screws.

.5 Reinforce and prepare doors to receive hardware. Refer to Section 08 71 00 for hardware requirements.

.6 Undercut doors where indicated.

PART 3 Execution

3.1 EXAMINATION

.1 Verify existing conditions before starting work.

.2 Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

.1 Install frames in accordance with CSDFMA.

.2 Coordinate with gypsum board and wall construction for anchor placement.

.3 Coordinate installation of doors and frames with installation of hardware specified in Section 08 71 00.

.4 After installation, touch up all scratched or damaged surface and prime.

.5 Insulate all frames exposed to the exterior.

.6 Install glazing in exterior door.

.7 Install door louvers, plumb and level.

3.3 ERECTION TOLERANCES

.1 Maximum Diagonal Distortion: 1.5 mm measured with straight edges, crossed corner to corner.

.2 Clearance on steel doors at head and jambs shall be: 3 mm maximum.

3.4 ADJUSTING

.1 Adjust door for smooth and balanced door movement.

3.5 CLEANING

.1 Do cleaning in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 WORK INCLUDED

.1 Window frames and sashes consisting of extrusions of polyvinyl chloride (PVC).

.2 Windows as pre-assembled units, including factory installation of glass and glazing.

.3 Furnish all labour, materials, equipment and services required for the design, fabrication, supply and installation of windows as shown on the drawings and as specified. Furnishment to include, but not be limited to the following:

- .1 Fully glazed vinyl window assemblies including vinyl shapes and glass.
- .2 All glazing accessories for window assemblies including gaskets, setting blocks, and sealants as required to meet the air and water tightness requirements of the section.
- .3 All necessary reinforcing members, brackets, anchors, fasteners and other accessories as required to meet the structural requirements of the installation and specifications in this section.
- .4 Shop applied galvanizing and electrolytic barrier painting of all steel parts.
- .5 All perimeter closures, membranes, sealants, flashings, and trim required to integrate the window assemblies with other cladding and finishing materials.
- .6 Assessment of the alignment of the existing façade elements as required to allow design and layout of the work in this section.
- .7 All fastening of the window assemblies to the rough openings

.4 Include also the following:

- .1 Checking of building lines and levels as required for the proper layout and installation of all work included in this section.
- .2 Shop painting of all steel shapes and ferrous metal used in attachment or reinforcing of window and field painting after steel shapes are installed.

.5 Window systems of the following types:

- .1 Single fixed lites.
- .2 Composite, with fixed lites and operable casement lites.

1.2 REFERENCE STANDARDS (Most recent version unless noted otherwise.)

.1 AAMA/WDMA/CSA101/I.S.2/A440-08-NAFS- North American Fenestration Standard/ Specification for windows, doors, and skylights

.2 CSA A440S1 – 09 “Canadian Supplement to AAMA/WDMA/CSA101/I.S.2/A440-08 – NAFS – North American Fenestration Standard/Specification for windows, doors, and skylights”

.3 British Columbia Energy Efficiency Act – Energy Efficiency Standards Regulation (BCEEA)

.4 CAN/CSA-A440-Windows; A440.1 User Selection Guide to A440; A440.2 Energy Performance Evaluation; A440.3 User Guide to A440.2; A440.4 Window and Door Installation.

.5 CAN/CSA-G164-Hot-Dip Galvanizing of Irregularly Shaped Articles

.6 CAN/CGSB-1.40-Primer, Structural Steel, Oil Alkyd Type.

.7 ASTM D4216, Standard Specification for Rigid Polyvinyl Chloride (PVC) and Related PVC and Chlorinated Polyvinyl Chloride (CPVC) Building Products Compounds.

.8 ASTM D4726, Standard Specification for Rigid Polyvinyl Chloride (PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors

.9 Glazing Contractor's Association of B.C. (GCABC) publication: Glazing Systems Specifications Manual

.10 IGMA Glazing Recommendations for Sealed Insulating Glass Units.

1.3 DEFINITIONS

.1 Single Unit Window: a window consisting of one fixed or one operable lite.

.2 Composite Window: a window consisting of a maximum of three lites in one main frame. Composite windows may consist of fixed or operable windows, or a combination of both.

1.4 DESIGN CRITERIA

.1 Materials, fabrications, attachments, accessories, assembly and performance, other that thermal performance, shall meet or exceed applicable requirements of CSA-A440, Windows, including appendices. The more stringent of CSA-A440 or this specification shall apply.

.2 Thermal performance shall be determined in conformance with CSA-A440.2, Thermal Performance Evaluation of Windows and Sliding Glass Doors, and Appendix A – Overview of the Procedure for Determining the U-Value by Computer Simulation.

.3 Design windows to be glazed from the interior.

.4 Design windows to equalize both positive and negative pressure between outside air and:
- .1 cavities surrounding insulating glass units, and
- .2 cavities surrounding operable sash.

.5 Design windows to provide drainage from spaces around operable sash and around insulating glass units to exterior.

.6 Design windows to provide for the continuity of the air seal from the inside face of the sealed unit to the surrounding frame.

.7 Design window anchorage to withstand wind load equal to or greater than calculated loads as per CSA A440S1-09 in accordance to the Performance Class specified herein or to Part 4 of the BC Building Code.

.8 Design vinyl components to accommodate thermally induced movement and to prevent creep deflection. Limit of creep deflection 3mm per meter in any member or assembly.

.9 Design assembly to accommodate structure movements due to wind, seismic, creep and live loads where applicable and/or as noted.

1.5 PERFORMANCE REQUIREMENTS

.1 This is a performance specification issued in conjunction with the drawings for the work. The drawings show the general arrangement of the finished work and these specifications described the minimum requirements of the finished system. The Contractor is responsible for designing and furnishing a window system that will fulfill the requirements of the specifications and drawings including items which may not be shown or specified but are required for performance of the system.

.2 The window shall be designed, fabricated and installed to meet or exceed the criteria in this subsection.

.3 Structural

- .1 Wind Load Resistance to NAFS in conjunction with CSA A440.09.
- .2 The window assembly and fasteners shall be designed to withstand negative and positive wind loads in accordance to BCBC using an annual probability factor of **1/50 years** for the reference wind velocity, and 8 per 1000 glass failure rate under this load.
- .3 The glass and window frames shall be designed to withstand guard loads at locations required by the BCBC.
- .4 The glass shall be designed to withstand thermal stresses imposed in service. In calculation, assume the use of blinds located not less than 50 mm from the inside surface of the glass.
- .5 The window system shall be designed to limit deflection orthogonal to the plane of the glass under wind or guard loads to **L/175** in all clear span dimensions of glass and framing members.
- .6 Anchors and fasteners shown on the drawings do not represent the required location or types required for installation of the new widow. Any attachment points must be shown on shop drawings for review by the Departmental Representative.
- .7 All fastenings and attachments shall be concealed.
- .8 Movement and Tolerances
  - .1 The window installation shall accommodate a building structure live load deflection of 9 mm at midspan of longest project window header/lintel without transferring load to the window.
  - .2 The window shall accommodate expansion and contraction of component materials over an exterior air temperature range of -18ºC to 35ºC and a possible solar heating range to 70ºC, and an interior temperature range of 0ºC to 30ºC without causing:
    - .1 failure of joint seals necessary for air and water tightness of the system,
    - .2 failure of perimeter seals at interfaces to adjacent wall systems,
    - .3 overstressing of fasteners,
    - .4 pinching or distortion or breakage of glass,

.5 distortion of aluminum members,
.6 or other harmful effects.

.4 The window shall be fabricated and installed square, level and plumb as follows:
.1 Plumb to within 3 mm of vertical over the height of each unit.
.2 Within 3.0 mm of level relative to a datum established for frames at the same floor.
.3 Within 1.5 mm of level relative to an adjacent frame.
.4 Each frame shall be within 3.0 mm of square when measured across the diagonals.
.5 Clearances required for installation should be considered and indicated on the shop drawings.
.6 All movements of the window system shall be noiseless.

.5 Weather Tightness
.1 Water Tightness to NAFS in conjunction with CSA A440.09 .
.2 The glazing system shall be installed so that it forms a continuous unbroken air seal on the room side of the assembly. The air seal shall extend from the glazing assembly to adjoining wall components at all interfaces. Airtightness of the window and interfaces shall restrict infiltration and exfiltration of air through the system in accordance to NAFS.
.3 The window system shall be designed in accordance with rainscreen principles, incorporating venting and drainage mechanisms and separate air and water barriers, effective so that any water entering the system past exterior seals drains harmlessly to the exterior via pressure equalized drainage cavities.
.4 Vent and drain holes shall be present in inconspicuously locations and shall not contribute to staining or marking of glass, mullions, or spandrels.

.6 Durability
.1 The window frames and integral seals shall be designed to have an expected service life of 30 years. All seals, gaskets, corrosion protection, coatings and attachments are expected to be serviceable at the end of this service period.

.2 The glazing shall have a guaranteed service life of five years. Any glazing failing to meet this service life shall be removed and replaced at no cost to the Departmental Representative under guarantee by the Contractor. Failure of any glazing shall be deemed to occur if any of the following are noted:
.1 Chipping, cracking, or breakage of glass panes occurring due to manufacturing defects or under specified service conditions.

.3 Seals between unitized components of the glazing system shall be formed with clamped rubber gaskets. Seals between frame units made with field applied sealants alone will not be accepted.

1.6 RESPONSIBILITY FOR MEETING PERFORMANCE REQUIREMENTS

.1 Meeting the performance requirements of this section during the design fabrications and installation of the work shall be the complete responsibility of the Contractor.

.2 The details shown on associated drawings show dimensions and profiles similar to those expected to be required to meet the specifications of this section. The Contractor may submit design proposals with minor changes to the details shown on the drawings in order to meet or exceed the performance requirements of this section by using proprietary technology. Every effort has been made to show on the drawings and in the specification items of the design that may not be altered or altered only to limited extents.

.3 The structural and energy use requirements of this section shall be certified by an Engineer employed by the Contractor using standards recognized by the local authority having jurisdiction, the product manufacturer and current trade associations.

.4 The design of the product and the responsibility of the Contractor's Engineer shall extend to accommodate all temporary conditions associated with fabrication, transport, storage, lifting, installation and temporary closure of the building without detrimental effect on the performance requirements of these contract documents.

.5 The Departmental Representative's review of the Contractor's submittals and the work is of the benefit only of the Departmental Representative. The Contractor shall remain responsible for the design, fabrication, installation and performance of the product.

1.7 SUBMITTALS

.1 Submittals to be made in accordance with Section 01 33 00 - Submittals.

.2 Product Data: Submit catalogue details for each type of window and framing system illustrating profiles, dimensions and methods of assembly, installation procedures, recommendations and data that products have been tested and comply with performance requirements.

.3 Submit test reports form an independent testing agency acceptable to the Departmental Representative, indicating windows to be supplied for the project meet specified requirements, including compliance with AAMA/WDMA/CSA101/I.S.2/A440-08-NAFS. Testing conducted by manufacturer to follow all required product test and sequence tests as described under Clause 5 in AAMA/WDMA/CSA101/I.S.2/A440-08-NAFS in conjunction with CSA A440S1-09.

.4 Energy Conformance: Supply documentation sufficient to confirm conformance of project window sizes and configurations with the British Columbia Energy Efficiency Act, using one of the following testing agencies or persons.
- .1 A person or organization accredited by the Standards Council of Canada
- .2 National Fenestration Rating Council accredited Inspection Agency
- .3 Architect or Professional Engineer, authorized to practice in British Columbia.

.5 Shop Drawings:
- .1 Submit shop drawings of windows prepared under the supervision and bearing the seal of a Professional Engineer of the Province of BC. Upon request, provide structural calculations per conformance to Building Codes, By-Laws and CAN/CGSB 12.20.
- .2 Clearly indicate each type of window, hardware and locations, framing system, extrusion profiles, methods of assembly, section and hardware reinforcement,

anchorages and location of exposed fasteners, isolation coatings, finishes, glazing components, insect screens, and location of manufacturer's name plates (if applicable).

.3 Provide scaled elevations, sections, plans, dimensions and quantity of units. Indicate rough opening requirements and tolerances of adjacent construction.

.4 Provide full size details for head, sill and jamb conditions, junctions between combination units (coupling mullions), and interior and exterior trim. Clearly indicate method and location of connection and continuity of the envelope air, vapour and water seals. Clearly indicate drainage and ventilation paths within the window assembly and at the interface to the building envelope. Confirm compatibility of materials that form the air/vapour/water barrier of the integrated system.

.5 Provide manufacturer's assembly instructions for operable units if they will be supplied demounted from main frame.

.6 Shop drawings are submitted to allow the Departmental Representative to review conformance of the proposed system. Review of the shop drawings by the Departmental Representative shall not relieve the Contractor of any responsibilities to perform under the terms of this specification. Notify the Departmental Representatives of any sequencing of submittals and reviews that will expedite the Contractor's delivery of the project

.7 No materials shall be purchased or units fabricated until final review of shop drawings is completed by Departmental Representative.

.6 Samples: If requested, make the following samples available for Departmental Representative's review at least one week prior to shop drawing preparation:

.1 150 mm long corner sections of head, jamb, sill, mullions, and coupling mullions to indicate profile.

.2 One (1), 4'x 4' with 2' operable section, representative model of each type of window.

.7 Maintenance Data: Provide in accordance with Section 01 78 23 – Maintenance and Renewal Manual, the following data for incorporation into specified maintenance manual:

.1 A recommended inspection procedure and schedule and component replacement schedule.

.2 Data for cleaning and maintenance of framing finishes, glazing and hardware.

.8 Warranties:

.1 Provide a written warranty signed and issued in the name of the Departmental Representative stating:

.1 All windows will be free from defects in material and workmanship for a period of two (2) years from the date of substantial Performance of the Work.

.2 All windows will continue to provide satisfactory resistance to water penetration for a period of five (5) years from the date of Substantial Performance of the Work.

.3 All insulating sealed double glazing units shall be covered for a period of ten (10) years from the date of Substantial Performance of the Work, against material obstruction of vision as a result of hermetic seal failure and dust or film formation on inner glass surfaces.

.2 If a 3rd party warranty is provided then the warranty requirements are to be the

most stringent of the 3rd party warranty or the requirements listed.

.3 Satisfactory performance means compliance with the performance criteria and the testing and construction standards of this specification, and with the reviewed shop drawings. This includes the performance of finishes, hardware glass and glazing materials, structural attachment, sealants and flashings.

.4 Correct all deficiencies that appear during the warranty period at no cost to the Departmental Representative.

1.8 QUALITY ASSURANCE

.1 Sealed insulation unit manufacturer to be a member in good standing of the Insulating Glass Manufacturers Alliance (IGMA).

.2 Glass and glazing work under this section to conform to IGMA standards.

.3 Window manufacturer and installation contractor to be a member in good standing of the Glazing Contractors Association of BC (GCABC) and have a minimum of 5 years uninterrupted experience in successfully carrying out projects of similar size. Contractor to document past experience on request.

.4 In-Plant Testing: Manufacturer to test 5% of windows prior to shipments to site. Verification letter shall accompany shipment.

Part 2 Products

2.1 SINGLE UNIT WINDOWS

.1 Meet or exceed requirements of selected Performance Class and Performance Grade as per AAMA/WDMA/CSA101/I.S.2/A440-08- NAFS- North American Fenestration Standard/Specification for windows, doors, and skylights and CSA A440S1- 09 – Canadian Supplement to NAFS and the secondary performance requirements:

.1 All windows shall conform to:
  .1 Class **CW – PG30 (metric)** - Fixed
  .2 Class **CW – PG30 (metric)** – Casement and Awning

.2 Water Penetration: Water penetration test pressures shall be **400 Pa.**

.3 Air Tightness Rating, Fixed Windows: Fixed Level.

.4 Air Tightness Rating, Operable Windows: A3 Level

.5 Operation Force for: Casement window - Normal Use (Clause 5.3.1.1, Table 6)

.6 Energy Performance: Overall Window U-Value averaged over all fenestration products within the scope of work to be no more than **1.424 W/m2•K**.

.7 All windows are to be labeled with the AAMA, CSA or WDMA label and have sash, leaf and size shown on the drawings.

2.2 COMBINATION WINDOWS

.1 Meet or exceed requirements of selected Performance Class and Performance Grade as per AAMA/WDMA/CSA101/I.S.2/A440-08- NAFS- North American Fenestration

Standard/Specification for windows, doors, and skylights and CSA A440S1- 09 - Canadian Supplement to NAFS, and the secondary performance requirements. Refer to Clause 2.1.1 for Window Performance Grades and Energy Performance.

.2 Air and water tightness of joints along frames mulled together, and at mullions where lites within one main frame join, shall meet or exceed performance ratings specified for the higher rated adjacent single unit windows.

.3 Lateral deflection of mulled frames shall not exceed **L/175** of span when subjected to loading equivalent to wind load resistance of the adjacent single unit windows.

2.3 WINDOW TYPES

.1 Fixed: with removable double-glazed insulated sealed units. Minimum performance standard to meet AAMA/WDMA/CSA 101/I.S.2/A440-08 – NAFS Class CW-PG30.
.2 Casement (Outswing sash): with removable double-glazed insulated sealed units. Minimum performance standard to meet AAMA/WDMA/CSA 101/I.S.2/A440-08 – NAFS Class CW-PG30.
.3 Screens: provide on ventilating portions of windows.

2.4 FRAME AND SASH REQUIREMENTS

.1 Frame and sash profiles and glazing detailed on drawings are not intended to restrict product types conforming to these specifications.
.2 Provide PVC frame and sash conforming to the following standards:
  .1 ASTM D4726, Standard Specification for Rigid Poly Vinyl Chloride (PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors.
  .2 ASTM D4216, class 1 32021 42 4040 or equivalent standard for weathering and mechanical properties.
  .3 Can/CGSB 41-GP-19MA, Rigid Vinyl Extrusions for Windows and Doors. The material shall show no reduction in surface gloss or colour after 10,000 hours in a UV arc weather-o-meter.
  .4 Minimum external wall thickness of extrusions: 2.5 mm nominal, exceeding requirements of CSA-A440 for vinyl (PVC) window wall types A, B, and C.

.3 Seal sash perimeter continuously at three locations minimum, with primary seal located between operator and interior seal.
.4 Secure hardware and attachments using screws into H-ports or penetrating minimum of two walls of framing or internal steel reinforcement.
.5 Join single units to form combination units with joints at combination unit frame perimeter finished with sealant and steel plate, 75 mm x 75% of depth of framing. Plate shall be screw fastened with a minimum of four screws through plastic into steel reinforcing.
.6 Anchor using metal retaining clips at head, nailing flanges at jambs and continuous back angle at sill.

2.5 GLASS AND GLAZING MATERIAL

.1 Insulating Glass Units: meet or exceed requirements as described in AAMA/WDMA/CSA101/I.S.2/A440-08- NAFS and CSA A440S1- 09 - Canadian Supplement to NAFS. Units shall be certified by the Insulating Glass Manufacturers Alliance (IGMA). Overall unit thickness shall be a minimum of 24 mm using a minimum of 4 mm glass thickness. In combination and composite units use the greater glass thickness throughout. Use two-stage seal method of manufacture, as follows:
   .1 Primary Seal: polyisobutylene or hot-melt butyl.
   .2 Secondary Seal: polyisobutylene, silicone or polysulphide based sealant, filling gap between the two lites of glass at the edge up to the spacer/separator and primary seal.
   .3 Spacer/separator: non-conductive, as required to suit performance requirements.

.2 Clear Float Glass: to CAN/CGSB-12.3, glazing quality, for inner and outer lite.

.3 Provide low-E coating on No. 2 surface of double glazed insulating glass units.

.4 Glazing Gaskets for PVC Sections: neoprene, thermoplastic rubber or EPDM, flexible at minimum design temperature, and as follows:
   .1 Profiles with a minimum of two (2) fins to contact glazing at interior and exterior of glass units
   .2 Designed to maintain pressure contact against glass units through design temperature range.
   .3 Co-extruded gaskets are not acceptable on the main frame or sash.
   .4 Foam or butyl glazing tapes are not acceptable.

.5 Other Glazing Accessories: setting blocks to AAMA/WDMA/CSA101/I.S.2/A440-08-NAFS.

.6 Provide Glazing panel meeting the above specification for installation in exterior metal door.

2.6 HARDWARE

.1 Exposed Hardware Components: cast metal, in finish selected by Departmental Representative from hardware manufacturer's standard range.

.2 Hardware exposed to exterior environment with sash in closed and open positions shall be corrosion-resistant stainless steel or bi-chromated steel composites.

.3 Secure hardware and attachments using screws into H-ports or penetrating a minimum of two walls of framing. Wherever possible provide metal reinforcement embedded in vinyl frames at screw attachment locations.

.4 Equip operable windows with hardware as follows:
   .1 Casement: concealed dual arm operator and stainless steel tracks, with under screen roto operator assembly. Provide multi-point locking with single handle operation.
   .2 Hardware to be adjustable to accommodate compression set of weather and air seals.

.5 Provide ADA approved handles for roto operators.

.6 Force to operate locking devices shall not exceed 20 N.

.7 Provide pole operated hardware where window latching devices are located in excess of 1900 mm above floor level:

2.7 ACCESSORIES

.1 Weatherstripping for operable sash: neoprene, thermoplastic rubber or EPDM, flexible at minimum design temperature, and as follows:
- .1 Profiled to mechanically key into window and sash framing members, at interior and exterior of sash.
- .2 Removable without special tools and without dismantling of frames.
- .3 Designed to maintain pressure contact against frame through design temperature range.
- .4 Provide a minimum of one weather seal gasket to the exterior and one air seal gasket to the interior of drained and vented cavities.

.2 Steel Reinforcement: sheet steel to ASTM A653M, hot dip galvanized, minimum Z275 coating designation.

.3 Transition membrane: minimum1.6 mm thick SBS membrane sheet reinforced with non-woven polyester or glass fleece. Stripping to be a minimum 150mm wide. Refer to details.

.4 Joint Sealants: as specified in Section 07 92 10, as recommended for substrates.

.5 Foam Backer Rod: extruded closed cell backer rod, oversize 30 to 50%.

.6 Screens: To CAN/CGSB-79.1.
- .1 Insect screening mesh: count 18 x 16.
- .2 Fasteners: tamper proof.
- .3 Screen frames: vinyl or aluminum, colour to match window frames.

2.8 FRAME AND SASH FINISHES

.1 Vinyl: Colour as selected by the Departmental Representative from the manufacturer's colour range.

2.9 AIR/VAPOUR RETARDER

.1 Ensure continuity of air/vapour retarder and seal from walls to window frame.

Part 3 Execution

3.1 FABRICATION

.1 Fabricate window units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement over 1800 mm.

.2 Mitre and heat weld full length of vinyl frame and sash joints at corners. All welding flash to be neatly removed.

.3 Fasten steel reinforcement to extruded vinyl mullions with concealed stainless steel fasteners at maximum 300 mm o/c.

.4 Continuously and uniformly compress length of gaskets during installation, to compensate for linear shrinkage.

3.2 GLAZING

.1 Clean sealing surfaces at perimeter of glass and sealing surfaces of rabbets and stop beads before applying tape, splines or gaskets. Use solvents and cleaning agents recommended by manufacturer of sealing materials.

