## **SPECIFICATION**

for

SAR RESIDENCE and SAR Station Float Services Hartley Bay, BC

Project No.

2018552



prepared for: Fisheries and Oceans, Real Property

prepared by: Number Ten Architectural Group

Feb 1 2021



## **SPECIFICATION**

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McElhanney-August 24 2020.

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## Part 1 General

## 1.1 WORK COVERED BY CONTRACT DOCUMENTS

The Work of this contract is comprised of:

- .1 The provision of services to the new Canadian Coast Guard Search and Rescue (SAR) Station located on a concrete float moored in the harbour.
- .2 The construction of a new Sar Crew Residence.

The project is located in the Village of Hartley Bay B.C.

Float services to be provided consist of water, sanitary, power and communications. A wood frame shelter on the existing ramp is to be demolished and reconstructed. Refer to individual specification sections and drawings for more detailed description of work.

- .1 Installation of the SAR float and piles may be underway during the course of the work. Contractor is to co-ordinate with the float installation contractor in areas of overlapping work.
- .2 Contractor is to prevent disruption of services to neighboring houses while performing work. Access to waterfront boardwalk to SAR Float is to be maintained at all times. Interruptions to access are to be co-ordinated with the Departmental Representative.

The crew residence is a 3 floor wood frame structure on a concrete foundation. Refer to individual specification sections and drawings for more detailed description of work.

Access to the site of the residence is by way of a wooden boardwalk structure that is rated for a maximum load of 2,268 Kg (5,000 lbs). All construction equipment must be transported to the site along this boardwalk. This includes excavation and material handling equipment, construction materials, aggregate and concrete. Pumped materials may be transported overland.

A beach area where a barge can be landed is indicated in the drawing package. Distances from the landing point to the construction site are as follows.

- .1 Distance from barge site to construction site is approximately 285 m over boardwalks or 240 m overland from high water mark.
- .2 Elevation of building site is 7 m (20') over high water.
- .3 Low Water adds 30 m (100') to distance and 7 m (20') in elevation.

## 1.2 LOCATION OF THE WORK

This project is located in Hartley Bay, which is a remote First Nations village on the west coast of British Columbia. The village is not accessible by road. There is monthly barge service from Prince Rupert run by Wainright Marine: <a href="http://wainwrightmarine.com/">http://wainwrightmarine.com/</a>. These services are weather dependant. The closest communities that are accessible by road are Prince Rupert and Kitimat.

The successful bidder will be responsible for:

- .1 Providing accommodation, cooking facilities and provisions for their own staff and subtrades. Assume that there is no accommodation available in the Village of Hartley Bay.
  - .1 Accommodations may be located on a barge moored in the bay.
- .2 Transport of all building materials to site, and removal of all construction wastes from the Village when the project is complete.

## 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 February 28 2022.
  - .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 make themselves thoroughly acquainted with the conditions at the site prior to the submission of tender, 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 Areas for on-site storage of materials and equipment are very limited. Moorage for a barge may be arranged if required. Maintain areas used for storage of materials and equipment clean and free of construction related debris. Make good damages resulting from contractors use of storage 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. Contractors shall also follow all latest travel restrictions, quarantine guidelines and best management practices as prescribed by BC Northern Health Region and BC First Nations Health Authority. The ultimate decision maker for all COVID and health related restrictions will be the village of Hartley Bay and Gitga'at Heatlh Services.

## 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 The Departmental Representative may terminate the Contract without liability to the Departmental Representative where the Contractor, in the opinion of The Departmental Representative, 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)
  - .3 Copies of reports or directions issued by Federal and Provincial health

and safety inspectors.

- .4 Copies of incident and accident reports.
- .5 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
- .6 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 as deemed necessary to protect site against entry.

## 1.9 PROJECT/SITE CONDITIONS

- .1 Work at site will involve contact with:
  - .1 Federal employees and general public.
  - .2 Energized electrical services.
  - .3 Working from heights.
  - .4 Working at a remote site.
  - .5 Work adjacent to water.

## 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. MSDS 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 Work on, over, under and adjacent to water.
- .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 (MSDS) 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 MSDS 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 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 deenergizing of new and existing circuits with Departmental Representative.
  - .2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

## 1.18 ELECTRICAL LOCKOUT

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

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

## 1.19 OVERLOADING

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

## 1.20 FALSEWORK

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

## 1.21 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).

## 1.22 CONFINED SPACES

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

## 1.23 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.

## 1.24 FIRE SAFETY AND HOT WORK

- .1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.
- .2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.

## 1.25 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 Approval from the Departmental Representative is required prior to any gas or diesel tank being brought onto the work site.

## 1.26 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.

## 1.27 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.

## 1.28 MEETINGS

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

## 1.29 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 the emergency contact center 1-888-691-6958 or 778-645-4911.
- .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.
- .2 The system used shall be capable of being heard throughout the construction site.

## 1.5 EXTERIOR FIRE PROTECTION SYSTEMS

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.
- 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 HOT WORKS

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

## .2 Area of hot works:

- .1 Hot works shall be carried out in an area free of combustible and flammable content.
  - .1 All flammable and combustible materials within 15m of the hot works shall be protected in accordance with the National Fire Code of Canada;
  - .2 A fire watch shall be provided during the hot work and for a period of not less than 60 minutes afterwards.
- .2 Where there is a possibility of sparks leaking onto combustible materials in areas adjacent to the areas where the hot work is carried out.
  - .1 Openings in walls, floors or ceilings shall be covered or closed to prevent the passage of sparks to such adjacent areas, or
- .3 Protection of flammable and combustible materials.
  - .1 Any combustible or flammable material, dust or residue shall be:
    - .1 Removed from the area where hot works is carried out; or
    - .2 Protected from ignition by non combustible materials.

- .4 Fire extinguisher:
  - .1 A fire extinguisher shall be provided within 3 m of all hot works. Minimum size shall be 20lbs.

## 1.12 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 Hartley Bay Fire Chief prior to and at completion of such work.

## 1.13 QUESTIONS AND/OR CLARIFICATION

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

## 1.14 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 30 00 Cast-In-Place Concrete
- .6 Section 31 23 33.01 Excavating, Trenching and Backfilling

## 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.
- .6 Cleaning of boardwalks.

## 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 Representative 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.
- All waste generated by this project must be removed from the Village of Hartley Bay and disposed of or recycled in an appropriate facility.

## 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.

## 1.9 WORK ADJACENT TO WATERWAYS

- .1 Do not operate construction equipment in waterways.
- .2 Do not dump excavated fill, waste material or debris in waterways.

## 1.10 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.

## 1.11 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.

## 1.12 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.

## 1.13 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.

## 1.14 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, sourced from locations outside Hartley Bay, 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 fill material imported from outside of the Hartley Bay area 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.
- 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.

## 1.15 ARCHAEOLOGICAL RESOURCES

- .1 Archaeological features may potentially be discovered and disturbed at the site during excavation and/or building deconstruction/construction.
- .2 The contractor must notify Departmental Representative 7 days prior to any in ground work.
- .3 The Departmental Representative will engage First Nations consultants to monitor the site during excavation activities.

- .1 Contractor to accommodate on site monitoring during excavation.
- .4 If archaeological deposits waste are discovered, stop work immediately and notify Departmental Representative.
- .5 Archaeologically significant material, if found on the property, remains the property of the Crown and shall not be removed from the site.
- Management of the archaeological materials will be coordinated through Departmental Representative.

### 1.16 NOTIFICATION

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

#### 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.

#### 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 reexecute 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.

#### 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 once new meter has been installed and BC Hydro connection has been made.
  - .1 Prior to B.C. Hydro connection, Contractor will be responsible for provision of power through the use of portable generators.
    - .1 Contractor to pay for provision of generators and fuel under this contract.
  - .2 Contractor to install provisions for temporary power once new power pole is installed.
- .2 Departmental Representative will determine delivery points and quantitative limits. Connect to existing power supply in accordance with Canadian Electrical Code.
- .3 Provide all equipment and temporary lines to bring these services to the work, at no additional cost to the contract.
- .4 Exercise conservation whenever using temporary electrical power supply.

### 1.4 FIRE PROTECTION

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

## Part 2 Products

## 2.1 NOT USED

#### Part 3 EXECUTION

.1 NOT USED

SAR Residence and SAR Station Float Services Hartley Bay B.C.

Section 01 51 00 Temporary Utilities Page 2

#### 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 HOISTING

- .1 Provide, operate and maintain hoists required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2 Hoists to be operated by B.C. certified personnel.
- .3 Notify Departmental Representative not less than 5 working days prior to any cranes or lifting devices coming on site.

#### 1.4 SITE STORAGE/LOADING

- .1 Confine work and operations of employees to areas as directed by Departmental Representative unless otherwise identified in Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work

### 1.5 ACCOMMODATIONS

.1 The successful contractor will be responsible for providing accommodations, cooking facilities and provisions for its own forces and subcontractors forces during the course of construction.

## 1.6 SITE OFFICE

- .1 Contractor to provide temporary office of sufficient size to accommodate site meetings and store documents required on site. Furnish with a drawing laydown table.
  - .1 Site office may be a part of accommodations provided by the contractor for the work force. This can be located on a barge moored in the bay.

### 1.7 EQUIPMENT, TOOL AND MATERIALS STORAGE

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

- .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities where directed by Departmental Representative.
- .3 Laydown area on this site is very limited.

### 1.8 SANITARY FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 This project is located in a remote location with limited access. Contractor to consider connection to local sanitary sewer for temporary sanitary facilities. Permanent connection to the local sanitary service is a portion of the work of this contract.

### 1.9 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

### General

### 1.1 INSTALLATION AND REMOVAL

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

#### 1.2 HOARDING and BARRIERS

- .1 Provide minimum 1,828.8mm high construction fencing around perimeter of the area of work.
  - .1 Extent of fencing to allow boardwalk access and prevent unsafe entry of work area's for persons not engaged by contractor.

## 1.3 PROTECTION OF EXISTING BOARDWALK

.1 Existing boardwalk surfaces to be protected from damage from excavation and material handling equipment during the course of construction.

## 1.4 ACCESS TO SITE

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

### 1.5 FIRE ROUTES

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

### 1.6 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.
- .3 Be responsible for damage incurred due to lack of or improper protection.

## 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 reinstallation at no increase in Contract Price or Contract Time.

#### 1.5 **OUALITY 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

#### 1.1 WASTE MANAGEMENT AND DISPOSAL

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

#### 1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Maintain public areas adjacent to the worksite in a tidy condition.
- .3 Remove waste materials from site at daily and as directed by the Departmental Representative.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site dump containers for collection of waste materials and debris.
- .6 Dispose of waste materials and debris.
  - .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
  - .2 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
  - .3 Remove hazardous materials away from public areas as they are exposed.
  - .4 All debris must be removed from the Village of Hartley Bay and disposed of in an approved facility.
- .7 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

#### 1.3 DAILY CLEANING

- .1 Conduct cleaning and disposal operations daily. Comply with local ordinances and antipollution laws.
- .2 Remove waste products and debris other than that caused by others, leave Work area clean.
- .3 Maintain cleanliness of adjacent areas during the demolition phase.

#### 1.4 FINAL CLEANING

- .1 When all of the Work has been Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris.
- .5 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .6 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .7 Sweep and wash clean paved areas.
- .8 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

## Part 2 Products

### 2.1 NOT USED

.1 Not Used.

### Part 3 Execution

### 3.1 NOT USED

.1 Not Used.

#### 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 remanufacture 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,
  - 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

- 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.
- .4 All waste generated by this project must be removed from the Village of Hartley Bay and disposed of or recycled in an appropriate facility.

#### 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 All materials for recycling or disposal must be removed from Hartley Bay Town site and delivered to appropriate facility, as previously noted.
- .6 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 submitted for 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.

### 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.

#### 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.

#### PART 1 General

### 1.1 RELATED REQUIREMENTS

- .1 Section 01 35 43 Environmental Procedures.
- .2 Section 01 56 00 Temporary Barriers and Enclosures.
- .3 Section 01 74 11 Cleaning.

#### REFERENCES

- .4 CSA International
  - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .5 Canadian Environmental Protection Act (CEPA), 1993, C.33.

## 1.2 REGULATORY REQUIREMENTS

- .1 Conform to applicable code for demolition of structures, safety of adjacent structures, and disposal.
- .2 Obtain required permits from authorities.

#### 1.3 SITE CONDITIONS

- .1 Take precautions to protect environment and undertake works in conformance with Contract Documents for siltation control and pollution prevention.
- .2 If material resembling spray or trowel-applied asbestos or other designated substance not listed in the hazardous materials report is encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
  - .1 Proceed only after receipt of written instructions have been received from Departmental Representative.
- .3 Notify Departmental Representative before disrupting building access or services.

### PART 2 Products

#### 2.1 NOT USED

.1 Not used.

## PART 3 Execution

#### 3.1 EXAMINATION

- .1 Inspect site and verify extent and location of items designated for removal, disposal, alternative disposal or recycling.
- .2 Locate and protect utilities.
- .3 Notify and obtain approval of utility companies before starting demolition.

#### 3.2 PREPARATION

- .1 Protection of In-Place Conditions:
  - .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and parts of building to remain in place. Provide bracing and shoring required.

- .2 Keep noise, dust, and inconvenience to site occupants to a minimum.
- .3 Provide temporary dust screens, covers, railings, supports and other protection as required.
- .4 Do Work in accordance with Section 01 35 30 Health and Safety.
- .5 Conduct demolition in accordance with requirements of Section 01 35 43 Environmental Procedures.

### 3.3 DEMOLITION/REMOVAL:

- .1 Do demolition work in accordance with CSA S350.
- .2 Remove existing wood structure as indicated.
  - .1 Decking under structure to remain.

#### 3.4 CLEANING

- .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas or to conditions that existed prior to beginning of Work.
- .1 Progress Cleaning: clean in accordance with Section 01 74 11 Cleaning.
  - .1 Leave Work areas clean at end of each day.
- .1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 Cleaning.
- .2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.
- .3 Transport material designated for alternate disposal using approved facilities listed in Waste Reduction Workplan and in accordance with applicable regulations.
  - .1 Disposal facilities must be those approved of and listed in Waste Reduction Workplan.
- .4 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.
  - .1 Disposal facilities must be those approved of and listed in Waste Reduction Workplan.
  - .2 Materials must be removed from site and disposed in an approved facility outside of Hartley Bay.

### 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 A23.1-19 /A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CAN/CSA O86-19, Engineering Design in Wood.
  - .3 CSA O121-17, Douglas Fir Plywood.
  - .4 CAN/CSA O325.0-16, Construction Sheathing.
  - .5 CSA S269.1-16, Falsework and Formwork.
  - .6 CAN/CSA-S269.3-M92(R2013), Concrete Formwork, National Standard of Canada.

### 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.
- 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 For concrete with special architectural features, use formwork materials to CSA A23.1/A23.2.
- .2 Tubular column forms: spirally wound, polyethylene impregnated virgin kraft interior layer and a waxed exterior, internally treated with release material.
- .3 Form ties:
  - .1 For concrete not designated Architectural: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes minimum 25 mm diameter in concrete surface.
  - .2 For Architectural concrete; snap ties complete with plastic cones and light grey concrete plugs.
- .4 Form liner:
  - .1 Plywood: Douglas Fir to CSA O121
- .5 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.
- .6 Falsework materials: to CSA S269.1.
- .7 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 Do not close wall forms before reinforcing steel has been reviewed by the Departmental Representative.
- .4 Install reinforcement as indicated in electrical drawings.
  - .1 Electrical kiosk base.
- .5 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .6 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.

- .7 Align form joints and make watertight.
  - .1 Keep form joints to minimum.
- .8 Use 25 mm chamfer strips on external corners and 25 mm fillets at interior corners, joints, unless specified otherwise.
- .9 Apply a form coating and release agent uniformly to the contact surface of formwork panels before reuse.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .11 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.
- .12 Clean formwork in accordance with CSA A23.1/A23.2, before placing concrete.

## 3.2 REMOVAL AND RESHORING

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
  - .1 3 days for walls and sides of beams.
  - .2 2 days for footings.
- .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.

### 1.1 RELATED REQUIREMENTS

- .1 Section 03 10 00 Concrete Forming and Accessories
- .2 Section 03 30 00 Cast-in-Place Concrete

### 1.2 PRICE AND PAYMENT PROCEDURES

- .1 Measurement and Payment:
  - .1 No measurement made under this Section.
    - .1 Include reinforcement costs in items of concrete work in Section 03 30 00 Cast-In-Place Concrete.

### 1.3 REFERENCE STANDARDS

- .1 American Concrete Institute (ACI)
  - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International (ASTM)
  - .1 ASTM A641/A641M-09a(2014), Standard Specification for Zinc–Coated (Galvanized) Carbon Steel Wire.
  - .2 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 /A23.2-19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CAN/CSA A23.3-19, Design of Concrete Structures.
  - .3 CSA G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement.
  - .4 CSA G40.20/G40.21-13 (R2018), 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.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: Convene for a 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.

#### 1.5 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 30 Health and Safety Requirements and 01 35 43 Environmental Procedures.
- .3 Shop Drawings:
  - .1 Submission of shop drawings is not required.
    - .1 If required for installation prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and SP-66.
    - .2 Indicate placing of reinforcement and:
      - .1 Bar bending details.
      - .2 Lists.
      - .3 Quantities of reinforcement.
      - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
      - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
    - .3 Detail lap lengths and bar development lengths to CAN/CSA A23.3, unless otherwise indicated.
      - .1 Provide Class B unless otherwise indicated.
    - .4 Indicate position and size of openings in slabs and walls. Coordinate with trades requiring openings.
- .4 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Submit project Waste Management Plan and Waste Reduction Workplan highlighting recycling and salvage requirements.
- .5 Quality Assurance Submittals:
  - .1 Submit in accordance with Section 01 45 00 Quality Control and as described in PART 2 SOURCE QUALITY CONTROL.

## 1.6 DELIVERY, STORAGE AND HANDLING

- 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.
- .4 Provide standard hooks at the ends of all hooked bars
- .5 Substitute different size bars only if permitted in writing by the Departmental Representative

### 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 PREPARATION

- .1 Galvanizing to include chromate treatment.
  - .1 Duration of treatment 1 hour per 25 mm of bar diameter.
- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A143/A143M.

### 3.2 FIELD BENDING

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

## 3.3 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.
- .6 Remove all loose scale, dirt, oil or other coating which would reduce bod prior to concrete pour.

### 3.4 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.

### 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 C309-19, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - .3 ASTM C494/C494M-19, 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/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A283-06-R2019, Qualification Code for Concrete Testing Laboratories.
  - .3 CSA A3000-18, 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 manufacturer's instructions, printed product literature and data sheets for Packaged, Dry, Combined Materials for Mortar and Concrete.
  - .3 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.
  - .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.
- .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 Corrosion-inhibiting admixture: to
- .4 Lithium-based admixture: to
- .5 Shrinkage-reducing admixture (SRA): to
- .6 Viscosity-modifying agent (VMA): to
- .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. Concrete mixes shall be provided as shown in the structural drawings.
  - .4 Provide quality management plan to ensure verification of concrete quality to specified performance.
  - .5 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

#### Part 3 Execution

#### 3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete.
  - .1 Provide 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 rehandling, 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 Drainage holes and weep holes:
  - .1 Form weep holes and drainage holes in accordance with Section 03 10 00 Concrete Forming and Accessories. If wood forms used, remove them after concrete has set.
  - .2 Install weep hole tubes and drains as indicated.
- .5 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.
- .6 Finishing and curing:
  - .1 Finish concrete to CSA A23.1/A23.2 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.

# .7 Toppings:

- .1 Topping mixture to meet minimum requirements as follows: Bonded overlay
- .2 Make allowance for bonded overlay topping thickness when pouring base course.
- .3 Apply latex bonding agent modified cement/sand grout to base course to CSA A23.1/A23.2.
- .4 Place bonded topping to CSA A23.1/A23.2 and topping manufacturers recommendations.
- .5 Ensure joints in topping of same material as those in base course. Ensure their locations precisely match those in base course. Provide reinforcing mesh and edge strips dividers as indicated.

### .8 Joint fillers:

- 1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.
- .2 When more than one piece required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .3 Locate and form expansion and construction joints as indicated.
- .4 Install joint filler.

### .9 Dampproof membrane:

- .1 Install dampproof membrane under concrete slabs-on-grade inside building.
- .2 Do not place on surface between Slab on Grade and Grade Beams.
- .3 Install in conformance with architectural drawings.
- .4 Lap dampproof membrane minimum 150 mm at joints and seal.
- .5 Seal punctures in dampproof membrane before placing concrete.
- .6 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 designated by Contractor 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 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .4 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.

#### Part 1 General

# 1.1 SECTION INCLUDES

- .1 Interior steel handrails for staircase.
- .2 Exterior fire escape/ roof access ladder.
- .3 Exterior aluminum and glass handrail system.

### 1.2 RELATED REQUIREMENTS

- .1 Section 03 30 00 Cast-in-Place Concrete.
- .2 Section 06 10 00 Rough Carpentry.
- .3 Section 08 80 50 Glazing.

### 1.3 REFERENCES

- .1 ASTM International
  - .1 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM B209 Aluminum and Aluminum Alloy Steel and Plate.
  - .3 ASTM B221- Aluminum and Aluminum Alloy Extruded Bars, Rod, Wire, Profiles and Tubes.
  - .4 ASTM A269-08, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .5 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

# .2 CSA International

- .1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA S16-09, Design of Steel Structures.
- .4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
- .5 CSA W59-M03(R2008), Welded Steel Construction (Metal Arc Welding) Metric.
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).
- .4 The Master Painters Institute (MPI).
  - .1 Architectural Painting Specification Manual current edition.

#### 1.4 SUBMITTALS

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

### .2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for sections, plates, pipe, tubing and bolts and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit copies of WHMIS MSDS in accordance with Section 01 35 30 Health and Safety Requirements.
  - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.

### .3 Shop Drawings:

- .1 Submit drawings for handrails, aluminum guardrail system and ladder stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.
- .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
- .3 Provide colour samples for powder coated items from manufacture's standard line.

### 1.5 **QUALITY ASSURANCE**

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 Common Product Requirements.
- .2 Leave protective coverings in place until final cleaning of the building.

# Part 2 Products

#### 2.1 MATERIALS

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W.
- .2 Steel pipe: to ASTM A53/A53M standard weight hot dipped galvanized finish.
- .3 Aluminum Sheet and Plate to ASTM B209.
- .4 Aluminum and Aluminum alloy extrusions to ASTM B221.
- .5 Welding materials: to CSA W59.
- .6 Welding electrodes: to CSA W48 Series.

- .7 Bolts and anchor bolts: to ASTM A307. Stainless steel alloy at exposed-to-view exterior applications, galvanized at concealed exterior applications.
- .8 Screws, lag bolts: purpose-made to suit applications, stainless steel alloy at exposed-toview exterior applications, galvanized at concealed exterior applications.
- .9 Nuts, washers: stainless steel alloy for exterior exposed-to-view applications, galvanized at concealed exterior applications.
- .10 Shop coat primer: to CAN/CGSB-1.40.
- .11 Ladders: ANSI A14.3.

## 2.2 FABRICATION

- .1 Fabricate in accordance with approved shop drawings.
- .2 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.
- .5 Remove welding slag and spatter. Grind smooth all sharp edges and welds.
- .6 Unless otherwise detailed, fabricate pipe railings generally as follows:
  - .1 Fit round steel caps, full welded in place, at exposed ends and terminations.
  - .2 Allow minimum 38 mm to maximum 50 mm clearance between railings and wall surfaces.
  - .3 Use pipe inserts to join railing sections together at joints.
  - .4 Fabricate railing and post assemblies in as large a size as possible to minimize on site welding.
- .7 All exterior metal assemblies to be hot dipped galvanized to CAN/CSA G164-M92.
- .8 Remove all rust, scale, oil and other foreign substances by wire brush, sand blasting or any other means which provides clean steel surfaces for first class smooth permanent paint finishes and galvanized coatings.

### 2.3 FINISHES

- .1 All exterior steel metal fabrications are to be hot dip galvanized.
  - .1 Do galvanizing after assembly fabrication. Do not alter metal fabrications after galvanizing.
  - .2 Hot dip galvanize items with not less than 600 g/m² zinc coating, to CAN/CSA-G164.
- .2 All exterior aluminum railing components to be powder coated.
  - .1 Colour to be selected from the manufacturer's standard range of colours.

### 2.4 INTERIOR HAND RAILINGS

- .1 Steel pipe: 38 mm nominal outside diameter, formed to shapes and sizes as indicated.
- .2 Railings: Fabricate railings in as long a length as possible.

### 2.5 ROOF ACCESS LADDER

- .1 Stringers: 48.3 mm outside diameter steel pipe.
- .2 Steel Rungs: 25 mm diameter, welded to stringers, 305 mm max, on centre.
- .3 Brackets: sizes and shapes as indicated, weld to stringers, complete with anchor plates suitable for bolt attachment to wall. Ladder brackets to be bolted to building structure in accordance with engineered shop drawings.

### 2.6 ALUMINUM AND GLASS GUARD RAIL SYSTEM

- .1 Provide a complete engineered guardrail system, purpose built.
  - .1 Provide all aluminum components of same alloy.
  - .2 Posts- mounted to face of balcony assembly.
    - .1 Square profile.
    - .2 Attachment in accordance with approved shop drawings.
  - .3 Top rails- Continuous over railings.
    - .1 Round profile.
  - .4 Provide glass guards where indicated.
  - .5 Provide pickets where indicated.

# 2.7 ACCESSORIES

- .1 Screws: Color matched, stainless steel.
- .2 Anchors and Inserts: As required to support work specified, in accord with approved shop drawings.
- .3 Fittings and Fasteners: Same basic material as parts being joined, unless otherwise indicated. Do not use metals corrosive or incompatible with materials being fastened.

#### Part 3 Execution

# 3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### 3.2 FABRICATION- ALUMINUM GUARD RAIL ASSEMBLIES

- .1 Fabricate handrails and railing systems to comply with manufacturer's printed requirements, project design requirements, details, dimensions, finish and member sizes, including post spacing and anchorage, but not less than the structural requirements to support loading.
- .2 Clearly mark component units for site assembly and installation.
- .3 Connect and attach in accordance with engineered shop drawings.

### 3.3 INSTALLATION- ALUMINUM GUARD RAIL ASSEMBLIES

- .1 Install railing system and related components in strict accordance with manufacturer's printed installation instructions and approved project shop drawings.
- .2 Preassemble railing system, including posts, pickets, and panels where shown, in easy to lift sections whenever possible.
  - .1 Align rails so that variations from level for horizontal members, and from parallel with rake of steps and ramps for sloping members, do not exceed 1/4 inch in 12 feet (6 mm in 3.65 m).
  - .2 Separate aluminum from building materials where electrolytic action may occur by means of asphaltic paint or other approved method.
- .3 Adjust, level, and securely install railing system components.
- .4 Install bottom rails in unspliced lengths between posts.
- .5 Install posts of continuous sections from mounting base to top rail.

### 3.4 ERECTION OF STEEL COMPONENTS

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Departmental Representative, such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles. Refer to details.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CSA S16.
- .7 Touch-up rivets, bolts and burnt or scratched surfaces with primer after completion of installation.
- .8 All field connections to be made with specified fasteners. No field welding allowed without specific permission by Departmental Representative.

# 3.5 INSTALLATION

- .1 Install items plumb and level, accurately fitted, free from distortion or defects.
- .2 Provide for erection loads, and for sufficient temporary bracing to maintain true.
- .3 Perform field welding in accordance with AWS D1.1.
- .4 Obtain approval prior to site cutting or making adjustments not scheduled.
- .5 Install pipe railings and guard rails in locations indicated.

# 3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 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.

### 3.7 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by metal fabrications installation.

#### PART 1 General

#### 1.1 RELATED REQUIREMENTS

Section 06 41 11 - Architectural Woodwork and Finish Carpentry.

Section 07 44 56 - Mineral Fiber Reinforced Cementitious Panels.

Section 07 61 00 - Sheet Metal Roofing.

#### 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 mounting accessories, including handrails, 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 Wood I-Joists in accordance with Prefabricated Wood I-Joists ASTM D5055.
- .5 Structural Composite Lumber SCL in accordance with ASTM D5456
- 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.
- .7 Plywood, OSB and wood based composite panels: to CSA O325.
- .8 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 tapping screws: Stainless steel, countersink head, of appropriate length.
- .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 Framing Lumber:
  - .1 As specified on drawings.
- .2 Roof Decking:
  - .1 As specified in Structural drawings.
- .3 Floor sheathing:
  - .1 As specified in Structural drawings.
- .4 Electrical equipment mounting boards:
  - .1 Plywood, DFP G1S grade, or, square edge 19 mm thick.

### 3.3 INSTALLATION

- .1 Ramp Shelter:
  - .1 Install wood framing, bench framing and sheathing as indicated in Architectural details.
  - .2 Replace existing floor sheathing as required.
- .2 Install wood framing, bench framing and sheathing as indicated in Architectural details.

- .3 Install wood framing, truss system, and sheathing as indicated in Structural and Architectural details.
- .4 Install floor sheathing as indicated.
- .5 Install rough bucks, nailers and linings to rough openings as required to provide backing for windows, door frames and other work.
- .6 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.
- .7 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .8 Countersink bolts where necessary to provide clearance for other work.

#### 3.4 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 Truss system and joists.
  - .2 Anchoring and mounting cabinets.
  - .3 Hardware.
  - .4 Electrical equipment.
  - .5 Fittings and fixtures not supplied with backing attachments.
  - .6 Wall mounted benches.
  - .7 Washroom accessories.

### 3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 Construction Waste Management and Disposal
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

#### 3.6 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by work performed under this section.

### Part 1 General

#### 1.1 SECTION INCLUDES

- .1 Custom shop fabricated lockers and cabinets.
- .2 Storage cabinets.
- .3 Kitchen and washroom cabinets and countertops.
- .4 Cabinet hardware.
- .5 Work bench.
- .6 Interior window sills.

#### 1.2 RELATED SECTIONS

- .1 Section 01 45 00 Quality Control.
- .2 Section 09 90 00 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.
- .9 Piano hinges: 19mm butt, stainless steel construction. Satin finish, lengths as detailed.
- .10 Hanging rods:
  - .1 Rods: chrome plated 25 mm o.d x minimum 1.9 mm wall thickness seamless steel tubing.
  - .2 Flanges: chrome plated steel round "captured" flanges to prevent unauthorized rod removal, complete with chromed plated mounting screws.
  - .3 Intermediate supports required when rod exceeds 1m length.

#### 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 VENEER PLYWOOD CASWORK

- .1 Plywood materials as detailed.
- .2 Solid wood edging to AWMAC Architectural Woodwork Standards (AWS) 1st Edition, 2009, Custom grade.

# 2.9 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.

#### 2.10 WORKBENCH

- .1 19mm DFP construction, hardboard facing.
- .2 Solid fir legs and trims

# 2.11 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.

#### 2.12 WOOD FINISHES

- .1 Factory Finishing:
  - .1 Finishing System: AWMAC, Custom grade, acrylic lacquer finish system.
  - .2 Sheen: Satin.

#### 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.
- .6 Coordinate fixture installation with Mechanical subtrade.

# 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.

### Part 1 General

#### 1.1 SECTION INCLUDES

.1 Traffic membrane, consisting of welded seam PVC roofing membrane, installed on balcony surfaces.

### 1.2 RELATED SECTIONS

- .1 Section 06 10 11 Rough Carpentry.
- .2 Section 07 62 00 Sheet Metal Flashing and Trim.

### 1.3 REFERENCES

- .1 CCMC Technical Guide for PVC Sheet Waterproofing (Exposed to Light Pedestrian Traffic).
- .2 CGSB 37-GP-55M Application of Sheet Applied Flexible Polyvinyl Chloride Roofing Membrane.

### 1.4 SUBMITTALS

- .1 Section 01 33 00 Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements, including special environmental conditions required to install the Product and potential incompatibilities with adjacent materials.
- .3 Product Data: Include product characteristics, limitations, and identify dissolving solvents, fuels, and potential destructive compounds.
- .4 Samples: Submit manufactures samples illustrating colour, surface texture, and variations.
  - .1 Select manufactures standard range of colours for colour selection by the Departmental Representative.

# 1.5 CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Operation and Maintenance Data: Include procedures for stain removal, repairing surface, and cleaning.

### 1.6 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section.
- .2 Installer Qualifications: Company experienced in performing the work of this section and familiar with good trade practices.

### 1.7 DELIVERY, STORAGE, AND PROTECTION

.1 Deliver and store product in accordance with Section 01 61 00.

- .2 Store and handle materials to prevent damage.
  - .1 Place materials on pallets.
  - .2 Prevent creasing of rolled materials.
  - .3 Do not use polyethylene to cover stored materials (canvas tarpaulins are acceptable).
  - .4 Keep containers closed, except when removing materials from them.

## 1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
- .2 Restrict traffic from area where materials are being installed or are curing.

#### 1.9 WARRANTY

.1 Provide manufacturer's 15-year warranty for membrane leaks due to a manufacturing defect, covering materials, and/or repair and replacement labor.

#### Part 2 Products

#### 2.1 MATERIALS

- .1 Traffic Membrane: Polyester reinforced PVC membrane with ultra-violet resistance, for fully-adhered installation with heat-welded seams and perimeter attachment.
  - .1 Sheet Width: 1828.8mm.
  - .2 Overall Sheet Thickness:1.5 mm.
  - .3 PVC Film Thickness: 1.3 mm.
  - .4 Weight:1864 g/sq m.
- .2 National Building Code of Canada Compliance: Comply with National Building Code of Canada 2015, Part 9, Clause 9.26.2.1(1)(h), and CCMC Technical Guide for PVC Sheet Waterproofing (Exposed to Light Pedestrian Traffic), as evidenced by current Evaluation Report prepared by National Research Council, Canada Construction Materials Centre (CCMC).
- .3 Miscellaneous Accessories:
  - .1 Provide PVC Coated Metal, Scuppers, Overflow Drains, Roof Drains, and Trims as required for proper installation.
  - .2 Provide Surface Conditioners, Adhesives, Sealants, Fillers, and Cleaners as required for proper installation.
  - .3 Provide mechanical fastening devices color coordinated to membrane color.
- .4 Adjacent Flashings: Coordinate with flashings provided under Section 07 62 00.

#### Part 3 Execution

#### 3.1 EXAMINATION

- .1 Do not begin installation until substrates have been properly prepared.
- .2 Verify that deck is:
  - .1 Secure, well supported, solid, and in accordance with contract documents.
  - .2 Properly sloped away from the structure.
  - .3 Clean and smooth, free of depressions, waves, and projections.
  - .4 Dry and free of ice and snow.
- .3 If substrate preparation is the responsibility of another installer, notify Departmental Representative of unsatisfactory preparation before proceeding.
  - .1 Do not proceed until substrate preparation meets manufacture's requirements.

#### 3.2 PREPARATION

- .1 Clean substrate surface free of foreign matter.
- .2 Fill joints, knot holes, voids, and low areas with filler and sand smooth.
- .3 Install flashings and accessories. Seal around all penetrations and edges.
- .4 Install cant strips secure at intersecting surfaces.
- .5 Membrane shall not come in contact with bituminous materials or polystyrene insulations. Contact manufacturer for additional information.
- .6 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.3 INSTALLATION

- .1 Install in accordance with manufacturer's instructions and applicable codes.
- .2 Install in accordance with CGSB-37-GP-55M.
- .3 Do not install when temperature is below minus 3.8 degrees C or above 36.6 degrees C. Do not install when winds are gusting over 48.3 kph.
- .4 Do not dilute primers, adhesives, coatings, or sealants.
- .5 Install membrane with minimum number of seams possible. Overlap seams 19 mm, to shed water; heat-weld all seams.
- .6 Adhere membrane to substrate.
- .7 Mechanically fasten all perimeter edges and penetrations.

### 3.4 PROTECTION OF FINISHED WORK

.1 Do not permit traffic over unprotected surfaces.

#### 3.5 CLEANING

.1 Clean in accordance with Section 01 74 11.

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.2 Protect finished surfaces from damage.

### Part 1 General

#### 1.1 RELATED SECTIONS

- .1 Section 07 28 00 Air and Vapour Barriers.
- .2 Section 07 44 56 Mineral Fiber Reinforced Cementitious Panels.
- .3 Section 07 61 00 Sheet Metal Roofing.

#### 1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C411 2011, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
  - .2 ASTM C518 2010, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
  - .3 ASTM C578 18, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
  - .4 ASTM C612 2010, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
  - .5 ASTM A653 / A653M 17 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - .6 ASTM C665 2011, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
  - .7 ASTM C795 2013, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
  - .8 ASTM C1338 2008, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
  - .9 ASTM C1289-05a, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- .2 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
  - .2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
  - .3 CAN/ULC S114-2005, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
  - .4 CAN/ULC-S704-03, Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.
- .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.
- .2 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, indicating attachment requirements for insulation clips and girt/hat track assembly.

# 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 cavity 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 °C.
      - .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 ° C: 0.76 m<sup>2</sup>K/W to ASTM C518.
    - .3 Water vapour permeance: 1555 ng/Pa.s.m<sup>2</sup> 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<sup>3</sup> to ASTM C612.
  - .2 Inner layer: 60 kg/m<sup>3</sup> 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 Roof Deck Insulation
  - .1 Polyisocyanurate to CAN/ULC-S704, factory finished both sides with impermeable facers to retard thermal drift of insulation material, glass fibre reinforced core, flat format, square edges.
    - .1 203mm thickness.
    - .2 R 44.8
  - .2 Mineral Fiber insulation
    - .1 Rigid surface
    - .2 Impregnated with bitumen on surface of insulation.
    - .3 Thermal resistance to ASTM 518.
      - .1 R 7.5
    - .4 50mm thick.

# 2.2 ACCESSORIES

- .1 Insulation Clips: Thermally broken 100% Pultruded glass fiber and thermoset polyester resin insulation clip.
  - .1 127 mm nominal depth.
    - .1 Girt clamp end where indicated
    - .2 Flat end where indicated.
  - .2 Fasteners:
    - .1 High hex head washer head with twin lead threaded design.
    - .2 Heat treated corrosion resistant coated steel.
- .2 Provide engineered shop drawings for attachment of clips and girt/hat track assemblies.
- .3 Horizontal girts: 22 mm galvanized "Z"bar compatible with insulation clips.
  - .1 25 mm deep.
  - .2 Corrosive resistance:
    - .1 Galvanized Steel to ASTM C653.
  - .3 Stainless steel fasteners to ASTM C795.
- .4 Hat track
  - .1 25mm deep and 9mm deep as indicated.
  - .2 Corrosive resistance:

- .1 Galvanized Steel to ASTM C653.
- .3 Stainless steel fasteners to ASTM C795.

### .5 Fasteners

.1 Insulation to deck/wall assemblies: coated insulation fasteners and galvanized plates engineered for wind uplift and corrosion resistance, as recommended by insulation manufacturer.

#### 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 WORKMANSHIP

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .4 Offset both vertical and horizontal joints in multiple layer applications.
- Do not enclose insulation until it has been inspected and approved by Departmental Representative.

### 3.3 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.

#### 3.4 EXTERIOR SEMI RIGID INSULATON

- .1 Install over self-adhered membrane and fitted tightly around insulation clips. Fasten with screws and washers to manufacturers recommendations and as detailed. Fasten through wall sheathing into studs where possible.
- .2 Install in conjunction with girt/hat-track system and the requirements of Section 07 44 56 Mineral Fiber Reinforced Cementitious Panels.

### 3.5 ROOF DECK INSULATION

- .1 Polyisocyanurate insulation boards.
  - .1 Install insulation board over self-adhered membrane to produce continuous thermal insulated roof plane.

- .2 Trim insulation for tight fit to obstructions, projections and around roof perimeter.
- .3 Fix board in place to vapour barrier and other laminated insulation boards using approved fasteners and washers.

### .2 Mineral Fiber Insulation Board:

- .1 Install insulation board over Polyisocyanurate insulation board to create a laminated assembly.
  - .1 Offset 2nd layer from 1st layer by 1/2 board each direction to stagger board joints between layers where using 2-layer installation technique.
- .2 Laminated boards must be in full contact with each other free of interlayer air passages.
- .3 Fix board in place to vapour barrier and other laminated insulation boards using approved fasteners and washers.

# 3.6 CLEANING

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

### Part 1 General

#### 1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM).
- .2 ASTM C665-12 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

### 1.2 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 copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 Submittal Procedures.

### 1.3 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.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

#### Part 2 Products

### 2.1 INSULATION

- .1 Pre-formed semi rigid Mineral Wool insulation in batt form, unfaced, friction fit, to ASTM C665.
  - .1 Thermal resistance and sizes as indicated.

### 2.2 BATT INSULATION SUPPORT

- .1 Flexible carbon steel spring wire rods sized slightly larger than stud spacing.
  - .1 Designed to hold installed insulation in place against the interior face of wall sheathing and underside of subfloor.

#### 2.3 WIRE MESH

- .1 13mm welded hardware cloth.
  - .1 Galavanized finish.

# 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 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .2 Install insulation in continuous contact with interior side of wall sheathing or underside of subfloor.
- .3 Hold insulation in place with wire rod insulation support system, or approved alternative.
- .4 Apply wire mesh to underside of main floor joists to protect finished assembly from rodents.
- .5 Cut flat on table, do not trim in place
- .6 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .7 Fit insulation tight to windows and doors and other penetrations.
- .8 Do not compress insulation to fit into spaces.
- .9 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

### 3.3 CLEANING

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

### Part 1 General

#### 1.1 SECTION INCLUDES

- .1 Sheet and sealant materials for controlling vapour diffusion.
- .2 Film vapour barriers.
- .3 Sheet air barriers.

#### 1.2 RELATED SECTIONS

- .1 Section 06 10 00 Rough Carpentry.
- .2 Section 07 21 13 Board Insulation.
- .3 Section 07 92 00 Joint Sealing.
- .4 Section 08 11 00 Metal Doors and Frames.

### 1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
  - .1 ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials.
  - .2 ASTM E154 Standard test methods for water vapour retarders in contact with earth under concrete slabs.
- .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 VAPOUR BARRIER

- .1 Crawlspace vapour barrier: Purpose made reinforced polyethylene vapour barrier manufactured from virgin materials with a permeance of less than 0.01 perms.
  - .1 Permeance tested in accordance with ASTM E1745.
  - .2 Strength to ASTM E1745 Class A.
  - .3 Thickness: 15 mils minimum.

### 2.2 SELF ADHESIVE MEMBRANE

.1 Modified Bituminous Membrane: Asphalt and polymer modifiers of styrene-butadienestyrene (SBS) type, reinforced with non-woven cross laminated polyethylene; smooth surfaced; .8 mm thick. To CAN/CGSB 37-GP-56M.

### 2.3 SEALANTS

.1 Underslab membrane: Membrane lap primer/sealant to membrane manufacturer's recommendations.

# 2.4 ACCESSORIES

- .1 Under slab barrier: proprietary seam tape as recommended by manufacturer.
- .2 Primer: Water based surface conditioner as recommended by self adhesive membrane manufacturer.
- .3 Seam tape- proprietary moisture resistant pressure sensitive adhesive tape.
- .4 Staples: corrosion-resistant alloy or plated, lengths required to penetrate sheathing for secure attachment of building/sheathing paper.
- .5 Sealants: Refer to Section 07 92 00 Joint Sealing

#### 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 - CRAWLSPACE

.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 on the floor and walls of the crawlspace. 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 foundation 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 SELF ADHESIVE MEMBRANE

- .1 Apply primer as recommended by membrane manufacturer.
- .2 Apply membrane at exterior of wall sheathing and roof deck as detailed.
- .3 Apply membrane at window and door openings as detailed.
- .4 Install membrane waterproofing in accordance with manufacturer's instructions.
- .5 Roll out membrane. Minimize wrinkles and bubbles.
- .6 Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.

#### 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 Insulation.
- .2 Section 07 21 16 Blanket Insulation.
- .3 Section 07 28 00 Air and Vapour Barriers
- .4 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<sup>2</sup> 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 Provide photo documentation to the Departmental Representative for review of mock up;
    - .1 Provide photos detailing all stages of siding installation to allow for a remote review of mock up, if this becomes necessary.
  - .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 Panels: to ASTM C1186, asbestos-free composite product intended for exterior use, insect resistant, fire resistant and non-combustible.
  - .1 Dimension:1,219mm x 2438.4mm panels.
  - .2 Thickness: 8mm.
  - .3 Finish: Smooth.
- .4 Trim-Sar Residence:
  - .1 Comb face wood trim boards compatible with cementitious panels and as detailed.
  - .2 Dimensions as indicated.
  - .3 Exposed Face: comb face.
  - .4 Finish: Factory pre-primed.
- .5 Trim Ramp Shelter:
  - .1 Fiber cement trim boards compatible with cementitious panels and as detailed.
    - .1 Dimensions as indicated.
    - .2 Exposed Face: Wood Textured.
    - .3 Finish: Factory pre finished.