.2 Install glazing gaskets uniformly with accurately formed corners and bevels. Ensure that proper contact is made with glass and rabbet interfaces.

.3 Support both lites of glass thermal units on levelled setting blocks, 4 or 6 mm minimum, spaced as recommended by glass manufacturer. Provide at least one setting block at quarter points from each corner. For casement windows, locate setting blocks closer to corners as recommended by manufacturer.

.4 Centre glass thermal units in glazing rabbet to maintain 6 mm minimum clearance between edges of glazing and plastic framing at sill or 4 mm minimum clearance between edges of glazing and plastic framing at sill if glazing bite incorporates a drainage channel with depth of 3 mm minimum.

.5 Size glass thermal units to ensure exposed face of spacer is in line with glazing stops.

.6 Use spacers and shims in accordance with glass manufacturer’s recommendations.

.7 Immediately replace damaged or broken glass.

3.3 WINDOW INSTALLATION

.1 Install in accordance with CAN/CSA-A440 and reviewed shop drawings.

.2 Arrange components to prevent abrupt variation in colour.

.3 Erect and secure window units in prepared openings, plumb and square, free from warp, twist or superimposed loads.

.4 Secure work accurately to structure and in a manner not restricting thermal movement of materials.

.5 Transfer window dead load to wall construction by anchors alone or in combination with plastic shims. Wood shims are not acceptable.

.6 Place shims under sill frame at exact setting block locations, and as marked on frames by window frame manufacturer.

.7 Conceal all anchors and fitments. Exposed heads of fasteners are not permitted.

.8 Maintain dimensional tolerances after installation. Maintain alignment with adjacent work.

.9 Provide seal around interior perimeter of window frame using foam joint sealant or foam backer rod, size as required to lightly compress between frame and rough opening, and sealant. Ensure continuity of air/vapour retarder and seal to window frame.

.10 Provide seal at head and jamb of exterior perimeter of window frame using foam joint sealant or foam backer rod, size as required to lightly compress between frame and rough opening, and sealant. Do not seal sill at exterior.

.11 Install sealant, in accordance with Section 07 92 10, and related materials as indicated on drawings.

.12 Adjust operable sash and hardware to operate smoothly.

.13 Temporary installations of windows if needed are to meet all requirements for occupant and public safety, such as but not limited to, operable unit restrictors, fastening, sharp edges etc.

.14 Install glazing provided under this section in exterior door.

3.4 SILL INSTALLATION

.1 Install sills with uniform wash to exterior, level in length, straight in alignment with plumb upstands and faces. Use one-piece lengths at each location.

.2 Secure metal sills in place with anchoring devices at upturn (end dam) located at ends and evenly spaced 600 mm o/c in between. Do not fasten through bottom of sill. If sill requires fastening along sloped portion, use dabs of mastic or sealant compatible with materials which are being adhered to.

3.5 CAULKING

.1 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates in bedding compound. Caulk butt joints in continuous sills.

.2 Apply sealant in accordance with Section 07 92 00 – Joint Sealing. Conceal sealant within window units except where exposed use is permitted by the Departmental Representative.

3.6 PROTECTION AND CLEANING

.1 Protect windows/doors from damage/staining during and after installation.

.2 Clean interior and exterior surfaces as soon as adjacent contaminating activities are completed, to recommendations of window manufacturer.

3.7 ENERGY CERTIFICATE

.1 Site certificates to be supplied in accordance with the British Columbia Energy Efficiency Act.

.2 Certificates to include the following information:

.1 The whole-product U-value for each fenestration product provided on site (in W/m2K).
.2 The overall average U-value for the whole project, averaged over every fenestration product in the scope of work (in W/m2K).
.3 The name of the person or agency acting as verifier for the fenestration products.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Hardware for hollow and insulated steel doors.

.2 Thresholds.

1.2 RELATED SECTIONS

.1 Section 08 11 00 - Metal 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 A156.4-2000, Door Controls - Closers.

.4 ANSI/BHMA A156.13-2002, Mortise Locks and Latches Series 1000.

.5 ANSI/BHMA A156.18-2006, Materials and Finishes.

.6 ANSI/BHMA A156.31- 2013, Electric Strikes and Frame Mounted Actuators

.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 (issue date listed in Section 01 41 00 - Regulatory Requirements).

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.

.2 Regulatory Requirements:

.1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification organization accredited by Standards Council of Canada.

1.7 DELIVERY, STORAGE, AND PROTECTION

.1 Deliver, store and handle materials in accordance with respective material manufacturer's requirements.

.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.

.6 Replace defective or damaged materials with new.

1.8 WASTE DISPOSAL AND MANAGEMENT

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

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 Other wall and floor stops: CBH, Gallery, Ives

.4 Thresholds and weatherstrip: Draft Seal, Pemko, National

2.2 HARDWARE - GENERAL

.1 General: Refer to paragraph. **3.7 Hardware Schedule** for further description and finishes of following items.

.2 Locks and latches:

.1 Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, grade 1, designed for functions scheduled and keyed as stated in Hardware Schedule.

.2 Lever handles, Plain design

.3 Escutcheons: round.

.4 Normal strikes: box type, lip projection not beyond jamb.

.5 Cylinders: keyed into keying system directed by Departmental Representative.

.6 Finishes: finished to 626.

.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 Architectural door trim: to ANSI/BHMA A156.6, designated by letter J and as scheduled.

.1 Door protection plates: Kick plate type 1.27 mm thick stainless steel finish to 630.

.5 Thresholds: 127 mm wide x 6mm maximum x full width of door opening, extruded aluminum mill finish, serrated surface.

2.3 KEYING

.1 Obtain final keying from Departmental Representative before ordering.

.2 Prepare keying schedule in co-operation with Departmental Representative.

.3 Supply keys in duplicate for every lock in this contract.

.4 Supply 3 master keys for each master key or grand master key group.

.5 Stamp Keying code numbers on keys and cylinders.

.6 Use a bonded locksmith for all keying work. Stamp all keys "Do Not Copy".

2.4 FINISHES

.1 Finishes: Stainless steel 630.

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 FASTENINGS

.1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.

.2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.3 Exposed fastening devices to match finish of hardware.

.4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.5 Use fasteners compatible with material through which they pass.

3.3 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.

.5 Provide metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.6 Remove construction locks when directed by the Departmental Representative.

.1 Install permanent cores and ensure locks operate correctly.

3.4 ADJUSTING

.1 Adjust hardware for smooth operation.

3.5 PROTECTION OF FINISHED WORK

.1 Do not permit adjacent work to damage hardware or finish.

3.6 CLEANING

.1 Do cleaning 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.

3.7 HARDWARE SCHEDULE

.1 Hinges

.1 A1 - Hinge 5 Knuckle - .180 gauge-114mm x 101mm x Non Removable Pin x 630

.2 A2 - Hinge 5 Knuckle - .134 gauge-114mm x 101mm x Non Removable Pin x 652

.2 Locks, Deadbolts and Privacy

.1	B1- Cylinder	Type x length x cam to suit	626
.2	B2 - Office Lock set	ANSI F82	626
.3	B3 - Privacy set	ANSI F76	626

.3 Auxilliary hardware

.1 D1 - Kick Plate 1.27 mm thickness x 254 mm height x width less 38 mm X 630

.2 D2 - Wall stop Cast concealed mount, concave bumper with back plate x 626

.3 D3-Floor mount door stop, SS construction, Suitable for exterior use.

.4 Thresholds, seals door bottoms, astragal:

.1 E1- Thresholds: as scheduled, one length per door opening without joins or splices. Max height 6.0 mm.

.5 Weatherstripping:

.1 F1-Head and Jamb seal:

.1 Extruded aluminum frame and solid closed cell nepoprene insert, clear anodized finish.

.2 Adhesive backed neoprene material

.2 F2-Door bottom seal:

.1 Extruded aluminum frame with closed cell neoprene, vinyl sweep, clear anodized finish.

Hardware Schedule

.6 Hardware Set 01 for Entry / Exit Door 101

3 Hinges	A1
1 Ea. Cylinder	B1
1 Ea. Lock set	B2
2 Ea. Kick Plate	D1
1 Ea. Threshold	E1
1 Ea. Weatherstripping	F1, F2
1Ea. Floor Stop	D3

.7 Hardware Set 02 Washroom Door 102

3 Hinges	A2
1 Ea. Deadbolt and cylinder	B1
1 Ea. Lock set	B3
2 Ea. Kick Plate	D1
1 Ea. Floor stop	D3
1 Ea. Threshold	E1
1 Ea. Weatherstripping	F1, F2

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Gypsum board and joint treatment.

.2 Metal stud wall framing.

.3 Rubber Base.

1.2 RELATED SECTIONS

.1 Section 09 90 00 - Painting.

1.3 REFERENCES

.1 ASTM C475/C475M-12 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.2 ASTM C645-11a - Standard Specification for Nonstructural Steel Framing Members.

.3 ASTM C754-11 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

.4 ASTM C1002-07 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.5 ASTM C1396/C1396M-09a, Standard Specification for Gypsum Wallboard.

.6 Gypsum Association GA-214-10 - Recommended Levels of Gypsum Board Finish.

.7 ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

PART 2 PRODUCTS

2.1 FRAMING MATERIALS

.1 Studs and Tracks: ASTM C645; galvanized sheet steel, 0.91 mm thick, C shape, with knurled faces.

.2 Slip joint head track: 0.91 thick, galvanized sheet steel, 50 mm deep.

.3 Fasteners: ASTM C1002.

.4 Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

2.2 GYPSUM BOARD MATERIALS

.1 Standard Gypsum Board: ASTM C1396; 16 mm thick type X, maximum available length in place; ends square cut, tapered edges.

.1 Paper facing: no less than 75% recycled.

.2 Gypsum core: no less than 10% recycled content.

2.3 ACCESSORIES

.1 Corner Beads: 0.45 mm thick, galvanized sheet steel, paper faced; tapable.

.2 Edge Trim: GA-201 and GA-216; Galvanized steel or rigid vinyl with 'J' type bead.

.3 Joint Materials: ASTM C475; reinforcing tape, joint compound, adhesive, and water.

.4 Fasteners: To ASTM C1002.

2.4 ACCESS PANELS

.1 Supply flush mounted access doors, for installation by Building Trades in non-accessible type ceilings and walls where necessary for access to service and/or to inspect mechanical equipment and accessories and life safety devices and where specifically indicated.

.2 Construction: 180 degree door swing, mitred rounded safety corners flush welded, concealed hinges, screwdriver latches, and anchor straps or lugs to suit construction, all steel shall be prime coated.

2.5 MATERIALS – RUBBER BASE

.1 Base: ASTM F1861, Type TV thermoplastic vinyl; coved profile; top set; premoulded end stops and external corners:

.1 Thickness: minimum 3 mm.

.2 Heights: 102 mm, unless noted otherwise.

.3 Lengths: roll.

.4 Colours: selected by Departmental Representative from standard colour range.

2.6

PART 3 EXECUTION

3.1 METAL STUD INSTALLATION

.1 Install studs in accordance with ASTM C754 Metal Stud Spacing: 400mm on center.

.2 Install slip joint head track where stud walls meet structure. Allow for 40 mm deflection.

.3 Coordinate installation of bucks, anchors, blocking, electrical and mechanical work placed in or behind partition framing.

3.2 GYPSUM BOARD INSTALLATION

.1 Install gypsum board in accordance with manufacturer's instructions.

.2 Erect single layer standard gypsum board horizontally with ends and edges occurring over firm bearing.

.3 Use screws when fastening gypsum board to metal furring or framing.

.4 Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

3.3 JOINT TREATMENT

.1 Tape, fill, and sand exposed joints, edges, and corners three coats minimum to produce smooth surface ready to receive finishes.

.2 Feather coats on to adjoining surfaces so that camber is maximum 0.8 mm.

3.4 ACCESS PANELS

.1 Install access panels where required to access concealed equipment.

3.5 TOLERANCES

.1 Maximum Variation of Finished Gypsum Board Surface from True Flatness: 3 mm in 3 m in any direction.

3.6 INSTALLATION - BASE

.1 Fit joints tight and vertical. Maintain minimum measurement of 450 mm between joints.

.2 Mitre internal corners. At external corners and exposed ends, use pre-moulded units.

.3 Install base in full bed of adhesive using full spread notched trowel. Cut and fit base neatly at corners, to tight fitting tolerances.

.4 Install base straight and level to maximum variation of 1:1000.

.5 Install base on toe kick of cabinets which occur in rooms and areas where resilient flooring is scheduled.

.6 Scribe and fit to door frames and other interruptions.

.7 Keep joints tight and well fitted.

3.7 CLEANING

.1 Do cleaning in accordance with Section 01 74 11 - Cleaning.

.2 Dispose of waste materials in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

.3 Dispose of excess GWB at the appropriate waste management facility

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C423-02a, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

.2 ASTM E1264-98, Standard Classification for Acoustical Ceiling Products.

.3 ASTM E1477-98a(2003), Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.

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

.1 Material Safety Data Sheets (MSDS).

.3 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC-S102-2003, Surface Burning Characteristics of Building Materials and Assemblies.

1.2 SUBMITTALS

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

.2 Shop Drawings:

.3 Submit shop drawings under the seal of a Structural Engineer registered to practice in the Province of B.C.

.1 Indicate layout of ceiling suspension system, seismic bracing, location and sizes of air diffusers and light fixture support method.

.4 Submit duplicate samples of each type acoustical units indicating color and finish.

.5 Submit duplicate samples of each component of the suspension system.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

.2 Store extra materials required for maintenance, where directed by Departmental Representative.

.3 Waste Management and Disposal:

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

1.4 ENVIRONMENTAL REQUIREMENTS

.1 Permit wet work to dry before beginning to install.

.2 Maintain uniform minimum temperature of 15 degrees C and humidity of 20% before and during installation.

.3 Store materials in work area 48 hours prior to installation.

1.5 EXTRA MATERIALS

.1 Provide extra materials of acoustic units in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide acoustical units amounting to 2% of gross ceiling area for each pattern and type required for project.

.3 Ensure extra materials are from same production run as installed materials.

.4 Clearly identify each type of acoustic unit, including colour and texture.

.5 Deliver to Departmental Representative, upon completion of the work of this section.

Part 2 Products

2.1 MATERIALS

.1 Acoustic units for suspended ceiling system: to ASTM E1264.

.1 Type-3
.2 Class A.
.3 Cellulose fibre with minimum 50 % recycled content
.4 Textures: medium.
.5 Flame spread rating of 25 or less in accordance with CAN/ULC-S102.
.6 Smoke developed 50 or less in accordance with CAN/ULC-S102.
.7 Noise Reduction Coefficient (NRC) designation of 25.
.8 Ceiling Attenuation Class (CAC) rating 35 , in accordance with ASTM E1264
.9 Light Reflectance (LR) range of .85 to ASTM E1477.
.10 Colour: White.
.11 Size 609 x 609 x 19 mm thick.

.2 Acoustical Suspension:

.1 Exposed tee bar grid components: Components: Extruded aluminum. Factory painted, satin sheen. Main tee: 9/16” face profile. Cross tee with integral hook type end detail to form positive interlock with main tee webs.
.2 No visible fasteners.
.3 Hanger wire: galvanized soft annealed steel wire, 3.6 mm diameter for access tile ceilings.
.4 Hanger inserts: purpose made.
.5 Accessories: splices, clips, wire ties, retainers and wall moulding [flush] [reveal], to complement suspension system components, as recommended by system manufacturer.

Part 3 Execution

3.1 EXAMINATION

.1 Do not install acoustical panels and tiles until work above ceiling has been inspected by Departmental Representative.

3.2 APPLICATION

.1 Install acoustical units parallel to building lines with edge unit not less than 50% of unit width, with directional pattern running in same direction. Refer to reflected ceiling plan.

.2 Scribe acoustic units to fit adjacent work. Butt joints tight.

.3 Wherever possible, make lengthwise panel cuts so that individual planks in the ceiling tile pattern remain at full width.

3.3 INTERFACE WITH OTHER WORK

.1 Co-ordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into acoustical ceiling components.

.1 Wherever possible, coordinate installation of these items so that they are centered on individual panels.

3.4 CLEANING

.1 Do cleaning in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 REFERENCES

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

- .1 Material Safety Data Sheets (MSDS).

.2 Master Painters Institute (MPI)

- .1 MPI Architectural Painting Specifications Manual, 2005.

.3 American Society for Testing and Materials (ASTM):

- .1 ASTM D4263-83-2018 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

.4 National Fire Code of Canada – 1995

.5 Green Seal Environmental Standards

- .1 Standard GC-03-97, Anti-Corrosive Paints.
- .2 Standard GS-11-93, Architectural Paints.
- .3 Standard GS-36-00, Commercial Adhesives

.6 South Coast Air Quality Management District (SCAQMD), California State

- .1 SCAQMD Rule 1113-04, Architectural Coatings.
- .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

1.2 SUBMITTALS

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

.2 Product Data:

- .1 Submit product data and instructions for each paint and coating product to be used.
- .2 Submit product data for the use and application of paint thinner.
- .3 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.

.3 Samples:

- .1 Submit duplicate 200 x 300 mm draw down samples of each scheduled paint colour with specified paint colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards.
- .2 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
- .3 Manufacturer's Instructions:
  - .1 Submit manufacturer's installation application instructions.
- .4 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 78 10 - Closeout Submittals include following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour numbers.

1.3 MAINTENANCE

.1 Extra Materials:

.1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 10 - Closeout Submittals.

.2 Quantity: provide one four litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

.3 Delivery, storage and protection: comply with Departmental Representative requirements for delivery and storage of extra materials.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

.1 Pack, ship, handle and unload materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.

.2 Acceptance at Site:

.1 Identify products and materials with labels indicating:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Storage and Protection:

.1 Provide and maintain dry, temperature controlled, secure storage.

.2 Store materials and supplies away from heat generating devices.

.3 Store materials and equipment in well ventilated area.

.5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.

.7 Remove paint materials from storage only in quantities required for same day use.

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

1.5 WASTE MANAGEMENT AND DISPOSAL:

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Unused coating materials must be disposed of at official hazardous material collections site as approved by Departmental Representative.

1.6 SITE CONDITIONS

.1 Surface and Environmental Conditions:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.

.3 Apply paint when previous coat of paint is dry or adequately cured.

.2 Additional interior application requirements:

.1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

.2 Test concrete floor for moisture per ASTM D 4263 prior to application of paint.

Part 2 Products

2.1 MATERIALS

.1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

.2 Provide paint materials for paint systems from single manufacturer.

.3 Conform to latest MPI requirements for painting work including preparation and priming.

.4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.

.5 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.

.6 Paint materials to conform to the requirements of:

.1 Green Seal Environmental Standards.

.1 Standard GS-11-93, Architectural Paints.

.2 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1113-04, Architectural Coatings.

2.2 COLOURS

.1 Departmental Representative to provide interior colour schedule after Contract award

.2 Selection of colours from manufacturers full range of colours.

.3 Where specific products are available in restricted range of colours, selection based on limited range.

2.3 GLOSS/SHEEN RATINGS

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1 - Matte Finish (flat)	Max. 5	Max. 10
Gloss Level 2 - Velvet-Like Finish	Max.10	10 to 35
Gloss Level 3 - Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 - Satin-Like Finish	20 to 35	min. 35
Gloss Level 5 - Traditional Semi-Gloss Finish	35 to 70	
Gloss Level 6 - Traditional Gloss	70 to 85	
Gloss Level 7 - High Gloss Finish	More than 85	

2.4 PAINTING SYSTEMS

.1 Exterior Galvanized metal: Exterior doors and frames.

.1 EXT 5.3J- W.B. Light industrial coating: G5 gloss level finish.

.2 Exterior Trims (comb face)

.1 EXT 6.2A over factory installed primer. Gloss level 3

.3 Interior window sills:

.1 INT 6.3E - Polyurethane varnish finish.

.4 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:

.1 INT 9.2A - Latex –gloss level 4 finish (over latex sealer).

.5 Concrete Slab:

.1 INT 3.2 B Alkyd Floor Enamel. Gloss level 6.

.2 Include broadcast application of non-skid aggregate in floor finish.

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 data sheet.

3.2 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

3.4 PREPARATION

.1 Protection:

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect building occupants and general public in and about the building.

.2 Surface preparation: clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements.

.3 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.4 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Touch up of shop primers with primer as specified.

3.5 APPLICATION

.1 Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

.1 Apply paint in uniform layer using brush and/or roller type suitable for application.

.2 Work paint into cracks, crevices and corners.

.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.

.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.

.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray application:

.1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.

.2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.

.3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.

.4 Brush out immediately all runs and sags.

.5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.

.5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

3.6 SITE TOLERANCES

.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.7 CLEANING

.1 Do cleaning in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

.1 ASTM A167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.2 ASTM B456-03, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

.3 ASTM A653/A653M-09, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.4 ASTM A924/A924M-09, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.2 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).

.2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.81-M90, Air Drying and Baking Alkyd Primer for Vehicles and Equipment.

.2 CAN/CGSB-1.88-92, Gloss Alkyd Enamel, Air Drying and Baking.

.3 CGSB 31-GP-107MA-90, Non-inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.

.4 CSA International

.1 CAN/CSA-B651-04, Accessible Design for the Built Environment.

.2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.2 SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop drawings

.1 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame requirements.

.4 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Tools:

.1 Provide special tools required for assembly, disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00 - Closeout Submittals.

.2 Deliver special tools to Departmental Representative.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's recommendations.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

1.6 WARRANTY

.1 For framed mirrors of this section, 12 month warranty period is extended to 120 months against failure of the silver mirror finish.

Part 2 Products

2.1 MATERIALS

.1 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion sleeves: fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.2 COMPONENTS

.1 Washroom

.1 Toilet tissue dispenser: Single roll type, surface mount, chrome plated steel frame, capacity of 500 double ply roll, roll under spring tension for controlled delivery.

.2 Combination Paper towel dispenser /Waste receptacle: Semi flush mount. Satin finish stainless steel. Door conceals mounting flange. Dispenses multiple styles of paper towels. Removable leak proof 24 L waste container. Barrier free construction.

.3 Mirror: One piece stainless steel channel frame. Bright polished finish. Mirror: 6mm silvered float glass. Galvanized steel back. Concealed wall hanger with theft resistant screws. Size: 762 x1070.

.4 Coat hook: surface mount with concealed fixing, No. 4 satin stainless steel construction, maximum 50 mm projection with blunted end.

2.3 FABRICATION

.1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.

.2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.

.3 Brake form sheet metal work with 1.5 mm radius bends.

.4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

.5 Back paint components where contact is made with building finishes to prevent electrolysis.

.6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CAN/CSA-G164.

.7 Shop assemble components and package complete with anchors and fittings.

.8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.

.9 Provide steel anchor plates and components for installation on studding and building framing.

Part 3 Execution

3.1 MANUFACTURERS 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 INSTALLATION

.1 Do not install accessories until wall have been painted, inspected and accepted.

.2 Install and secure accessories rigidly in place as follows:

.1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.

.3 Use tamper proof screws/bolts for fasteners.