#### .6 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.

## .7 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.

#### .8 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.
- .9 Touch-up paint: siding/panel manufacturer formulation for exact touch-up/repair of prefinished siding/panels.
- .10 Accessories: Aluminum bug screen closure
  - .1 Rigid aluminum screen.
  - .2 Custom fabricated for bottom of rain screen assembly.

#### 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 Ramp Shelter to receive plank type siding. Residence siding types as indicated on elevation drawings.

- .5 Siding and shingle panels:
  - .1 Install to match details and 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.
- .6 Smooth Panels
  - .1 Install on underside of main floor joists as indicated.
- .7 Corner Trim
  - .1 Install corner and window trims as detailed. Use stainless steel trim head screws of appropriate length for attachment.
- .8 Soffit
  - .1 Install aluminum soffit as indicated.
    - .1 Refer also to Section 07 62 00 Sheet Metal Flashing and Trim.
- .9 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.

#### 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 Insulation.
- .3 Section 07 28 00 Air and Vapour Barriers.
- .4 Section 07 62 00 Sheet Metal Flashing and Trim.
- .5 Section 11 24 29 Facility Fall Protection.

#### 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 Submits shop drawings for snow guard system under the seal of qualified professional structural engineer specializing in the design of snow guard systems.

## .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 OUALITY 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.
- .3 Document each step of the roofing installation with photos prior to proceeding with the next step. Do not permit installations to be concealed or enclosed prior to photographing.

#### 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.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- .1 Section 01 61 00: Deliver, store, protect and handle products to site.
- .2 Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- .3 Prevent contact with materials which may cause discolouration or staining.
- .4 Store materials requiring protection from weather in weatherproof shelters. Avoid exposing light or heat sensitive materials to sunlight for prolonged periods of time.
- .5 Do not store materials on roof in concentrations which exceed design live loads.
- .6 Protect installed work and materials from damage. Replace damaged materials and damaged roofing panels, at no cost to Contract.

#### 1.10 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: 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.
- 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 for SAR Residence.
  - .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.
- .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 completed roof insulation, strapping and deck 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.

## Part 1 General

#### 1.1 RELATED SECTIONS

- .1 Section 07 61 00 Sheet Metal Roofing.
- .2 Section 08 11 00 Metal Doors and Frames.
- .3 Section 08 53 13 Fiberglass Windows.

## 1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A240/A240M-07e1, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - .2 ASTM A653/A653M-07, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .3 ASTM B32-04, Standard Specification for Solder Metal.
  - .4 ASTM D523-89(1999), Standard Test Method for Specular Gloss.
  - .5 ASTM D822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
  - .6 ASTM C920-08, Standard Specification for Elastomeric Joint Sealants.
- .2 Aluminum Association (AA)
  - .1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.
- .3 American Architectural Manufacturers Association (AAMA)
  - .1 AAMA 611-98, Voluntary Specifications for Anodized Finishes Architectural Aluminum.
- .4 NBC, National Building Code of Canada (issue date listed in Section 01 41 00 Regulatory Requirements)
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

# 1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

## .3 Samples:

.1 Submit duplicate samples of each type of sheet metal material, finishes and colours for Departmental Representative color selection.

## 1.4 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.

# 1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturers recommendations.
- .2 Protect pre-finished materials from scratching.
- .3 Stack pre-formed materials in manner to prevent twisting, bending and rubbing.

#### 1.6 WASTE MANAGEMENT AND DISPOSAL:

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

## Part 2 Products

# 2.1 MATERIALS

- .1 Zinc coated sheet steel: to ASTM A653/A653M, commercial quality, Grade 33, with not less than Z275 designation zinc coating, pre-finished.
  - .1 Pre-finish: coil stock finished with polyvinylidene fluoride gloss paint on epoxy primer prior to profile fabrication, with colour coat containing not less than 70% pvdf resin. Include permanent-type treatment to reverse side of coil stock to prevent corrosion of backside surfaces.
    - .1 Specular gloss: 30 units +/- in accordance with ASTM D523.
    - .2 Coating thickness: not less than 22 micrometres
    - .3 Resistance to accelerated weathering for chalk rating of 8, colour fade 5units or less and erosion rate less than 20% to ASTM D822 as follows:
      - .1 Outdoor exposure period 2500 hours.
      - .2 Humidity resistance exposure period 5000 hours.
    - .4 Colours: As selected by Departmental Representative.
  - .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 fasteners: #8-18x19mm, self-tapping screws.

- .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 Departmental 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.
- .2 Fabricate typical flashings using not less than 0.61 mm thick pre-finished zinc coated sheet steel, unless detailed/indicated otherwise. Use greater metal thickness at locations of wider span to prevent "oil-canning" and deformation of flashings.
- .3 Fabricate flashings accurately with true crisp lines and quality metalwork joinery suitable for exposed installation.
- .4 Pre-fabricate corners with mitred joints. Form watertight lock-seams set in sealant for all mitred corner joints.
- .5 Maintain 1:6 minimum slope on horizontal surfaces.
- .6 Hem exposed edges. Fold under minimum 10 mm.
- .7 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .8 Refer to drawings for self-adhesive SBS membrane locations under metal flashings.

# 2.3 FABRICATION OF WINDOW FLASHINGS

.1 Fabricate in straight sections as indicated.

## 2.4 SOFFITS

- .1 Soffit: to CAN/CGSB-93.2, Type B, Class 1.
  - .1 Colour: selected by Departmental Representative.
  - .2 Gloss: medium.
  - .3 Finish to ASTM A653/A653M
  - .4 Profile: flat sheet 'V' crimped for stiffness, preformed with elongated slits and small perforations.
    - .1 Pattern: perforated surface.
    - .2 Thickness: .38 mm steel thickness.
    - .3 J type moulding: at perimeter of soffit as required for attachment.

#### 2.5 GUTTERS

.1 Material: ASTM B209M utility sheet aluminum, shop pre-coated with high molecular weight polyester (hmp) gloss paint on epoxy primer prior to profile fabrication, colours selected by Departmental Representative to match sheet metal roofing.

# .2 Components:

- .1 Gutters: 125 mm size rectangular profile, not less than 0.80 mm metal thickness.
- .2 Downspouts: 75 mm o.d. round profile, not less than 0.48 mm metal thickness.
- .3 End caps, downspout outlets, straps, support brackets, downspout strainers: profiled to suit gutters and downspouts.

## .3 Accessories:

- .1 Anchorage devices: stainless steel alloy screws and washers.
- .2 Gutter supports: designed to fit into, engage and support gutters; non-corroding plated finish stamped metal or aluminum alloy casting fabrications.
- .3 Downspout supports: straps.
- .4 Downspout adapters: ABS plastic units sized to downspouts and to drain pipes, offset and straight designs, colours selected by Departmental Representative.

## .4 Fabrication:

- .1 Form gutters and downspouts of profiles and sizes detailed/indicated.
- .2 Form sections square, true and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance.

#### Part 3 Execution

## 3.1 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 Soffits:

- .1 Install in accordance with detail drawings.
- .3 Gutters and downspouts
  - .1 Install in accordance with detail drawings.

## 3.2 CLEANING

- .1 Do cleaning in accordance with Section 01 74 11 Cleaning.
- .2 Clean flashings to remove handling marks and smudges.
- .3 Progress cleaning: leave Work area clean at end of each day.
- .4 Final cleaning: on completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, equipment and barriers.

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## Part 1 General

#### 1.1 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).
- .2 Underwriter's Laboratories of Canada (ULC).
  - .1 ULC-S115-1995, Fire Tests of Fire stop Systems.
- .3 Green Seal Environmental Standards.
  - .1 Standard GS-36-00, Commercial Adhesives.
- .4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards.
  - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

#### 1.2 **DEFINITIONS**

- .1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- .2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- .3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.
- .4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1 and 9.10.9.6.1): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.
  - .1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

#### 1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit product manufacturer's ULC result cut sheets for each fire stopping condition.
  - .3 Submit electronic copies of WHMIS MSDS Material Safety Data Sheets (MSDS).
    - .1 Indicate precautions for workers using fire stopping products.

# .3 Shop Drawings:

- .1 Submit shop drawings to show proposed material, reinforcement, anchorage, fastenings and method of installation.
- .2 Construction details should accurately reflect actual job conditions.

# .4 Samples:

- .1 Submit samples showing actual fire stop material proposed for project on Departmental Representative's request.
- .2 Submit manufacturer installation instructions and special handling criteria, installation sequence, cleaning procedures.

## 1.4 **QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: company specializing in fire stopping installations and experienced in good trade practices.
  - .2 Overall Project quality control:
    - .1 Employ one applicator firm to install all firestopping throughout project, using personnel that meet installer qualifications stated above.
    - .2 Do not permit separate trades to firestop their own service penetrations.
  - .3 Health and safety requirements: do construction occupational health and safety in accordance with Section 01 35 30 Health and Safety.

## 1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle materials in accordance with Section 01 61 00 Common Product Requirements.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
  - .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.
- .2 Storage and Protection:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.
- .3 Waste Management and Disposal:
  - .1 Separate waste materials for recycling in accordance with Section 01 74 19 Construction Waste Management and Disposal.

#### Part 2 Products

## 2.1 MATERIALS

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

- Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended.
- .2 Fire stop system rating: Refer to drawings for assembly ratings
- .2 Service penetration assemblies: systems tested to CAN-ULC-S115.
- .3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.
- .4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .6 Fire stopping 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.
- .7 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .8 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .9 Sealants for vertical joints: non-sagging.

#### Part 3 Execution

#### 3.1 MANUFACTURER'S INSTRUCTIONS

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

#### 3.2 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
  - .1 Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.
- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

## 3.3 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
- .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to neat finish.
- .5 Remove excess compound promptly as work progresses and upon completion.

## 3.4 FIELD QUALITY CONTROL

- .1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
- .2 Installed firestopping will be examined to determine if assemblies have been installed in accordance with respective ULC listings.
  - .1 Allow for destructive testing of installed firestopping during examination including re-instatement of damaged firestopping during inspection, at no additional cost to Contract.
  - .2 Deviation from ULC listed systems will be considered grounds for rejection and will require replacement of firestopping to conform with respective ULC listings, at no additional cost to Contract.

#### 3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 Cleaning.
- On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

## Part 1 General

## 1.1 RELATED REQUIREMENTS

- .1 Section 07 61 00 Sheet Metal Roofing.
- .2 Section 07 62 00 Sheet Metal Flashing and Trim.
- .3 Section 08 11 00 Metal Doors and Frames.
- .4 Section 08 53 13 Fiberglass Windows.
- .5 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 AAMA 809 Voluntary Specifications and Test Methods for Sealants.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).
- .6 Green Seal Environmental Standards
  - .1 Standard GS-36-00, Commercial Adhesives.
- .7 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 manufacturers recommendations.
- .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 Management and Disposal.

## 1.7 SITE CONDITIONS

- .1 Environmental Conditions:
  - .1 Proceed with installation of joint sealants only when:
    - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
    - .2 Joint substrates are dry.
    - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .2 Joint-Width Conditions:

- .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
  - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with sealant bonding have been removed.
- .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 Non-drying butyl sealant to AAMA 809.
- .3 Silicones one part: to CAN/CGSB-19.13.
- .4 Acrylics one part: to CGSB 19-GP-5M.
- .5 Acrylic latex: one part, non sag siliconized acrylic polymer to CAN/CGSB-19.17.
- .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<sup>3</sup> 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 Gypsum board control joints: to make joints suitable for subsequent "painting out" with interior wall finishes.
  - .1 Acrylic latex.
- .4 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.
- .5 Under-slab vapour barrier
  - .1 Non-drying butyl sealant to AAMA 809

## 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.

#### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- .1 Non-rated, fire rated and thermally insulated steel frames.
- .2 Non-rated, fire rated and thermally insulated steel doors.

## 1.2 RELATED SECTIONS

- .1 Section 08 71 00 Door Hardware: Hardware, silencers, and weather-stripping.
- .2 Section 08 80 50 Glazing.
- .3 Section 09 90 00 Painting.

#### 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 REGULATORY REQUIREMENTS

- .1 Fire Rated Frame Construction: Conform to UL 10B.
- .2 Installed Door and Frame Assembly: Conform to NFPA 80 for fire rated class as scheduled.

# 1.7 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<sup>2</sup>.
- .2 Insulated Core Doors: minimum, 1.2 mm surface sheets, and top and bottom end channels; cores filled with insulation.
- .3 Honeycomb Core Doors: minimum ,1.2 mm surface sheets and, top and bottom end channels; cores filled with honeycomb material laminated under pressure to surface sheets.
- .4 Fire Rated Doors: Minimum, 1.2 mm surface sheets and, top and bottom end channels, of ULC label requirements indicated on drawings.
- .5 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.
- .6 Glazing Stops: 0.9 mm rolled steel channel shape, butted corners; 16 mm high profile; prepared for countersink screws.

#### 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 Attach fire rated label to each fire rated door unit.
- .7 Glazing Stops: 0.9 mm rolled steel channel shape, butted corners; 16 mm high profile; prepared for countersink screws.
- .8 Provide drywall returns on all frames.
- .9 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 Fabricate fire rated hollow metal doors in accordance with requirements of Underwriters Laboratories of Canada (ULC). Place ULC labels where visible when in installed position.

- .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 Reinforce and prepare doors to receive hardware. Refer to Section 08 71 00 for hardware requirements.
- .5 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 masonry, gypsum board, concrete wall construction for anchor placement.
- .3 Coordinate installation of glass and glazing.
- .4 Coordinate installation of doors and frames with installation of hardware specified in Section 08 71 00.
- .5 Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.
- .6 After installation, touch up all scratched or damaged surface and prime.
- .7 Insulate all frames exposed to the exterior.
- .8 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, maximum between pairs of doors.

## 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.

## PART 1 GENERAL

## 1.1 SECTION INCLUDES

.1 Flush wood doors, non-rated.

#### 1.2 RELATED SECTIONS

- .1 Section 08 11 00 Metal Doors and Frames.
- .2 Section 08 80 50 Glazing.
- .3 Section 08 71 00 Door Hardware.

## 1.3 REFERENCES

- .1 AWI/AWMAC Quality Standards Illustrated (QSI), current edition.
- .2 CSA O115-M1982, Hardwood and Decorative Plywood.
- .3 CAN/CSA O132.2 Series-90, Wood Flush Doors.
- .4 UL 10B Fire Tests of Door Assemblies.

## 1.4 SUBMITTALS

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- .3 Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, and undercuts required.

## 1.5 QUALITY ASSURANCE

- .1 Perform work in accordance with AWI/AWMAC QSI, Custom Finish doors in accordance with AWI/AWMAC QSI Quality Standard.
- .2 Health and safety requirements: do construction occupational health and safety in accordance with Section 01 35 35 Health and Safety Requirements.

## 1.6 DELIVERY, STORAGE, AND PROTECTION

- .1 Package, deliver and store doors in accordance with AWI/AWMAC QSI.
- .2 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.
- .3 Store doors in well ventilated room, off floor, in accordance with manufacturer's recommendations.

.4 Protect doors with resilient packaging. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges if stored more than one week.

## 1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .2 Dispose of all packaging material in appropriate on-site bin for recycling in accordance with Section 01 74 19 Construction Waste Management and Disposal.

#### PART 2 PRODUCTS

#### 2.1 DOOR TYPES

- .1 Flush Interior Doors: Solid core: to CAN/CSA-O132.2.1.
- .2 Pocket doors- Provide doors complete with wood frame suitable for in wall mounting and metal wheel and track hardware.

## 2.2 DOOR CONSTRUCTION

.1 Non rated, solid particleboard core: stile and rail frame bonded to particleboard core with wood lock blocks 3-ply construction.

#### 2.3 FLUSH DOOR FACING

.1 Veneer Facing: QSI A Grade quality Maple veneer, quarter sliced with bookmatched grain, for transparent finish.

#### 2.4 FABRICATION

- .1 Fabricate non-rated doors in accordance with QSI Custom Grade Quality Standards requirements.
- .2 Provide lock blocks at lock edge and top of door for closer for hardware reinforcement.
  - .1 Door Edge Detail to conform to QSI No. 1 Edge, hardwood vertical edges of species to match face veneer.
- .3 Bond edge banding to cores.
- .4 Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- .5 Provide edge clearances in accordance with AWMAC unless otherwise noted.

# 2.5 FINISH

- .1 Factory finish doors in accordance with approved sample.
- .2 Seal door top edge with sealer to match door facing.

# PART 3 EXECUTION

# 3.1 EXAMINATION

- .1 Verify that opening sizes and tolerances are acceptable.
- .2 Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

# 3.2 INSTALLATION

- .1 Install doors in accordance with manufacturer's instructions.
- .2 Install pocket door hardware prior to GWB installation.

# 3.3 ADJUSTING

- .1 Adjust door for smooth and balanced door movement.
- .2 Adjust closer for full closure

# 3.4 CLEANING

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

## PART 1 GENERAL

#### 1.1 SECTION INCLUDES

.1 Non-rated, thermally insulated fiberglass clad door with wood frame.

#### 1.2 RELATED SECTIONS

- .1 Section 08 14 16 Flush Wood Doors
- .2 Section 08 71 00 Door Hardware.
- .3 Section 09 90 00 Painting.

#### 1.3 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.

## 1.4 QUALITY ASSURANCE

.1 Conform to requirements of CSDFMA SDI-100.

## 1.5 PROJECT CONDITIONS

.1 Coordinate the work with frame opening construction, door, and hardware installation.

## PART 2 PRODUCTS

## 2.1 EXTERIOR DOORS AND JAMBS

- .1 Fiberglass outer and inner skin, embossed with a "Craftsman" style two panel design.
- .2 One quarter light glazing panel, low E glass.
  - .1 Obscuring glass with horizontal and vertical mullion design.
  - .2 Triple glazing.
- .3 Polyurethane core.
- .4 Pre hung in wood frame
- .5 Pre bored for lock set.

#### 2.2 FABRICATION FRAMES

.1 Coordinate hinge and hardware placement with the requirements of Section 08 14 16 Flush Wood Doors and Section 08 71 00 Door Hardware.

#### 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 installation of doors and frames with installation of hardware specified in Section 08 71 00 Door Hardware.
- .3 After installation, touch up all scratched or damaged surface and prime.
- .4 Insulate all door and window frames exposed to the exterior.

# 3.3 ERECTION TOLERANCES

- .1 Maximum Diagonal Distortion: 1.5 mm measured with straight edges, crossed corner to corner.
- .2 Clearance on door 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.

#### Part 1 General

## 1.1 SECTION INCLUDES

- .1 Overhead sectional door.
- .2 Hardware and supports.

## 1.2 RELATED SECTIONS

.1 Section 07 92 00 - Joint Sealants: Perimeter sealant and backup materials.

## 1.3 REFERENCES

- .1 ASTM A653/A653M-08 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
  - .2 CAN/CGSB-12.8-M90, Insulating Glass Units.
  - .3 CAN/CGSB-12.10-M76, Glass, Light and Heat Reflecting.
- .3 IGMAC, Insulating Glass Manufacturer's Association of Canada, Glazing Guidelines for Sealed Insulating Glass Units.
- .4 TBCBC, The British Columbia Building Code (TBCBC) 2006.

# 1.4 SYSTEM DESCRIPTION

- .1 Sectional steel garage door.
- .2 Panels: Steel construction, embossed wood grain, simulated frame and panel design.
  - .1 Triple glazed top panels.
- .3 Thermally insulated.
- .4 Manual operation.

# 1.5 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings:
  - .1 Indicate door design, dimensions, construction, finishes, glazing arrangements.
  - .2 Indicate arrangement of hardware, operating mechanisms and required clearances, fixing and anchorage requirements, finishes.
  - .3 Submit shop drawings of sectional door prepared under the supervision and bearing the seal of a Professional Engineer of the Province of BC, for wind load and seismic design.

- .3 Product Data: Submit manufacturer printed product literature, specifications and data sheets.
- .4 Samples: Submit exterior panel finish samples illustrating colour and finish prior to ordering project materials. Printed paper color samples are not acceptable.

### 1.6 CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Operation and Maintenance Data:
  - .1 Full identification of each type of door installed (i.e., model and model/series number) for Owner's later use in obtaining service and replacement parts.
  - .2 Name, address and telephone numbers of installer and of local service/repair agent.
  - .3 Warranty certificates made out to Owner.

# 1.7 QUALITY ASSURANCE

- .1 Use sectional door products that have been used in similar applications for at least 10 years.
- .2 Installer Qualifications: Company experienced in performing the work of this section and familiar with good trade practices.

#### Part 2 Products

#### 2.1 MATERIALS

- .1 Sheet Steel: ASTM A653/A653M galvanized to Z275; pre-coated with silicone polyester finish.
- .2 Insulation: Rigid polystyrene same thickness as core framing members bonded to facing.

#### 2.2 PANEL CONSTRUCTION

- .1 Solid door sections: 50 mm thick, width x length required to suit door opening. Door sections to use minimum 0.48 mm metal thickness galvanized sheet steel interior and exterior faces interlocked together mechanically, interior face isolated from exterior face by means of continuous effective thermal break, arranged in hinged door sections full width of each opening, each section filled completely with bonded polystyrene core providing R9.8 insulation value through non-glazed door sections, minimum 1.6 mm metal thickness door section end caps.
  - .1 Simulated frame and panel design.
  - .2 Upper section of door to be glazed.
- .2 Glazed door sections: as indicated x lengths required to suit door opening full vision glazing sections.

#### 2.3 DOOR COMPONENTS

- .1 Track: Galvanized sheet steel profiles, with fittings suitable for torsion spring lifting, including all required attachment/suspension items.
- .2 Hinges: door manufacturer standard, non-corroding finish 14 ga.
- .3 Rollers: 10 ball nylon rollers.
- .4 Roller brackets: heavy duty galvanized sheet steel adjustable profile.
- .5 Counterbalances:
  - .1 Torsion springs: oil tempered, helically wound, 200,000 cycle rating.
  - .2 Shafts: ball-bearing mounted keyed steel profile.
  - .3 Drums: precision grooved steel profiles.
  - .4 Cables: aircraft quality.
- .6 Pusher springs: door manufacturer standard design.
- .7 Weatherstripping:
  - .1 Jambs: continuous vinyl sweeps to seal doors to jambs.
  - .2 Heads: continuous vinyl stripping or tube to seal doors to head jamb.
  - .3 Bottom: continuous vinyl tube to seal door bottom to floor.
  - .4 Section-to-section: Tongue and groove joints between all panels.
- .8 Operation: Manual

### 2.4 FINISHES

- .1 Door finishes: 2 coat baked-on paint system consisting of primer plus polyester finish coat.
  - .1 Colour: Selected from manufacturers full range of premium colours.
  - .2 Colour to be selected by Departmental Representative from samples provided.
- .2 Finish all other galvanized sheet steel components using Z275 designation zinc coating.

### Part 3 Execution

#### 3.1 INSTALLATION

- .1 Install sectional doors, track, operators and all required hardware in accordance with reviewed shop drawings and door manufacturer instructions.
- .2 Maintain dimensional tolerances and alignment with adjacent construction.
  - .1 Variation from plumb: maximum 3 mm.
  - .2 Variation from level: maximum 3 mm.
- .3 Fix track and hardware items in place to resist pulling away and loosening.

- .4 Adjust operable parts for correct operation.
- .5 Touch up damaged paint and galvanized finishes

# 3.2 ADJUSTING

.1 Adjust door assembly to smooth operation and in full contact with weatherstripping.

# 3.3 CLEANING

- .1 Section 01 74 00: Cleaning installed work.
- .2 Clean doors, frames and glass.
- .3 Remove temporary labels and visible markings.

# 3.4 PROTECTION OF FINISHED WORK

.1 Do not permit construction traffic through overhead door openings after adjustment and cleaning.

# **END OF SECTION**

### 1.0 GENERAL

### 1.1 WORK INCLUDED

- .1 Window frames, sashes and patio doors constructed of fiberglass pultrusions.
- .2 Windows and patio doors 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 fiberglass window assemblies including fiberglass 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.
  - 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.
  - .3 All windows and doors to be triple glazed.
  - .4 Patio door.

# 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.
- .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.
- .3 Patio door consisting of one fixed lite and one rolling lite.
- .4 Glazed swinging door and frame.

### 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.
  - 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 Consultant.
  - .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 -18°C to 35°C and a possible solar heating range to 70°C, and an interior temperature range of 0°C to 30°C 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 twenty years. Any glazing failing to meet this service life shall be removed and replaced at no cost to the Owner 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 Consultant's review of the Contractor's submittals and the work is of the benefit only of the Owner. 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 Consultant, 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. Submit completed BC Building Code Letters of Assurance (Schedules B1 and B2) together with the initial shop drawing submission. 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.
- 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 Representative 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 the Departmental Representative.
- .6 Samples: If requested, make the following samples available for Departmental Representative 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.
  - One (1), 4'x 4' with 2' operable section, representative model of each type of window.

- .7 Letters of Assurance: The Registered Professional Engineer who signed and sealed the shop drawings shall perform sufficient field reviews in order to provide a letter of professional assurance after completion of the Work, giving assurance that the Work has been fabricated and installed in general conformance with the sealed shop drawings. Approved forms are BC Building Code Letters of Assurance (Schedule C). Written inspection reports of field reviews shall be submitted to the Architect promptly as the field reviews are made.
- .8 Maintenance Data: Provide in accordance with Section 01 78 10 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.

# .9 Warranties:

- .1 Provide a written warranty signed and issued in the name of the Owner stating:
  - 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 twenty (20) 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 above.
- .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 Owner.

# 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 Installer Qualifications: Company experienced in performing the work of this section and familiar with good trade practices.

### 2.0 PRODUCTS

### 2.1 WINDOWS

.1 Description: sash comprised of purpose-made fiberglass pultrusions, thermally broken, rain screen design with fiberglass sub sill, exterior flange mount, fitted with insulated glass unit glazing and rigid pultruded fiberglass snap-in glazing stop, in sizes and arrangements detailed/indicated.

# 2.2 DOORS

.1 Patio and Swing doors: comprised of purpose-made fiberglass pultrusions, thermally broken, rain screen design with fiberglass sub sill, exterior flange mount, fitted with insulated glass unit glazing and rigid pultruded fiberglass snap-in glazing stop, in sizes and arrangements detailed/indicated.

### 2.3 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 **1.8** 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.

#### 2.4 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.

### 2.5 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.

### 2.6 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 fiberglass frame and sash conforming to the following standards:
  - .1 Minimum external wall thickness of extrusions: 2.5 mm nominal.
- .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.
- Anchor using metal retaining clips at head, nailing flanges at jambs and continuous back angle at sill.

#### 2.7 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 Insulated glass unit assembly to provide following minimum performance requirements. Following is based on 6 mm thick Low E glass in 25 mm thick insulating unit with 13 mm thick Argon gas filled space and 6 mm thick clear inner glass.
  - .1 Transmittance:

Ultra-violet (UV) light: 19% Visible daylight: 70% Total solar energy: 33%

.2 Reflectance:

Visible light: 11% Total solar energy: 30%

.3 U-values (Imperial):

Winter night time: 0.25 Summer day time: 0.25

.4 Shading coefficient factor: 0.44

.5 Solar heat gain coefficient: 0.37 .6 Light-to-solar gain (LSG): 1.84

- .3 All windows to be fitted with triple glazed units, refer to window schedule.
- .4 Clear Float Glass: to CAN/CGSB-12.3, glazing quality, for inner and outer lite.

- .5 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.
- .6 Other Glazing Accessories: setting blocks to AAMA/WDMA/CSA101/I.S.2/A440-08-NAFS.

#### 2.8 HARDWARE

- .1 Exposed Hardware Components: cast metal, in finish selected by Consultant 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:

### 2.9 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.
- .4 Joint Sealants: as specified in Section 07 92 00, 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.

### 2.10 FRAME AND SASH FINISHES

.1 Factory applied water-borne urethane finish.

### 2.11 AIR/VAPOUR RETARDER

.1 Ensure continuity of air/vapour retarder and seal from walls to window frame.

### 3.0 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 fiberglass 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.
- .5 Fabricate swing door to accept hardware specified in Section 08 71 00 Door Hardware.

### 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 AND DOOR 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 jamb extensions, casings, brick moulds and trim as indicated on drawings.
- .12 Install sealant, in accordance with Section 07 92 00, and related materials as indicated on drawings.
- .13 Adjust operable sash and hardware to operate smoothly.
- .14 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.

#### 3.4 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 Sealants. Conceal sealant within window units except where exposed use is permitted by the Consultant.

### 3.5 PROTECTION AND CLEANING

- .1 Do cleaning in accordance with Section 01 74 11 Cleaning.
- .2 Protect windows/doors from damage/staining during and after installation.
- .3 Clean interior and exterior surfaces as soon as adjacent contaminating activities are completed, to recommendations of window manufacturer.

# 3.6 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.
- .3 Certificates are to be posted in plain view at the project site for a period of at least 120 days after the last manufactured fenestration product is installed in the building.

END OF SECTION

### Part 1 General

### 1.1 SECTION INCLUDES

- .1 Hardware for hollow and insulated steel doors, wood doors, fiberglass doors.
- .2 Thresholds.
- .3 Weatherstripping, seals, and door gaskets.

#### 1.2 RELATED SECTIONS

- .1 Section 08 11 00 -Metal Doors and Frames.
- .2 Section 08 14 16 Flush Wood Doors.
- .3 Section 08 16 13 Fiberglass Entry Doors.
- .4 Section 08 53 13 Fiberglass Windows.

# 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.
- .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.

#### 1.9 WARRANTY

- .1 For Work of this Section 08 71 00 Door Hardware, 12 months warranty period is extended to:
  - .1 60 months for door closers of this Section will be free from manufacturing defects.
  - .2 Manufacturing defects will be deemed to occur if any of following conditions are noted.
    - .1 Defects of material and factory workmanship.
    - .2 Fluids leaks.
- .2 Defective products to be corrected, replaced or maintained without cost to Canada as necessary to enable such products to perform as warranted.
- .3 Start warranties at date of Final Certificate of Completion.

#### Part 2 Products

# 2.1 MANUFACTURERS

- .1 Hardware items to be of the best grade, free from defect and of first line quality production suitable for this level of project.
- .2 Use one hardware manufacturer product only for each similar hardware item.

#### 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 Electric strikes to ANSI/BHMA A156.31- 2013 suitable for installation in hollow metal door frames. Fail secure. c/w power supply. Refer to Electrical
  - .6 Cylinders: keyed into keying system directed by Departmental Representative.
  - .7 Finishes: finished to 626
- .3 Card reader, controller and fobs
  - .1 All devices from the same manufacturer, compatible with electric strike.
- .4 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.
- .5 Door closers and accessories:

- .1 Door controls (closers): to ANSI/BHMA A156.4, designated by letter C, sizes as required by NBC and to provide following requirements.
- .2 Maximum degree of opening required.
- .3 Size to door.
- .6 Thresholds: 127 mm wide x full width of door opening, extruded aluminum mill finish, serrated surface.
- .7 Weatherstripping:
  - .1 Head and Jamb seal:
    - .1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.
    - .2 Adhesive backed neoprene material
  - .2 Door bottom seal:
    - .1 Extruded aluminum frame with closed cell neoprene, vinyl sweep, clear anodized finish.

### 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 Supply construction cores.
- .7 Supply 30 fobs for card reader.
- .8 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–Hinge5Knuckle-.180gauge-114mmx101mmx NonRemovablePinx630
- .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 - Privacy set         | ANSI F76 with indicator     | 626 |
| .3 | B3 - Lock set            | ANSI F109                   | 626 |
| .4 | B4- Lock set             | ANSI F07                    | 626 |
| .5 | B5- Passage set          | ANSI F75                    | 626 |
| .6 | <b>B6-Dormitory lock</b> | ANSI F90                    | 626 |
| .7 | B7- Electric strike      | BHMA Grade 1                | 626 |
| .8 | B8- Deadbolt             | cylinder only               | 626 |

# .3 Closers

- .1 C1 Institutional, non sized, compression spring buffer arm x delayed action 689.
- .2 Include through bolts and grommet nut fasteners

## .4 Auxilliary hardware

- .1 D2 Wall stop Cast concealed mount, concave bumper with back plate x 626
- .5 Threshold, seals door bottoms, astragal:
  - .1 E1- Thresholds: as scheduled, one length per door opening without joins or splices.
  - .2 E2- Weatherstripping/Seals: Adjustable jamb type with silicone insert.
  - .3 E3-Astragal: overlapping, extruded aluminum, neoprene weather seal, finished to match doors.
  - .4 E4 –Flush bolts

# Hardware Set 01 for Exterior single door D10

| 3 Hinges               | A1 |
|------------------------|----|
| 1 Ea. Lock set         | B3 |
| 1 Ea. cylinder         | B1 |
| 1 Ea. Closer           | C1 |
| 1 Ea. Threshold        | E1 |
| 1 Ea. Weatherstripping | E2 |
| 1 Ea. Electric Strike  | B7 |
| 1 Ea. Power supply     |    |
| 1 Ea. Deadbolt         | B8 |
| 1 Ea Wall stop         | D2 |

Access control hardware refer to Electrical

# Hardware Set 02 Exterior single door D24, D36A

| 3 Hinges       | A1 |
|----------------|----|
| 1 Ea. Lock set | В3 |
| 1 Ea. cylinder | B1 |

| 1 Ea. Closer           | C1 |
|------------------------|----|
| 1 Ea. Threshold        | E1 |
| 1 Ea. Weatherstripping | E2 |
| 1 Ea Wall stop         | D2 |

Hardware Set 03 Passage doors D10A,D11,D12 D15, D20, D30. Corridor Doors 10A, D20, D30- have magnetic hold open devices, refer to electrical.

| 3 Hinges          | A2 |
|-------------------|----|
| 1 Ea. Closer      | C1 |
| 1 Ea. Passage set | B5 |
| 1 Ea Wall stop    | D2 |

Hardware Set 04 Storage rooms D34, D37, D33, D35.

| 3 Hinges          | A2 |
|-------------------|----|
| 1 Ea. Door stop   | D2 |
| 1 Ea. Passage set | B5 |
| 1 Ea Wall stop    | D2 |

Hardware Set 03 Cabin Doors D13, D14, D25, D26, D33.

| 3 Hinges             | A2 |
|----------------------|----|
| 1 Ea. Dormitory lock | B6 |
| 1 Ea Wall stop       | D2 |

Hardware Set 05 Cabin Washrooms D13A D14A, D25A, D26A, D31 and Cabin D36

| 3 Hinges          | A2 |
|-------------------|----|
| 1 Ea. Privacy set | B2 |
| 1 Ea Wall stop    | D2 |

Hardware set 08 Storage Room Pocket door D23

1 Ea. Latch set & pull

# **END OF SECTION**

#### Part 1 General

#### 1.1 REFERENCES

- .1 ASTM International
  - .1 ASTM D2240-05, Standard Test Method for Rubber Property Durometer Hardness.
  - .2 ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
  - .3 ASTM F1233-08, Standard Test Method for Security Glazing Materials and Systems.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
  - .2 CAN/CGSB-12.8-9, Insulating Glass Units.
- .3 AAMA/WDMA/CSA101/I.S.2/A440-08-NAFS- North American Fenestration Standard/ Specification for windows, doors, and skylights.
- .4 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."
- .5 British Columbia Energy Efficiency Act Energy Efficiency Standards Regulation (BCEEA).

## 1.2 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for Glazing materials and sealants. Include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit 2 copies of WHMIS Material Safety Data Sheets.
    - .1 Indicate VOC for glazing materials during application and curing.
- .3 Samples
  - .1 Submit minimum 305 x 305 mm size samples of glass requested by Departmental Representative.
  - .2 Manufacturers instructions.
    - .1 Submit installation instructions.

### 1.3 QUALITY ASSURANCE

.1 Installer Qualifications: Company experienced in performing the work of this section and familiar with good trade practices.

### 1.4 DESIGN CRITERIA

- .1 Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follows:
  - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
  - .2 Size glass to withstand local positive and negative wind loads listed in NBC for location of building or identified on structural drawings, whichever more severe.
  - .3 Size glass to withstand seismic conditions for building location listed in NBC.

### 1.5 DELIVERY, STORAGE AND HANDLING

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

### 1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.

#### 1.7 WHMIS

.1 Comply with WHMIS requirements regarding use, handling and storage of glazing materials.

#### 1.8 WARRANTY

- .1 For Work of this Section 08 80 50 Glazing, 12 months warranty period is extended to:
  - .1 120 months for insulating glass units of this Section to be free from manufacturing defects.
  - .2 Manufacturing defects will be deemed to occur if any of following conditions are noted.
    - .1 Appearance of condensation between panes.
    - .2 Obstruction of vision within unit perimeter.
    - .3 Measurable deterioration (more than 10%) of specified thermal transmission or shading coefficient performance ratings.
    - .4 Chipping, cracking or breakage of glass panes occurring due to manufacturing defects or under specified service conditions.
    - .5 Migration of edge spacer.
- .2 Defective products to be corrected, replaced or maintained without cost to Canada as necessary to enable such products to perform as warranted.
- .3 Start warranties at date of Final Certificate of Completion.

### Part 2 Products

#### 2.1 MATERIALS

- .1 Flat Glass:
  - .1 Safety glass: to CAN/CGSB-12.1,
    - .1 Type 2-tempered.
    - .2 Class B-float.
    - .3 Transparent.
    - .4 Compatible with engineered aluminum railing system.
  - .2 Wired glass: to CAN/CGSB-12.11
    - .1 Type 1-polished both sides (transparent).
    - .2 Wire mesh styles 3-square.
- .2 Insulating Glass Units:
  - .1 Refer to Section 08 53 13 Fiberglass Windows for sealed unit requirements.

### 2.2 ACCESSORIES

- .1 Setting blocks: neoprene, EPDM or silicone, 80-90 durometer hardness to ASTM D2240, to suit each application.
- .2 Spacer shims: neoprene, EDPM or silicone, 50-60 durometer hardness to ASTM D2240, Sized to suit each application.
- .3 Glazing tape: Glazing tapes: pre-formed macro-polyisobutylene tape with continuous integral neoprene shim (to prevent "pumping out" of tape under glass load conditions), paper release, black colour, width x thickness to suit installations.
- .4 Primers, sealers, cleaners: to glass manufacturer standards and compatible with framing system material/finish.
- .5 Glazing sealant: purpose-made for glazing use, compatible with insulating glass units.
- .6 Weather sealant: polyurethane, non-sag, 1-part formulation, colours selected by Departmental Representative.
- .7 Insulation: to ASTM C612 Type IVB, non-combustible, 70 kg/m³ density mineral wool fibre board, zero flame spread and smoke development in accordance with CAN/ULC-S102, maximum water absorption of 0.03% in accordance with ASTM C1104/C1104M, minimum 5 year "aged" thermal resistance value RSI 0.74 per 25 mm thickness, of thicknesses or total RSI values detailed/indicated.

### 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 GENERAL GLAZING REQUIREMENTS

- .1 Clean sealing surfaces at perimeter of glass and sealing surfaces of rabbets before applying glazing tapes and sealant. Use solvent and cleaning agents recommended by manufacturer of sealing materials. Wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Install glazing tapes uniformly with accurately formed corners and bevels. Ensure that proper contact is made with glass and rabbet interfaces.
- .4 Set glass on setting blocks, spaced as recommended by glass manufacturer. Place at least one block at quarter points from each corner.
- .5 Centre glass in glazing rabbet to maintain required clearances at perimeter on all 4 sides.
- .6 Use glazing sealant for heel beads to seal glazing vapour tight to frames.
- .7 Install wired glass with wire parallel to sash members and aligned in adjacent panels.
- .8 Make door glass installations rattle-free.

### 3.3 INSTALLATION

- .1 Install glass and insulating glass units to metal doors and frames:
  - .1 Use glazing tape, on both sides. Butt tape tight at corners. Use full length pieces of glazing tape, from corner to corner.
  - .2 Install removable stops without displacing glazing tape.
  - .3 For interior exposure applications:
    - .1 Set glazing tape flush with glass sight line.
    - .2 Trim off glazing tape protruding above top of stops.
  - .4 For exterior exposure applications:
    - .1 Set glazing tape approximately 2 mm below glass sight line to allow cap bead of sealant.
    - .2 Place cap bead of weather sealant to exterior side full perimeter of glass.
    - .3 Apply sealant to uniform and level line, flush with sight line.
    - .4 Tool sealant to a smooth concave appearance.
- .2 Install tempered glass in aluminum railing system in accordance with engineered shop drawings and manufacturer's requirements.

### 3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 Cleaning.
  - .1 Leave Work area clean at end of each day.
    - .1 Remove traces of primer, caulking.
    - .2 Remove glazing materials from finish surfaces.
    - .3 Remove labels.
    - .4 Clean glass and mirrors using approved non-abrasive cleaner in accordance with manufacturer's instructions.

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

# 3.5 PROTECTION

- .1 After installation, mark each light with an "X" by using removable plastic tape or paste.
- .2 Remove markings when directed by Departmental Representative.

# **END OF SECTION**

### Part 1 General

#### 1.1 SECTION INCLUDES

.1 Gypsum board and joint treatment.

#### 1.2 RELATED SECTIONS

- .1 Section 06 10 00 Rough Carpentry.
- .2 Section 07 92 00 Joint Sealing.
- .3 Section 07 84 00 Firestopping.
- .4 Section 08 11 00 Metal Doors and Frames.
- .5 Section 09 90 00 Painting.

### 1.3 REFERENCES

- .1 ASTM C36 Standard Specification for Gypsum Wallboard.
- .2 ASTM C475 Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .3 ASTM C514 Standard Specification for Nails for the Application of Gypsum Wallboard.
- .4 ASTM C557 Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
- .5 ASTM C630 Standard Specification for Water-Resistant Gypsum Backing Board.
- .6 ASTM C840-04a Standard Specification for Application and Finishing of Gypsum Board.
- .7 ASTM C1002-01 Steel Self-Piercing, Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .8 ASTM C1396/C1396M-04 Standard Specification for Gypsum Board.
- .9 ASTM C 1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
- .10 ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
- .11 Association of the Wall and Ceilings Industries International (AWCI).

# 1.4 REGULATORY REQUIREMENTS

- .1 Conform to applicable code for fire rated assemblies.
  - .1 Fire Rated Partitions: Listed assembly by ULC.

#### 1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 19 Construction Waste Management and Disposal.
- .2 Divert unused gypsum from landfill to gypsum recycling facility for disposal.

#### Part 2 PRODUCTS

# 2.1 GYPSUM BOARD MATERIALS

- .1 Fire rated gypsum board: to ASTM C1396/C1396M Type X, thicknesses detailed/indicated on drawings x widths to suit framing centres x maximum practical lengths, wrapped tapered edges, square cut ends, bearing ULC fire rating labels.
  - .1 Paper facing: no less than 75% recycled.
  - .2 Gypsum core: no less than 10% recycled content.
- .2 Steel drill screws: to ASTM C1002, designed for use with wood framing.
- .3 Casing beads/j-beads, corner beads: to ASTM C1047, all metal construction without paper flanges, zinc-coated by hot-dip process or zinc-coated by electrolytic process 0.5 mm base thickness, perforated flanges, one piece length per location.
- .4 Joint compound: to ASTM C475, asbestos-free.
- .5 Tape:
  - .1 Paper face gypsum board applications: spark perforated paper tape.

#### Part 3 EXECUTION

### 3.1 GYPSUM BOARD INSTALLATION

- .1 Ensure that insulation is installed and inspected prior to installation of gypsum board.
- .2 Install gypsum board in accordance with ASTM C840.
- .3 Erect single layer fire rated gypsum board horizontally, with edges and ends occurring over firm bearing.
- .4 Use screws when fastening gypsum board to wooden furring or framing.
- .5 Double Layer Applications: Secure second layer to first with adhesive and sufficient support to hold in place. Apply adhesive in accordance with manufacturer's instructions.
- .6 Place second layer parallel to first layer. Offset joints of second layer from joints of first.
- .7 Place control joints consistent with lines of building spaces as directed, but not more than 10 m o.c.

### 3.2 ACCESSORY INSTALLATION

.1 Install straight and ridged with joints butted tight. Use longest practical length.

.2 Place corner beads at external corners Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials and at openings where board edge is not obscured by building trim.

## 3.3 **JOINT TREATMENT**

- .1 Finish gypsum board surfaces to following levels in accordance with AWCI Recommended Specification on Levels of Gypsum Board Finish.
- .2 Levels of finish:
  - .1 Level 1: embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable.
    - .1 Use: where assembly will be completely concealed from view such as in attic spaces and behind solid wall finishes.
  - .2 Level 4: embed tape for joints and interior angles in joint compound and apply 3 separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
    - .1 Use: where assembly will receive paint finish

### 3.4 CLEANING

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

**END OF SECTION** 

### Part 1 General

#### 1.1 REFERENCES

- .1 ASTM E84-12c Standard Test Method for Surface Burning Characteristics of Building Materials.
- .2 ASTM F1861-08(2012)e1 Standard Specification for Resilient Wall Base.
- .3 ASTM F1860-14e1 Standard Specification for Rubber Sheet Floor Covering With Backing.
- .4 ASTM F2034 18 Standard Specification for Sheet Linoleum Floor Covering.
- .5 CAN/ULC-S102.2-10 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.
- .6 Green Guard Environmental Institute.
  - .1 Greenguard Certification..
- .7 South Coast Air Quality Management District (SCAQMD), California State
  - .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

#### 1.2 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Submit Workplace hazardous materials information system (WHIMS) Material Safety Data Sheets (MSDS).
  - .1 Indicate precautions for workers when handling flooring preparation and installation products.
  - .2 Indicate VOC content of flooring preparation and installation products.
- .3 Product Data: Provide data on specified products, describing performance, physical characteristics, sizes, patterns and colours available.
- .4 Shop Drawings: Indicate seaming plan.
- .5 Samples:
  - .1 Submit two (2) samples of manufacturer's standard colour range, one (1) to Departmental Representative and one (1) to Consultant, for colour selection.