.4 Fill units with necessary supplies shortly before final acceptance of building.

3.3 ADJUSTING

.1 Adjust toilet and bathroom accessories components and systems for correct function and operation in accordance with manufacturer's written instructions.

.2 Lubricate moving parts to operate smoothly and fit accurately.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by toilet and bathroom accessories installation.

3.5 SCHEDULE

.1 Refer to drawings for approximate locations.

.2 Main floor Washroom:

- .1 Toilet paper roll holders: one adjacent toilet.
- .2 Paper towel dispenser:
  - .1 Location as indicated.
  - .2 Confirm clearance in wall cavity.
  - .3 Provide blocking as required for installation.
- .3 Mirrors: one per washroom basin.
- .4 Coat Hooks: 2
  - .1 One located on back of washroom door.
  - .2 One located adjacent to main door.

.3 Final locations directed by Departmental Representative.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Provide means supply and install.

.2 Work means material and labour.

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.

1.3 CODES, REGULATIONS AND STANDARDS

.1 Mechanical work shall conform to the following Codes, Regulations and Standards, and all other Codes in effect at the time of award of Contract, and any others having jurisdiction. The revision of each Code and Standard and their amendments which are adopted by the Authority Having Jurisdiction shall apply unless otherwise specified in the Contract Documents:

- .1 Bylaws
  - .1 Local Building Bylaws.
- .2 Canadian Standards Association
  - .1 CSA Standard B52 Mechanical Refrigeration Code.
- .3 National Fire Codes
  - .1 NFPA 10 Portable Fire Extinguishers.
- .4 National Research Council of Canada
  - .1 National Building Code of Canada - 2015.
  - .2 National Plumbing Code of Canada - 2015.
  - .3 National Fire Code of Canada.
- .5 Province of British Columbia
  - .1 BC Industrial Health & Safety Regulations, WorkSafeBC.
- .6 SMACNA Publications
  - .1 HVAC Duct Construction Standards.
  - .2 Guidelines for seismic restraints of mechanical systems.

.2 All specification references to the Building Code refer to the National Building Code.

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 including service connection fees as applicable to the work of this Section. Comply with all Provincial, Municipal and other legal regulations and bylaws applicable to the work.

.2 Where Authorities Having Jurisdiction provide inspection, arrange for their inspection of all work. On completion of the work, furnish final unconditional certificates of approval by the inspecting authorities.

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 SHOP DRAWINGS

.1 Shop drawings/product data shall be reviewed, signed and processed as described by the Mechanical Contractors Association of British Columbia.

.2 Provide an electronic copy or five (5) hard copies of shop drawings of all equipment on the drawings and specifications to the Departmental Representative for review.

.3 Review or non-review of shop drawings does not alter the requirements of the equipment and materials provided to conform to the specification.

1.10 SEISMIC RESTRAINT

.1 Provide seismic restraints for the piping and ductwork systems and all equipment specified in this Section to meet the requirements of the Building Code, to be in general conformance to SMACNA Guidelines, to keep the equipment in place during a seismic event, to minimize damage to the systems and equipment from a seismic event, to prevent systems and equipment from causing personal injury during a seismic event.

.2 Arrange and pay for the services of a structural Professional Engineer registered in British Columbia referred to here as the Seismic Engineer.

.3 The Seismic Engineer shall review, seal and sign all submittals required for all components, assemblies, attachments and installation procedures for the seismic restraint of all piping, ductwork and equipment installed under this Section.

.4 The Seismic Engineer shall provide all necessary direction to the contractor during installation of the seismic restraint installation and submit a statutory declaration that the final seismic restraint installation conforms to the submittal documents sealed by the Seismic Engineer and satisfies all regulatory requirements.

.5 The Seismic Engineer shall submit Letters of Assurance for the seismic restraint to the Departmental Representative.

.6 The Seismic Engineer shall coordinate attachment to the equipment with the equipment manufacturer to ensure the method and location of attachment of the seismic restraint to the equipment does not compromise the structural integrity of the equipment.

.7 It is the entire responsibility of equipment manufacturers to design their equipment so that the strength and anchorage of the mounting points and internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure during a seismic event of code design magnitude.

1.11 ACCESS DOORS

.1 Provide suitably sized flush mounted access doors in non-accessible type ceilings and walls, where necessary for access to service and/or to inspect mechanical equipment and accessories, life safety devices and where specifically indicated.

.2 Provide stainless steel access doors in wet areas.

.3 Size access doors to accommodate the required access.

1.12 MISCELLANEOUS METAL

.1 Be responsible for all miscellaneous steel work relative to this Section of the Specifications, including but not limited to:

.1 Support of equipment.

.2 Hanging, supporting, anchoring, guiding and related work as it applies to piping, ductwork and mechanical equipment.

.3 Earthquake restraint devices.

.2 All exterior miscellaneous steel shall be hot-dipped galvanized.

.3 All steel work not galvanized shall be primed, undercoat painted and finish painted. On galvanized materials, which are subsequently welded, apply Galvicon.

1.13 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.

1.14 EQUIPMENT INSTALLATION AND ACCESSIBILITY

.1 All work shall be readily accessible for adjustment, operation and maintenance. Supply access doors where required in building surfaces for installation by building trades.

.2 Pipe equipment drains to floor drains.

.3 Ensure that equipment does not transmit noise or vibration to other parts of the building as a result of poor installation practices.

1.15 CUTTING, PATCHING, CANNING AND CORING

.1 Lay out all cutting, patching, canning and coring required to accommodate the mechanical services. Coordinate with other Divisions. Be responsible for correct location and sizing of all openings required under this Section. Allow oversized openings for firestopping, pipe penetrations where continuous insulation is specified and fire dampers.

.2 Openings through structural members of the building shall not be made without the approval of the Departmental Representative.

1.16 ESCUTCHEONS AND PLATES

.1 Provide on pipes passing through walls, partitions, floors and ceilings where exposed to view in finished areas.

.2 Plates shall be stamped steel, split type, chrome plated or stainless steel, concealed hinge, complete with springs, suitable for external dimensions of piping/insulation. Secure to pipe or finished surface. Outside diameter shall cover opening or sleeve.

1.17 IDENTIFICATION

.1 Secure engraved laminated plastic identification tags (black face and white letters) on the following items:

.1 Temperature control devices and equipment.

1.18 OPERATION AND MAINTENANCE MANUALS

.1 Provide maintenance data for incorporation into Operational and Maintenance manual.

.2 Employ the Balancing Agency to prepare the manuals.

.3 Allow sufficient time to provide the final reviewed manuals to the Departmental Representative before Substantial Performance.

.4 Provide one draft copy of the manuals to the Departmental Representative for review. Make all required changes and resubmit to the Departmental Representative. Repeat until accepted. Then submit the following, identical to the accepted copy, to the Owner:

.1 Three (3) hard copies - organized in binders, refer to below.

.2 Two (2) PDF electronic copies (minimum of 600 DPI scanning quality) of full binder contents on CD, DVD, or flash drive.

.5 Obtain a receipt and send a copy to the Departmental Representative. Allow ten days for the first submittal review by the Departmental Representative and seven days for each subsequent review.

.6 The binders shall be 3-ring binder. The maximum overall thickness of the filled binder shall be 100 mm [4”]. Provide multiple binders for each manual as required.

.7 Each binder shall have large clear lettering in a clear label insert on the front cover indicating the name of the project and “OPERATING AND MAINTENANCE MANUAL - MECHANICAL”.

.8 Provide an index and tab each section.

.9 The manual shall include:

.1 Description of the operation of each system.

.2 Air balance report.

.3 Commissioning report.

.4 Copy of any required approvals, certifications and acceptance by Authorities Having Jurisdiction.

.5 List of local source of supply.

.6 Manufacturer’s operating and maintenance literature and wiring and control diagrams.

.7 All shop drawings.

1.19 RECORD DRAWINGS

.1 Site Records:

.1 Keep a set of Contract prints on site for the sole purpose of keeping an up-to-date record marked in red of the installation of the mechanical work where they vary from the drawings.

.2 Changes for all mechanical work and piped site service trades, including sketches for Change Orders and Site Instructions shall be kept on this set of drawings.

.3 Services shall not be concealed until the Site Records are up-to-date for the services.

.4 All inaccessible concealed services shall be accurately located.

.5 Identify each drawing in lower right hand corner in letters at least 10 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" and under this add the Contractor’s name, an authorized signature and the date.

.6 Submit the prints for review by the Departmental Representative. Make any additional changes identified by the Departmental Representative including returning to the site if necessary to make measurements and/or to confirm installation locations and details. Resubmit to the Departmental Representative.

.2 Record Drawings:

.1 The Consultant will prepare record drawings from the As-Built drawings and submit them to the Contractor.

.2 The Contractor shall add the contracting firm’s name and authorized signature and date certifying the drawings as “RECORD DRAWINGS” and return them to the Consultant.

1.20 DEMONSTRATION AND INSTRUCTION TO OWNER

.1 Provide certified personnel to demonstrate and provide maintenance instructions for each mechanical system to the Owner's operating staff.

.2 Provide adjustments of mechanical equipment and any changes or modification in equipment made under terms of guarantee.

.3 Finalize demonstration and instructions by obtaining a signed statement from the Owner that the demonstration and instructions have been given satisfactorily.

1.21 BALANCING AND COMMISSIONING

.1 Employ the Balancing Agency to:

.1 Prepare Operation and Maintenance Manuals.

.2 Commission each mechanical system.

.3 Adjust and balance exhaust air systems to provide the design air quantities (within +10%/-5%) at each inlet.

.4 Submit a report to the Departmental Representative indicating final fan speed, motor operating amperages, system static pressure, filter static pressure, design air quantities and final air quantities obtained.

Part 2 Insulation

2.1 GENERAL

.1 Apply insulation and accessories so that the finished product is smooth and neat and with longitudinal seams concealed from view. Apply insulation, accessories and finishes in accordance with the manufacturer’s recommendations.

.2 Insulation and vapour barrier shall be continuous. Finish and seal insulation at hangers, supports, access doors fire dampers and other insulation protrusions.

2.2 PIPING INSULATION

.1 Materials:

.1 Mineral Fibre - Low and Medium Temperature, vapour barrier jacket. Maximum thermo conductivity: 0.033 W/m-°C at 24°C [0.23 Btu-in/(hr-ft2-°F) at 75°F]:

.2 Flexible Foamed Elastomeric Insulation.

.3 Flexible Closed Cell Insulation.

.4 Tape - self-adhesive, aluminum, reinforced, 50 mm [2”] wide

.5 Vapour barrier jacket adhesive.

.6 Vapour barrier coating on reinforcing membrane or on insulating cement.

.7 PVC Jacket and Fitting Covers:

.1 Staples and PVC self-adhesive tape, plastic pop rivets, staples

.8 Aluminum Jacket:

.1 22 ga. corrugated or smooth aluminum jacketing.

.2 Longitudinal slip joints and 50 mm [2"] end laps.

.3 Factory applied protective liner on interior surface.

.2 Scope:

.1 All domestic hot and cold water supply piping - 25 mm [1”] thickness.

.2 All condensate drain piping - 25 mm [1”] thickness.

.3 Installation:

.1 The insulation shall include provision of a continuous vapour barrier.

.2 Mineral fibre insulation

.3 Spreading staples at 75 mm centres.

.4 Tape over all joints with vapour-barrier adhesive and staples

.5 Fittings - tightly wrapped flexible insulation to full thickness with PVC fitting cover

.3 Scope: Refrigerant Piping

.1 25 mm [1"] thick flexible foamed elastomeric or flexible closed cell preformed piping insulation.

.2 Secure longitudinal and butt joints with adhesive. Insulate all fittings and components.

.4 Pipe Insulation Finishes

.1 "Concealed" insulation will require no further finish.

.2 "Exposed" insulation inside the building shall be finished as follows:

.1 Apply PVC fittings and covers.

.3 "Exposed" insulation outside the building and in the crawlspace shall be finished as follows:

.1 Insulation shall have a vapour sealed vapour barrier jacket.

.2 Over the pipe insulation jacket apply aluminum or PVC weather protecting jacket. The longitudinal seam shall be located to shed water. Secure the jacket using necessary fastenings on approximately 150 mm [6"] centres.

.3 Locate seams on underside and seal all outdoor jacketing watertight.

Part 3 Fire Protection

3.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS

.1 2.3 kg [5 lbs] Extinguisher:

.1 Multipurpose stored pressure rechargeable fire extinguisher, squeeze grip positive on/off operation, heavy duty glossy enamel finish steel cylinder, pull pin safety lock, forged valve, rating for 2-A, 10-B, C with universal wall mounting bracket.

.2 Installation

.1 Install extinguishers on brackets at the building exit door.

.2 Identify extinguishers in accordance with the recommendations of NFPA 10.

.3 Attach a tag or label to extinguishers, indicating the month and year of installation, which provides space for subsequent service date recording.

Part 4 Plumbing Systems

4.1 GENERAL

.1 All work and equipment shall be in accordance with the Building Code and the Authorities Having Jurisdiction.

.2 Tests shall be as follows:

.1 Sanitary drains - hydraulic, 3 m [10 feet] for 8 hours.

.2 Domestic water - hydraulic, 1034 kPa [150 psig] for 8 hours.

4.2 PIPING, VALVES AND FITTINGS

.1 Drainage Piping

.1 ABS drain and waste pipe and fittings.

.2 DWV copper pipe and fittings.

.2 Water Piping

.1 Type ‘L’ copper pipe with cast brass or wrought copper fittings 95/5 Sn/Sb solder.

.3 Hangers and Supports:

.1 Inside the building: Cadmium plated hangers and rods.

.2 For copper pipe: Copper plated or epoxy coated.

.4 Install dielectric couplings at copper piping connections to plumbing equipment of dissimilar material.

.5 Ball Valves:

.1 Lever handle, brass two piece body, blow-out proof stem, PTFE seats, brass ball chrome plated

.2 Sweat ends to ANSI/ASME B16.18, Class 150.

.3 Threaded ends to Class 150.

.6 Strainers:

.1 Bronze body, screwed connections, bronze or stainless steel perforated screen.

.7 Pressure Reducing Valve:

.1 Screwed, bronze or cast iron body.

.8 Backflow preventers:

.1 Double Check Valve Assembly (DCVA).

.2 Factory assembled station complete with inlet and outlet isolation valves.

.9 Water Entry Station Assembly:

.1 Ball valve, strainer, union, DCVA backflow preventer, union, pressure reducing valve, ball valve, bypass with valve.

.10 Trap Primers:

.1 Flow actuated devices piped to the closest plumbing fixture.

.11 Cleanouts:

.1 Nickel bronze to suit floor finish.

.12 Lead Flashings:

.1 2.27 kg [5 lb.] lead - vent terminals.

.13 Pressure Gauges:

.1 Bourdon tube type. Cock and snubber. 100 mm [4”] minimum diameter gauge.

4.3 FIXTURES

.1 Water Closets (WC1) - Floor Mounted, Tank Ultra-low Flush

.1 Close coupled, vitreous china, elongated bowl, 4.8 lpf [1.28 gpf].

.2 White open front seat less cover. Seat shall be compatible with the fixture.

.3 12 mm [1/2”] cold water chrome plated supply with stop.

.2 Lavatory Basin (LB1) - Counter Mounted

.1 Counter mounted, self-rimming, oval, vitreous china lavatory basin with front overflow, mounting assembly, punching to suit trim. Basin size: 394 x 289 mm [15-1/2" x 11-1/4"], overall size: 518 x 286 mm [20-3/8" x 17-3/4"].

.2 Singe lever handle, chrome plated metal construction, 1.9 l/min at 414 kPa [0.5 gpm at 60 psi].

.3 Chrome plated open grid strainer.

.4 Chrome plated P-trap.

.5 12 mm [1/2”] hot and cold water chrome plated supplies with stop.

.3 S1 - Single Compartment, Ledge-Back, 200 mm [8”] Deep

.1 Stainless steel single compartment sink with undercoating, basket strainer, tail piece, clamps, confirm punchings. Compartment size: 410 x 460 x 200 mm [16" x 18" x 8"], overall size: 520 x 510 mm [20-1/2" x 20"].

.2 Singe lever handle, 2-function pull-down kitchen faucets for deck mounting, solid brass fabricated body. 400mm [15-11/16"] high, 240 mm [9 1/2"] gooseneck spout that swings 360°, quick connect hoses. Pull-down wand operates in an aerated or spray mode. Integral check valves in sprayer. 6.8 L/min at 414 kPa [1.80 gpm at 60 psi].

.3 40 mm [1-1/2”] cast brass P-trap. Provide dishwasher trap.

.4 12 mm [1/2”] hot and cold supplies with stops.

Part 5 HVAC Systems

5.1 PIPING, VALVES AND FITTINGS

.1 Pipe Material

.1 Service: Condensate.
Material: DWV copper.

.2 Service: Equipment drains and overflows.
Material: DWV copper.

.2 Pipe Fittings - Copper Pipe

.1 Cast bronze: to ANSI B16.18 or wrought copper and bronze: to ANSI B16.22.

.3 Install piping with all necessary changes of direction, expansion loops, anchors and guides to prevent overstressing the piping and equipment piping connections from thermal expansion and contraction.

.4 Hangers and Supports:

.1 Inside the building: Cadmium plated hangers and rods.

.2 For copper pipe: Copper plated or epoxy coated.

.5 Refrigerant Tubing and Fittings

.1 Tubing:

.1 Processed tubing for refrigeration installation, deoxidized, dehydrated and sealed.

.2 Hard copper tube, type L, to ASTM B88M.

.3 Annealed copper tube to ASTM B280, with minimum wall thickness as per CSA B52.

.2 Fittings

.1 Service: design pressure 300 psig and temperature 250°F.

.2 Brazed: wrought copper to ANSI B16.22 or cast bronze to MIL-F-1183E.

.3 Flanged: bronze or brass, Class 150 and Class 300 to ANSI B16.24.

.4 Flare: Bronze or brass, for refrigeration, to ANSI B16.26.

.5 Long radius type for elbows and return bends.

.3 Joints

.1 Brazing materials shall be SIL-FOS-15 phosphor-copper-silver alloy for copper piping jointed by copper fittings and silver solder for brass fittings.

5.2 DUCTWORK AND ACCESSORIES

.1 General

.1 Construction and installation of ductwork shall meet the standards of the latest editions of the SMACNA duct manuals and ASHRAE handbooks.

.2 The project drawings are diagrammatic. Effort has been made to indicate offsets and transitions, but not all are necessarily shown. Changes may be required to ductwork to avoid interference with structure and other services. Determine all required adjustments prior to fabrication and provided the adjustments without additional cost to the contract.

.3 During construction, protect ductwork openings from the entry of dirt, dust and debris with suitable covers.

.4 Provide flashing and counter flashing on ducts through exterior walls.

.2 Ducts - Galvanized Steel - 500 Pa [2" W.G.] Static Pressure rating

.1 Ductwork Galvanized steel shall be lock forming quality with galvanizing coat both sides to ASTM A525 G90.

.2 Provide 100 mm [4”] flexible connections where ducts connect to fans.

.3 Ducts - Flexible

.1 Flexible duct may not be used on this project.

.4 Ductwork Sealing

.1 SMACNA Seal Classification A for all ductwork and plenums. Duct sealing to meet ASHRAE 90.1 2010 requirements.

Part 6 Controls

6.1 GENERAL

.1 Set up, adjust, test and commission the control system to achieve optimum operation of the HVAC system. This includes sequencing, timing and readjustment, as required. These modifications shall continue through the construction period, commissioning period and warranty period as required to achieve optimum operation of the mechanical system.

.2 This Section is a performance specification clarified in certain sections to establish minimum standard of equipment, installation or level of control. The specification describes the basic functions required but not all of the installation details or components. The Controls Contractor is expected to have sufficient experience to be able to design and estimate the cost of an appropriate control system. Materials and work necessary to achieve a satisfactory result will not be considered extra to the contract.

6.2 ELECTRICAL COMPONENTS, WIRING AND CONDUIT

.1 All control system components to make a complete and operable system, except those supplied as part of packaged equipment controls, but including all auto-sequencing devices and electrical interlocks required to accomplish the sequences specified hereafter. Refer to the electrical equipment schedule, the electrical drawings and the electrical specification Division serving mechanical systems. Materials, equipment, connections and power not provided by the Electrical Division but required for the Control System shall be provided under this section.

.2 All control circuit transformers (120/1/60 or 24/1/60 and as designated).

.3 All control wiring and metallic conduit for mechanical system controls.

.4 Supply, installation and connection of all electric control items.

.5 All wiring and conduit from power distribution system to any control devices needing power.

.6 Coordinate with the Electrical Contractor.

.7 Electrical work installed under this Section shall be to the standards specified under Electrical Division.

.8 Obtain electrical permit.

.9 Carrier System:

.1 All wiring in mechanical service spaces, where exposed to view and all 120 volt wiring shall be run in EMT conduit except the final 900mm [36"] of wiring to all operators and to all sensors subject to vibration shall be run in flexible metallic conduit.

.2 Run wiring not installed in conduit parallel to building lines and support every one meter independent of piping, ductwork, and equipment.

.3 Provide steel fittings with nylon throats for all conduit connections.

.4 Identify each wire and cable at every termination point. Identify conduit with colour bands at no more than 7.5m [25'] intervals and on both sides of walls and floor

6.3 CALIBRATION AND DEMONSTRATION

.1 Set up and calibrate all sensors during the initial start-up of the systems and check, recalibrate and readjust and debug operation as necessary.

.2 Demonstrate the controls system to the satisfaction of the Departmental Representative.

6.4 SEQUENCE OF OPERATION

.1 Split System Heat Pump (HP-1/CU-1)

.1 Mount the wall-mounted controller provided with the air conditioning unit.

.2 Provide all required wiring between the wall-mounted controller, the AC unit and the condensing unit on the roof.

.3 The air conditioning unit's wall mounted controller shall control the operation of the air conditioning unit.

.2 Washroom Exhaust Fan (EF-1)

.1 Electrical Division shall provide a timeclock to control the operation of the exhaust fan.

.3 Forced Flow Heater (FF-1)

.1 Provide a thermostat and wire it to the forced flow heater starter relay.

Part 7 Equipment Schedules

7.1 DOMESTIC HOT WATER TANK - ELECTRIC (T-DHW)

.1 Commercial grade porcelainized glass-lined tank, electric hot water heater, CSA certified, maximum hydrostatic working pressure 1034 kPa [150 psi].

.2 Rigid R-16 polyurethane foam, mineral wool or fibreglass insulation.

.3 Enamelled steel jacket.

.4 Fully automatic controls, manually adjustable thermostat, 120 volt control circuit with fused transformer.

.5 3 year extended warranty certificate.

.6 Complete with pressure and temperature relief valve.

.7 Vacuum relief valve.

.8 Pipe overflow and drain pan to sanitary drain.

7.2 SPLIT SYSTEM HEAT PUMP UNIT (HP-1 / CU-1)

.1 Ductless split heat pump unit.

.2 Indoor unit shall be wall mounted complete with integral CSA approved condensate pump and wall mounted remote control unit.

.3 The outdoor condensing unit shall be mounted on structural support.