### **CLOSEOUT SUBMITTALS**

- .6 Section 01 78 10: Submission procedures.
- .7 Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

#### 1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Section 01 78 10: Maintenance and extra material requirements.
- .2 Extra Stock Materials: Provide 5 sq.m of flooring, 15 lin m of base material specified.

# 1.4 QUALITY ASSURANCE

.1 Installer Qualifications: Company specializing in performing the work of this section experienced in good trade practice.

# 1.5 DELIVERY, STORAGE, AND PROTECTION

- .1 Transport, handle, store, and protect products. In accordance with manufacturers specifications
- .2 Protect roll materials from damage by storing on end.

## 1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Store materials for three (3) days prior to installation in area of installation to achieve temperature stability.
- .2 Maintain ambient temperature required by adhesive manufacturer three (3) days prior to, during, and twenty-four (24) hours after installation of materials.

#### 1.7 WARRANTY

- .1 Provide flooring manufacturers 5 year written material warranty against excessive wear under normal usage.
- .2 Warranties to start at date of substantial completion.

#### Part 2 Products

#### 2.1 MATERIALS - SHEET FLOORING RUBBER

- .1 Rubber Flooring to ASTM F1860:
  - .1 To be installed in rooms: 11- Fitness area.
  - Description: pre-fabricated rubber flooring; calendered and vulcanized with natural and synthetic rubber base, stabilizing agents and pigmentation, manufactured in 2 layers vulcanized together, shore hardness of top layer greater than that of bottom layer.
  - .3 Surface: smooth, permanent no-wax finish.
  - .4 Appearance: solid background colours with random marbleized pattern throughout wear layer.
  - .5 Thickness; Not less than 3 mm.
  - .6 Colour: to be selected from manufacturers standard colour range.
  - .7 Flooring systems installed in the building interior shall meet the requirements of the following standards:
    - .1 Green Guard Certification.
    - .2 SCAQMD 1168.

## 2.2 MATERIALS – SHEET FLOORING-LINOLEUM

.1 Linoleum sheet flooring to ASTM F 2034.

- .2 To be installed in floor areas not indicated for Rubber flooring installation.
  - .1 Allow for installation of two separate colours.
- .3 Description: Homogeneous floor covering made from natural ingredients including linseed oil, rosin binders, wood flour, limestone and dry pigments which are mixed and then calendared onto a natural jute backing.
  - .1 Proprietary high performance UV cured top coat finish that creates a ready to use finish that can be refreshed or repaired.
- .4 2.5mm thickness.
- .5 Jute backing.
- .6 Colour- selected from manufacturers standard colour range.

### 2.3 MATERIALS- WORKSHOP FLOORING.

- .1 100% Polyvinyl composition sheet material.
- .2 Raised diamond pattern.
- .3 2.54 mm thickness.
- .4 Adhered to subfloor.

#### 2.4 MATERIALS-STAIR TREADS

- .1 Stair treads: to ASTM F2169.
  - .1 Material: purpose-made sheet rubber profiles with integral tread, nosing, and riser. Approx. 3 mm material thickness.
  - .2 Pattern: marbled or plain colour selected by Departmental Representative.
  - .3 Texture: Raised square pattern.
  - .4 Integral nosing: approx. 38 mm high x profile to suit stair construction.
    - Nosing to be angled to match angle of tread to riser.
  - .5 Visual stripe: approx. 50 mm wide solid colour insert recessed into a flat or design surface tread suppling contrast for visually impaired users.
  - .6 Resilient stair stringer
    - .1 Pre moulded rubber.
    - .2 Heights: to suit risers.
    - .3 Thickness: Approx 3mm.
  - .7 Size: full width x depth each tread, full width x height each riser.
  - .8 Colours:
    - .1 Treads: selected by Consultant.
    - .2 Visual stripe: selected by Consultant for best contrasting safety
  - .9 Standard of acceptance Johnsonite Rubber stair treads with integrated riser.

### 2.5 MATERIALS - BASE

- .1 Base: ASTM F1861, Type TV thermoplastic rubber; 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 ACCESSORIES

- .1 Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- .2 Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
  - .1 Adhesives to SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .3 Edge Strips: Metal.
- .4 Adhesives: solvent-free waterproof types recommended by respective flooring manufacturer to suit each flooring material and each application condition, with low emission and odour levels.
- .5 Joint sealing/welding material: purpose-made welding thread (rod) of type recommended by respective flooring manufacturers to suit application, colours to match flooring.

#### Part 3 Execution

#### 3.1 EXAMINATION

.1 Verify floor and lower wall surfaces are free of substances that may impair adhesion of new adhesive and finish materials.

#### 3.2 PREPARATION

- .1 Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- .2 Prohibit traffic until filler is cured.
- .3 Ensure wall to receive base is smooth, level, free from waves and other defects, and ready for base installation, refer to section 09 21 16 Gypsum Board Assemblies.
- .4 Vacuum clean substrate.

## 3.3 INSTALLATION - SHEET FLOORING

- .1 Install sheet flooring to manufacturers written instructions.
- .2 Spread only enough adhesive to permit installation of materials before initial set.
- .3 Set flooring in place, press with heavy roller to attain full adhesion.
- .4 Lay flooring with joints and seams to produce minimum number of seams.

- .5 Install sheet flooring parallel to length of room. Provide minimum of one third (1/3) full roll width. Double cut sheet; provide butt joint.
- .6 Seal joints of sheet flooring, using welding thread (rod). Form joints uniform in width, appearance and as inconspicuous as possible. Form joints flush, well adhered in place, watertight and free of peaking or projections.
- .7 Terminate flooring at centreline of door openings where floor finish is dissimilar.
- .8 Install edge strips at unprotected or exposed edges, and where flooring terminates.
  - .1 Secure metal strips after installation of flooring with stainless steel screws.
- .9 Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

### 3.4 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 premoulded 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.

#### 3.5 INSTALLATION-STAIR TREAD:

- .1 Install integral treads and risers in accordance with manufacturers written instructions.
- .2 Roll with a j-hand roller after installation to ensure proper bonding.

## 3.6 CLEANING

- .1 Do cleaning in accordance with Section 01 74 11 Cleaning.
- .2 Clean installed work.
- .3 Remove access adhesive from floor, base, and wall surfaces without damage.
- .4 Clean and seal floor in accordance with manufacturers written instructions.

## 3.7 PROTECTION OF FINISHED WORK

.1 Prohibit traffic on floor finish for forty-eight (48) hours after installation.

### **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, 2004.
- .3 National Fire Code of Canada 1995
- .4 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
- .5 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 Management 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.

### 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 SCAOMD 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      | Max. 5             | Max. 10            |
| (flat)                            |                    |                    |
| Gloss Level 2 - Velvet-Like       | Max.10             | 10 to 35           |
| Finish                            |                    |                    |
| 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       | 35 to 70           |                    |
| Semi-Gloss Finish                 |                    |                    |
| Gloss Level 6 - Traditional Gloss | 70 to 85           |                    |
| Gloss Level 7 - High Gloss        | More than 85       |                    |
| Finish                            |                    |                    |

### 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 Interior Galvanized metal: Doors, frames, railings, misc. steel, pipes.
  - 1 INT 5.3M High performance architectural latex gloss level 3 finish.
- .3 Dressed lumber: including, doors, and interior wall panels:
  - .1 INT 6.3E Polyurethane varnish finish.
- .4 Window sills:
  - .1 INT 6.3A High Performance Architectural Latex, gloss level 4.
- .5 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
  - .1 INT 9.2A Latex –gloss level 3 finish (over latex sealer).
- .6 Electrical room Backboards:
  - .1 INT 6.3R Fire retardant pigmented.
- .7 Ramp Shelter
  - .1 Exterior Trims and benches.
    - .1 EXT 6.2A over factory installed primer. Gloss level 3

#### 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 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
  - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
  - .2 Apply wood filler to nail holes and cracks.
  - .3 Tint filler to match stains for stained woodwork.
- .4 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.
- .5 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 10 - 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 10 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 shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

## 2.2 COMPONENTS

- .1 Cabin Washrooms:
  - .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 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.
  - .3 Shower curtain rod: 304 Stainless steel construction, satin finish, 26mm diameter. Mounted with wall brackets concealed by snap fitted stainless steel escutions.
  - .4 Shower curtain: Opaque, matte white vinyl, 0.2mm thick, contains antibacterial and flame retardant agents. Nickel-plated brass grommets along top, one every 150mm. Hemmed bottom and sides. Sized to suit shower stall. Complete with stainless steel shower curtain hooks.

.5 Robe 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 Cabin Washrooms:
  - .1 Toilet paper roll holders: one adjacent each toilet.
  - .2 Mirrors: one per washroom basin/vanity.
  - .3 Shower Curtain and Rod: one per shower stall.
  - .4 Robe Hooks: one per washroom.
- .3 Final locations directed by Departmental Representative.

## **END OF SECTION**

### Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 07 61 00 Sheet Metal Roofing.

#### 1.2 REFERENCES

- .1 Canadian Standards Association (CSA International).
  - .1 CSA B272-93(R2000), Prefabricated Self-Sealing Roof Vent Flashings.
  - .2 CAN/CSA-Z259.2.1-98(R2011), Fall Arresters, Vertical Lifelines and Rails
  - .3 Z259.16-04(R2009), Design of Active Fall-Protection Systems.
- .2 WCB, Workers' Compensation Board (WorkSafeBC).
  - .1 Occupational Health and Safety Regulation, Part 11 Fall Protection.

#### 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 fall arrest system. Include detailed drawings of fall arrest anchors.
  - .2 Submit load test data of safety anchors for review.
- .3 Shop Drawings:
  - .1 Submit shop drawings under the seal of a professional structural engineer registered in the province of British Columbia.
  - .2 Submit design and shop drawings showing complete layout and configuration of system including calculations, for review prior to fabrication of fall arrest anchors.
    - .1 Include types, quantities, all locations, markings, materials, sizes and shapes and methods of connecting, anchoring, fastening, bracing and attaching to work of other trades.
    - .2 Include also all necessary restrictive and non-restrictive working usage notes and general safety requirements.
    - .3 Provide handling and installation instructions, including templates and rough-in dimensions.
  - .3 Manufacturers instructions:
    - .1 Submit manufacturer printed installation instructions.

### 1.4 DESIGN CRITERIA

- .1 Installations and to meet the most stringent of the following requirements:
  - .1 CAN/CSA-Z259.2.1.

- .2 WCB regulations.
- .2 Locate fall arrest anchors at spacings in accordance with the more stringent of the following requirements.
  - .1 Roof plan drawings.
  - .2 WCB regulations.
- .3 Co-ordinate placement of built-in structural reinforcing required for connection of fall arrest anchors
- .4 Ensure that all fall arrest anchors and related components conform to proper engineering principles and are designed under seal of qualified professional structural engineer registered in British Columbia experienced in design of fall protection equipment.
- .5 Design, fabricate and install all fall arrest anchors in accordance with reference standards noted and to resist a force of not less than 22 kN (5,000 lbs) applied in the most adverse direction, without fracture or pull-out.

## 1.5 QUALITY ASSURANCE

- .1 Design, fabrication and installation of fall arrest anchors to be by manufacturer qualified in production of such equipment. Do not employ companies such as miscellaneous metal fabricators that are not normally engaged in design and manufacture of fall arrest anchors.
- .2 Fall arrest anchor manufacturer to carry not less than \$7,000,000.00 anchor integrity insurance in form of \$3,000,000.00 Commercial General Liability <u>plus</u> \$4,000,000.00 Umbrella Liability for each type of fall arrest anchor installed in Project. Provide Departmental Representative with proof of such insurance coverage(s) prior to ordering fall arrest anchors.

### 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.

## 1.7 WASTE MANAGEMENT AND DISPOSAL:

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

## 1.8 CLOSEOUT SUBMITTALS

- .1 Make submissions in accordance with Section 01 78 10 Closeout Submittals
- .2 Provide following for inclusion in Project operating and maintenance manuals and for inclusion in Fall Protection Manual:
  - .1 Certification under seal of same professional engineer responsible for sealing shop drawings that fall arrest anchors have been installed in accordance with sealed shop drawings.
    - .1 Include all associated costs of inspections and certifications as part of cost of work under this section.

- .2 Warranty certificates
  - .1 Submit all warranty information for inclusion into the O&M manual.
- .3 Submit reduced laminated copy of roof plan(s) for posting at every roof level entrance, adjacent to Fall Protection Manual. Roof plans to contain following information:
  - .1 Plan view of roof(s) showing locations of all fall arrest anchors installed.
  - .2 Details and safe working load of each type of fall arrest anchor installed.
  - .3 Restrictions applicable to each type of fall arrest anchor installed.
  - .4 Relevant obstructions and structures or other obstacles that will impede the safe use of fall arrest anchors as installed.
- .4 Fall Protection Manual: produce a durable binder housed in a wall-mounted hinged lid metal wall holder marked "Fall Protection Manual" for posting at every roof level entrance. Fall Protection Manual to contain following information:
  - .1 Certification under seal of same professional engineer responsible for sealing shop drawings that fall arrest anchors have been installed in accordance with sealed shop drawings.
  - .2 Warranty certificates.
  - .3 Safety inspection log book for yearly inspection of fall arrest anchors.
  - .4 Safety instructions showing following information:
    - .1 Type and correct use of worker safety harness.
    - .2 Safety line attachment to fall arrest anchors.
    - .3 Locations/zones on roof within which worker safety lines must be attached to fall arrest anchors.
    - .4 All additional information pertinent to the safety of persons accessing the roof.

### Part 2 Products

#### 2.1 FALL ARREST ANCHORS

- .1 Description: proprietary purpose-made devices meeting para. <u>1.4 Design Criteria</u> and suitable for permanent through-bolt installations, complete with companion fixings and underdeck plates which form part of each certified fall arrest anchor, covered with jack flashing to ensure permanent watertight installations.
- .2 Construction: forged Type 304 stainless steel alloy fixed eye roof anchor welded to top of urethane insulated Type 304 stainless steel alloy HSS post; HSS post bottom end welded to Type 304 stainless steel alloy base plate pre-drilled for 4 through-bolt fixing to roof deck; pre-drilled underdeck plate; each roof anchor supplied with 4 Type 304 stainless steel alloy through bolts each complete with Type 304 stainless steel alloy nut, flat washer and lock washer for through deck fixing.
  - .1 Non-standard fall arrest anchor heights: extended designs to accommodate increased roof insulation thicknesses.
  - .2 Provide under deck plates, of area and thickness directed by designated engineer suitable to roof deck conditions. Under deck plates to be cleaned and shop painted all surfaces and edges with anti-corrosive structural steel alkyd primer.

- .3 Jack Flashings to CSA B272.
  - .1 Description: purpose-made proprietary units sized to fit fall arrest anchor posts, with integral PVC painted deck flange for sealing into roofing membrane and EPDM triple pressure seals to ensure permanent watertight installations to fall arrest posts.
  - .2 Material: 0.8 mm metal thickness spun Type 304 stainless steel alloy, mill finish.
- .4 Provide additional flashings and collars as required to produce a waterproof assembly under Section 07 61 00 Sheet Metal Roofing.

## Part 3 Execution

## 3.1 MANUFACTURERS INSTRUCTIONS

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

#### 3.2 INSTALLATION

- .1 Notify other trades sufficiently in advance to ensure that provision is made for installation of fall arrest anchors.
- .2 Install fall arrest anchors in accordance with reviewed shop drawings.
- .3 Drill roof deck for fall arrest fixing bolts without damaging reinforcing, conduit, steel structure or any installations in the immediate area.
- .4 Install fall arrest anchors true and plumb and to proper locations.
- .5 Complete inspection log book entries and certify each fall arrest anchor ready for use.

# 3.3 CLEANING

- .1 Proceed in accordance with Section 01 74 11 Cleaning.
  - .1 Progress cleaning: leave Work area clean at end of each day.
  - .2 Final cleaning: on completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, equipment and barriers.

#### END OF SECTION

.1

.1

.2

.3

Refrigerators (3 required):

.1

.2

Capacity .58 cu. meter.

## Part 1 General 1.1 **SECTION INCLUDES** .1 Refrigerator. .2 Range. .3 Range hood. .4 Microwave oven. .5 Dishwasher. .6 Washer and Dryer. RELATED SECTIONS 1.2 .1 Division 26 – Electrical Power. 1.3 SUBMITTALS FOR REVIEW .1 Section 01 33 00: Submission procedures. .2 Product Data: Provide data on equipment and accessories. 1.4 SUBMITTALS FOR INFORMATION .1 Section 01 33 00: Submission procedures. .2 Installation Data: Manufacturer's special installation requirements. 1.5 **CLOSEOUT SUBMITTALS** .1 Section 01 78 10: Closeout Submittals. .2 Warranty and Maintenance Documentation: Include warranty and maintenance information on regular servicing. 1.6 **QUALITY ASSURANCE** .1 All electric appliances to be energy efficient models bearing Energy Star designations. Part 2 **Products** 2.1 **APPLIANCES**

Style: Free Standing, top mount freezer, frost free.

Fresh food section .43 cu meter.

Overall dimensions 750mm wide x 825mm deep x 1750mm high.

Freezer section .14 cu meter.

- .4 Doors: 2, reversible hinging one each for refrigerator and freezer sections. Hinge to be on side away from the counter.
- .5 Shelves: Cantilevered, adjustable, spill proof glass.
- .6 Vegetable Crispers: 2, pull-out design drawers, humidity controlled.
- .7 Meat keepers: 1, Pull out design drawer.
- .8 Door Bins: 3 adjustable, covered butter-keeper.
- .9 Controls: Refrigerator section temperature and moisture, Freezer section temperature.
- .10 Accessories: 2 ice cube trays.
- .11 Finish /Colour: Textured sheet steel.
- .12 Colour to be selected by Departmental Representative.

## .2 Range:

- .1 Electric, free standing type, single oven, width 762 mm.
  - .1 Self-clean oven, with concealed bottom element and interior oven light.
  - .2 Ceramic range top.
  - .3 Four top burners.
  - .4 Vision panel.
  - .5 Timed convenience outlet.
  - .6 Colour to be selected by Departmental Representative.

## .3 Range hood

- .1 762 mm wide.
- .2 Outdoor venting with all venting adapters included.
- .3 2 speed fan.
- .4 Filter element.
- .5 Integral light fixtures-2.
- .6 Colour to be selected by Departmental Representative.

#### .4 Dishwasher:

- .1 Under countertype, nominal width 600 mm depth to suit counter depth.
  - .1 Two level wash cycle.
  - .2 Two rubber coated pull out dish racks with adjustable top rack.
  - .3 One loose utensil bin.
  - .4 Colour to be selected by Departmental Representative.

## .5 Microwave Oven:

- .1 Countertop type, interior space .22 cu m, electronic timed cooking and interior light.
  - .1 Rotating glass platform.
  - .2 Removable shelf.
  - .3 Motorized rotisserie.
  - .4 Colour to be selected by Departmental Representative.

## .6 Washer:

- .1 Free standing high efficiency front loading type, nominal width 762 mm.
  - .1 2 required- Refer to drawings for locations.
  - .2 Variable water level control.
  - .3 Loose small wash bin.
  - .4 Dispenser for liquid softener, liquid soap, bleach, powder soap.
  - .5 Colour to be selected by Departmental Representative.

## .7 Dryer:

- .1 Electric nominal width 762 mm with interior light and removable lint screen.
  - .1 2 required- Refer to drawings for locations.
  - .2 Of same manufacture as washing machine.
  - .3 Colour to be selected by Departmental Representative.

#### 2.2 ACCESSORIES

- .1 Appliances: Pipe and fittings to connect to utilities.
- .2 Power cord to connect to utilities.
- .3 Fasteners and Anchors: Galvanized or stainless steel type, anchors, screws, bolts, expansion shields, set screws; required by the type of construction to which they are attached.

## Part 3 Execution

## 3.1 PREPARATION

- .1 Verify that prepared openings are ready to receive work and opening dimensions are as indicated on shop drawings and instructed by the manufacturer.
- .2 Verify that proper power supply is available.

#### 3.2 INSTALLATION

- .1 Prior to installation, ensure that finished flooring is protected from indentation of dolly wheels, crates.
- .2 Install appliances to manufacturer's written instructions requirements.
- .3 Set and adjust units level and plumb.
- .4 Activate units to confirm correct operation.
- .5 Turn refrigerators on to moderate temperature setting
- .6 Connect to utilities and make units operational.

## **END OF SECTION**

## Part 1 General

#### 1.1 RELATED REQUIREMENTS

.1 Section 06 10 00- Rough Carpentry: Wood blocking.

#### 1.2 REFERENCES

- .1 ASTM International:
  - .1 ASTM D1784-11, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

## 1.3 DESIGN REQUIREMENTS

- .1 Design blinds to following requirements:
  - .1 Be designed in manner that allows wear susceptible parts to be replaceable by either user or manufacturer.
  - .2 Guarantee of at least 5 years of available replacement parts following discontinuation of product manufacture.
  - .3 Be accompanied by instructions for replacing or repairing worn parts, including inventory numbers for parts and procedures for ordering replacement parts.
  - .4 Program that allows for the refurbishing or return of used blinds.
  - Designed in manner that permits effective disassembly of components in order to permit recycling of materials for which recycling markets exist.

## 1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature and data sheets for horizontal louver blinds and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate on drawings dimensions in relation to window jambs, operator details, head anchorage details, hardware and accessories details.

### .4 Samples:

- .1 Submit one representative working sample of horizontal louver blind, if requested by Departmental Representative.
- 2 Submit duplicate samples of manufacturer's standard colours for selection by Departmental Representative.
- .3 Samples will be returned after approval if requested.

## 1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Packaging Waste Management: remove for recycling as specified in Section 01 74 19 Construction Waste Management and Disposal.

#### Part 2 Products

### 2.1 DESIGN CRITERIA

- .1 Design horizontal louvre blinds to following requirements:
  - .1 Allow wear susceptible parts to be replaceable by either user or manufacturer.
  - .2 Guarantee of at least five-years of available replacement parts following discontinue of products manufacture.
  - .3 Include instructions for replacing or repairing worn parts, including inventory numbers for parts and procedures for ordering replacement parts.
  - .4 Allow for refurbishing or return of used vertical louvre blinds.
  - .5 Permit effective disassembly of components in for recycling of materials.
  - .6 Include stamps on major plastic components indicating composition code to facilitate recycling efforts.

### 2.2 MATERIALS AND FABRICATION

- .1 Slats: 25 mm wide with rounded corners and rough edges removed.
  - .1 Aluminum construction.
  - .2 Colour and finish: as selected by Departmental Representative.
- .2 Ladders:
  - .1 Braided polyester yarn designed for full tilting action while retaining same level and position of each slat.
  - .2 Ladders spaced not more than 150 mm from end of slats and 550 mm on centre.
- .3 Headrails:
  - One piece steel channel with rolled edges, formed to provide sufficient strength to support blind without sagging, twisting or distorting.
  - .2 Metal minimum 0.50 mm thick.
- .4 Bottom rails:
  - .1 Lock seam tubular steel section.
  - .2 0.36 mm thick.
- .5 Bottom rail end caps:
  - .1 Soft moulded plastic fitted snugly over ends of rails.

- .2 Colour to match slats.
- .6 Tilt rods: solid steel.
- .7 Tassels:
  - .1 Soft moulded plastic.
  - .2 Colour to match slats.
- .8 Pulleys: designed to permit ease of operation with minimum wear to cord.
- .9 Valance: sufficient width the conceal headrail, same material colour and finish as slats.
- .10 Tilters:
  - .1 Fully enclosed and lubricated, with positively locked to drum to prevent slippage and ensure accurate timing.
  - .2 Use anti-friction materials for worm and gear.
- .11 Cord locks: designed to provide smooth operation with feature to prevent accidental dropping of blinds.
- .12 Ladder cap: designed to provide sufficient retention when snapped onto bottom rail to hold ladders in proper position.
- .13 Installation brackets: end and centre if recommended by manufacturer type complete with safety locking caps to secure headrail and valance.
- .14 Lift cords: 1.98 mm diameter, minimum tensile strength 689 kPa, with tassels.
- .15 Hold down clips: jamb mountings, to engage bottom rail end caps.
- .16 Tilter controls: transparent wand, minimum 8 mm diameter.

#### Part 3 Execution

## 3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates and surfaces to receive horizontal louvre blinds previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's instructions prior to horizontal louvre blinds installation.
  - .1 Visually inspect substrate.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### 3.2 INSTALLATION

- .1 Install blinds on interior and exterior windows.
- .2 Include centre brackets where necessary to prevent deflection of headrail.
- .3 Adjust to provide for operation without binding.
- .4 Use non corrosive metal fasteners for installation, concealed in final assembly.

## 3.3 ADJUSTING

- .1 Adjust horizontal louvre blinds components for correct function and operation in accordance with manufacturer's written instructions.
- .2 Lubricate moving parts to operate smoothly and fit accurately.

## 3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 Cleaning.

## 3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by horizontal louvre blinds installation.

## **END OF SECTION**

#### Part 1 General

#### 1.1 SECTION INCLUDES

.1 Manual, chain-operated, horizontal window roller shades for installation on bedroom windows.

### 1.2 RELATED SECTIONS

.1 Section 09 21 66 – Gypsum Board Assemblies.

#### 1.3 SYSTEM DESCRIPTION

- .1 Provide for infinite positioning of window shade.
- .2 Noise reduction seals for sound isolation and absorption of mechanism noise.
- .3 Shade Orientation: Shade cloth to roll at window side of roller.
- .4 Degree of Openness: 0%, blackout.
- .5 Provide for smooth and quiet operation.

### 1.4 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide manufacturer's data sheets describing components, accessories, dimensions, tolerances for window openings required, colours and textures.
- .3 Shop Drawings: Indicate dimensions in relation to window jambs, operator details, top rail, corner conditions, anchorage details, hardware and accessories details, electrical operating mechanisms, connections and required clearances.
- .4 Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the drawings and include opening sizes, key to typical mounting details.
- .5 Samples:
  - .1 Submit one (1) samples of manufacturer's standard fabric colour range for colour selection.
  - .2 Submit one (1) 300 mm long samples of each visible-to-view component indicating colour, surface texture and sheen.

### 1.5 WARRANTY

.1 Provide a five (5) year warranty to include coverage for failure to meet specified requirements.

## 1.6 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Obtain roller shades system through one source from a single manufacturer.
- .2 Installer Qualifications: Company experienced in performing the work of this section and familiar with good trade practices.

#### 1.7 CLOSEOUT SUBMITTALS

.1 Section 01 78 01: Closeout Submittals.

#### Part 2 Products

#### 2.1 COMPONENTS

- .1 Horizontal Shade Band:
  - .1 Assembly: Fabric, internal bottom bar, roller tube, attachment of shade bands to roller tube.
  - .2 Fabric: Single thickness, opaque, 0.76 mm thick, non-ravelling vinyl fabric, woven from 0.46 mm diameter extruded vinyl/polyester yarn.
    - .1 Openness Factor: 0%, blackout.
    - .2 Colour: Selected from manufacturer's available range.
- .2 Concealed Hembar: Continuous extruded aluminum bar for the entire width of shade.
  - .1 Hembar shall be heat sealed on all sides.
  - .2 Open ends will not be accepted.
- .3 Shade Roller Tube: Extruded aluminum, diameter and wall thickness required to support shade fabric, with reinforced internal ribs to provide maximum span without tube deflection.
- .4 Internal Tension Idler: Adjustable, to automatically control the amount of torque generated for constant smooth operation of the shade system, with automatic release during down-travel, and automatic engage during up-travel.
- .5 Chain Drive: Heavy duty, commercial grade sprocket, a planetary gear assembly for increased performance, speed ratio, smoothness, and balance to the chain and shade assembly.
  - .1 Drive Mechanism: Provide positive mechanical engagement to shade roller tube. Friction fit connectors are not acceptable.
  - .2 Shade Hardware: Constructed of minimum 3.18 mm thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
  - .3 Brake: shall be an over running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 22 kg in the stopped position.
  - .4 Assembly shall be permanently lubricated. Products that require externally applied lubrication, or are not permanently lubricated are not acceptable.
  - .5 Operating Chain: No.10, heavy duty stainless steel bead chain, rated to minimum 40 kg load test.
  - .6 Chain Hold Down: To fully secure shade to chain holder.
- Mounting Brackets: 15 mm galvanized steel, snap on brackets for ceiling, wall, or recessed mount in ceiling, capable of supporting roller tube and fascia panel.
- .7 Fascia: Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.

- .1 Shall be able to be installed across two or more shade bands in one piece.
- .2 Shall fully conceal brackets, shade roller and fabric on the tube.
- .3 Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
- .4 Finish: Anodized.
- .5 Size: Fascia to extend full width of window opening.
  - .1 If multiple lengths of fascia required breaks to occur at divisions of blinds.

### 2.2 FABRICATION

- .1 Provide manual shade chain drive window shade, of:
  - .1 Tension activated lifting mechanism with multi-layer concentric constant tension.
  - .2 Lifting mechanism with a memory tension lock.
  - .3 Shade to not require re-tensioning after removal for cleaning.
  - .4 Internally free-floating mechanism along grooved non-corrosive shaft, and reversible for future alterations and maintenance.
- .2 Factory assemble in a one piece container, closed on all four sides, with top, back, sides and bottom return of plastic injected-moulded end caps.
- .3 Lifting mechanism to accommodate tension modules for maximum shade performance. Provide memory lock for tension modules to retain torque.
- .4 Mounting detail: Head/jamb mounted within window frame.

#### Part 3 Execution

#### 3.1 EXAMINATION

- .1 Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- .2 Examine substrate and conditions for installation.
- .3 Beginning of installation means acceptance of substrate and project conditions.

### 3.2 INSTALLATION

- .1 Install blackout roller shades in bedroom windows.
  - .1 Refer to schedule.
- .2 Install units and their accessories to manufacturer's instructions.
- .3 Securely screw end plugs to conceal exposed cut aluminum of exterior hem bar.
- .4 Securely anchor units plumb and level, using hardware and accessories to provide smooth operation without binding.

### 3.3 INSTALLATION TOLERANCES

- .1 Maximum gap at window opening perimeter: 3.18 mm at opening perimeter, 6.35 mm between shades.
- .2 Maximum offset from level: 3 mm over 1200 mm.
- .3 Use manufacturer's edge clearance requirements for shades where the width-to-height ratio exceeds 1:3.

### 3.4 ADJUSTING

- .1 Adjust units for smooth operation.
- .2 Adjust shade and shade cloth to hang flat without waves, folds, or distortion.
- .3 Replace any units or components which do not hang properly or operate smoothly.

### 3.5 CLEANING

- .1 Section 01 74 00: Cleaning installed work.
- .2 Touch up damaged finishes and repair minor damage in a manner to eliminate evidence of repair. Remove and replace work that cannot be satisfactorily repaired.
- .3 Clean exposed surfaces and edges/ends, including metal and shade cloth, using nonabrasive materials and methods recommended by manufacturer. Remove and replace work which cannot be satisfactorily cleaned.

### 3.6 CLOSEOUT ACTIVITIES

.1 Demonstration: Demonstrate operation method and instruct Owner's personnel in the proper operation and maintenance of the window shade assembly.

#### **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 Fire, Smoke and Radiation Damper Installation Guide.
    - .3 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 ASBESTOS

.1 All material/products provided shall be free of asbestos.

#### 1.11 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.
- 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.

## 1.12 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.

#### 1.13 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.

### 1.14 SPARE PARTS

- .1 Provide spare parts as follows:
  - .1 One set of V-belts for each V-belt drive.
  - .2 One set of filters for each filter or filter bank installed.

#### 1.15 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.

## 1.16 EQUIPMENT INSTALLATION AND ACCESSIBILITY

- .1 Provide unions and flanges to permit equipment maintenance, disassembly or removal, to minimize disturbance to piping and duct systems and to avoid interfering with building structure or other equipment.
- .2 All work shall be readily accessible for adjustment, operation and maintenance. Supply access doors where required in building surfaces for installation by building trades.
- .3 Pipe equipment drains to floor drains.
- .4 Ensure that equipment does not transmit noise or vibration to other parts of the building as a result of poor installation practices.

### 1.17 CUTTING, PATCHING, DIGGING, CANNING AND CORING

- .1 Lay out all cutting, patching, digging, 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.
- Openings through structural members of the building shall not be made without the approval of the Departmental Representative.

## 1.18 SERVICE PENETRATIONS IN RATED FIRE SEPARATIONS

- .1 Scope: All new piping, tubing, ducts, wiring, conduits, etc. installed under this Section
- .2 Service penetrations through rated fire separations shall be firestopped with ULC approved materials. Only tested firestop systems shall be used. The firestop system installation must be in accordance with the requirements of CAN4-S115-M or ULC S-115-M tested assemblies that provide the required rating.

- .3 For those firestop applications that exist for which no ULC or ULc tested system is available through the manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other test shall be submitted to the local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Firestop Council. This Contractor shall allow for all costs associated with obtaining the seal of a BC Registered Professional Engineer on each engineered judgement.
- .4 All smoke and fire stopping shall be installed as per the manufacturer's instructions by qualified Contractor applicators who are certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install the manufacturer's products per specified requirements. Each installer must have a written certification card available on-site for review at the Departmental Representative's request.
- .5 Notify the Departmental Representative and allow for review before firestopping is concealed.
- A qualified Contractor applicator shall submit a letter certifying that all work is complete and in accordance with this specification.

### 1.19 SERVICE PENETRATIONS OF NON-RATED SEPARATIONS

.1 All piping, tubing, ducts, wiring, conduits, etc. shall be tightly fitted and sealed with silicon sealant on both sides of non-rated walls and floors to resist the passage of smoke and sound.

#### 1.20 PIPE SLEEVES

- .1 Provide pipe sleeves of minimum 24 ga. galvanized sheet steel with lock seam joints for all piping passing through rated interior walls and floors.
- .2 Insulated pipes and ducts passing through non-rated fire rated separations shall be wrapped with 24 ga. galvanized sheet steel band to which the flexible caulking compound shall be applied.

## 1.21 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.

### 1.22 DUCT AND PIPE MOUNTED CONTROL EQUIPMENT

.1 Automatic control dampers will be supplied by the Controls trade but shall be installed by the appropriate trade.

### 1.23 LUBRICATION OF EQUIPMENT

.1 Submit a checklist, showing that all operated equipment has been lubricated prior to and during any operation.

#### 1.24 CLEANING AND FINAL ADJUSTMENT

.1 Submit a letter certifying that the interior and exterior of all systems including strainers and filters are clean.

### 1.25 PAINTING AND IDENTIFICATION

- .1 Apply a coat of rust inhibiting primer to all exposed, bare steel provided under this Section.
- .2 Where mechanical services are visible from an occupied space through a grille, paint all visible surfaces matte black.
- .3 Make good any damage to factory finishes on equipment supplied under this Section.
- .4 Identify all ductwork in mechanical equipment rooms to denote system and/or zone served and indicate air flow direction with an arrow.
- .5 Piping Identification
  - .1 Each system shall be labelled including directional flow arrows. Obtain from the Departmental Representative the Pipe Identification Schedule.
  - .2 Identify piping adjacent to valves, at least once in each room, at 15 m [50 ft.] maximum spacing in open areas, both sides where piping passes through walls, partitions and floors, at penetration of each pipe chase or confined space, at each access opening.
  - .3 Identification labels may be stencilled or be vinyl cloth or vinyl film, with adhesive compatible with the surface temperature.

### .6 Valve Tags

- .1 Provide valve identification tags appropriately secured. Tags may be of brass, aluminum, metalphoto, laminated plastic or fiberglass, stamped or engraved, 25 mm [1"] minimum diameter.
- .2 Schedule the valve numbers using a sequential numbering system to the building standard and continuing from the last listed valve. Provide a valve tag list indicating valve number, system, location, normal operating position (open or closed) and the area it serves.
- .7 Secure engraved laminated plastic identification tags (black face and white letters) on the following items:
  - .1 Temperature control instruments, gauges and panels, coordinated with control diagrams identification.

### 1.26 OPERATION AND MAINTENANCE MANUALS

- .1 Provide maintenance data for incorporation into Operational and Maintenance manual.
- .2 Employ the Balancing Agency to prepare the manuals.
- 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.

#### 1.27 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 Upon completion of the Departmental Representative's review, submit final Record Drawings to the Departmental Representative. Final record drawings shall include revised REVIT files prepared by a qualified draftsperson to the same standards as the original drawings.

#### 1.28 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. Provide adjustments of mechanical equipment and any changes or modification in equipment made under terms of guarantee.
- .2 Finalize demonstration and instructions by obtaining a signed statement from the Owner that the demonstration and instructions have been given satisfactorily.

#### 1.29 BALANCING AND COMMISSIONING

- .1 Employ Flotech Mechanical Systems Specialists, KD Engineering Co., Scott Technical Service Ltd. or Western Mechanical Services as the Balancing Agency to:
  - .1 Prepare Operation and Maintenance Manuals.
  - .2 Commission each mechanical system.
  - .3 Adjust duct and terminal balance dampers and adjust to balance supply, return and exhaust air systems to provide the design air quantities (within +10%/-5%) at each outlet and inlet and to maintain the design relationship between the supply, return and exhaust air system quantities.
  - .4 Permanently mark the final balance position on all balance dampers.
  - .5 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 through all non-rated separations.
- .3 Finish and seal insulation at hangers, supports, access doors fire dampers and other insulation protrusions.
- .4 Where exposed, terminate piping insulation 75 mm [3"] back from all uninsulated fittings for working clearance and around the base of thermometer wells, pressure gauges, flow switches and pressure and control sensors and bevel insulation at 45° and finish with a hard coat insulating cement to match the adjacent insulation.
- .5 Where concealed, terminate piping insulation 75 mm [3"] back from all uninsulated fittings, with heavy coat of vapour barrier coating to secure glass fibres.

### 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: Warm/Hot Piping

- .1 All domestic hot water supply and recirculation piping 25 mm [1"] thickness.
- .2 Installation:
  - .1 Mineral fibre insulation
  - .2 Spreading staples at 75 mm centres.
  - .3 Tape over all joints and secure with staples
  - .4 Fittings tightly wrapped flexible insulation to full thickness with PVC fitting cover

### .3 Scope: Cold Piping

- .1 All domestic cold water piping 25 mm [1"] thickness.
- .2 All condensate drain piping 25 mm [1"] thickness.
- .3 Float Services: 25 mm [1"] thick on domestic cold water piping over heat tracing.
- .4 Float Services: 25 mm [1"] thick on pressurized sanitary piping over heat tracing.
- .5 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

### .4 Scope: Refrigerant Piping

- .1 Flexible foamed elastomeric or flexible closed cell preformed piping insulation 25 mm [1"] thickness.
- .2 Secure longitudinal and butt joints with adhesive. Insulate all fittings and components.

## .5 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 shall be finished as follows:
  - .1 Insulation shall have a vapour sealed vapour barrier jacket.
  - Over the pipe insulation apply aluminum or PVC weather protecting jacket. Secure the jacket using necessary fastenings on approximately 150 mm [6"] centres.
  - .3 Over insulated fittings, valves and flanges apply aluminum or PVC fittings to provide a complete jacket system. Secure with necessary fastenings.
  - .4 Locate seams on underside and seal all outdoor jacketing watertight.

## 2.3 DUCTWORK INSULATION

- .1 Materials:
  - .1 External Insulation Flexible. Maximum thermo conductivity: 0.040 W/m-°C at 24°C [0.27 Btu-in/(hr-ft2-°F) at 75°F].
  - .2 Duct Liner Flexible. Minimum noise reduction criteria (NRC): 0.70 as per ASTM C423 'Type A mounting'.
  - .3 Insulation Adhesive.
  - .4 Vapour Barrier Tape
  - .5 PVC Jacket and Fitting Covers:
    - 1 Staples and PVC self-adhesive tape, plastic pop rivets, staples
- .2 Scope: Ductwork Exterior Thermal Insulation
  - .1 All cooling and heating supply ducts -25 mm (1) thickness.
  - .2 Outdoor air ductwork (from intake to mixing plenum) 50 mm (2") thickness.
  - .3 Installation:
    - .1 Adhere insulation with insulation adhesive applied in 150 mm [6"] wide strips on 300 mm [12"] centres.
    - .2 On rectangular ductwork and plenums, over 610 mm [24"] in width secure insulation with pins at one per 0.1 sq. m [1.0 sq ft] minimum.
    - .3 Adhere vapour barrier tape over all butt joints, raw edges, holding washers and other points of penetration of the vapour barrier jacket.
  - .4 "Concealed" insulation will require no further finish.
  - .5 "Exposed" insulation shall be finished as follows:
    - .1 Apply PVC fittings and covers or thermocanvas jacket with fabric adhesive.
    - .2 On thermocanvas jacket finish fabric with one (1) coat of fabric coating.
- .3 Scope: Ductwork, Interior Flexible Acoustic Insulation
  - .1 25 mm [1"] thickness where indicated by single hatching and as otherwise noted.

#### Part 3 Fire Protection

## 3.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS

2.3 kg [5 lbs] Extinguisher: 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 or mount extinguishers on brackets as indicated.
- .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 Float Services:
  - .1 Water and Sanitary Piping CPVC or PEX:
    - .1 Piping and fittings to CSA B137.5.
    - .2 Piping shall be listed for use with potable water.
  - .2 Flexible Hose
    - .1 25mm, smooth, white, phthalate free, taste free food quality synthetic rubber complete with reinforcement.
    - .2 Reinforcement: High-tensile steel wire helix embedded between layers of synthetic textile cords.
    - .3 Cover: Wrapped finish, ozone and weather resistant synthetic rubber.
    - .4 Temperature Range: -30°C (-22°F) to 100°C (212°F).
    - .5 Pressure rating: 150 psi or more.
  - .3 Hangers and Supports
    - .1 316 stainless steel pipe clamps and holders.
    - .2 316 stainless steel Unistrut supports, fitting and screws/bolts.
    - .3 316 stainless steel hose support grips to support hanging flexible hoses.

- .4 Valves and Fittings:
  - .1 All stainless steel to ASTM A351.
  - .2 Valve: 316 stainless steel lever handle and body, ball 316 or 304 stainless steel, shaft 316 stainless steel, blow-out proof stem, reinforced TFE seats, flanged ends.

#### .2 Residential Services:

- .1 Waste and Vent Piping Systems:
  - .1 Copper tube components.
    - .1 Pipe: DWV Copper Tube: to ASTM B306.
    - .2 Joint and fitting components.
      - .1 Wrought copper fittings: to ANSI B16.29.
      - .2 Cast copper, brass and bronze fittings: to ANSI B16.23.
      - .3 Solder joints: to ASTM B32.
      - .4 Brazed joints: to ASTM B664.
  - .2 ABS pipe components.
    - .1 Pipe: ABS plastic pipe: to CAN/CSA-B181.1.
    - .2 Joint and fitting components:
      - .1 Fittings: ABS fittings to CAN/CSA-B181.1.
      - .2 ABS solvent cement: to ASTM D2235.
      - .3 ABS PVC solvent cement: to ASTM D3138.
  - .3 DWV Pipe Components:
    - .1 Pipe: DWV pipe: to CAN/CSA-B281.
    - .2 Mechanical joint and fittings consisting of:
      - .1 Hubless cast iron fittings: to CAN/CSA-B70.
      - .2 Adaptor ring: elastomeric pipe end protection component to CAN/CSA-B281.
      - .3 Gasket: double ribbed elastomeric gasket to CAN/CSA-B70.
      - .4 Joint coupling: stainless steel mechanical joint coupling to CAN/CSA-B70.

# .2 Water Piping

- .1 Copper Pipe: Type 'L', ASTM B88 with ASME B16.22 wrought copper or ASME B16.18 cast copper, brass and bronze fittings, ASTM B32 solder, or ASTM B664 brazed joints.
- .2 CPVC Schedule 80 Pipe: ASTM F441/F441M with ASTM F438 socket, ASTM F439 socket, or ASTM F437 threaded type fittings.
- .3 PEX Distribution System: ASTM F877, SDR 9 tubing ASTM F1807, metal-insert type with copper crimp rings and matching PEX tube dimensions.
- .4 ACR Copper: ASTM B280.
- .5 DWV Copper: ASTM B306.