.4 HCFC refrigerants shall not be used.

.5 Provide wind baffle suitable and the unit shall be suitable for low ambient operation to –17.8°C [0°F].

.6 Capacity as scheduled.

.7 Controls subtrade shall provide all required wiring between outdoor unit and indoor unit.

.8 Accessories:

.1 Internal condensate drain pump.

7.3 FORCED FLOW HEATER – ELECTRIC (FF-1)

.1 Recessed wall fan heater

.2 Construction: 18 gauge steel front cover, bottom air outlet.

.3 Heating Element: Durable tubular heating element with fins.

.4 Fan: Closed factory lubricated motor, fan delay purges heater of residual heat.

.5 Finish: epoxy/polyester paint.

.6 Integral over-temperature protection.

.7 Control: 24V control relay .

.8 Capacity as scheduled.

7.4 PASSIVE VENTILATION VENT

.1 150 diameter, passive ventilation vent complete with an exterior aluminum exterior wall cap, transfer duct and interior wall diffuser.

7.5 EXHAUST FAN (EF-1)

.1 Ceiling exhaust fan complete with aluminum exhaust grille.

.2 Acoustically insulated cabinet.

.3 Centrifugal fan on rubber isolators.

.4 Integral motor thermal overload protection.

.5 Motor disconnect plug and integral receptacle.

.6 Accessories:

.1 Solid state speed control for balancing.

.2 Backdraft damper.

7.6 AIR GRILLE (TG-1)

.1 Louvered face return air grille, steel, single deflection, 19mm (3/4”) blade spacing, 45°, blades parallel to the long dimension, surface mount, countersunk screw holes.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This Section describes the Common Work Results applicable to electrical disciplines.

1.2 GENERAL

.1 The general conditions and general requirements together with all amendments and supplements contained in the General Specifications shall form an integral part of the electrical specification and will be made part of this contract.

.2 Reference to “Electrical Divisions” shall mean all Divisions 26, 27, 28, 33, 34 and 48 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 Confirm with the architectural plans and specifications the extent and nature of the work and how it will affect the electrical work. Include in the tender sum for any complications or additional work described therein.

.5 Review mechanical plans and specifications for the extent of electrical work required to make mechanical systems complete and include this work in the tender sum.

.6 Review structural plans for limitations of penetrations or inclusions of electrical equipment. In the tender sum, allow for avoiding critical areas with electrical equipment.

.7 Review existing record plans and site conditions for limitations of penetrations or inclusions of electrical equipment. In tender sum, allow for avoiding critical areas with electrical equipment.

.8 Comply with the requirements of the General Contract, and coordinate the installation with all other trades on site.

.9 Confirm on-site the exact location of equipment, outlets, and fixtures and the location of outlets for equipment supplied by other trades.

1.3 WORK INCLUDED

.1 This work shall include the supply and installation of all the necessary materials and apparatus for complete operating systems as indicated on the plans or mentioned in this specification, with the exception of materials or apparatus specifically mentioned to be omitted or to be supplied by Departmental Representative.

.2 Items obviously necessary or reasonably implied to complete the work, shall be included as if shown on drawings and noted in the specifications.

.3 All materials, tools, appliances, scaffolding, apparatus and labour necessary for the execution, erection and completion of the systems described herein shall be furnished. This includes providing lighting and power for own work.

.4 This contract shall include, but is not confined to, the following scope of work:

.1 Underground services

.2 All electrically related civil works, trenching, backfilling, resurfacing

.3 Power distribution equipment
.4 Power connections and outlets
.5 Lighting system
.6 Lighting controls system
.7 Emergency lighting
.8 Data/Communications system
.9 Asbuilt drawings

.5 Complete all electrical connections to equipment and accessories pertaining to this contract and leave all in operating condition to the Departmental Representative's satisfaction.

.6 Remove all existing electrical equipment and material made redundant by this contract or in conflict with work to be carried out. Reroute, reinstall or replace existing electrical material that becomes necessary due to work carried out by this contract so a complete working electrical system will be retained in all areas affected by this installation.

.7 Whether indicated or not on electrical plans, provide a dedicated 120 volt circuit fed from a 15 amp 1-pole circuit breaker to all DDC control panels. Confirm final locations and quantities with Mechanical Contractor and Mechanical Drawings.

.8 Provide 120 volt power source to mechanical equipment for internal lights and receptacles, whether indicated on electrical plans or not. Confirm final locations and quantities with Mechanical Contractor and Mechanical Drawings.

.9 For renovation projects with existing 347 volt luminaires, retrofit all existing luminaires with luminaire disconnect.

1.4 WORK EXCLUDED

.1 The contract scope of work shall not include the following:

.1 Low voltage mechanical systems control wiring where indicated in electrical and mechanical specifications to be done by controls contractor shall be excluded from the electrical contractor work as noted.

1.5 DRAWINGS AND SPECIFICATIONS

.1 The drawings and specifications compliment each other and what is called for by one is binding as if called for by both. If there is any doubt as to meaning or true intent due to a discrepancy between the electrical drawings and specifications, and all other contract documents, obtain written ruling from Departmental Representative prior to tender closing. **Failing this, the most expensive alternative is to be allowed for.**

.2 The plans show the approximate location of outlets and apparatus but the right is reserved to make such changes in location as may be necessary to meet the emergencies of construction in any way. No extra will be allowed for such changes to any piece of electrical equipment unless the distance exceeds 3 metres, or if the relocation is required after initial installation is complete.

.3 It is imperative that the contractor visit the site and completely familiarize himself as to the work to be undertaken.

1.6 CODES AND STANDARDS

.1 All electrical work shall be carried out in accordance with the latest edition of the CEC C22.1 (Canadian Electrical Code) as amended and adopted by the Province of British Columbia and to the satisfaction of the Electrical Inspection Authority having jurisdiction, except where specified or specifically stated otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1 latest edition, except where specified or specifically stated otherwise.

.3 All work shall be carried out in accordance with the National Building Code current edition (including all local amendments) to the satisfaction of local building inspector authority having jurisdiction.

.4 Any electrical material and/or equipment supplied by any contractor or sub-contractor for installation on this project must bear evidence of CSA approval or special CSA certification acceptable to the Chief Electrical Inspector for the Province of British Columbia.

1.7 CARE, OPERATION AND START-UP

.1 Instruct Departmental Representative and Operating Personnel in the operation, care and maintenance of systems, system equipment and components.

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

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

1.8 VOLTAGE RATINGS

.1 Operating voltages: to CAN3-C235 latest 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.

1.9 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay all associated fees.

.3 Fees will cover all routine inspections by the District Electrical Inspector. Any fees for follow-up inspections found to be necessary by the District Electrical Inspectors as a result of incorrect work shall be borne by this contractor without any cost to the Departmental Representative.

.4 Notify Departmental Representative of changes required by Electrical Inspection Department prior to making changes.

.5 Furnish Certificates of Acceptance from Electrical Inspection Department authorities having jurisdiction on completion of work to Departmental Representative.

.6 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work. Obtain electrical permit and pay associated fees.

.7 Departmental Representative will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost to the Contractor.

.8 Furnish to Departmental Representative on completion of work Certificates of Acceptance from Electrical Inspection Department.

1.10 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with the Construction Waste Management Plan as established by the Construction Manager.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal: paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

.5 Fold up metal banding, flatten and place in designated area for recycling.

1.11 SINGLE LINE ELECTRICAL DIAGRAMS

.1 Provide single line electrical diagrams under plexiglass in glazed frames as follows:

.1 Electrical distribution system: locate in main electrical room.

.2 Electrical power generation and distribution systems: locate in power plant rooms.

.2 Drawings: 600mm x 600mm minimum size.

1.12 LOCATION OF OUTLETS

.1 Locate outlets in accordance with these specifications and as indicated on the Architectural and Electrical drawings.

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

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

.4 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

.5 Provide 120 volt power to all Direct Digital Control (DDC) panels indicated on Mechanical Drawings and Specifications, where shown or not on Electrical Drawings.

1.13 MOUNTING HEIGHTS

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

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

.3 Install electrical equipment at following heights unless indicated otherwise on the Architectural and Electrical drawings.

.1 Local switches: 1400 mm.

.2 Wall receptacles:

.1 General: 300 mm.

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

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

.4 In mechanical rooms: 1400 mm.

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

.4 Telephone and interphone outlets: 300 mm.

.5 Pay Telephone Outlets: 1194mm

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

.7 Fire alarm stations: 1200 mm.

.8 Fire alarm bells: 2100 mm (or if in conflict with ceiling, 300mm below ceiling).

.9 Television outlets: 300 mm.

.10 Wall mounted speakers: 2100 mm.

.11 Clocks: 2100 mm.

.12 Door bell pushbuttons: 1500 mm.

1.14 LOAD BALANCE

.1 Measure phase current to panelboards with normal loads (lighting and mechanical) 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 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State voltage, time and date at which each load was measured.

1.15 CONDUIT AND CABLE INSTALLATION

.1 Install flashing and gooseneck assembly for all roof penetrations for running cables to serve roof mounted equipment.

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

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

1.16 EXTRA WORK

.1 Any extra work ordered to be done shall be governed by this specification unless specific instructions or clauses are contained in the Change Order. In such cases, these instructions or clauses shall supersede those of the specification for this particular application only.

1.17 FIELD QUALITY CONTROL

.1 All electrical work to be carried out by qualified, licensed electricians or supervised apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks. The activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

.2 The work of this division to be carried out by a contractor who holds a valid Master Electrical Contractor License as issued by the Province that the work is being conducted.

.3 Conduct and pay for following tests:

.1 Power and distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and lighting control.

.4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.5 Systems: communications.

.4 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

.5 Insulation resistance testing:

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

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

.3 Check resistance to ground before energizing.

.6 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.7 Submit test results for Departmental Representative's review.

1.18 CO-ORDINATION OF TRADES

.1 Consult with Construction Manager and all subtrades involved to confirm the location of the various outlets and equipment, and cooperate fully to ensure that no conflict arises during the installation.

.2 Special care shall be taken that equipment, outlets, junction boxes or pullboxes will not be obstructed by other structure, equipment, pipes or ducts installed under this general contract by other trades.

.3 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 Departmental Representative, without the Departmental Representative’s written approval.

.4 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.

.5 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.

.6 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.

1.19 SUBSTITUTIONS

.1 Unless otherwise noted on the plans or specifications, substitutions may be approved by the Departmental Representative if requested by the contractor or by equipment suppliers, for items specified by the manufacturer's catalogue number.

.2 Requests for approval of such substitutions shall be submitted at least five (5) working days prior to the tender closing date.

.3 Complete description and data sheets of proposed substitution shall accompany the application and supplier must be prepared to submit samples for approval on short notice.

.4 Proposed substitutions must be at least of equal quality to that of the specified item. The manufacturer's specification of the specified item shall apply for comparison if no other clause of this specification applies. The decision of the Departmental Representative to accept or reject shall be final.

.5 Off-the-shelf items such as standard boxes, EMT, which are specified by description only or indicated on the drawings, without any manufacturer, model, type or catalogue number, do not require approval prior to the tender closing date.

.6 Submit list of alternates used, within one week after acceptance of tender.

1.20 PROTECTION OF EQUIPMENT

.1 This contractor shall provide and ensure maximum protection of electrical equipment on the site. Electrical equipment, including existing electrical equipment, shall be kept clean and dry at all times and caution shall be taken to ensure no mechanical damage is done to the equipment. Equipment shall not be delivered to the site until it can be stored safely or placed in final position and the space is clean.

1.21 DAMAGES

.1 If the finish of electrical equipment is damaged either when received or during installation, have such equipment completely refinished and restored to its original condition at no cost to the Departmental Representative.

.2 Irreparably damaged equipment shall be replaced at no cost to the Departmental Representative.

1.22 SHOP DRAWINGS

.1 Submit shop drawings, product data and samples in accordance with the contract specifications.

.2 Shop drawings and product data shall indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.

.3 Where applicable, include wiring, single line and schematic diagrams.

.4 Include wiring drawings or diagrams showing interconnection with work of other sections.

.5 Prior to manufacture of any item made specifically for this job, submit detailed drawings of the item through the Construction Manager.

.6 Shop drawings must be received by the Departmental Representative at a date early enough to permit reasonable study prior to approval and manufacture, or to permit alterations where necessary. Late submissions of shop drawings will be sufficient reason for a stoppage of construction pending approval, or removal and replacement of any unsatisfactory item at the contractor's expense.

.7 Shop drawings/product data content:

.1 Shop drawings submitted title sheet.

.2 Data shall be specific and technical.

.3 Identify each piece of equipment.

.4 Information shall include all schedule 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.

1.23 CUTTING AND PATCHING

.1 This contractor is responsible for all cutting or blocking out required to install electrical equipment.

.2 If this contractor makes excessive cuts or does not coordinate work so that finished work requires cutting or patching, then this contractor shall pay for all patching to original condition.

.3 Any dispute resulting from this shall be referred to the Departmental Representative for decision.

.4 Prior to any major cutting of walls or floor, review the proposed location, size and method with the Departmental Representative. This includes notification when cutting or coring into any fire rated construction.

1.24 FIRE STOPPING

.1 Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of ULC or cUL firestop systems to be used and manufacturer's installation instructions to comply with Section 01 33 00.

.2 Submit material safety data sheets provided with product delivered to job-site.

.3 Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary training to install manufacture’s products per specified requirements. A supplier’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.

.4 The work is to be installed by a contractor with at least one of the following qualifications:

.1 FM 4991 Approved Contractor

.2 UL Approved Contractor

.3 Hilti Accredited Fire Stop Specialty Contractor

.5 Installer shall have minimum 3 years of experience with fire stop installation.

.6 Seal all openings for conduit or sleeve penetrations in fire rated and smoke rated separations using approved materials.

.7 All block outs and access slots to be sealed using approved fire stopping assembly. Provide full details for all fire stopping applications as they relate to each application.

.8 Provide shop drawings for all fire stopping products, including assembly details as it relates to each application. Products shall be ULC approved as an assembly.

.9 Allow for the destructive testing of 10% of fire stopping applications. Should installations not conform to manufacturer’s details, an additional 25% of installation will be destructively tested and should there be more failures, the contract OR will be responsible to remove all fire stopping products and reinstall products correctly, at no additional cost to the Departmental Representative.

1.25 PROTECTION OF EXPOSED LIVE EQUIPMENT

.1 Protect exposed live equipment during construction for personnel safety.

.2 Shield and mark live parts "LIVE 120 VOLTS", or with appropriate voltage.

.3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

1.26 SPRINKLER PROTECTION

.1 Provide drip covers or CSA Type 2 enclosure for all new surface mounted panelboards and cabinets in sprinklered rooms.

.2 Provide drip covers for all communications backboards in sprinklered rooms.

.3 Provide sprinkler covers for all communications racks in sprinklered rooms.

1.27 INSPECTIONS AND TESTS

.1 Notify the Departmental Representative and authorities having jurisdiction at least five (5) working days in advance when the installations will be ready for inspection or testing.

.2 Test reports, signed by all attending authorities, shall be submitted to the Departmental Representative through the General Contractor after successful completion of an inspection or test.

.3 Conduct all tests in a thorough and complete manner to the satisfaction of the Departmental Representative and pay for any fees incurred to complete tests.

.4 Furnish the Departmental Representative with a copy of Certificate of Inspection from B.C. Electrical Safety Branch indicating that all work has been satisfactorily completed and issued prior to final connection.

1.28 CLEAN UP

.1 Vacuum clean all new raceways and any electrical equipment. Ensure that no debris or spare parts are left in any electrical equipment.

.2 Any scrap material shall be removed from the site and disposed of by the Contractor.

.3 At time of final cleaning, clean lighting reflectors, lenses and other lighting surfaces that have been exposed to construction dust and dirt.

1.29 SURPLUS MATERIALS

.1 All material removed from existing site and not being reused in this contract shall be the property of the Departmental Representative and delivered as directed by the Departmental Representative’s representative. Material as it becomes surplus shall be reviewed by the Departmental Representative's representative and that part considered of value to the Departmental Representative shall be classed as surplus material, all other becomes scrap material, and shall be disposed of by the contractor.

1.30 AS BUILT DRAWINGS

.1 Obtain two (2) sets of white prints for the sole purpose of recording changes in installation as they occur. One (1) set is to be used in the field for day-to-day recording, and one (1) set for submittal after completion.

.2 These plans shall be kept up-to-date as changes occur and shall be available to be inspected by the Departmental Representative.

.3 Arrange and pay for the incorporation of any "as-built" changes to digital PDF plans and AutoCAD (Revit) plans on disks. These changes shall be of similar quality of presentation as the original plans. NOTE: All plans whether requiring as-built changes or not, shall be included in this disk.

.4 **Should the contractor require the Departmental Representative to prepare the as-built CAD (Revit) disk, the cost would be $275 per plan, unless excessive changes have been required. Costs associated with such excessive changes should be included with the change orders.**

.5 Update costs for the Revit model will be determined based on the extent of the work required.

.6 These amended drawings shall be given to the Departmental Representative at time of final inspections.

.7 "As-built" drawings shall include the location and circuit numbers of junction boxes in ceiling spaces, and all conduit placed in or under poured concrete. Note normal depth of conduits below top of concrete slab.

1.31 OPERATING AND MAINTENANCE MANUALS

.1 Submit **four sets** of operating and maintenance manuals for equipment or as requested by the general section of the contract. Include descriptive and technical data, all shop drawings, operating procedures, routine and preventative maintenance, wiring diagrams, spare parts lists, warranties, service companies, suppliers for replacement parts, test results, fire alarm certificate of verification, electrical inspection authority certificate and contract guarantee.

.2 Submit documentation in **green colored** heavy duty three ring binders, with lettering on spine identifying: "OPERATING AND MAINTENANCE MANUAL", project title and system names.

.3 Submit one copy for approval by Departmental Representative prior to assembly of final sets.

1.32 DEMONSTRATION OF SYSTEMS

.1 Instruct Departmental Representative and operating personnel in the operation, care and maintenance of equipment.

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

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

1.33 WARRANTY

.1 Within a period of one year from the date of final acceptance of work, replace or repair at own expense any defect in workmanship or material. Reused material shall be operating satisfactorily at the time of final acceptance, but subsequent failures are not the responsibility of this contractor.

.2 Warranties for equipment having more than one-year guarantee shall be made out to Departmental Representative, and copies shall be provided in the maintenance manuals.

.3 Maintenance from manufacturer and contractor of all equipment shall be included for first year, including all lamps except incandescent.

1.34 PAINTING

.1 Arrange and pay for the painting of the devices noted in these specifications, in particular:

.1 exposed conduits and conduit fittings.

.2 Painting shall be to match colour and finish of adjacent walls, with at least two coats of sprayed enamel paint to the satisfaction of the Departmental Representativ.

1.35 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Provide a coordination/protective study and short circuit study of all equipment specified herein and submit for review.

.2 Include the following:

.1 12/25 kV cable thermal damage curves

.2 12/25 kV and 600V air circuit breaker overcurrent, overload, and ground fault devices

.3 347/600 and 120/208V panelboards, MCCs, emergency generator and switchgear, connecting feeder cables

.4 25 kV and 600V transformer damage curves, magnetizing currents for the transformer

.5 Locked rotor currents, acceleration times and damage curves for motors 75 HP and larger

.6 Generator overcurrent device, generator short circuit curves

.7 Any additional data necessary for successful completion of the coordination and short circuit study

.3 Data shall clearly state the operating time in cycles of each breaker and indicate whether the time current curves for relays are inclusive of breaker trippings time or otherwise.

.4 Prepare a summation chart showing all ratings and settings with easy reference to the appropriate curve.

.5 Symmetrical and asymmetrical fault current calculations shall be submitted to verify the correct choice of the protective elements of the system.

.6 Prepare a systems single line diagram on which the resultant short circuit values, device numbers and equipment ratings are shown.

.7 Include a list of recommended settings for each relay.

.8 Prepare an arc fault analysis including all labelling for equipment.

.1 Arc fault labels to indicate system voltage, fault level and PPE level required.

.9 Qualifications

.1 This study shall be provided by the supplier of the main switchboard.

.2 This study shall be performed by and bear the stamp and signature of a Professional Engineer registered in the Province of British Columbia.

.3 Relay style, CT ratios and fuse sizes have been selected on a preliminary basis for design purposes. Final selection shall be based on the results of this study and shall be included at no extra cost.

.10 Submittals

.1 Submit the complete study for review prior to carrying out calibration and verification.

.2 Submit typed results of coordination and short circuit study in maintenance manuals.

1.36 ARC FLASH HAZARD ASSESSMENT

.1 The Electrical Contractor is to include in tender sum a cash allowance to retain the services of an Electrical Engineer to perform an arc flash hazard assessment of electrical power distribution equipment installed under this contract in accordance with NFPA-70E requirements and IEEE-1584 Guidelines. Refer to "Cash Allowances and Separate Prices" in this Section.

.2 Arc flash hazard assessment is to take place at time of completion of power distribution equipment installation and is to include power system wide short circuit and protective device coordination study of the electrical equipment installed to determine arc flash hazard threshold incident energy level boundaries and PPE requirements at each distribution panel installed.

.3 Printed warning labels to be provided for installation by the Electrical Contractor at each panel indicating the following:

.1 Flash hazard boundary (inches)

.2 Cal/cm^2 Flash hazard at 18 inches

.3 PPE level and required protective equipment

.4 Shock hazard in KV when cover is removed

.5 Available fault current level in KA

.4 Single line drawing of the power distribution system indicating let-through energy level of each protective device and required PPE at each piece of equipment will be provided by the Engineer for posting by the Electrical Contractor under clear polycarbonate cover in the main electrical room.

.5 Include copy of arc flash assessment in with maintenance manuals.

Part 2 Products

2.1 MANUFACTURERS AND CSA LABELS

.1 Visible and legible, after equipment is installed.

2.2 MATERIALS AND EQUIPMENT

.1 Equipment and materials shall be NEW, CSA certified, and manufactured to standard quoted.

.2 Where there is no alternative to supplying equipment which is not CSA certified, contractor shall obtain special prior approval from DFO RPSS Departmental representative. CSA equivalent inspection to be performed prior to being put into service.

.3 Contractor shall use products of one manufacturer to match existing, including classification, unless otherwise specified.

.4 Unless otherwise specified, Contractor shall comply with manufacturer's latest printed instructions for materials and installation methods.

.5 Contractor shall deliver, store and maintain materials with manufacturer's seals and labels intact.

.6 Contractor shall not store materials on site without DFO RPSS Site Authority approval.

.7 DFO RPSS accepts no responsibility for Contractor materials or equipment stored on site.

.8 Contractor shall supply shop drawings and manufacturer's instructions and specifications on all new installations for inclusion in the building inventory.

.9 Where the contractor supplies equipment purchased from a contractor manufacturer, the Contractor shall obtain from the Manufacturer the normal warranty period and such warranty shall be made out to Her Majesty the Queen in right of Canada.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on the electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule.

.2 Control wiring and conduit is specified in Divisions 26,and 27 except for conduit, wiring and connections below 50 V which are related to control systems specified in Mechanical Specifications and shown on mechanical drawings.

2.4 WARNING SIGNS

.1 As specified and to meet the requirements of the BC Electrical Inspection Authority and the Departmental Representative.

.2 Decal signs, minimum size 175mm x 250mm.

2.5 FINISHES

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

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

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

2.6 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.2 Nameplates:

.1 Lamicoid 3mm thick plastic engraving sheet, mechanically attached with self tapping screws.

.2 Nameplate colors shall be as follows:

.1 Normal power: Black face with white letters;

.2 Life safety emergency power: Red face with white letters;

.3 Standby power: Blue face with white letters.

.3 Nameplate sizes shall be as follows

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 Labels:

.1 Embossed plastic labels with 6mm high letters unless specified otherwise.

.4 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.

.5 Allow for average of twenty-five (25) letters per nameplate and label.

.6 Identification to be English

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

.8 *Identify equipment with Size 3 labels engraved "ASSET INVENTORY No. [___]".* Number as and if directed by Departmental Representative.

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

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

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

2.7 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 latest edition.

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

2.8 CONDUIT AND CABLE IDENTIFICATION

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

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

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

	Prime	Auxiliary
250V regular	Yellow	
250V UPS	Yellow	Orange
250V Emergency	Yellow	Red
600V Regular	Yellow	Green
600V UPS	Yellow/Green	Orange
600V Emergency	Yellow/Green	Red
5kV	Yellow	Blue
25kV	Yellow	Black

	Prime	Auxiliary
Ground	Green	
Telephone	Green	Black
Data	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other security	Red	Black
DDC	Orange	

Part 3 Execution

3.1 NOT USED

.1 Not Used.

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 Departmental Representative, 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 Departmental Representative.

.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 (4) 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 Departmental Representative. 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 flash drive in the latest version of Acrobat.

.2 Flash drive to be reproducible by Departmental Representative 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 Departmental Representative are to be completely interactive allowing the Departmental Representative 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 Departmental Representative 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 Departmental Representative.

.9 In addition to the specified hardcopy, provide an electronic copy in pdf format. Electronic copy to be produced on a flash drive in the latest version of Acrobat.

.1 Flash drive to be reproducible by Departmental Representative 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 Departmental Representative are to be completely

interactive allowing the Departmental Representative 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 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 or Departmental Representative.

.4 Project shall comply with the local bylaw where applicable.

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

1.3 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 [4 ft] 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 Representatives for their reference.

3.3 FLOOR MOUNTED EQUIPMENT

.1 Bolt all equipment, e.g. transformers, switchgear, generators, motor control centres, free standing panelboards, control panels, capacitor banks, etc. to the structure. 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 EXCAVATION AND BACKFILL

.1 Check the drawings of other Divisions of the work for the existence of underground services, and report any serious interference before proceeding with the work. The services of Utility Authorities shall be engaged to accurately determine the location of any underground services prior to excavation.

.2 Carefully coordinate duct bank location below building with the structure.

.3 In the execution of this work, or any extra work in connection therewith, do not move any structure or services without the consent of the proper parties. In crossing or running parallel with said structures or services, secure same in place until the work is completed. Any damage to structures or services of this kind caused by neglect to attend to same shall be paid for by the Contractor.

.4 Keep excavations dry at all times by bailing, pumping, or other means as is necessary.

.5 Prove grades and the route of ductwork and conduits and the location of manholes far enough along the route in advance of forming and concrete pour so that any relocation or re-design necessitated by unforeseen obstacles may be carried out.

.6 Grade the bottom of trenches for ducts, duct banks and conduit and level with pit-run gravel and sand, graded from coarse to fine with a maximum size of 38mm. Where excavation is carried out to a depth greater than that required for the proper elevation for the ducts, duct bank, or conduit, backfill with carefully compacted and power-tamped sand and pit-run gravel as specified to the required grade.

.7 Backfill trenches under building floor areas with sand placed in layers in an approved manner to achieve 95% modified Proctor compaction. Material from excavation shall not be used for backfilling.

.8 In locations other than under building floor areas, thoroughly tamp same around and over ducts and conduits to a height of at least 300mm above. Fill remainder of trench and consolidate on 450mm layers with approved excavated materials, free from stone and foreign materials.

.9 Except where beneath the building, supply and install polyethylene HIGH VOLTAGE marking tape over and along the full length of underground services at a depth of 300mm below grade.

.10 Backfill the top 150mm of the excavation with pit-run gravel where the excavation is situated on a paved or travelled road; crushed rock screenings where the

excavation is situated on a concrete sidewalk; black loam where the excavation is on a developed grass boulevard; and sand or earth free of clay, extraneous material, or rock no larger than 38mm in any dimensions elsewhere. All shall be thoroughly tamped. Where area was originally grassed, rake loam clear of all stones and debris and leave ready for re-sodding.

.11 Backfill as soon as possible, so that regular traffic in and around the work will not be inconvenienced.

.12 Fill depressions to restore the correct grade after a period adequate to reveal settlement has passed. Restore all surfaces (paving, sidewalk, grass) to same quality as the surroundings. Assume responsibility for making good any subsequent settlement of such fill. Pay costs involved in making good pavement, surfacing lawns, curbs and all other surfaces damaged by such settlement and subsequent restoration.

.13 Store materials excavated during the progress of the work in such locations as directed by the Departmental Representative and in such a manner as to produce a minimum of inconvenience, damage or disfigurement of existing ground.

.14 Remove and dispose of excess excavated material remaining on completion of the work and leave site clear and unencumbered.

1.3 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 penetrations of vapour barrier, maintain integrity of the system. Restore penetrations through existing surfaces to match the surroundings.

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

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

1.4 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.

1.5 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 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 Departmental Representative 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 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

- .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

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 Clamp for stranded aluminum conductors round aluminum bar.
- .4 Stud clamp bolts.
- .5 Bolts for copper conductors and bar.
- .6 Bolts for aluminum conductors and bar.
- .7 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 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.

.2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2No.65.

.3 Install fixture type connectors and tighten. Replace insulating cap.

.4 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 Aluminium conductors only permitted where indicated on drawings and then typically only for feeder conductors larger than 3/0 AWG. All conductor sizes indicated on drawings are based on copper conductors unless otherwise noted.

.3 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.

.4 BX, PVC and aluminum conduit not acceptable, except for short flexible connections to light fixtures from conduit boxes, not to exceed 2 meters in length, per cable 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 conductors, except where permitted by the IOS Site Authority or representative.

.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 unless otherwise noted on drawings. 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 [3’] 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.

.9 Where cabling is required to be protected by a minimum of 1-hour (or greater) fire rating the electrical contractor shall provide 2 hour rated cabling (Vitalink Armored cabling or Vitalink Ethernet for communications). All installation methods shall meet the manufacturers recommendations and UL 2196 and CAN/ULC-S101 requirements. Note: fire rated shafts for conductors is not an acceptable method of fire protection.

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors: copper and sized as indicated.

.3 Insulation: Chemically cross-linked thermosetting polyethylene rated type RW75XLPE,600V

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: flat galvanized steel.

.6 Overall covering: PVC jacket with FT-4 flame spread rating. PVC flame retardant jacket over armour meeting requirements of Vertical Tray Fire Test of CSA C22.2 No. 0.3 with maximum flame travel of 1.2 m.

.7 Fastenings:

.1 One (1) hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two (2) or more cables.

.3 Threaded rods: 6 mm dia. to support suspended channels.

.8 Connectors: Watertight approved for TECK cable

2.3 ARMOURED CABLE (AC-90)

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90 600 V rated.

.3 Armour: interlocking type fabricated from galvanized steel.

.4 Anti-short connectors.

.5 AC-90 cable is only to be used for extending from ceiling mounted junction box to device boxes mounted on suspended accessible ceiling (3m maximum length), or where expressly permitted by the Departmental Representative.

2.4 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 Copper conductors with R90 insulation.

.2 Lugs, terminals, screws used for termination of wiring to be suitable for copper conductors.

.3 Install all cables and wiring.

.4 Conductor length for parallel feeders to be identical. Provide permanent plastic nametag indicating load fed.

.5 Group Teck, Armoured, & Sheathed cables on channels wherever possible.

.6 Lace or clip groups of feeder conductors at all distribution centres, pullboxes, and termination points.

.7 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.

.8 All grounding and bonding conductors and straps to be copper. All bonding conductors to have green insulation jacket.

.9 Colour coding to be strictly in accordance with Section 26 05 00 – Common Work Results.

.10 Provide sleeves where cables enter or exit cast concrete or masonry.

.11 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.

.12 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.

.13 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.

.14 Install all control cables in conduit.

.15 Provide numbered wire collars for all control wiring. Numbers to correspond to control drawing legend. Obtain wiring diagram for control wiring of other Divisions.

.16 Life safety cabling required to have 1-hour fire rating or better shall be VITALink cabling; installing regular cabling in a fire rated shaft is not acceptable. When VITALink is installed, the installation must meet UL 2196 and CAN/ULC-S101 requirements.

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 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 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE) – most recent version

.1 ANSI/IEEE 837, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

.2 Grounding equipment to: CSA C22.2 No.41.

.3 All grounding conductors to be stranded soft annealed copper unless otherwise noted.

.4 Install complete grounding and bonding system in accordance with Canadian Electrical Code and local inspection authority requirements.

.5 ANSI/TIA 607B Generic Telecommunications Bonding and Grounding for Customer Premises.

PART 2 PRODUCTS

2.1 EQUIPMENT

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

.2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, soft annealed, size as indicated.

.3 Grounding conductors: bare stranded copper, tinned, soft annealed, size as per C.E.C.

.4 Insulated grounding conductors: green, copper conductors, sized as per C.E.C.

.5 Ground bus: copper, complete with insulated supports, fastenings, connectors.

.6 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Bolted type conductor connectors.

.4 Thermit welded type conductor connectors.

.5 Bonding jumpers, straps.

.6 Pressure wire connectors.

2.2 STANDARDS OF ACCEPTANCE

.1 Acceptable manufacturers:

.1 Burndy Corp.

.2 Erico Inc.

.3 Cadweld.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.

.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

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

3.2 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process, permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Install bonding wire in EMT conduits.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Install separate ground conductor to outdoor lighting standards.

.10 Connect building structural steel and metal siding to ground by welding copper to steel.

.11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.12 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

.13 Provide a grounding/bonding bus in each electrical room and in the Generator room. Connect a #2/0cu bonding conductor or as shown on the drawings between grounding/bonding buses.

.14 All bonding and grounding connections to be compression type unless noted otherwise.

.15 Bond bonding bus of switchboard to the grounding grid with a #3/0 copper conductor.

.16 Ground the secondary winding of potential and current transformers.

.17 Supply and install complete grounding and bonding system as indicated and as required by Canadian Electrical Code and the local electrical inspection authorities.

.18 All components shall be securely and adequately bonded and where required to accomplish this, bonding jumpers, grounding studs and bushings shall be used.

.19 Ensure that all raceways, terminal panels, etc. for fire alarm, etc. are securely and adequately bonded and provide grounding conductor to main ground bus where called for or when required.

.20 All interior metallic gas piping which may become energized to be made electrically continuous and to be bonded in accordance with requirements of Canadian Electrical Code.

.21 Bond all low tension equipment with #6 AWG green insulated bonding conductor.

.22 Bond all structural steel, all concrete reinforcing steel and all metal systems with a #6 AWG copper bonding conductor. Connect to closest ground bus or bonding point.

.23 All metallic conduits longer than 1m in length, containing a single grounding or bonding conductor, shall be bonded as per the Canadian Electrical Code.

3.3 MAINTENANCE HOLES

.1 Install conveniently located grounding stud, electrode, size as indicated stranded copper conductor in each maintenance hole.

.2 Install ground rod in each maintenance hole so that top projects through bottom of maintenance hole. Provide with lug to which grounding connection can be made. Confirm ground resistance meets or exceeds Canadian Electrical Code minimum requirements.

3.4 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of 120/240 V system.

3.5 EQUIPMENT BONDING

.1 Install bonding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, UPS units, elevators and escalators, distribution panels, outdoor lighting and cable trays.

.2 Provide a bonding conductor from the secondary of every distribution transformer to the grounding system. Bond conductor to be sized and installed in accordance with Canadian Electrical Code.

3.6 MECHANICAL EQUIPMENT BONDING

.1 Provide a #2 bond conductor from the mechanical room ground bus to each MCC.

.2 Provide a #6 bond conductor from the mechanical room ground bus to each VFD

.3 Bond wires to be installed in all conduit serving motor feeder circuits and to extend to ground screws on junction and outlet boxes for bonding.

3.7 COMMUNICATION SYSTEMS

.1 Install Bonding connections for telephone, sound, fire alarm, security systems, intercommunication systems as required in ANIS/TIA 607B:

.1 Utility Provider grounding system in accordance with telephone company's requirements.

.2 Communication, sound, fire alarm, security systems, intercommunication systems as indicated.

3.8 SYSTEMS BONDING

.1 Install a home run #6 AWG insulated bonding conductor in conduit from the main ground bus to the:

.1 Surveillance cabinet.

3.9 POST MOUNTED LUMINAIRE BONDING

.1 Provide #10 AWG bonding conductor with green RW90 X-link insulation to luminaire standards. Connect to luminaire corrosion resistant ground stud or ground clamp.

3.10 LABELLING

.1 Provide equipment identification labelling nameplates for grounding bus bar, bonding and grounding conductors.

.2 Apply identification and warning labels to grounding bus bar, bonding and grounding conductors.

3.11 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 08 00 – Commissioning and Demonstration.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

PART 1 GENERAL

1.1 RELATED 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 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs, connection bars to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three spare terminals on each set of lugs in splitters less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

2.3 CABINETS

.1 Type E: sheet steel, hinged door and return flange overlapping sides, handle and catch, for surface mountings.

.2 Type T: sheet steel cabinet, with full length hinged door, latch, lock, 2 keys, containing 19 mm G1S fir plywood backboard for surface or flush mounting as appropriate.

.3 Include filtered vents and/or fan-cooling when enclosed equipment is heat producing.

PART 3 EXECUTION

3.1 SPLITTER INSTALLATION

.1 Install splitters as indicated and mount plumb, true and square to the building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible spaces.

.2 Only main junction and pull boxes are indicated. Provide pull boxes so as not to exceed 30 m of conduit run between pull boxes.

.3 Provide pull boxes and junction boxes in locations shown on the drawings and as required to suit job conditions.

.4 Locate pull boxes and junction boxes above removable ceilings, in electrical rooms, utility rooms or storage areas.

.5 Junction boxes, when used, to be installed in areas that are accessible through luminaire openings, and/or access panels.

.6 Where pull boxes are flush mounted, provide overlapping covers with flush head cover retaining screws, prime coated and painted to match wall or ceiling finish.

.7 Where cast corrosion resistant boxes are used, covers to be of matching type and gasketted.

.8 For special (not 100mm square or octagonal) pull boxes and/or junction boxes, paint identification for the system and provide lamicoid nametags to box covers with a size 2 nameplate 5mm lettering identifying system.

.9 Interior of all pull boxes and junction boxes for each system to be spray painted with colour as specified in Section 26 05 00

.10 All pull boxes, junction boxes and cabinets to be supported directly from building structure using one or a combination of galvanized screws, galvanized bolts, galvanized rods, and approved box clip.

.11 Support of pull boxes, junction boxes by conduit fittings or wire is not acceptable.

3.3 CABINETS INSTALLATION

.1 Mount cabinets with top not higher than 2 m above finished floor.

.2 Cabinets shall be flush mounted in finished areas where depth can be accommodated in the walls. Provide flush trim to suit.

.3 Provide fit up in Type T cabinets as indicated.

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 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 [4”] 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.

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.83-1976.

.4 Rigid PVC conduit: to CSA C22.2 No.211.2.

.5 Flexible metal conduit: to CSA C22.2 No.56-1977 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 for raceways: to CSA C22.2 No. 18-1972.

.2 Fittings manufactured for use with conduits specified. Coating same as conduit.

.3 Provide factory "ells" where 90 degree bends are required for 27mm [1”] and larger conduits.

.4 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 Install separate ground wire in E.M.T. when required. Minimum size ¾ inch.

.4 Where practical conceal conduits.

.5 Any exposed conduit in finished areas to be free of unnecessary labels and trademarks.

.6 All conduit ends to be reamed to ensure a smooth interior finish that will not damage the insulation of the wiring.

.7 Ensure bonding continuity in all conduit systems.

.8 Surface conduits are acceptable in mechanical and electrical service rooms and in unfinished areas or where indicated.

.9 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.

.10 Field threads on rigid conduit shall be sufficient length to draw conduits ends together.

.11 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.

.12 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.

.13 All home-run branch circuit conduit and communication conduits to be minimum 27 mm [1"] diameter unless otherwise indicated.

.14 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.

.15 Conduits are not permitted in terrazo or concrete toppings.

.16 Cap turned up conduits to prevent the entrance of dirt of moisture during construction.

.17 Locate conduits more than 75mm parallel to steam or hot water lines with a minimum of 25mm at crossovers.

.18 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.

.19 Provide polypropylene pull cord in empty conduits to facilitate pulling wiring in future.

.20 Where conduits become blocked, the use of corrosive agents is prohibited. Remove and replace blocked section.

.21 Damaged conduits to be repaired or replaced.

.22 Dry conduits out thoroughly before installing wiring. Swab out conduit and thoroughly clean internally before wires and cables are pulled.

.23 Conduits shall not pass through structural members except as indicated.

.24 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.

.25 Conduits and ducts crossing building expansion joints shall have approved conduit expansion fittings to suit the type of conduit used.

.26 Seal conduits with approved sealant where conduits are run between heated and unheated areas.

.27 Seal openings with approved sealant where conduits, cables, or cable trays pierce fire separations.

.28 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.

.29 Where drawings show conduit designations, these conduits shall be identified at each point of termination with Thomas & Betts "Ty-Rap" No. TY532M labels.

.30 Use "Condulet" fittings for power and telephone type conduit terminations in lieu of standard boxes where box support is not provided.

.31 Provide necessary roof jacks or flashing where conduits pass through roof or watertight membranes. Apply approved sealant to maintain membrane integrity.

.32 Use flexible metal conduit for connection to recessed luminaires without a prewired outlet box. Flexible metal conduit runs shall not exceed 1200 mm.

.33 Use liquid tight flexible metal conduit for connection to motors sprinkler monitoring devices, and other vibrating equipment and transformers.

.34 Use explosion proof flexible connection for connection to explosion proof motors.

.35 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 [5’] 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 SPARE CONDUITS

.1 Provide spare conduits as indicated.

.2 Provide 4x27 mm spare conduits up to ceiling space and 2x27 mm spare conduits down to ceiling space below from each flush panel tub. Terminate the conduits in 150x150x100 mm junction boxes in ceiling spaces or in case of an exposed concrete slab, terminate each conduit in a flush concrete box. Provide cover plates for all junction boxes.

3.4 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 [6”] 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.

3.5 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 [6”] 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.

3.6 EXPANSION JOINT CONDUIT FITTINGS

.1 Provide conduit expansion joint fittings at concrete expansion joint.

3.7 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 REQUIREMENTS

.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 CSA International – most recent version

.1 CAN/CSA-Z809, Sustainable Forest Management.

.2 Forest Stewardship Council (FSC) – most recent version

.1 FSC-STD-01-001, FSC Principle and Criteria for Forest Stewardship.

.3 Insulated Cable Engineers Association, Inc. (ICEA)

.4 Sustainable Forestry Initiative (SFI) – most recent version

.1 SFI Standard.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Sustainable Design Submittals:

.1 Wood Certification: submit manufacturer's Chain-of-Custody Certificate number for CAN/CSA-Z809 or FSC or SFI certified wood.

PART 2 PRODUCTS

2.1 CABLE PROTECTION

.1 38 x 140mm planks pressure treated with coloured, copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

2.2 MARKERS

.1 Concrete type cable markers: 600 x 600 x 100 mm with words: cable, joint or conduit impressed in top surface, with arrows to indicate change in direction of cable and duct runs.

.2 Cedar post type markers: to CAN/CSA-Z809 or FSC or SFI 89 x 89mm, 1.5m long, pressure treated with coloured copper napthenate or 5% pentachlorophenol solution, water repellent preservative, with nameplate fastened near post top, on side facing cable or conduit to indicate depth and direction of duct and cable runs.

.1 Nameplate: aluminum anodized 89 x 125mm, 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 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for cable installation in accordance with manufacturer's written instructions.

.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

3.2 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in ducts.

.2 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 To facilitate matching of colour coded multi-conductor control cables reel off in same direction during installation.

.6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.7 After installation of cables, seal duct ends with duct sealing compound.

3.3 MARKERS

.1 Mark cable every 150m along cableruns and changes in direction.

.2 Mark underground splices.

.3 Where markers are removed to permit installation of additional cables, reinstall existing markers.

.4 Install concrete cable markers within 180m from each side of runway centreline; 45m from each side of taxi way centreline; 50m from edge of taxi ramps or aprons.

.5 Install cedar post type markers.

.6 Lay concrete markers flat and centred over cable with top flush with finish grade.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests using qualified personnel.

.1 Include necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds.

.1 Ensure resistance to ground of circuits is not less than 50megohms.

.5 Pre-acceptance tests:

.1 After installing cable but before splicing and terminating, perform insulation resistance test with megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests:

.1 Ensure that terminations and accessory equipment are disconnected.

.2 Ground shields, ground wires, metallic armour and conductors not under test.

.3 High Potential (Hipot) Testing.

.1 Conduct hipot testing at original factory test voltage in accordance with manufacturer's recommendations.

.4 Leakage Current Testing:

.1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.

.2 Hold maximum voltage for specified time period by manufacturer.

.3 Record leakage current at each step.

.7 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.

.8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.5 PROTECTION

.1 Repair damage to adjacent materials caused by cables installation.

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 Departmental Representatives 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 Departmental Representative) 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 Departmental Representative's 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 Departmental Representative'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 Departmental Representative 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 and Controls Contractor.

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 Departmental Representative-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 Communication Systems testing:
  .1 Refer to Section 27 10 05 for testing results.

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's 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 Departmental Representative 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

.5 Power Distribution Equipment:

.1 Panelboards:

.1 Types and sizes of breakers.
.2 Spare capacity.
.3 Visual maintenance inspections.
.4 Maintenance procedures.
.5 Testing requirements and procedures
.6 Spare parts.

.2 Branch Circuits:

.1 Power receptacle system
.2 Miscellaneous wiring devices
.3 Miscellaneous equipment

.4 Heat tracing and electric heat

.3 Grounding and Bonding System
- .1 System Overview
- .2 Location and routing
- .3 System tests and labelling
- .4 Special grounding/bonding testing results

.6 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

.7 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

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 Line voltage dual technology occupancy wall mounted sensors shall be equal to Sensor Switch WSD-PDT-SA (set to manual on); color to match switches.

.3 Line voltage dual technology occupancy two pole wall mounted sensors shall be equal to Sensor Switch WSD-PDT-2P and be set to manual on for both loads; color to match switches.

.4 Line voltage dual technology occupancy wall mounted sensors installed in larger rooms shall be equal to Sensor Switch LWS-PDT (set to manual on); color to match switches.