- .6 Joints and Fittings:
  - .1 Wrought Copper Fittings: ASME B16.22.
  - .2 Cast Copper, Brass and Bronze Fittings: ASME B16.18.
  - .3 Solder Joints: ASTM B32.
  - .4 Brazed Joints: ASTM B664.
  - .5 95/5 Sn/Sb solder.
- .3 Hangers and Supports:
  - .1 Inside the building: Cadmium plated hangers and rods.
  - .2 Outside the building: Galvanized hangers and rods.
  - .3 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 Scr860 kPa [125 psi] rating.
  - .2 Bronze body or epoxy coated inside and out.
- .8 Backflow Preventers:
  - .1 Backflow preventers shall meet the requirements of the latest edition of CAN/CSA B64.10-01/CAN/CSA-B64.10.1-01 Manual for the Selection and Installation of Backflow Prevention Devices/Manual for the Maintenance and Field Testing of Backflow Prevention Devices.
  - .2 Vacuum breakers:
    - .1 Continuous pressure, high hazard, anti-siphon, anti-spill vacuum breaker.
    - .2 12 mm [1/2"] unit on pipe sizes up to 25 mm [1"].
    - .3 20 mm [3/4"] unit on pipe sizes up to 40 mm [1-1/2"].
  - .3 Double Check Valve Assembly (DCVA):
    - .1 Factory assembled station complete with inlet and outlet isolation valves to CSA B64.
- .9 Water Entry Station Assembly:
  - .1 Ball valve, strainer, union, DCVA backflow preventer, union, pressure reducing valve, ball valve, bypass with valve.
- .10 Hose Bibbs:
  - .1 HB1: Exterior Drainable, frost proof complete with backflow preventer and operating key.
  - .2 HB2: Interior Chrome plated vacuum breaker on outlet.

## .11 Trap Primers:

.1 Flow actuated devices piped to the closest plumbing fixture.

#### .12 Water Hammer Arrestors:

Piston style with stainless steel casing or bellows style with welded stainless steel nesting bellows, ANSI approved and to PDI WH201.

#### .13 Water Meter:

.1 Bronze body, compound type to AWWA C702 with internal positive displacement and turbine meters recording to a single hermetically sealed register.

#### .14 Cleanouts:

- .1 Provide caulked or threaded type clean-outs extended to finished floor or wall surface. Ensure ample clearance at clean-out for rodding of drainage system.
- .2 Provide access covers for floors in unfinished areas: round with nickel bronze serrated frames and plates. Provide round access covers in finished areas with depressed centre section to accommodate floor finish. Provide wall clean-outs with chrome plated caps.

## .15 Lead Flashings:

.1 2.27 kg [5 lb.] lead - vent terminals - floor drains, roof drains, shower

## .16 Pressure Gauges:

.1 Bourdon tube type. Cock and snubber. 100 mm [4"] minimum diameter

# .17 Domestic Hot Water Tank - Electric (T-DHW):

- .1 System: to ASHRAE 90.1
- .2 Seamless, blow-molded, polybutene rust and corrosion proof tank.
- .3 Titanium sheath elements to resist lime build-up. Thermally fused.
- .4 Fully automatic controls, manually adjustable thermostat.
- .5 Molded polyethylene outer shell.
- .6 Full port, full flow brass drain valve.
- .7 Factory installed temperature and pressure relief valve and vacuum relief valve.
- .8 Pipe overflow to floor drain.

## .18 Recirculation Pump (P-DHWR):

- .1 Type: all-bronze or stainless steel, vertical inline.
- .2 Motor: drip-proof with thermal overload protection.
- .3 Support circulating pumps: manufacturer's recommendations.

## .19 Expansion Tank (ET-DHW):

.1 Steel construction with sealed-in elastomer diaphragm.

# 4.3 HEAT TRACING FOR PIPING

- .1 Provide complete, CSA approved system of heat tracing on the following:
  - .1 All exposed domestic water piping.
  - .2 All exposed pumped sanitary piping.

- .3 Plumbing traps in the crawlspace.
- .2 Domestic water and pumped sanitary piping heat tracing:
  - .1 System shall be thermostatically controlled with a thermostat with a non-adjustable set point of 5°C [40°F] complete with a 900 mm [36"] capillary.
  - .2 16.5 W/m [5 W/ft].
  - .3 Thermostat: Line voltage remote bulb type thermostat with:
    - .1 120 Volt.
    - .2 3m copper capillary tube.
    - .3 Moisture and dust-resistant enclosure.

## .3 Installation:

- .1 Install to manufacturer's requirements.
- .2 Prior to installing heating cables, ensure the pipe system are complete and have passed all necessary tests.
- .3 Cables to be secured to pipes using tape at 300mm [12"] intervals on pipe.
- .4 Ensure that heating cables do not touch or cross each other.
- .5 Coordinate cable installation with insulation application. Loop additional cable at fittings, valves, and flanges.
- .6 Run only cold leads in conduit and ensure sensing bulb does not touch cable. Ground shield to building ground.
- .7 Make power and control connections.
- .8 After pipes are traced test all lengths prior to installation of pipe insulation.
- .9 Insulate all heat traced piping and traps.
- .10 Provide suitable identification for those pipe systems provided with heat tracing. At 6 m [20 ft] intervals provide an adhesive backed nameplate "Caution Heat Tracing".

## 4.4 FIXTURES

- .1 WC1 Water Closet, Floor Mounted, Tank Ultra-low Flush
  - .1 Close coupled, vitreous china, 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 LB1 Lavatory Basin, 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, 5.7 l/min at 414 kPa [1.5 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 SH1 - Shower

- .1 Acrylic shower stall with high gloss surface, upper and lower toiletry shelves, clear acrylic grab bar, 114 mm [4.5"] high threshold, light kit. 2286 mm high x 1308 wide x 927 mm deep [90" x 51-1/2" x 36-1/2"]. Confirm handing.
- .2 Pressure balance shower valve with lever handle, showerhead, integral stops and checks. 0.95 l/s at 414 kPa [1.5 gpm at 60 psi].
- .3 Stainless steel or brass drain. P-trap.
- .4 12 mm [1/2"] hot and cold supply.
- .4 S2 Sink, Double Compartment, Ledge-Back, 200 mm [8"] Deep
  - .1 Stainless steel double compartment sink with undercoating, basket strainer, tail piece, clamps, confirm punchings. Compartment size: 410 x 360 x 200 mm [16" x 14" x 8"], overall size: 520 x 790 mm [20-1/2" x 31-1/4"].
  - .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.

## .5 CW1 - Clothes Washer

- .1 Automatic washing machine valve with supply and drain.
- .2 Duplex protector valve with 50 mm [2"] drain. Unit shall be recessed and mounted to facilitate easy access.
- .3 50 mm [2"] P-trap with standpipe.
- .4 12 mm [1/2"] hot and cold with stops.

## .6 Floor Drain (FD1)

.1 Cast iron floor drain with membrane clamp and 130 mm [5"] diameter nickel bronze strainer. Cast iron non-plated parts to be epoxy coated. Trap primer connection.

## Part 5 HVAC Systems

## 5.1 PIPING, VALVES AND FITTINGS

- .1 Pipe Material
  - .1 Service: Condensate; Pumped 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 Cadmium plated hangers and rods.
  - .2 Outside the building: Galvanized hangers and rods.
  - .3 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 Square throated radius heel elbows shall not to be used.
  - .4 Duct sizes on drawings are the airway size clear of any specified internal lining. Size internally insulated ducts so that the free area of the duct is the dimension shown on the drawings.
  - During construction, protect ductwork openings from the entry of dirt, dust and debris with suitable covers.
  - .6 Provide flashing and counter flashing on ducts through roofs and flashing and counter flashing on ducts through exterior walls.

- .7 Install duct necks before grilles, registers and diffusers. Install cushion heads at diffusers.
- .8 Provide suitably sized, factory manufactured access panels for dampers, fire dampers, at devices requiring maintenance, coils, at base of duct risers and elsewhere as indicated.
- .2 Ducts Galvanized Steel 500 Pa [2" W.G.] Static Pressure rating
  - 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, equipment, terminal boxes and as shown.
- .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.
- .5 Balance Dampers
  - .1 Provide balance dampers where indicated on the drawings and as required by the Balancing Agent to properly balance the system.
    - .1 Of same material as duct, 16 ga., V-groove stiffened.
    - .2 Multi-blade, factory manufactured where over 300 mm [12"] high.
    - .3 Locking quadrant with shaft extension to accommodate insulation thickness.
    - .4 End bearings both ends. Nylon on dampers up to 300 mm [12"] high, oilite bronze on dampers over 300 mm [12"] high or diameter.
    - .5 Channel frame of same material as adjacent duct, complete with angle stop.

#### 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

- 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 EQUIPMENT SUPPLIED FOR INSTALLATION UNDER OTHER SECTIONS

- .1 Hand over automatic control dampers to the appropriate trade sections for installation.
- .2 The Controls Contractor shall be responsible for arranging, coordinating and supervising the installation of the above devices in a suitable manner and readily accessible location.

## 6.4 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.

#### 6.5 PRODUCTS

- .1 7 Day, 24 Hour Programmable Thermostat:
  - .1 7 Day, 24 Hour programmable thermostat, for the control of the heat pump and HRV.

#### .2 Thermostat

- .1 Wall mounted electric heating thermostat with:
  - .1 Temperature setting range: 5°C to 30°C.
  - .2 Scale markings: off-5-10-15-20-25°C.

# .3 Control Dampers:

- .1 Parallel type blade for all two position dampers unless otherwise indicated.
- .2 Extruded aluminum or formed galvanized steel blades, frames, gussets and blade stops.
- .3 Shafts galvanized steel with keyways for securing blades to shafts.
- .4 Hardware keyed to prevent blade slippage and to provide smooth blade movement.
- .5 Bearings oil impregnated sintered bronze.
- .6 Assemblies rigid and adequately braced with corner gussets.
- .7 Bearings and seals suitable for exposure to a minimum of -30°C [-22°F] and a maximum of 100°C [212°F].
- .8 Low leakage type with blade and frame seals.
- .9 Maximum leakage in closed position shall be 50 L/s per square metre [10 CFM per square ft.] of face area at 1000 Pa [4" w.g.] pressure differential.
- .10 Galvanized coating on all sheared edges of galvanized steel frames and blades exposed to outside atmosphere.
- .11 Indicated size is outside frame dimension. Confirm with installer before fabrication.
- .12 Dampers shall be adequate for the maximum system pressure. Refer to the appropriate section of the specification.
- .13 Damper Actuator:
  - .1 Size actuators to control dampers against maximum pressure or dynamic closing pressure whichever is greater.
  - .2 Size damper actuators so that they will provide smooth and full travel of the dampers while stroking in both directions.

#### .4 Installation:

- .1 All equipment shall be installed according to manufacturers' published instructions.
- .2 Adjust all existing and new damper blades to ensure that they close tightly against seals and stops.
- .3 All sensors shall be stabilized to such a level as to permit on-the-job installations that will require minimum field adjustments or calibration.
- .4 Install labels on all sensors and actuators identifying the point name.

## 6.6 SEQUENCE OF OPERATION

- .1 Domestic Hot Water System
  - .1 The internal controls of the Domestic Hot Water Tank shall control the operation of the system to maintain a water temperature of 60°C [140°F] within the tank.

- .2 Split System Heat Pumps (HP-1)
  - .1 Provide a programmable thermostat.
  - .2 The heat pump shall be controlled by the programmable thermostat to maintain room temperature set point.
  - .3 There shall be an appropriate dead band between cooling and heating modes.
- .3 Heat Recovery System and Washroom Exhaust (HRV-1)
  - .1 Provide a timeclock to cycle the HRV ON/OFF.
  - During the OCCUPIED it shall RUN and be OFF during the UNOCCUPIED periods.
  - .3 Operate the heat recovery wheel to maintain the supply air temperature set point. Initially set to 20°C [68°F].
- .4 Workshop Room Temperature Control (Room 15)
  - .1 The system consists of:
    - .1 Unit heaters (UH-1).
    - .2 Room thermostat.
    - .3 Door switch.
  - .2 Provide a room thermostat for Room 15. Coordinate the exact location of the sensors on site with the Departmental Representative.
  - .3 Monitor the operation (OPEN/CLOSED) of the Workshop door.
  - .4 Provide a relay in the unit heater.
  - .5 Cycle the unit heater (UH-1) to satisfy the thermostat.
  - .6 When the Workshop door is OPEN then disable the unit heater.
- .5 Exhaust Fans (EF-xx)
  - .1 The system consists of:
    - .1 Exhaust fan (EF-xx).
    - .2 Wall mounted timer switch.
  - .2 Electrical Division shall provide a manual wall mounted switch to control the operation of the exhaust fan.
- .6 Electric Baseboard Heaters (BB-xxx)
  - .1 Provide a room thermostat for each heater. Coordinate the exact location of the sensors on site with the Departmental Representative.
  - .2 The baseboard heaters, provided by Electrical Division, shall be complete with a relay for remote thermostat connection.
  - .3 Cycle the baseboard heater to satisfy the thermostat..
- .7 Clothes Dryer
  - .1 Provide CD-1 as indicated on the drawings.
  - .2 Interlock CD-1 to open when either dryer operates.

# Part 7 Equipment Schedules

# 7.1 SPLIT SYSTEM HEAT PUMP UNIT (HP-1)

- .1 Units shall be complete with:
  - .1 Electric heater for defrost cycle.
  - .2 Anti-corrosion coating on the casing, supports and coil of the condensing unit suitable for a marine environment. Anti-corrosion coating shall be factory applied, second party application of coating shall not be accepted. Bare aluminum coils (fins and tubes) are not an acceptable equivalent for the coated coil.
  - .3 Supplier shall confirm within the shop drawings that the unit performance is with the applied anti-corrosion coating.
  - .4 Low-ambient package suitable for operation at -9°C [17°F].
  - .5 Wired controller with remote sensor.

## 7.2 HEAT RECOVERY VENTILATOR (HRV-1)

- .1 Provide a heat recovery ventilator as indicated on the drawings and schedules
- .2 Unit shall consist of:
  - .1 Galvanized steel cabinet with hinged access doors.
  - .2 A supply fan and an exhaust fan.
  - .3 Direct drive forward curved supply and exhaust fans, self-aligning bearings, polished, solid steel shafts, internal vibration isolation
  - .4 Polymerized paper and aluminium core crossflow.
  - .5 Positively draining pan (no standing water).
  - .6 Automatic defrost function.
  - .7 Acoustically insulated cabinet.
  - .8 MERV 8 disposable filters. Provide spare filters.
  - .9 Five (5) year warranty.

# 7.3 EXHAUST FAN (EF-x)

- .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.
  - .2 Backdraft damper.
  - .3 Aluminum wall cap.

# 7.4 UNIT HEATERS – ELECTRIC (UH-1)

- .1 CSA approved.
- .2 Electric Coils: Nickel chrome electric resistance coils embedded in refractory material and enclosed in steel sheathing.
- .3 Fan: Direct drive propeller type.
- .4 Motor: Thermally protected, prelubricated sealed bearings and resilient motor supports.
- .5 Air Outlet: Independently adjustable horizontal louvres.
- .6 Controls:
  - .1 Overheat protection (automatic and manual reset).
  - .2 Magnetic contactor.
  - .3 Transformer for controls.
  - .4 Heater shall require only power wiring connections and remote wiring to temperature controller
  - .5 Shop drawings to include wiring diagrams.
- .7 Cabinet: cold rolled steel, phosphatized, factory baked enamel, mounting brackets for rod hangers.
- .8 Accessories: Mounting bracket for wall mounting.

# **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

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- .3 Underground ducts including concrete encasement, pullboxes, and transformer pads
- .4 Power distribution equipment
- .5 Power connections and outlets
- .6 Surface wireways
- .7 Mechanical equipment connections
- .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.
- 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.

### 1.4 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.

#### 1.5 CARE, OPERATION AND START-UP

- .1 Instruct Departmental Representative 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 startup 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.

# 1.6 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.

### 1.7 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 or FSR declaration on completion of work to Departmental Representative.
- .6 Departmental Representative will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost to the Contractor.
- .7 Furnish to Departmental Representative on completion of work Certificates of Acceptance from Electrical Inspection Department or FSR.

## 1.8 UTILITY WORK

- .1 Work performed on behalf of the Authority (Utility). All references to Utility include Power Supply, Communications and any other Utility that requires coordination.
  - .1 The electrical contract, including the drawings and specifications, describe the general intent of the electrical systems as they pertain to the private (non-Utility) infrastructure. The drawings and specifications describe these systems in detail and should be executed in accordance with all applicable Codes, Standards and Regulations to satisfy the Authority Having Jurisdiction.
  - .2 The electrical contract also describes the general intent of the work required by the power supply authority. This work is not governed by the same Codes, Regulations and Standards as the privately installed infrastructure. The electrical contractor is hereby responsible for the following with respect to work performed on behalf of the utility:
    - .1 For work performed by the electrical contractor on behalf of the Utility, the Electrical Contractor shall:
      - .1 Include in this contract all applicable Utility charges and costs to meet the utilities Codes, Standards, and Regulations.

- .2 The Contractor shall refer to the Utility standard for specific details applicable to that part of the project which is executed on behalf of the Utility. The Contractor shall obtain these standards from the Utility prior to submitting tender and setting out with the work. Should the Contractor have any concerns or questions, as to which standard applies to a given project, they shall bring this matter to the attention of the Departmental Representative and the Utility prior to submitting tender for a written ruling on the applicable regulations. Failing this, the Electrical Contractor shall allow the most expensive alternative according to the Utility regulation.
- .3 The work on behalf of the Utility is to be executed in accordance with all Utility Codes, Standards, and Regulations without deviation. Where, due to site conditions, the Utility infrastructure cannot be installed exactly as provided in the Utility Standards, the Contractor shall bring the condition to attention of the Utility designer and Departmental Representative for their express written permission and approval of any deviation prior to setting out with the work.
- .4 All shop-drawings depicting equipment that interfaces with the supply Utility are subject to review by the Utility and shall be submitted to the supply authority for approval prior to submission for review by the Departmental Representative under the general electrical contract.
- .5 All work performed on behalf of the utility shall be inspected and approved by a representative from the Utility with notification to the Departmental Representative before cover or activation. Any corrections or alteration arising from this review are the responsibility of the electrical contractor to meet the utility inspectors notice.
- .6 All work performed on behalf of the Utility, for Utility owned infrastructure under this contract is exempt from electrical permit requirements or fees. Any monies, costs or allowances are free from permit fee calculation for that part of the installation performed on behalf of the Utility.

## 1.9 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with the Construction Waste Management Plan.
- .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.

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.4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by the Departmental Representative.

#### 1.10 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centerline 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 Panelboards: as required by Code or as indicated.

#### 1.11 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 centers, operating under normal load. State voltage, time and date at which each load was measured.

#### 1.12 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.

## 1.13 FIELD QUALITY CONTROL

- 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 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.

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- .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.

#### 1.14 CO-ORDINATION OF TRADES

- .1 Consult with Departmental Representative 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 Department Representative 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.
- Ensure that all materials and equipment fit into the allotted spaces and that all equipment can be properly serviced and replaced, if and when required. Advise the Departmental Representative of space problems before installing any material or equipment. Demonstrate to the Departmental Representative on completion of the work that all equipment installed can be properly, safely serviced and replaced, if and when required.

# 1.15 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.

#### 1.16 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.

#### 1.17 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 Departmental Representative.
- 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 contractors 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.

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.4 A written description of control sequences relating to the schematic diagrams.

#### 1.18 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.

## 1.19 FIRE STOPPING

- .1 Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations.
- .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 Seal all openings for conduit or sleeve penetrations in fire rated and smoke rated separations using approved materials.
- .5 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.
- .6 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.
- .7 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.

## 1.20 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.

#### 1.21 INSPECTIONS AND TESTS

- .1 Notify the Departmental Representative 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.

#### 1.22 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.

### 1.23 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. Material as it becomes surplus shall be reviewed by the Departmental 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.

#### 1.24 SPARE PARTS

- .1 This contract calls for spare parts or material. These are to be provided new in unopened cartons to the Departmental Representative at the time of substantial completion of the contract.
- .2 Provide the Departmental Representative with spare lamps in unopened cartons. Quantity of each lamp source type to be 10% of total project amount.
- .3 Obtain a signed receipt from the Departmental Representative for all these parts or materials and include a copy in the front of the maintenance manual. Without this receipt these items will be treated as a deficiency and the cost withheld at twice the estimated value by the Departmental Representative.

# 1.25 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.

#### 1.26 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 Department Representative prior to assembly of final sets.

#### 1.27 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.

#### 1.28 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.

#### 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 material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.
- .2 Factory assemble control panels and component assemblies.

# 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.

# 2.4 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;

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- .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 Department 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 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .9 Terminal cabinets and pull boxes: indicate system and voltage.
- .10 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 or latest edition.
- .4 Use colour coded wires in communication cables, matched throughout system.

# 2.8 CONDUIT AND CABLE IDENTIFICATION

Other Security Systems

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at [15] m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

| up to 250 V                              | Prime<br>Prime<br>Yellow | Auxiliary<br>Auxiliary |
|--|--------------------------|------------------------|
| Telephone<br>Other Communication Systems | Green<br>Green           | Blue                   |

Red

Yellow

# Part 3 Execution

.1 Not used

# **END OF SECTION**

#### Part 1 General

#### 1.1 DESCRIPTION

- .1 The purpose of this section is to guide the electrical contractor with responsibilities in the commissioning process, which are being directed by the Commissioning Authority. Other electrical systems testing is specified in other electrical sections.
- .2 Commissioning requires the participation of the Electrical Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in the Commissioning Authority's Commissioning Plan. The Electrical Contractor shall be familiar with all parts of the commissioning plan issued by the Commissioning Authority, and shall execute all commissioning responsibilities assigned to them in the Contract Documents.
- .3 Electrical systems requiring testing and commissioning include the following:

|    |                              | Commission    | Commission    |
|----|------------------------------|---------------|---------------|
|    |                              | for           | Under General |
|    |                              | Commissioning | Contract      |
|    |                              | Authority     |               |
| .1 | Lighting Controls            | NO            | Yes           |
| .2 | Emergency Generator          | No            | Yes           |
| .3 | Fire Alarm System            | No            | Yes           |
| .4 | Data/Communications System   | No            | Yes           |
| .5 | Information Digital Metering | No            | Yes           |
|    | System                       |               |               |
| .6 | Distribution Equipment       | No            | Yes           |
| .7 | Exit Signs & DC Emergency    | No            | Yes           |
|    | Lighting                     |               |               |

#### 1.2 RESPONSIBILITIES

- .1 <u>Electrical Contractors.</u> The commissioning responsibilities applicable to the electrical contractor are as follows (*all references apply to commissioned equipment only*):
  - .1 Construction and Acceptance Phases
    - .1 Include the cost of commissioning in the contract price.
    - .2 In each purchase order or subcontract written, include requirements for submittal data, O&M data, and training.
    - .3 Attend a commissioning scoping meeting and other necessary meetings scheduled by the Commissioning Authority to facilitate the commissioning process.
    - .4 Electrical shop drawings to be reviewed by the Departmental Representatives and forwarded to the Commissioning Authority via the Departmental Representative.
    - .5 Provide additional requested documentation, prior to normal O&M manual submittals, to the Commissioning Authority for development of start-up and functional testing procedures.