.5 Line voltage dual technology occupancy ceiling mounted sensors shall be equal to Sensor Switch CMR-PDT-9 color white.

.6 Line voltage dual technology occupancy ceiling mounted sensors for larger rooms shall be equal to Sensor Switch CMR-PDT-10 color white.

.7 Line voltage dual technology occupancy ceiling mounted two pole sensors shall be equal to Sensor Switch CMR-PDT-9-2P color white.

.8 Line voltage dual technology occupancy and daylight sensing ceiling mounted sensors shall be equal to Sensor Switch CMR-PC-ADT color white.

.9 Line voltage dual technology occupancy ceiling mounted wide view sensors shall be equal to Sensor Switch WVR-PDT color white.

.10 Line voltage dual technology occupancy ceiling mounted hallway sensors shall be equal to Sensor Switch HWR-13 color white.

.11 Photocell equal to Sensor Switch SBOR series.

.12 Line voltage dimmers shall be equal to Leviton TPI10-1LW series.

.13 Line voltage switches as per Section 26 27 26.

.14 The lighting control system shall be tested and certified by the manufacturer's representative as per ASHRAE 90.1-16 requirements. Provide documentation of certification in maintenance manual and submit copy to the Engineer.

.15 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 Departmental Representatives' 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 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 PLANT ASSEMBLY

.1 Install circuit breakers in panelboards before shipment from plant.

.2 Install and prewire low voltage relays assemblies where indicated.

.3 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.4 All panelboards to be of a common manufacturer.

1.3 FINISH

.1 Apply finishes in accordance with Section 26 05 00.

.2 Panel finish in electrical and equipment rooms and closets to be standard ASA Grey baked enamel for normal power service and. Confirm with Departmental Representative prior to shop finishing panels.

.3 Panels in finished and/or public areas to be either as clause .2 above or prepared to accept painting to closely match surroundings as directed by the Departmental Representative. In the later instance, the final paint coat to be done by Division 09 but coordinated by the Electrical Division in particular for protection and masking of locks and sensitive parts. Confirm with Departmental Representative prior to paint finishing panels.

PART 2 PRODUCTS

2.1 PANELBOARDS, DOORS AND TRIMS

.1 Bus and breakers rated for 22 KA symmetrical, minimum, interrupting capacity for 600V and 10kA symmetrical, minimum interrupting capacity for 208V or as indicated.

.2 Copperbus with full size neutral.

.3 Minimum 20% spare capacity.

.4 Mains, number of circuits and number and size of branch circuit breakers as indicated.

.5 Provide all necessary connectors and mounting hardware in every space to facilitate installation of future breakers. Provide blank fillers for all spaces.

.6 Concealed hinges and concealed trim mounting screws, hinged locking door with flush catch.

.7 Panelboards to have flush doors. (Gasketted where required).

.8 Provide two keys for each panelboard and key similar voltage panelboards alike.

.9 Panel tubs to be typically 600mm wide.

.10 Provide "sprinkler-proof" design in areas where sprinkler fire protection is installed. In any event, all surface mounted enclosures to be complete with sprinkler drip cover.

.11 Provide door within door trims where indicated to facilitate ease of service maintenance Each tub trim cover to be hinged and self-supporting and to swing out to expose breaker cable terminations and wireways. Hinged trim shall be secured with cover screws on opening side by concealed machine screws. Hinged breaker cover shall be recessed into the hinged overall tub cover. Breaker cover shall have latch type closures. Submit details on shop drawings prior to manufacturing.

.12 Feed through lugs as indicated.

.13 Integral Surge Protection Devices as indicated; refer to section 26 24 17.

2.2 BREAKERS

.1 All breakers to be bolt on type, moulded case, non-adjustable and non-interchangeable trip, single, two and three pole, 120/208(240)V or 347/600V and with trip free position separate from "On" or "Off" positions.

.2 Two and three pole breakers to have common simultaneous trip and able to be located in any circuit position within the panelboard. Minimum interrupting rating of breakers to be as follows:

.1 120/240V panelboards - 10,000 Amps at 250 volts.

.3 Main breaker to be separately mounted at top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Provide circuit breakers with indicated trip ratings as shown in the panelboard schedules.

.5 Provide at least 10% spare 15 Amp single pole breakers whether indicated or not.

.6 Provide GFI type breakers as indicated.

.7 Provide Lock-on devices as indicated and in any event for Fire Alarm circuits, Security equipment circuits, EXIT sign circuits and Emergency Battery equipment circuits.

2.3 PANELBOARD IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00.

.2 Nameplate for each panelboard size 5 (2 line) engraved as indicated and include panel designation and voltage/phase.

.3 Complete circuit directory with typewritten card(s) located in slide-in plastic pocket(s) fixed to the back of the related door. Directory card to indicate the panel designation, mains size, voltage/phase and the location and load controlled of each circuit. Include a “letter sized” paper copy of each directory in the project maintenance manual.

.4 Provide a plasticized typewritten information card fixed to the back of the each panel door. Information card to indicate the panel designation and location, feeder type and size and locations of any controlling contactors and feeder pullboxes. Include a "letter sized" paper copy of each information card in the project maintenance manual.

2.4 STANDARD OF ACCEPTANCE

.1 Cutler Hammer Type Pow-R Line 1a

.2 Schneider Type NQOD

.3 Siemens Canada.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb true and square, to adjoining surfaces.

.2 Panelboards located in service rooms, mechanical rooms, and electrical rooms to be mounted on unistrut supports.

.3 Connect loads to circuits as indicated.

.4 Connect neutral conductors to common neutral bus with respective neutral identified.

.5 Install 4x27mm empty conduits (or equivalent) from each flush mounted panelboard single tub to ceiling space above and 2x27mm empty conduits (or equivalent) from each flush mounted panelboard single tub down to ceiling or space below where space exists.

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 OF WORK

.1 In general the HVAC and the Plumbing/Fire Protection motors and drives will be respectively provided under the Mechanical Division and Plumbing/Fire Protection Divisions. Refer to the related division of the specifications and drawings for exact locations and requirements.

.2 Provide the following components:

.1 All disconnect switches required.

.2 All starters, contactors, control transformers, except where supplied by the Mechanical or Plumbing/Fire Protection Divisions as noted in the equipment schedule.

.3 Electric Heat Devices

.3 Thermostats, solenoid valves, pressure switches, aquastats, flow switches, timeclocks heat trace and VFD's are generally provided by the Mechanical or Plumbing Divisions except as noted in the equipment schedule(s).

.4 Refer to equipment schedule(s) for details of motor controls and devices.

.5 Provide all power wiring from power distribution centre, through starter and control equipment to the motors.

.6 Conduit, wire and connections for all HVAC low voltage control wiring shall be the responsibility of Mechanical Division unless otherwise specified.

.7 Provide, connect and verify all Fire Alarm control wiring and devices.

1.3 CONTROLS - GENERAL

.1 Mechanical and Plumbing Divisions differ both in regard to the particulars of drives, motors, etc. specified. The Mechanical Division typically includes a major section on controls whereas the Plumbing Division typically includes more package equipment requiring power service connection only. Because of these variations the demarcation point between the work of the Electrical Division and the Mechanical and Plumbing Divisions typically differ.

.2 Generally for drives, equipment, etc. detailed in the Mechanical Division, the work of the Electrical Division finishes with the supply of a standard terminal block array for each starter. All further wiring, relays, timers, etc., together with control consoles, are provided under the Mechanical Division.

.3 Generally for the package equipment, drives and special controls detailed in the Plumbing Division, the work of the Electrical Division typically includes the provision of all wiring, devices, etc. to complete each system and left ready for commissioning, set up, etc. by the Plumbing Division.

1.4 ELECTRICAL DIVISION RESPONSIBILITIES FOR MECHANICAL DIVISIONS

.1 Provide a ten point terminal block for each starter or contactor.

.2 Provide inter-wiring between starters or contacts and terminal blocks. Starter to be entirely factory-wired.

.3 Terminals to be as follows:

- .1 120 V line from control transformer.
- .2 Terminals for remote 3 wire stop/start.
- .3 HOA or other control.
- .4 120V neutral.
- .5 Normally open dry contact.
- .6 Common.
- .7 Normally closed dry contact.
- .8 Normally open dry contact.
- .9 Common.
- .10 Normally closed dry contact.

.4 Except where otherwise indicated, the work of the Electrical Division shall not extend beyond the control terminal blocks. The Mechanical Division shall provide all conduit, wire, wiring connections and components such as relays, timers, etc. as required to provide the interlocking functions and controls as outlined in the specifications. If the standard terminals supplied by the Electrical Division require supplementation in any way, e.g. by supplying additional N.O. or N.C. contacts, these facilities are included in the Mechanical Division scope.

.5 Mechanical Division shall provide the mechanical control consoles complete with pilot controls, indicating lights, etc., as outlined in the specifications.

.6 When an item provided under the Mechanical Division is factory supplied with a starter or contactor and it is necessary to alter or add to the control wiring in order to achieve the method of operation specified in the Mechanical Division, this work shall be included in Mechanical Division.

.7 When control items such as thermostats, float controllers, etc., are connected to power wiring in series with the item being powered (e.g. unit heater motor, fractional HP fans, etc.) the supply and installation of the controller devices are included in Mechanical Division. Power wiring to and from the controllers is included in the Electrical Division. Install line voltage thermostats for single phase motors provided by the Mechanical Division where specifically indicated on the drawings and/or the “Equipment Schedule” of this specification.

.8 When the electrical characteristics of a controlled item exceed the capacity of a specified controller, provision of a contactor and the required wiring shall be included in the Mechanical Division.

1.5 ELECTRICAL DIVISION RESPONSIBILITIES FOR PLUMBING DIVISIONS

.1 When a drive, motor, etc. provided under the Plumbing Divisions is factory supplied with a starter, contactor, alternator, pressure switch, etc., the wiring and installation of these items and controls shall be included in the Electrical Division.

.2 The ten point terminal blocks similar to those specified under the Mechanical Division controls are not mandatory for the Plumbing Division equipment.

.3 The Electrical Division shall provide stop/start or HOA controls as specified for each item except where these stations are factory supplied with equipment.

.4 The Electrical Division shall leave each system fully functional and requiring only minor final adjustments (such as pressure or vacuum settings) by the Plumbing Divisions.

PART 2 PRODUCTS

2.1 CONTROL RELAYS

.1 Control relays to be rated minimum 10 A, 300V, with contacts as required and 120 V control coil unless otherwise noted. Relays to be typically mounted in CSA Type 1 enclosures located in control terminal cabinets and/or MCC.

.2 Provide required fire alarm relays and auxiliary contacts in motor control centres or at the related equipment cabinets to provide activation and deactivation of mechanical fan units as specified in the Mechanical Division.

.3 Relays for Fire Alarm shutdown system control to be approved for Fire Alarm use and powered from the Fire Alarm panel. Fire Alarm relay enclosures to be finished in red and identified “FIRE ALARM RELAY”

.4 Time delay relays to incorporate time delay feature to delay either opening or closing as specified. Time period to be adjustable from 0 to 5 minutes unless otherwise specified.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Provide all labour and materials required to complete power wiring for HVAC, Plumbing and Fire Protection equipment as called for in the project specifications and/or shown on the drawings.

.2 Provide all single and 3 phase motor protection switches, combination starters and disconnects contactors and relays as required for mechanical equipment unless otherwise specifically noted in these specifications or on the drawings.

.3 Terminate all line voltage wiring to the designated equipment terminals.

.4 Obtain a full set of HVAC control shop drawings and have a full understanding of the scope before commencing installation and including any fire alarm interface.

.5 Verify the recommended overcurrent protection and rating of Mechanical and Plumbing and Fire Protection equipment and equipment supplied by the Departmental Representative. Change feeder overcurrent protection as required to comply with equipment recommendations. Notify the Departmental Representative of all revisions.

.6 Connections to motors and other vibrating equipment shall be made with flexible copper cabling, weather proof where required.

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 Canadian Standards Association (CSA International):

.1 CAN/CSA C22.2 No.4, Enclosed Switches.

.2 CSA C22.2 No.39, Fuseholder Assemblies.

PART 2 PRODUCTS

2.1 DISCONNECT EQUIPMENT

.1 "Heavy Duty" class, enclosed manual air break switches in non-hazardous locations: to CSA C22.2 No.4

.2 Fuseholder assemblies to CSA C22.2 No.39.

.3 Fusible and non-fusible disconnect switch in CSA enclosure.

.4 Provision for padlocking in off switch position.

.5 Fuses as indicated. Allow for Class J or L for general circuits, Class RK5 for transformer, motor or other high inrush current circuits

.6 Fuseholders in each switch suitable without adaptors, for type of fuse as indicated.

.7 Quick-make, quick-break action.

.8 ON-OFF switch position indication on switch enclosure cover.

.9 Weatherproof as required.

.10 NEMA-3 rated disconnect for roof top.

2.2 EQUIPMENT IDENTIFICATION

.1 Indicate name of load controlled on size 4 name plate to Section 26 05 00.

2.3 STANDARD OF ACCEPTANCE

.1 Cutler Hammer – Heavy Duty

.2 Schneider - Heavy Duty

.3 Siemens - Heavy Duty

PART 3 EXECUTION

3.1 INSTALLATION

.1 Provide and locate safety disconnect switches to isolate individual items of equipment in accordance with Canadian Electrical Code CSA 22.1 whether indicated on not on the contract drawings.

.2 Install disconnect switches complete with fuses where indicated or required.

.3 All disconnect switches for elevator machine rooms shall be fused in accordance with the equipment supplier's requirements.

.4 Provide and locate safety disconnect switches to isolate individual items of equipment in accordance with Canadian Electrical Code CSA 22.1 whether indicated on not on the contract drawings.

3.2 MOTOR PLUG/RECEPTACLE AND QUICK DISCONNECTS

.1 Motor quick disconnects do not negate the requirement for a switched safety disconnect as specified in this Division. A separate disconnect is still required unless the Departmental Representative has given a special pre-approved circumstance.

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 Canadian Standards Association (CSA International):

.1 CSA C22.2 No.14, Industrial Control Equipment.

PART 2 PRODUCTS

2.1 CONTACTOR EQUIPMENT

.1 Contactors: to CSA C22.2 No.14.

.2 Half size contactors not accepted.

.3 Electrically operated, electrically or mechanically held, multi-pole full voltage type.

.4 Contactors to have 120V operating (and unlatching) coils unless otherwise noted.

.5 Controlled by pilot devices as indicated and rated for type of load controlled.

.6 Breaker or Fused switch combination contactor as indicated.

.7 Complete with 1 normally open and 1 normally closed auxiliary contacts unless indicated otherwise.

.8 Provide NEMA enclosure as required for location unless indicated otherwise.

2.2 CONTACTOR REMOTE CONTROLS

.1 Include following options in cover or in remote locations where indicated:

.1 Red LED indicating lamp (incandescent not acceptable)

.2 Stop-Start pushbutton or

.3 Hand-Off-Auto selector switch or

.4 On-Off selector switch.

.2 Include following remote control options where indicated:

.1 Key operated remote control buttons shall heavy duty type, momentary contact, two (2) position spring return to centre, key operated control switch complete with engraved lamicoid nameplate reading "Off/On". Provide and adjacent standard bullseye type, LED 120 volt rated, red pilot light indicating "power on". Mount pilot light on same faceplate as control switch. Confirm keying requirements (master/submaster) and provide 2 sets of keys.

.2 Mushroom style “STOP” controls to be heavy duty type, large red button, momentary contact, non-latching spring return switch complete with engraved lamicoid nameplate reading "STOP".

.3 Provide flush mounting boxes and satin stainless steel plates for remote control devices in finished areas. Provide industrial quality, malleable die cast surface mounted units to suit the application classification.

2.3 EQUIPMENT IDENTIFICATION

.1 Indicate name of load controlled on size 4 name plate to Section 26 05 00.

2.4 STANDARD OF ACCEPTANCE

.1 Cutler Hammer – Heavy Duty

.2 Schneider - Heavy Duty

.3 Siemens - Heavy Duty

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install contactors and connect auxiliary control devices.

.2 Pilot lights to be illuminated when contactor is closed.

.3 Control wire to be minimum #14 AWG. Remote control wiring to be 5A fuse protected and the wiring shall be upsized to limit voltage drop to no more than 2%.

.4 Control circuits shall fail safe leaving the contactor in the open position if the power fails or where automatic reset could be a safety or operational concern. Provide a control circuit seal-in contact for all momentary contact control devices unless otherwise indicated.

.5 The contactor shall not automatically reset after a power failure unless otherwise indicated or for such items as automatic freeze protection, snow melting, light control etc.

.6 Electrically held contactors to be located in service rooms where practical.

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 International Electrotechnical Commission (IEC)

.1 IEC 947-4-1, Part 4: Contactors and motor-starters.

1.3 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Starters: to IEC 947-4 with AC4 utilization category.

.2 Equal to Cutler Hammer Freedom Series.

2.2 MANUAL MOTOR STARTERS

.1 Single and Three phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:

.1 Switching mechanism, quick make and break.

.2 One or Three overload heater[s], manual reset, trip indicating handle.

.2 Accessories:

.1 Pushbutton: heavy duty labelled as indicated.

.2 Indicating light: heavy duty type and colour as indicated.

.3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FULL VOLTAGE MAGNETIC STARTERS

.1 Combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Contactor solenoid operated, rapid action type.

.2 Motor overload protective device in each phase, manually reset from outside enclosure.

.3 Wiring and schematic diagram inside starter enclosure in visible location.

.4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.2 Combination type starters to include circuit breaker with operating lever on outside of enclosure to control circuit breaker, and provision for:

.1 Locking in "OFF" position with up to 3 padlocks.

.2 Independent locking of enclosure door.

.3 Provision for preventing switching to "ON" position while enclosure door open.

.3 Accessories:

.1 Selector switches: heavy duty labelled as indicated.

.2 Indicating lights: heavy duty type and color as indicated.

.3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

2.4 FULL VOLTAGE REVERSING MAGNETIC STARTERS

.1 Full voltage reversing magnetic starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Two - 3 pole magnetic contactors mounted on common base.

.2 Mechanical and electrical interlocks to prevent both contactors from operating at same time.

.3 Three overload relays with heater elements, automatic reset.

.2 Accessories:

.1 Selector switches: heavy duty labelled as indicated.

.2 Indicating lights: heavy duty type and color as indicated.

.3 Auxiliary control devices as indicated.

2.5 MULTI-SPEED STARTERS

.1 2 speed starters of size, type, rating and enclosure type as indicated. Starter suitable for variable torque type motor and with components as follows:

.1 One-3 pole contactor for each winding for separate winding motors.

.2 One-3 pole and one-5 pole contactor for each reconnectable winding for consequent pole type motors.

.3 Three overload relays with 3 heater elements and manual reset for each speed.

.2 Accessories:

.1 Selector switches: heavy duty labelled as indicated.

.2 Indicating lights: heavy duty, type and color as indicated.

.3 Auxiliary control devices as indicated.

2.6 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with secondary fuse, installed in with starter as indicated.

.2 Size control transformer for control circuit load plus 20% spare capacity.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install starters, connect power and control as indicated.

.2 Ensure correct fuses and overload devices elements installed.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 08 00 – Commissioning and Demonstrations and manufacturer's instructions.

.2 Operate switches, contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

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 MATERIALS - GENERAL

.1 All heating devices shall be finished in a colour suitable as a finished surface.

.2 All built-in thermostatic controls shall be of a tamper-proof type, suitable only for screwdriver adjustment.

2.2 BASEBOARD HEATERS

.1 Electric base board heaters shall be equal to Ouellet OFM series **120 or 240** 1 phase, wattage as noted on Drawings.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Provide a complete electrical heating system, with heaters of type, rating, characteristics, and control as shown on the drawings. Including all necessary electrical heating controls, such as relays, control transformers, thermostats, etc.

.2 Unless otherwise noted units to come with integral thermostats.

.3 Supply and install line voltage thermostats as noted on the Drawings, equal to Ouellet OLT101C or equivalent; white finish.

.4 Electric heaters shall be white in color.

3.2 INSTALLATION - RADIANT HEATING PANEL

.1 Supply and install a complete radiant heating system comprising of radiant heating panels, conduit, wiring, and controls as indicated on the drawings and as specified herein.

.2 Radiant heating panels shall be secured to the building structure in the same manner as fluorescent lights in T-bar ceilings.

.3 Surface mount radiant panels in drywall ceilings using manufactured supplied frame kit.

.4 Radiant panels shall, when indicated on the drawings, be controlled by a control relay which in turn is controlled by an Interval Timer.

.5 Provide all wiring between Interval Timer and relays. Connect control coil to Interval Timer with wire in conduit. Make all final power connections.

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 ADDITION OF ACCEPTABLE MANUFACTURERS

.1 Excepting luminaires listed as ‘Cash Allowance Fixture’ each luminaire in the Luminaire Schedule has 3-4 listed alternates already listed in the Luminaire Schedule; no other alternates will be allowed.

.2 Where listed luminaire is out of date; the manufacturer shall indicate alternate to Engineer during Tender period. No extra will be provided for out of date luminaires not identified during the Tender process; Engineer has final say on alternate fixture in this case.

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.

.3 Drives shall have 0-10V dimming standard.

2.2 LEDS

.1 LEDs in fixtures shall be 4 step Binning or better.

.2 LEDs shall be CRI 90 or higher.

.3 Fixtures shall be designed to allow for replacement of LED boards.

2.3 WIRE GUARDS

.1 All fixtures in storage rooms and service rooms shall have wire guards.

2.4 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 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 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 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 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.

.9 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.

.10 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.

.11 Where drivers are to be remotely located, they shall be racked together and labelled with size 3 lamicoid. Label shall bear the driver 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 (11"x17") 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 GUARANTEE

.1 Provide a written guarantee, stating that the battery for emergency lighting is guaranteed against defects in material and workmanship for a period of ten years, with a no-charge replacement during the first five years and a pro-rate charge on the second five years, from the date of the Final Certificate of Completion.

PART 2 PRODUCTS

2.1 BATTERY UNIT EQUIPMENT

.1 Unit equipment for emergency lighting: to CSA C22.2 No.141.

.2 Battery pack units shall be equal to Lumacell RGS series, 12V DC complete with 2 LED emergency light heads.

.3

.4 Alternate Manufacturers:

.1 Readylite LDX series

.2 Beghelli Nova series

2.2 REMOTE LAMP HEADS

.1 LED Remote Dual Head devices shall be equal to Lumacell MQM-2 (12V 6W). Do not provide single lamp devices.

.2 LED Decorative vandal-resistant frosted cube fixtures (double head) in high risk areas or where indicated equal to Lumacell MQMP2 - 12V 6W.

.3 Provide equipment guards for Gymnasium and similar installations.

.4 Acceptable Manufacturers:

.1 Readylite

.2 Beghelli

2.3 WIRING FOR REMOTE EQUIPMENT

.1 Wiring 12V battery standby circuits to all remote heads and exit signs.

.2 Low voltage wiring to be installed so that the maximum volt drop does not exceed 5%. The following wiring/load sizes shall not be exceeded for the 12-volt system:

.1 #8 AWG not to exceed 6500 watt feet per run.

.2 #10 AWG not to exceed 4000 watt feet per run (minimum size).

PART 3 EXECUTION

3.1 INSTALLATION

.1 Provide and install a fully functional emergency lighting system as detailed on the Drawings. Paint all junction boxes green for the emergency lighting system.

.2 The emergency lighting system shall be tested for maintained luminance to a minimum of 30minProvide written document verifying the operation of the system after the test.

.3 The contractor shall ensure conductor size is suitable for the emergency lighting system to maintain a minimum of 3% volt drop to remote heads.

.4 Install unit equipment for emergency lighting in accordance with CSA C22.1, Section 46.

.5 Install unit equipment and remote mounted fixtures as indicated.

.6 Direct heads as indicated.

.7 Provide a junction box adjacent to the battery pack for the purpose of splicing the separate wiring runs together.

.8 Provide a 15 Amp, 125 volt receptacle adjacent to each battery unit and connect circuit to lighting circuit in the area service by the batter pack.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section specifies empty telecommunications raceway systems.

1.2 SYSTEM DESCRIPTION

.1 Empty telecommunications raceways system consists of outlet boxes, cover plates, terminal distribution, cabinets, conduits, pull boxes, sleeves and caps, fish wires, service fittings.

1.3 REFERENCES

.1 Canadian Electrical Code (CEC)

.2 BICSI Telecommunications Distribution Methods Manual (TDMM), most recent edition

.3 ANSI/TIA-569-D Telecommunications Pathways and Spaces Standard

.4 ANSI/TIA -606-B Administration Standard for Commercial Telecommunications Infrastructure.

.5 ANSI/TIA-607-B Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

Part 2 Products

2.1 MATERIAL

.1 Conduits: in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Junction boxes and cabinets: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.3 Outlet boxes, conduit boxes, and fittings: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.4 Fish wire: polypropylene type.

Part 3 Execution

3.1 INSTALLATION

.1 Install empty raceway system, including distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cabletroughs, bonding, miscellaneous and positioning material to constitute complete system.

.2 Conduit Specifications

.1 The inside radius of a bend in a conduit shall be not less than six times the internal diameter when the conduit is less than 50 mm in diameter and ten times the internal diameter when conduit is 50 mm in diameter or larger.

.2 All zone conduits shall be identified and labeled at both ends. Tags shall identify start and finish of conduit runs. Pull boxes shall be labeled on the exposed exterior.

.3 All metallic parts of the cable distribution supporting system shall be bonded together using a 6 AWG green jacketed stranded copper ground wire. The metallic components of the cable distribution system shall be bonded together at the MTR then bonded to their respective telecom ground bus bars.

.4 All conduits/sleeves that enter the IT Room shall be fitted with an approved ground bushing c/w ground lug and bonded together mechanically (one continuous piece preferred). This shall be connected to the approved building ground by means of a minimum No. 6 AWG or as indicated to the grounding bus bar.

.5 All conduits entering or exiting through the ceiling or walls of the IT Room shall protrude into the room 25-50mm.

.6 All conduit runs shall follow building grid lines and shall be concealed where possible.

.7 All conduits shall be thin wall EMT, reamed and bushed at both ends and bonded to the distribution system. Rigid PVC or flexible metallic or PVC conduits are NOT acceptable.

.8 Unless otherwise specified, all conduit runs shall be a maximum of 30 meters (100 ft) in length with a maximum of two 90 degree bends between pull points.

.9 A pull box shall be placed in conduit runs where the sum of the bends exceeds 180 degrees, where the overall length of the conduit run is more than 30m, or if there is a reverse bend in the run.

.10 Pull boxes shall be constructed and sized in accordance with Canadian Electrical Code and TIA/EIA standards of code gauge steel and shall have a rust resistant finish. Locations and sizes of all pull boxes shall be as indicated on the design submission.

.11 In all instances pull boxes shall be placed in straight sections of conduit run and shall not be used in lieu of a bend. Corresponding ends of the conduit are to be aligned with each other. Conduit fittings or pull elbows fittings shall not be used in place of pull boxes or bends.

.12 Pull boxes shall be installed at a reasonable height, in an exposed location and such that access for installation of cables is not prohibited. Pull boxes shall not be placed in a fixed false ceiling space, unless immediately above a suitably marked and hinged access panel. Provide indicator decals on ceiling T-bar rail or ceiling tiles showing location of pull box or splice box. Refer to the Design Authority for details.

.13 Conduit must enter the outlet boxes from the top or bottom.

.14 All conduit shall be installed in accordance with Canadian Electrical Code, Part 1 Section 12, applicable building codes and in accordance with TIA/EIA 569.

.15 The minimum size (inside diameter) for EMT conduit running between the IT Room and the Telecommunications outlet at an outlet location is twenty-five millimeters (25 mm).

.16 The maximum horizontal cable run distance not to exceed 90 metres. The cable length from the mechanical termination in the MTR room to the Telecommunications outlet. Where the horizontal distance exceeds 90 meters, provide additional rooms as required.

.17 Cable fill capacities of conduit, cable tray and raceways shall not be greater than 40%.

.18 A pull cord or fish tape shall be installed in all conduits.

.19 The telecommunications outlet conduit system shall be labelled green.

.20 Place pull boxes in readily accessible locations only.

.3 Outlet Boxes

.1 Outlet boxes shall be installed in locations identified The outlet box shall be installed at 300mm AFF or at the same height and within 300mm of the adjacent electrical duplex receptacles, unless otherwise noted on the building plans. Wherever possible, the face of the plastic ring should be installed flush with the finished wall.

.2 Back to back outlet boxes shall not be used.

.3 Outlet boxes must be equipped with a plaster ring to accommodate the installation of telecommunication face plates.

.4 Plaster rings will be specified as single or double gang to accommodate requirements.

.5 Plaster rings or raised adapter plates shall not reduce the size of the outlet such that two additional outlets could not be added in the future.

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 45 00 Quality Control.

.4 Section 01 61 00 - Common Product Requirements.

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 Refer to Section 01 35 43 Environmental Procedures.

.2 Excavated material may be disposed of on site as directed by Departmental Representative.

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 reports as described in PART 3 of this Section and as refered to on civil drawings.

.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.

1.7 WASTE MANAGEMENT AND DISPOSAL

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

.1 Confirm locations of recent excavations adjacent to area of excavation.

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 Departmental 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.

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.

3.4 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.

3.5 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 notify Departmental Representative to arrange for geotechnical engineer to review conditions and provide recommendations.

3.6 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Protect open excavations against flooding and damage due to surface run-off.

.3 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

.4 Advise Departmental Representative at least 7 days in advance of excavation operations. Excavate to lines, grades, elevations and dimensions as indicated.

.5 All trenches to conform to WorkSafeBC Guidelines and Regulations and MMCD standard drawing G4.

.6 Keep excavated and stockpiled materials safe distance away from edge of trenches as directed by Departmental Representative.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Do not obstruct flow of surface drainage or natural watercourses.

.9 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.

.10 Correct unauthorized over-excavation as follows:

.1 Fill with MMCD granular base material to not less than 100% Standard Proctor Density.

.11 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.

.12 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 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 The Departmental Representative 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.

.1 Contractor to coordinate testing with Geotechnical engineer as required.

.6 Install drainage system in backfill as indicated.

3.12 RESTORATION

.7 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 19 - Construction Waste Management and Disposal, trim slopes, and correct defects as directed by Departmental Representative.

.8 Replace topsoil as indicated.

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 Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 Cast-In-Place Concrete.

1.2 REFERENCES

.1 ASTM International

.1 ASTM A53/A53M-10, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A90/A90M-09, Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

.3 ASTM A121-07, Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.

.4 A653/A653M-10, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.5 ASTM C618-08a, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

.6 ASTM F1664-08, Standard Specification for Poly(Vinyl Chloride) (PVC)-Coated Steel Tension Wire Used with Chain-Link Fence.

.7 ASTM A123/A123M-09, Standard Specification for Zinc (Hot Dip Galvanized) coatings on Iron and Steel Products.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-138.1-96, Fabric for Chain Link Fence.

.2 CAN/CGSB-138.2-96, Steel Framework for Chain Link Fence.

.3 CAN/CGSB-138.3-96, Installation of Chain Link Fence.

.4 CAN/CGSB-138.4-96, Gates for Chain Link Fence.

.5 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.6 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles

.7 CAN/CSA-G40.20-13/G40.21-13, General requirements for rolled or welded structural quality steel / Structural quality steel

.8 CAN/CSA-W59-13 - Welded steel construction (metal arc welding)

.3 CSA International

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A3000-08, Cementitious Materials Compendium.

.4 Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual - current edition.

.5 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for concrete mixes, fences, posts and gates and include product characteristics, performance criteria, physical size, finish and limitations.

.2 For powered gates:

.1 indicate electric power requirements, installation details, wiring diagrams.

.2 Submit manufacturer's written installation instructions.

.3 Drive unit shall bear a label indicating that the gate controller/operator mechanism has been tested certified to UL 325 and CSA C22.2 No. 247 standards for all electrical components.

.4 Provide operation and maintenance data for gate for incorporation into manual specified in Section 01 78 10 - Closeout Submittals.

.5 Provide concrete foundation designs sealed by an Engineer registered to practice in BC.

.3 Layout drawings for the powered gate:

.1 The Contractor will provide a detailed drawing showing the proposed layout of the powered gate including the following:

.1 Clearance to existing and proposed site features..

.2 Connection and termination details between gates/fences/buildings

.3 Gate clear openings

.4 Proposed access control pedestal details.

.5 Electrical conduit routing and panel placement.

1.4 QUALITY ASSURANCE

.1 Manufacturer: A company specializing in the manufacture of automated gate systems.

.2 Installer: A minimum of three years' experience installing similar equipment and approved by manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect fence and gate materials from damage.

.3 Replace defective or damaged materials with new.

.3 Packaging Waste Management: remove for reuse of pallets, crates, padding, packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with CSA A23.1 and Section 03 30 00 - Cast-in-Place Concrete.

- .1 Nominal coarse aggregate size: 20-5.
- .2 Compressive strength: 20 MPa minimum at 28 days.
- .3 Additives: fly ash to CSA A3000 ASTM C618.

.2 Chain-link fence fabric: to CAN/CGSB-138.1.

- .1 Type 1, Class A, medium style, Grade 2.
- .2 Height of fabric: as indicated.

.3 Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe. Dimensions as indicated.

.4 Top, bottom tension wire: to CAN/CGSB-138.2, single strand, galvanized steel wire.

.5 Tie wire fasteners: aluminum wire.

.6 Tension bar: to ASTM A653/A653M, 5 x 20 mm minimum galvanized steel.

.7 Gates: to CAN/CGSB-138.4.

.8 Gate frames: to ASTM A53/A53M, galvanized steel pipe, standard weight 45 mm outside diameter pipe for outside frame, 35 mm outside diameter pipe for interior bracing.

- .1 Fabricate gates as indicated with electrically welded joints, and hot-dip galvanized after welding.
- .2 Fasten fence fabric to gate with twisted selvage at top.
- .3 Furnish all gates with galvanized malleable latch and latch catch with provision for padlock which can be attached and operated from either side of installed gate.
- .4 Furnish man gate with malleable iron hinges and automatic closing hardware.
- .5 Refer to electrical drawings for gate power and control details.

.9 Fittings and hardware: to CAN/CGSB-138.2, galvanized steel.

- .1 Tension bar bands: 3 x 20 mm minimum galvanized steel or 5 x 20 mm minimum aluminum.
- .2 Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail.
- .3 Overhang tops to provide waterproof fit, to hold top rails and an outward inward projection to hold barbed wire overhang.
  - .1 To match existing chain like fencing installation.
- .4 Include projection with clips or recesses to hold 3 strands of barbed wire spaced 100 mm apart.
  - .1 New fencing sections to match existing.
- .5 Projection of approximately 300 mm long to project from fence at 45 degrees above horizontal.
- .6 Turnbuckles to be drop forged.
- .7 Organic zinc rich coating: to CAN/CGSB-1.181 MPI #18.

.10 Barbed wire: to ASTM A121 2 mm diameter galvanized steel wire aluminum coated steel wire 4 point barbs 125 mm spacing.

.11 Barbed wire: to CAN/CGSB-138.2, 2.5 mm diameter.

.12 Grounding rod per Canadian Electrical Code.

.13 For powered gates:

.1 Steel sheet: hot dipped galvanized to ASTM A653/A653M, A36 pre galvanized steel.

.2 Steel sections: to CAN/CSA-G40.21

.3 Welding materials: to CSA W59.

.4 Electrical components: Complete gate system to be CSA C22.2 No.247 and complying with local requirements.

.5 Power Supply: 115VAC/230VAC – 15 Amp single phase 60 hertz power supply

.6 Panels to be capable of fully opening within 10 seconds

.7 Fence Mounting Devices: Provide mounting brackets for mounting adjoining fence material to columns.

.8 Drive unit:

.1 Provide 24VDC drive with printed circuit board - integrated motor control circuitry for controlling electro-mechanical drive system. Drive system to incorporate current sensing resistors and adaptive monitoring software as inherent entrapment protection.

.2 All electrical drive components to be enclosed in weather-resistant housing.

.3 Integrated battery back up

.4 Emergency override: Provide point for manual opening and closing in case of power failure/malfunction.

.14 Cantilevered Vehicular Access Gate:

.1 Cantilevered, pretensioned gate, welded frame and panels.

.2 Access control: Electronically operated by electronic keypad.

.3 Exit Control: Electronically operated by electronic keypad.

.4 Guides:

.1 Guide wheels top and bottom, with wheel guards.

.5 Safety Devices

.1 Through beam photoelectric transmitter and receiver: Equip each column with 2 built-in photocells at 20” and 60 inches above the base plate. To be mounted within the columns.

.15 Man gate:

.1 Provide man gate as indicated.

2.2 FINISHES

.1 Galvanizing:

.1 For chain link fabric: to CAN/CGSB-138.1 Grade 2.

.2 For pipe: 550 g/m²minimum to ASTM A90.

.3 For barbed wire: to CAN/CGSB-138.2 ASTM A121, Class 2.

.4 For other fittings: to ASTM A123/A123M.

.5 For powered gates: Hot dip galvanized finish 0.5 kg/m2 zinc coating to CAN/CSA-G164.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for fence and gate 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 and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Refer to Section 01 35 43 Environmental Procedures.

.2 Grading:

.1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.

.1 Provide clearance between bottom of fence and ground surface of 30 mm to 50 mm.

.3 Layout

.1 Contractor to provide full layout of the fences, gates, powered gates and adjacent features and report any potential conflicts to the Departmental Representative prior to construction.

.4 Existing gate and opener.

.1 Remove existing powered gate and opener including machine box and gate arm.

.2 Remove existing man gate and fencing as indicated.

.3 Remove existing keypad and mounting pedestals

.1 Retain keypads for re-use for new gate system.

3.3 RESTORATION OF FENCE

.1 Restore and damaged or temporarily removed sections of fence as shown in the Contract Drawings in accordance with this specification and to match existing.

.2 Install new fencing sections as indicated.

3.4 ERECTION OF FENCE

.1 Erect fence along lines as indicated and to CAN/CGSB-138.3.

.2 Excavate post holes to dimensions indicated 600 mm depth x 300 mm diameter as directed by Departmental Representative.

.3 Space line posts 3 m apart, measured parallel to ground surface.

.4 Space straining posts at equal intervals not to exceed 150 m if distance between end or corner posts on straight continuous lengths of fence over reasonably smooth grade, is greater than 150 m.

.5 Install additional straining posts at sharp changes in grade and where directed by Departmental Representative.

.6 Install corner post where change in alignment exceeds 10 degrees.

.7 Install end posts at end of fence and at buildings.

.1 Install gate posts on both sides of gate openings.

.8 Place concrete in post holes then embed posts into concrete to minimum 450 mm depth.

.1 Extend concrete 50 mm above ground level and slope to drain away from posts.

.2 Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.

.9 Install fence fabric after concrete has cured, minimum of 5 days.

.10 Install brace between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface.

.1 Install braces on both sides of corner and straining posts in similar manner.

.11 Install overhang tops and caps.

.12 Install top rail between posts and fasten securely to posts and secure waterproof caps and overhang tops.

.13 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.

.14 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals.

.1 Knuckled selvedge at bottom.

.2 Twisted selvedge at top.

.15 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals.

.1 Give tie wires minimum two twists.

.16 Install barbed wire strands and clip securely to lugs of each projection.

.17 Install grounding rods as required.

3.5 INSTALLATION OF GATES

.1 Relocate gate controls as indicated. One gate control to be installed on guard house on 400mm standoff arm.

.2 Install gates in locations as indicated.

.3 Install powered gates to manufacturer's written instructions.

.4 Level ground between gate posts and set gate bottom approximately 40 mm above ground surface.

.5 Install gate stops where indicated.

3.6 TOUCH UP

.1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas as indicated.

.1 Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

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 Waste Management and Disposal.

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

END OF SECTION

APPENDIX A

Proposed Guardhouse at 4222 Columbia Highway, Cultus Lake B.C.
Geotechnical Investigation Report.
Horizon Engineering Inc, March 31 2020

HORIZON ENGINEERING INC

Unit 220 - 18 Gostick Place
North Vancouver, BC
Canada V7M 3G3

P: 604-990-0546
F: 604-990-0583
www.horizoneng.ca

March 31, 2020

Our File: 120-4701

Department of Fisheries and Ocean

Attention: Collin Douglas Gagne

Re: Proposed Guard House at
4222 Columbia Valley Highway, Cultus Lake, BC
Geotechnical Investigation Report

1.0 INTRODUCTION

This document provides geotechnical comments and recommendations for the proposed guard house based on the results of our subsurface investigation at the project site, our past experience within the vicinity of the site, and published information. This report is prepared in general conformance with our scope of services dated February 7, 2020 (ref. File No: P20-3116). Authorization to Proceed was received on February 24, 2020.

2.0 SITE DESCRIPTION

The proposed location for the guard house is located within the Cultus Lake laboratory facilities at 4222 Columbia Valley Highway, Cultus Lake, BC, specifically, northwest of the main gated entrance. The proposed location is bounded by the gated fence to the west, the access roadway to the south, the existing underground water reservoir to the north and landscaping vegetation (mainly lawn) to the east.

Topography in the general vicinity of the subject site is gently sloping down to the southeast.

3.0 PROPOSED DEVELOPMENT

At this stage of the project no design drawings are available. Based on the information provided by our client via email dated January 30, 2020, it is understood that the proposed development would comprise a one-storey building to be constructed at grade with approximate footprint of 3.1 metres by 3.1 metres (10.0 feet by 10.0 feet).

4.0 BACKGROUND INFORMATION

4.1 Surficial Geology

Published information from the Geological Survey of Canada (Map 1487A, Chilliwack) indicates that the surficial geology expected at the subject site consists of Sumas Drift and Sumas and Pre-Sumas Deposits.

Sumas Drift is generally described as till, glaciofluvial, and ice-contact deposits, specifically: "outwash gravel and sand up to 10+m thick." Sumas and Pre-Sumas Deposits is composed of till, glaciofluvial, glaciomarine, fluvial, and marine sediments, described as: "gravel and sand in part proglacial, may be in part fluvial, probably includes Fort Langley, Vashon, Coquitlam, and older deposits; as indicated on the map most of these deposits lie beneath Sumas till (Sf)".

4.2 Seismic Hazard

Based on published information from the 2018 edition of BC Building Code, the seismic event with a 2% probability of exceedance in 50 years at the project site would have peak ground acceleration (PGA) of 0.242, where g is the gravitational acceleration. An event with a 2% probability of exceedance in 50 years corresponds to return period of 2475 years. The peak ground acceleration is for the firm ground conditions and is assumed to have no vertical acceleration component. The 2% probability of exceedance in 50 years published spectral acceleration values for different natural periods are presented in Table 1.

Table 1: BC Building Code 2018 Spectral Accelerations (g) for 2% Probability of Exceedance in 50 Years (firm ground)

Period (s)	Sa (0.2)	Sa (0.5)	Sa (1.0)	Sa (2.0)	Sa (5.0)	Sa (10.0)
Spectral Acceleration (g)	0.539	0.448	0.277	0.174	0.062	0.021

5.0 SUBSURFACE INVESTIGATION

5.1 Subsurface Investigation

The subsurface investigation was carried out by "Adams Excavating" on March 11, 2020. Utility locate searches was conducted by "Quadra Utility Locating" to assess the proposed test hole location with respect to underground utilities. A combination of visual and electromagnetic techniques were utilized to delineate the location of the underground utilities in the immediate vicinity of the proposed test hole.

The investigation program consisted of one test pit that was advanced using a back-hoe excavator. The approximate location of the test pit is shown on Figure 2. Select soil samples were retrieved from test pit for further soil characterization.

The subsurface investigation was directed by an engineer from our office who also documented the soil stratigraphy in the test pit. The test pit was subsequently backfilled with excavated spoil. The footprint of the test pit was measured to be approximately 1.5 metres by 2.1 metres (5.0 feet by 7.0 feet).

5.2 Soil Conditions

A summary of the soil conditions encountered at the test pit is provided in this section. Detailed descriptions of the subsurface materials encountered at the test pit is provided in the test pit log attached to this report. The generalized soil stratigraphy encountered at the test pit is summarized below:

- Topsoil (dark brown) - encountered at surface, extended to depths of about 0.2 metre (8 inches); dark brown, silty sand with trace organics (roots and rootlets). The sand is fine to medium grained. This soil type was inferred to be very loose.
- Silty Sand (grey) - encountered beneath the topsoil and extended to depth of about 0.6 metre (2.0 feet); grey, silty sand with some gravel and trace organics (roots and wood fragments). The sand was fine-grained. This soil type was inferred to be loose and fill.
- Gravelly Sand (light brown) - encountered beneath grey, silty sand, extended to depth of about 0.8 metre (2.8 feet); grey mottled brown, gravelly sand with trace silt. The sand was medium to coarse grained. The gravel subangular to rounded. This soil type was inferred to be loose to compact and possible fill.
- Sand (grey mottled brown) - encountered at depths of about 0.8 metre (2.8 feet) below grade, extended to depth of at least 1.8 metres (6.0 feet), where the test pit was terminated; grey mottled brown, sand with trace silt. The sand was fine grained. This soil type was inferred to be compact.

The test pit was terminated at 1.8 metres (6.0 feet) below grade because the natural grey sand exposed at 0.8 metre (2.8 feet) below grade was consistent with the site geology and expected to extend to a depth of interest for the type of building proposed and to avoid further site disturbance due to the proximity of the test hole to the proposed building footprint.

5.3 Groundwater Conditions

Moderate groundwater seepage was observed in the test pit. It was noted that where groundwater was intercepted in the test pit, the bottom of the test pit excavation would rapidly fill with water. Groundwater was noted to be perched on the surface of the grey mottled brown fine grained sand and generally flowed from north to south which was consistent with the local topography sloping down towards the southeast. The near-surface, perched groundwater seepage was observed is typically related to the infiltration of surface water into the more permeable surficial soil. The natural, fine-grained sand is expected to be less permeable than the overlying fill and surficial soil.

6.0 GEOTECHNICAL COMMENTS AND RECOMMENDATIONS

6.1 General

From a geotechnical point of view, the subject site is considered to be suitable for the proposed development provided that the following recommendations are incorporated into the design and construction and the final design be provided to Horizon Engineering for review.

The surficial soil types including topsoil and fill are not considered suitable for supporting settlement sensitive structures such as building foundations and floor slabs. These materials are considered to be compressible and typically have significant settlement with increased surcharge loads and time. Based on the test pit investigation results, these surficial soil types may typically be in the order of 0.8 metre (2.8 feet) thick.

The grey mottled brown, fine grained sand encountered at shallow depth in the test pit is considered suitable for supporting settlement sensitive structures.

It is envisaged that unsuitable surficial materials would be stripped from proposed building areas and construction pad comprised of suitably compacted fill materials would be used to restore the grades to the proposed underside of the foundation and appurtenant structures. Buildings would

be supported on this construction pad utilizing shallow foundations consisting of strip and pad type footings.

6.2 Site Preparation

It is recommended that all topsoil, organic, or unsuitable fill materials including any loosened, softened, disturbed, or otherwise deleterious material be stripped from beneath settlement-sensitive facilities such as foundations, floor slabs, and underground utilities such that the natural, undisturbed, grey mottled brown, compact fine grained is exposed. Thickness of soil stripping was estimated to be less than 0.9 metre (3.0 feet).

It is envisaged there are existing underground utilities within the proposed site preparation areas. It is recommended that a site specific review carried out by the design team to ensure that location of the proposed guard house is not in conflict with the existing utilities.

6.3 Temporary Excavation Support

Excavations are expected to encounter groundwater discharge and perched surface water flows at comparatively shallow depths of less than 0.9 metre (3.0 feet) below current grade. We envisage that most of this water flow would be managed by conventional trenches, sumps and pumping.

Grade adjacent to an excavation should be sloped to direct surface runoff away from the excavation slopes. Alternatively, any surface water should be controlled such that is does not discharge over the crest into the excavation.

It is recommended that excavated spoil and construction materials be stockpiled no closer than the greater horizontal distance of 1.8 metres (6.0 feet) or half the excavation depth to the crest of the excavation slopes.

Unshored excavation slopes in soil should be protected by a layer of 6 mil polyethylene sheeting securely tied to the ground.

It is estimated that surficial soil types encountered in the test pits could be excavated using conventional hydraulic excavation equipment in good repair. It is possible that large boulders may be encountered which may require splitting for removal. It is common that boulders with a volume in excess of 1 cubic metre are defined as "rock" for contractual purposes and typically the volumes of boulders are quantified (i.e. measured / surveyed) by the owner, or owner's agent.

In general, it is recommended that unshored excavation slopes, in soil types encountered at the test holes be no steeper than 1 vertical to 1 horizontal (45 degrees).

It is envisaged that there will be sufficient room to accommodate sloped excavations across the subject property. Should steeper excavation slope be required, site specific recommendations should be developed subsequent to on-site review of soil and ground conditions.

Excavations deeper than 1.2 metres (4.0 feet) should be reviewed by Horizon Engineering to confirm the soil and slope conditions. Therefore, Horizon Engineering should be provided with opportunities to review the soil and groundwater conditions encountered during excavation to confirm the suitability of the ground conditions with respect to excavation slope stability.

6.4 Construction Pad

Based on the aforementioned discussion, we expect that subsequent to stripping the site from topsoil and unsuitable soils, a construction pad (which would comprise of Engineered fill placed

over grey mottled brown, fine grained sand) will be constructed in order to restore or raise grade to design elevations.

Typically, the bulk fill material for these construction pad would consist of well-graded, crushed rock with a gradation ranging between 25 mm to 100 mm (1 to 4 inches). This material is considered to be free-draining and would have a void ratio of more than 30 percent.

It is recommended that construction pad comprised of the aforementioned crushed rock have permanent side slopes no steeper than 1 Vertical : 2 Horizontal, as shown on Figure 3. If steeper permanent side slopes are required, these areas should be reviewed on a site specific basis and may require lowering the footings or constructing a retaining wall.

Construction pad should be capped with a minimum 0.5 metre (1.6 feet) thick, granular, well-graded, compacted road-base type, sand and gravel layer.

6.5 Fill Materials

6.5.1 Re-use of Excavation Material.

Most of the surficial materials encountered at the test hole consisted of silt and fine-grained soil. Fine-grained soils are typically not recommended for re-use as Engineered Fill due to the potential difficulty of placement and achieving suitable compaction. This fine-grained soil may be suitable for landscaping purposes and where support of settlement-sensitive structures is not required. It should be noted that fine-grained soil may be moisture sensitive and susceptible to water softening; therefore, this soil should only be placed under dry weather conditions.

6.4.2 Engineered Fill

Within the context of this report, Engineered Fill used for the construction pads should consist of select, clean, well-graded granular material with less than 5% fines content by mass and range in soil particle diameter sizes from 25mm to 100mm (1 to 42 inch). Blasted rock material should be placed in maximum 300mm (1 feet) thick loose lifts and compacted with a minimum 1000 lb, vibratory drum-roller compactor. Engineered Fill used as capping material over the construction pad fill should consist of select, clean, well-graded granular material with less than 5% fines content by mass with a maximum grain size diameter of 75mm (3 inch). Fine grained soil is defined as particles passing the US #200 sieve.

Engineered Fill should be placed and compacted within 2% of its optimum moisture content to the equivalent of at least 100% of its maximum dry density when determined in accordance with ASTM D698 (Standard Proctor).

The supplier of the material selected as engineered fill should provide written material specifications to confirm the selected fill material conforms with the recommended specifications. Fill materials should be capable of withstanding the effects of handling, spreading, and compaction without excessive degradation or production of deleterious fines. The particles should be reasonably uniform in quality and free from organic materials and deleterious matter.

Horizon Engineering should be given the opportunity to review the actual compaction level achieved using periodic field density tests. A practical method of assuring that the fill has been suitably compacted may be to place the fill in 200mm thick lifts (loose thickness) and compacted using a vibratory plate tamper until there is no noticeable "seam" between adjacent passes.

Where a testing agency is retained for density confirmation, test results should be forwarded to the Geotechnical Engineer of Record for review.

6.6 Foundation Recommendations

6.6.1 Bearing Pressure

It is envisaged that the proposed building foundation will be supported on construction pad that is overlying grey mottled brown fine grained sand with trace silt. It is recommended that a design bearing pressure of 1,500 psf be used for sizing footings supported on the construction pad fill materials under Serviceability Limit States (SLS) design provided that the fill thickness does not exceed 2.5 metres (8 feet). This maximum fill thickness would correspond with a maximum total settlement of 25mm (1 inch).

Based on the published information and our previous experience, total long-term settlement of the footings can be estimated to be in the order of 1% of the fill thickness. Therefore, the proposed structures should be designed for this range of total and differential settlements for the proposed SLS design value. We envisage that the structural design details for the proposed one storey guard house would not be significantly affected if the fill thickness exceeds 2.5 metres (8 feet). Potential differential settlements of the building foundations can be calculated based on the above approach and variation of fill thickness at each construction pad. Based on the variations of the fill thickness, we don't expect differential settlement would exceed 50% of the total settlement across the width of the building.

The proposed SLS design value should be revised if the above assumptions (quality and thickness of Engineered Fill) are not in accordance with the recommendations provided in this report.

Foundation subgrades should be protected from freezing. In addition, groundwater and rainwater runoff should be directed to temporary sumps and footing subgrades should be kept free of standing water.

Horizon Engineering should be provided with an opportunity to review the exposed subgrade and quality of "Construction Pads" prior to footing construction.

6.6.2 Recommended Footing Characteristics - Typical

Minimum pad footing dimensions of 600 mm (2 feet) and minimum strip footing widths of 250 mm (0.8 foot) are recommended. For buildings designed in accordance with the 2018 edition of the BC Building Code Part 9, minimum footing sizes are provided in Table 9.15.3.4 of the building code document.

It is recommended that foundations be placed at least 450 mm (1.5 feet) below final exterior grades for frost protection.

Foundations should step at no more than 1.0 vertical to 2.0 horizontal.

The design underside of proposed footing elevations should be no closer than 1.0 vertical to 2.0 horizontal from the underside of adjacent conduits or underground utilities.

6.6.3 Seismic Considerations

The above design bearing pressures may be increased by 100% for short term transient loading conditions under Ultimate Limit States design, such as those induced by wind and earthquakes.

Based on the BC Building Code (2018), the subject site is judged to have a Site Class designation of "D" as indicated in Table 4.1.8.4.A in Division B, Part 4. The site coefficients for spectral acceleration, F(T), may be determined as described in Tables 4.1.8.4.B to 4.1.8.4.I of the BC Building Code (2018).

6.7 Slabs-on-Grade

It is recommended that a 150 mm (6 inches) thick drainage layer of compacted 19 mm (3/4 inch) clear crushed gravel be placed beneath any slab-on-grade. This drainage layer should be separated from the slab-on-grade by a continuous layer of 6 mil polyethylene sheeting. The under-slab drainage layer should be reviewed by Horizon Engineering prior to pouring concrete for the slab-on-grade. If the capping material is considered free-draining, the proposed underslab drainage layer may be omitted.

6.8 Foundation Drainage

It is recommended that foundation drains consist of 100 mm (4 inch) diameter, rigid, perforated, PVC pipe placed around the perimeter of the buildings. The maximum invert elevation of the drain pipe should be 100 mm (4 inch) (or more) below the elevation of the underside of the slab-on-grade (eg 200 mm (8 inches) below the slab-on-grade finished floor elevation for a 100 mm (4 inches) thick slab). The pipes should be bedded on and surrounded by a minimum of 150 mm (6 inches) of 19 mm (3/4 inch) clear crushed gravel. A layer of non-woven geotextile filter fabric (such as Propex 4545 or approved equivalent) should be placed between any adjacent soil or fill and the gravel in an effort to ensure that fine grained materials do not migrate into the drainage system. A sample of this filter fabric should be provided to the Geotechnical Engineer for review prior to construction. Foundation drains should be installed with a minimum grade of 1.0%, and collected water should be directed to a suitable disposal system. The suitability of this system should be confirmed during construction by the professional having the responsibility for site and foundation drainage.

The foundation drainage system along the north of the proposed building would also perform as a drainage feature to intercept near-surface, perched groundwater and divert it to a suitable disposal system. Based on our site observation and information provided by the client during our test pit investigations, the aforementioned drainage feature can be connected to the near-by manholes or catch basins. The details to be coordinated at later stage of the project with the civil engineer or contractor.

7.0 REVIEWS

In accordance with the 2018 edition of the BC Building Code's, the Geotechnical Engineer of Record is obligated to carry out field reviews. For this project, geotechnical field reviews should be completed for the following items or during the following stages of construction:

Geotechnical - Temporary
7.1 Excavation
Geotechnical - Permanent
8.1 Bearing capacity of the soil
8.3 Compaction of engineered fill
8.5 Backfill

Thus, Horizon Engineering must be given the opportunity to review the stability of excavation slopes, confirm the foundation and slab-on-grade subgrades, review the suitability of engineered fill and backfill, and review the placement and compaction level of the engineered fill. Any in-situ density test results should be forwarded to Horizon Engineering for review in a timely manner.

8.0 CLOSURE

This report has been prepared for the sole use of our client, **Institute of Ocean Sciences RP&TS**, and other consultants for this project as described. Any use or reproduction of this report for other than the stated intended purpose is prohibited without the written permission of Horizon Engineering Inc.

We are pleased to be of assistance to you on this project and we trust that our comments and recommendations are both helpful and sufficient for your current purposes. If you would like further details or require clarification of the above, please do not hesitate to contact us.

For:
HORIZON ENGINEERING INC

Alisa Donnelly., P.Eng.
Geotechnical Engineer

For:
HORIZON ENGINEERING INC

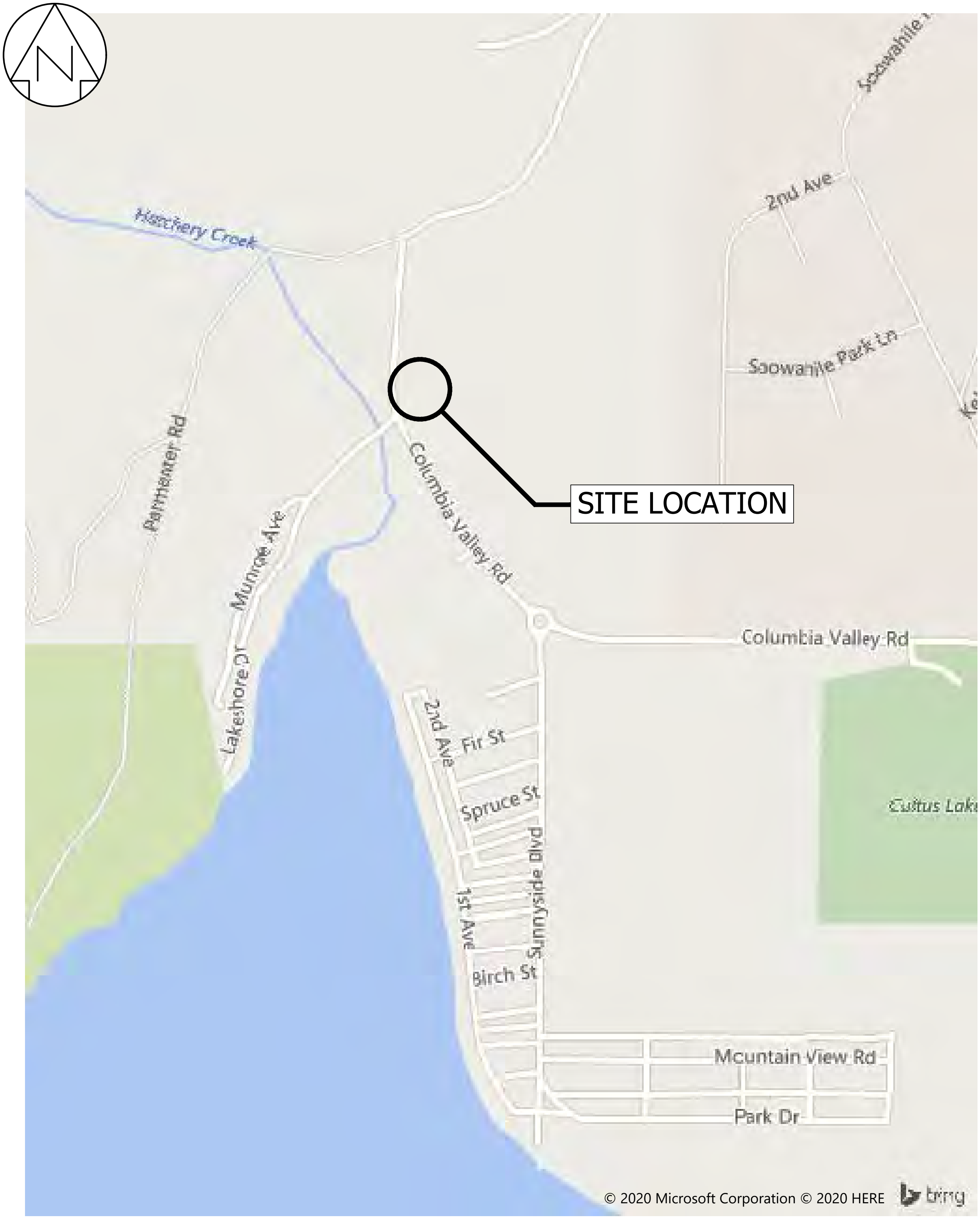
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
K. KARIMZADEGAN
#27156

May 1, 2020

Karim Karimzadegan, M.A.Sc., P.Eng.
Principal

Attachment:
Figure 1: Site Location Plan [1 page]
Figure 2: Test Hole Location Plan [1 page]
Figure 3: Section A-A [1 page]
Test Hole Log [1 page]

N:\2020 Projects\120-4701 CHL Cultus Lake\Reports\120-4701 Geotechnical Report 20200318RD3wpd.wpd



INSTITUTE OF OCEAN SCIENCES RP&TS 9860 West Saanich Road Sidney, BC V8L 4B2	SITE LOCATION PLAN	HORIZON ENGINEERING INC			
PROPOSED GUARD HOUSE 4222 Columbia Valley Hwy, Cultus Lake, BC		Scale: NTS	File No: 120-4701	Date: MAR/2020	FIGURE: 1
		Des: AD	Dwn: CT	Chk: KK	Rev:

LEGEND

- Approximate location of Test Pit

SCALE: 1:500 — 0, 5m, 10m, 20m, 30m, 40m

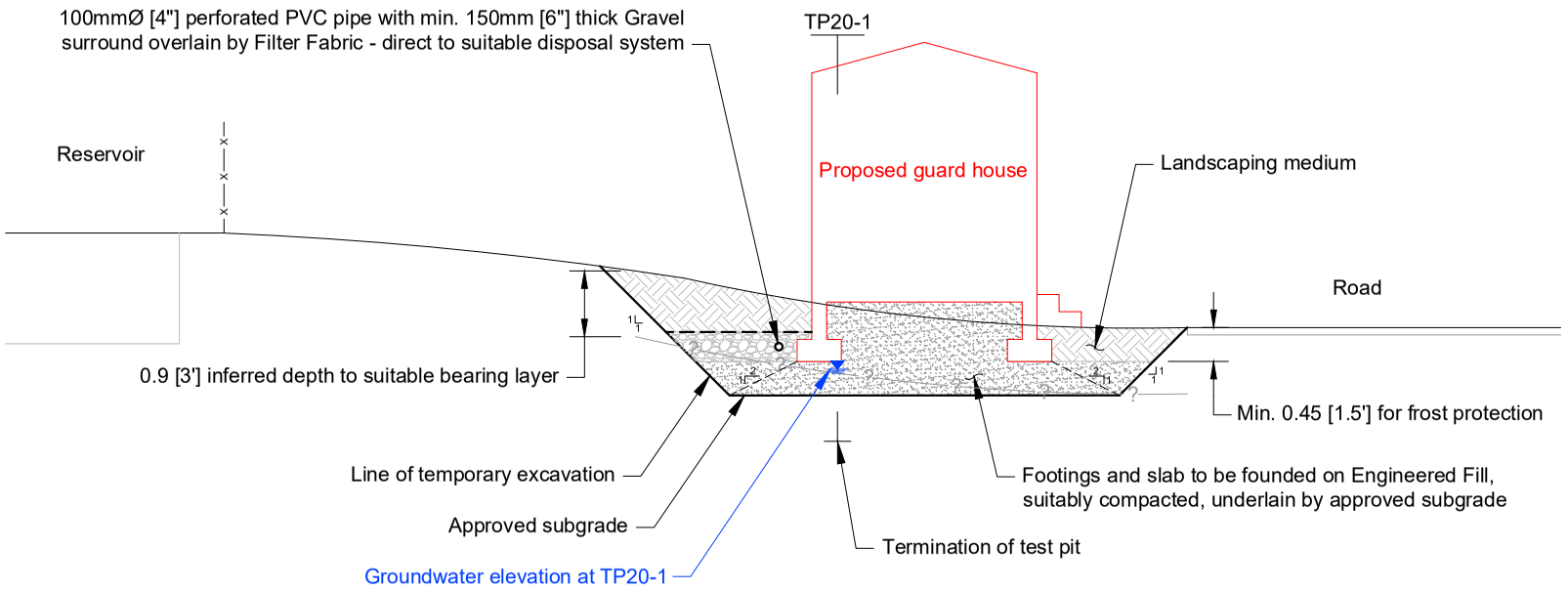
INSTITUTE OF OCEAN SCIENCES RP&TS
9860 West Saanich Road
Sidney, BC V8L 4B2

PROPOSED GUARD HOUSE
4222 Columbia Valley Hwy, Cultus Lake, BC

TEST HOLE
LOCATION PLAN

HORIZON ENGINEERING INC

Scale: 1:500	File No: 120-4701	Date: MAR/2020	FIGURE: 2
Des: AD	Dwn: CT	Chk: KK	Rev:



NOTES:

2. Gravel is to be clear-crushed, passing a 25mm (1") screen and retained on a 19mm (3/4") screen.
3. Filter Fabric is to be non-woven needle punch Nilex 4545, or an approved equivalent.
4. Engineered Fill is to be composed of inert, clean, tough, durable mineral particles capable of withstanding the effects of handling, spreading and compaction without excessive degradation or production of deleterious fines. The particles shall be uniform in quality and free from organic materials and deleterious matter. Suitable material would be well graded with less than 5% passing the US #200 sieve and 100% passing a 75mm (3") sieve designation. All granular fill should be placed in 200mm (8") thick lifts and compacted to greater than 100% of its maximum dry density as determined by ASTM D698 (Standard Proctor).

INSTITUTE OF OCEAN SCIENCES RP&TS
9860 West Saanich Road, Sidney, BC

PROPOSED GUARD HOUSE
4222 Columbia Valley Hwy, Cultus Lake, BC

SECTION A-A

HORIZON ENGINEERING INC

Scale:	File No:	Date:	FIGURE:
1:100	120-4701	MAR/2020	3

Des:	Dwn:	Chk:	Rev:
AD	CT	KK	

Test Pit Log No. TP20-1

LOGGED BY: AD REVIEWER: KK DATE: 2020 / 03 / 11 ADDRESS: 4222 Columbia Valley Hwy, Cultus Lake

METHOD: Backhoe NORTHING: _____ EASTING: _____ ELEVATION: _____

Type of Test:
- ○ Dynamic Cone Penetrometer Test (DCPT)
- ● Becker Denseness Test (BDT)
- ▲ Standard Penetration (SPT)
- ■ Moisture Content (% of dry weight)
- > Plastic limit
- < Liquid limit

TYPE -- Type of sample
- SPT -- Split spoon
- S -- Shelby tube
- G -- Grab
- O -- Other (specify)

▽ Ground water level

Notes: 2020-03-11: Groundwater seepage at 2.8 ft

Depth m	Depth ft	DESCRIPTION	Symbol	Depth	SAMPLE TYPE	Piezometer / Comments / Additional Testing
0	0	**TOPSOIL - SILTY SAND** (dark brown) fine to medium grained, trace organics (roots and rootlets), moits				
		- inferred to be loose		0.6		
		FILL - SILTY SAND (grey) fine grained, trace to some gravel, trace organics (roots and wood fragments), moist				
		- inferred to be loose		2		
		POSSIBLE FILL - GRAVELLY SAND (grey motlled brown) medium to coarse grains, subangular to rounded gravel, trace silt, wet				
		- inferred to be loose to compact		2.8		Groundwater ▽ seepage at 2.8 ft
1		**SAND** (grey mottled brown) fine grained, trace silt, wet			G 1	
		- inferred to be compact				
	5					
		Test Pit terminated at 6 feet		6	G 2	
2						
3						

20 40 60 80

HORIZON ENGINEERING INC

PROJECT: Proposed Gaurd House

FILE NO.: 120-4701

CLIENT: Institute of Ocean Sciences RP&TS

SHEET 1 of 1

TESTHOLE LOG 120-4701 GINT.GPJ HORIZON.GDT 13/3/20