- .1 Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, performance expectations, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Authority.
- .2 The Commissioning Authority may request further documentation necessary for the commissioning process.
- .3 This data request may be made prior to normal submittals.
- .4 Provide a copy of the O&M manual submittals of commissioned equipment, through normal channels, to the Departmental Representative, who will review and reject or approve, then forward the approved manual to the Commissioning Authority for review and approval.
- .5 Contractors shall assist (along with the design department representative) in clarifying 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.
- .6 Provide to the Departmental Representative and the Commissioning Authority the specific functional performance test procedures required for the commissioning. Subs shall review test procedures to ensure feasibility, safety, and equipment protection and provide necessary written alarm limits to be used during the tests.
- .7 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 and other requested equipment documentation to Commissioning Authority for review.
- .6 Conduct and Record Equipment and System Commissioning:
  - .1 Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present in accordance with the agreed-upon schedules, and for sufficient duration, to complete the necessary tests, adjustments and problem solving.
  - .2 During the startup and initial checkout process, execute and document the electrical-related portions of the pre-functional checklists for all commissioned equipment.
  - .3 Perform and clearly document all completed startup and system operational checkout procedures, and provide a completed and signed copy to the Departmental Representative and the Commissioning Authority.
  - .4 Address current A/E punch list items before functional testing.

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- .5 Perform functional performance testing under the direction of the Department representative and the Commissioning Authority for the specified equipment. Assist the Departmental Representative and Commissioning Authority in interpreting the monitored data and test results, as necessary.
- .6 Correct deficiencies (differences between specified and observed performance) as interpreted by the Departmental Representative and the Commissioning Authority, PM and A/E and retest the equipment.
- .7 Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original equipment, performance and sequences of operation to as-built conditions.
- .8 Prepare red-line, as-built drawings for all drawings and final as-builts for contractor-generated coordination drawings.
- .9 Provide training of the Owner's operating personnel as specified.
- .10 Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
- .11 Prior to Final Completion of the Work, the responsible contractors shall certify that they have provided all the materials, installation and/or services specified in the Contract Documents, Addendums and Change Orders. Completion of the following sheet, with signatures of the contractually responsible parties, is required and represents such certification.

#### .2 Warranty Period

- .1 Execute seasonal or deferred functional performance testing, witnessed by the Commissioning Authority, according to the specifications.
- .2 Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

## Part 2 PRODUCTS

## 2.1 TEST EQUIPMENT

.1 The Electrical Contractor shall provide all test equipment necessary to fulfil the testing requirements of this Division.

## Part 3 EXECUTION

## 3.1 SUBMITTALS

.1 The Electrical Contractor shall provide the required commissioning submittal documentation to the Departmental Representative and the Commissioning Authority, as indicated and requested by the Commissioning Authority.

#### 3.2 STARTUP

- .1 The electrical contractors shall follow the start-up and initial checkout, as approved by the Commissioning Authority. The Electrical Contractor has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design and performance objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the Commissioning Authority or Departmental Representative.
- .2 Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems, or sub-systems at the discretion of the Commissioning Authority. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all pre-functional checklists as soon as possible.

## 3.3 FUNCTIONAL PERFORMANCE TESTS

.1 Perform function performance tests for all electrical systems.

# 3.4 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

- .1 Provide testing documentation as required by the Departmental Representative and Commissioning Authority.
- .2 Collect shop drawings for equipment, maintenance procedures and recommended maintenance schedules for equipment, switchgear schedules, and warrantees from all contractors.
- .3 Compile 3 copies of all the items mentioned in the preceding sentence. Enclose these in labelled 3-ring binders. Submit 3 copies to Departmental Representative for review. Make modifications until department representative and Commissioning Authority approve these O&M Manuals.

# 3.5 OPERATIONS AND MAINTENANCE (O&M) MANUALS

- .1 The Electrical Contractor shall compile and prepare documentation for all equipment and systems covered in the Electrical contract for inclusion in the O&M manuals.
- .2 The Commissioning Authority shall receive a copy of the O&M manuals (after approval by the Departmental Representative) for review.

## 3.6 TRAINING OF OWNER PERSONNEL

- .1 The Commissioning Authority and the Departmental Representative and shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment or systems.
- .2 <u>Electrical Contractor.</u> The electrical contractor shall have the following training responsibilities:
  - .1 Provide the Commissioning Authority with a training plan two weeks before the planned training.
  - .2 Provide designated Owner personnel with comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.

- .3 Training shall start with classroom sessions, if necessary, followed by handson training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
- .4 During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
- .5 The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise, as well as in-depth knowledge of all modes of operation of the specific piece of equipment, are required. More than one party may be required to execute the training.
- .6 The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
- .7 Training shall include:
  - .1 Use the printed installation, operation, and maintenance instruction material included in the O&M manuals.
  - .2 Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance; special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shutdown, seasonal changeover, and any emergency procedures.
  - .3 Discuss relevant health and safety issues and concerns.
  - .4 Discuss warranties and guarantees.
  - .5 Cover common troubleshooting problems and solutions.
  - .6 Explain information included in the O&M manuals and the location of all plans and manuals in the facility.
  - .7 Discuss any peculiarities of equipment installation or operation.
  - .8 Hands-on training shall include start-up, operation in all modes possible, including manual, shutdown and any emergency procedures and maintenance of all pieces of equipment.
  - .9 The electrical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not *controlled* by the central control system.
- .8 Training shall occur after functional testing is complete, unless approved otherwise by the Departmental Representative.

## **END OF SECTION**

#### Part 1 General

#### 1.1 SECTION INCLUDES

- .1 This section includes materials and installation for tested firestopping systems as follows:
  - .1 Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated separations.

## 1.2 REFERENCES

.1 Test Requirements: CAN/ULC-S115-05, "Fire Tests of Fire Stop Systems"

## 1.3 QUALITY ASSURANCE

- .1 Contractor's certified installer, or manufacturer's direct installation trainer to assist with initial installation of firestop systems to ensure appropriate contractor system selection and installation procedures.
- .2 Firestop System application, products and installation must meet requirements of a listed system in accordance with CAN/ULC-S115, tested to provide the appropriate fire (and temperature if applicable) rating for the penetrated assembly. Systems may be approved by any Standards Council of Canada approved testing agency.

#### 1.4 SUBMITTALS

- .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 1300.
- .2 Submit material safety data sheets provided with product delivered to job-site.

# 1.5 INSTALLER QUALIFICATIONS

.1 Installer shall have experience with installation of firestopping materials submitted for use.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and ULC or cUL label where applicable.
- .2 Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
- .3 Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.
- .4 Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- .5 Do not use damaged or expired materials.

## 1.7 PROJECT CONDITIONS

- .1 Do not use materials that contain flammable solvents.
- .2 Scheduling

- .1 Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.
- .2 Schedule installation of Drop-In firestop devices after placement of concrete but before installation of the pipe penetration. Diameter of sleeved or cored hole to match the listed system for the device
- .3 Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.
- .3 Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- .4 Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.
- .5 During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

#### Part 2 PRODUCTS

### 2.1 FIRESTOPPING, GENERAL

- .1 Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- .2 Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- .3 For penetrations that are anticipated to be re-used (communication cable-trays, riser shaft sleeves, etc.), use a firestopping system that is re-enterable without the use of additional materials or detailed knowledge of the system.

# 2.2 MATERIALS

.1 Use only firestop products that have been tested and approved for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

## Part 3 EXECUTION

## 3.1 PREPARATION

- .1 Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
  - .1 Verify penetrations are properly sized and in suitable condition for application of materials.
  - .2 Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

- .3 Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
- .4 Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
- .5 Do not proceed until unsatisfactory conditions have been corrected.

#### 3.2 COORDINATION

- .1 Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.
- .2 Responsible trade is to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interference.

## 3.3 INSTALLATION

- .1 Regulatory Requirements: Install firestop materials in accordance with ULC Fire Resistance Directory or equivalent.
- .2 Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.
  - .1 Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
  - .2 Consult with mechanical department representative, project manager, and damper manufacturer prior to installation of ULC firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
  - .3 Protect materials from damage on surfaces subjected to traffic.

#### 3.4 FIELD QUALITY CONTROL

- .1 Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
- .2 Keep areas of work accessible until inspection by authority having jurisdiction.
- .3 Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.
- .4 Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

### 3.5 IDENTIFICATION

- .1 Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
  - .1 The words: "Warning -Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."
  - .2 Contractor's Name, address, and phone number.
  - .3 Through-Penetration firestop system designation of applicable testing and inspecting agency.
  - .4 Date of Installation.

- .5 Through-Penetration firestop system manufacturer's name.
- .6 Installer's Name.

# **END OF SECTION**

#### 1.1 SECTION INCLUDES

.1 This section specifies the materials and installation for wire and box connectors, rated to 1000V.

#### 1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-C22.2No.18 latest edition, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
  - .2 CSA C22.2No.65 latest edition, Wire Connectors.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1 EEMAC 1Y-2, latest edition, 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 to consist of:
  - .1 Connector body and stud clamp for stranded copper conductors.
  - .2 Clamp for stranded copper conductors.
  - .3 Stud clamp bolts.
  - .4 Bolts for copper conductors.
  - .5 Sized for conductors as indicated.
- .4 Clamps or connectors for armoured cable, aluminum sheathed cable, flexible conduit, as required to: CAN/CSA-C22.2No.18.m

# 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 C22.2 No.65.

#### 1.1 SECTION INCLUDES

- .1 This section specifies copper, ACM alloy and aluminum conductors rated 0-1000 Volts and the most common electrical insulation and covering materials.
- .2 This section does not include fire rated building wire to ULC S139 and CSA C83, marine, hazardous, mining, instrumentation, communication and fire alarm wiring.

#### 1.2 REFERENCES

- .1 CSA C22.2 No .0.3 latest edition, Test Methods for Electrical Wires and Cables.
- .2 CAN/CSA-C22.2 No. 131 latest edition, Type TECK 90 Cable.

# 1.3 GENERAL REQUIREMENTS

- .1 Typically use insulated 98% conductivity copper conductor wiring enclosed in EMT (steel) conduit for the general wiring systems unless otherwise indicated.
- .2 Aluminium conductors only permitted where indicated on drawings and then typically only for feeder conductors larger than 100 A. 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 Flexible AC90 armoured cabling (BX) shall not be used for the general wiring system other than final drops to recessed light fixtures in concealed locations.
- .5 Cabling indicated to be 2-Hour Fire-Rated shall be compliant to CAN/ULC-S139 and CSA 38-95. Cabling shall be low smoke halogen free. Conduit to be sized and installed as per manufacturers' requirements for these specialized cables and assemblies regardless of the size indicated on drawings.
- .6 Provide all control wiring except HVAC controls as specified in Mechanical Divisions.
- .7 Refer to Equipment Schedule(s) for detailed responsibilities.
- .8 Non-metallic sheathed wiring is not to be used on this project.

#### Part 2 Products

#### 2.1 WIRE AND CABLE GENERAL

- .1 Conductors: stranded for 10 AWG and larger. Minimum size #12 AWG.
- .2 Use RWU90XLPE for underground installations.
- .3 Main feeders to be conduit and copper insulated wiring unless otherwise noted on drawings. Provide ground wiring for all conduits in or below slabs. Increase conduit size as required.

| Part 1        | General   |  |  |  |  |
|---------------|---|--|--|--|--|
| <b>1.1</b> .1 | <b>SECTION INCLUDES</b> This section includes materials and installation for connectors and terminations. |  |  |  |  |
| <b>1.2</b> .1 | REFERENCES CSA C22.2 No.41- Grounding and Bonding Equipment.  |  |  |  |  |
| Part 2        | Products  |  |  |  |  |
| 2.1           | CONNECTORS AND TERMINATIONS   |  |  |  |  |
| .1            | Copper or Aluminum compression connectors as required sized for conductors.                               |  |  |  |  |
| .2            | Contact aid for aluminum cables where applicable.   |  |  |  |  |
| Part 3        | Execution   |  |  |  |  |
| 3.1           | INSTALLATION  |  |  |  |  |
| .1            | Install stress cones, terminations, and splices in accordance with manufacturer's instructions.           |  |  |  |  |
| .2            | Bond and ground as required to CSA C22.2 No.41.   |  |  |  |  |

#### 1.1 SECTION INCLUDES

.1 This section specifies the materials and installation for grounding electrical systems rated 750V or less.

#### 1.2 REFERENCES

- .1 ANSI/IEEE 837- 2004 Standard for Qualifying Permanent Connections Used in Substation Grounding.
- .2 CSA C22.2 No. 41 2007 Grounding and Bonding Equipment.

#### Part 2 Products

# 2.1 EQUIPMENT

- .1 Copper conductor: minimum 3- 6 m long for each concrete encased electrode, bare, stranded, soft annealed, size as indicated.
- .2 Rod electrodes: copper clad steel19 mm diameter by 3 m long.
- .3 Plate electrodes: galvanized steel, surface area 0.2 m<sup>2</sup>, 1.6 mm thick.
- .4 Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .5 Ground bus: copper, size as required, complete with insulated supports, fastenings, connectors.
- Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1 Grounding and bonding bushings.
  - .2 Protective type clamps.
  - .3 Bolted type conductor connectors.
  - .4 Thermit welded type conductor connectors.
  - .5 Bonding jumpers, straps.
  - .6 Pressure wire connectors.

#### Part 3 Execution

# 3.1 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where conduit is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, using permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 Make grounding connections in radial configuration only. Avoid loop connections.

# 3.2 ELECTRODES

- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
- .2 Install rod electrodes and make grounding connections.
- .3 Bond separate, multiple electrodes together.
- .4 Make special provision for installing electrodes that will give resistance to ground values that meet CEC requirements where rock or sand terrain prevails. Ground as indicated.

#### 3.3 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of secondary system.

# 3.4 GROUNDING BUS

- .1 Install copper grounding bus mounted on insulated supports on wall of electrical room.
- .2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size 2/0 AWG

# 3.5 COMMUNICATION SYSTEMS

- .1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:
  - .1 Telephones: make telephone grounding system in accordance with telephone company's requirements

# 1.1 SECTION INCLUDES

.1 This section specifies U shape support channels either surface mounted. Suspended or set in poured concrete walls or ceilings.

#### Part 2 Products

#### 2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41mm, 2.5mm thick, surface mounted, suspended, or set in poured concrete walls and ceilings.

#### Part 3 Execution

#### 3.1 INSTALLATION

- .1 Secure equipment to surfaces with lead anchors or nylon shields as required.
- .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 For surface mounting of two or more conduits use channels at 1.5m on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12

.13 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of department consultant.

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.14 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

#### 1.1 SECTION INCLUDES

.1 This section specifies materials and installation for splitters, junction boxes, pull boxes and cabinets.

# 1.2 PRODUCT DATA

- .1 Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data: submit manufacturer's product data sheets indicating dimensions, materials, and finishes, including classifications and certifications.
- .3 Shop Drawings: submit shop drawings for custom manufactured items showing materials, finish, dimensions, accessories, layout, and installation details.

#### 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 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 Sheet steel cabinet, with full length hinged door, latch, lock, 2 keys, containing 19 mm G1S fir plywood backboard (if required) for surface or flush mounting as required.
- .2 Include filtered vents and/or fan-cooling when enclosed equipment is heat producing.

# Part 3 Execution

# 3.1 SPLITTER INSTALLATION

- .1 Install splitters 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 locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor.

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- .3 Install terminal blocks as required.
- .4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

# 3.3 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 20 05 00 Common Work Results Electrical.
- .2 Install size 2 identification labels indicating system name, voltage and phase, as appropriate to clearly indicate the enclosure use.

#### 1.1 SECTION INCLUDES

.1 This section specifies rigid and flexible fasteners, fittings and installation.

# Part 2 Products

# 2.1 Outlet and Conduit Boxes - General

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

# 2.2 Sheet Steel Outlet Boxes

- .1 Electro-galvanized steel single and multi-gang device boxes for flush installation, minimum size 76 x 51 x 38 mm or as indicated. For 347 V switches, use 347 V type device boxes.
- .2 Larger 102 mm square x 54mm deep outlet boxes to be used for single gang when more than one conduit enters one side, for telecommunication outlets (for slack storage), or for flush mounting devices in finished plaster and/or tile walls. Provide raised device covers as required.
- .3 For larger boxes (those requiring more wiring space, MUTOAs, etc.) use pre-ganged 102 mm high x 51 mm deep solid type as required. Allow extra gang for telecommunication outlets.
- .4 For larger boxes for special receptacles (multi-phase, high ampacity) use 102 mm square or 119 mm square boxes 54 mm deep with appropriate cover(s).
- .5 Boxes for surface mounted switches, receptacles, or telecommunications outlets to be 102 mm square, or 102 mm high utility, boxes, with rounded corners and raised surface covers. Minimum 38 mm (54 for telecom.) deep
- .6 Lighting fixture outlets: 102 mm square outlet boxes or octagonal outlet boxes.
- .7 Provide extension and plaster rings as required.

# 2.3 Masonry Boxes

.1 Electro-galvanized steel masonry single and multi gang type shallow or deep boxes for devices flush mounted in exposed block walls, minimum 95 mm high x 63 mm deep.

#### 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.

#### 2.5 Floor Boxes

- .1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with flanged cover assemblies and faceplate. Device mounting plate to accommodate short or long ear receptacles. Minimum depth: 28 mm for receptacles; 73 mm for communication equipment.
- .2 Cover assemblies to be die-cast aluminum, provide barriers between the power and low voltage sections. A minimum of two (2) gangs for power and two (2) gangs for communications devices.
- .3 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 16 mm and 21 mm conduit. Minimum size: 73 mm deep

#### 2.6 Surface Conduit Boxes

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

# 2.7 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.

#### 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 Fill open boxes with paper, sponges, foam or similar approved material to prevent entry of construction material. Remove upon completion of work.
- .5 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .6 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not to be used.
- .7 All outlet boxes to be flush mounted in all areas, excluding mechanical rooms, electrical rooms, and above removable ceilings.
- .8 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.
- .9 No sectional or handy boxes to be installed.
- .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.

Page 3

- .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 an assembly with a fire-resistance rating (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. Such boxes may not exceed 0.016 mm2 per NBCC 3.1.9.2.

# 1.1 SECTION INCLUDES

.1 This section specifies rigid and flexible conduits, fasteners, fittings and installation.

#### 1.2 REFERENCES

- .1 Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware: to CSA C22.2 No. 18.
- .2 Rigid metal conduit (RMC): to CSA C22.2 No. 45.
- .3 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .4 Electrical metallic tubing (EMT): to CSA C22.2 No. 83.
- .5 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .6 PVC (DB2) conduit: to CSA #C22.1 211-1.
- .7 Flexible metal conduit (FMC): to CSA C22.2 No. 56.
- .8 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3.

#### 1.3 BASIC WIRING METHODS

- .1 Underground or in concrete exterior to building:
  - .1 All wiring shall be in Schedule 40 RPVC conduit.
- .2 Concrete walls and slabs interior to building:
  - .1 All wiring shall be in Schedule 40 RPVC conduit.
- .3 Partition walls and ceilings:
  - .1 All wiring to be run in EMT conduit for:
    - .1 Distribution feeders and sub-feeders.
- .4 Surface raceways interior:
  - .1 All surface raceways shall be EMT, except if located without protection in areas susceptible to damage, which shall be rigid steel conduit.
- .5 Surface raceways exterior:
  - .1 All surface raceways shall be UV compensated Schedule 40 RPVC conduit, protected from damage and excessive heating to the Department Representative's satisfaction.

# 1.4 LOCATION

- .1 Electrical drawings are diagrammatic and do not show all conduits, wire, cable, etc. Electrical contractor to provide conduit, wire cable, etc., for a complete operating job to meet in all respects the intent of the drawings and specifications
- .2 All raceways and wiring shall be installed concealed in building fabric, except for mechanical and electrical rooms where they shall be installed on the surface.
- .3 All outlet boxes, junction boxes, and cabinets to hold electrical devices shall be mounted so the equipment can be flush mounted unless indicated otherwise.

- .4 All junction boxes and other raceway access devices shall be mounted to avoid being visible from public areas. Obtain approval from Department Representative for any and all junction boxes that, due to the building design, cannot be concealed.
- .5 All junction boxes mounted, out of necessity, on surface of solid walls shall be painted to match adjacent surface, with junction boxes painted to match designated systems.

#### Part 2 Products

#### 2.1 PVC DUCT RACEWAY

- .1 PVC duct fittings shall be of the same manufacturer as duct.
- .2 PVC duct shall be colour coded white for communications, grey for power.

#### 2.2 EMT RACEWAY

- .1 Electrical Metallic Tubing (EMT) shall be galvanized steel of sufficient quality and thickness to allow smooth field formed bends.
- .2 EMT couplings, connectors and fittings shall be steel. Cast type units shall not be used on this installation.
- .3 Conduit fittings shall be steel liquid tight type that fit over PVC jacket and seal uniformly all round.

# 2.3 FLEXIBLE ELECTRIC NON-METALLIC (ENT) TUBING

.1 Flexible electrical non-metallic tubing (ENT) **shall not** be used on this project.

#### 2.4 JUNCTION BOXES

- .1 Except as noted for rigid PVC raceways, all outlet boxes and junction boxes shall be one piece formed or welded.
- .3 Junction boxes to be galvanized steel or aluminum.

# 2.5 INNERDUCTS

- .1 Provide and install innerducts in underground conduits where called for on plans.
- .2 Innerducts to be outdoor corrugated high density polyethylene type complete with pullstring, cable plugs, blank plugs for unused innerducts, and quadraplex sealing plugs.

# 2.6 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1500mm oc.
- .4 Threaded rods, 6 mm dia., to support suspended channels.

# 2.7 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT in all exterior applications. Set-screws are not acceptable.

# 2.8 FISH CORD

.1 Polypropylene.

#### Part 3 Execution

#### 3.1 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .3 Use rigid galvanized steel threaded conduit except [where specified otherwise].
- .4 Use epoxy coated conduit underground corrosive areas.
- .5 Use electrical metallic tubing (EMT) except in cast concrete and above 2.4 m not subject to mechanical injury.
- .6 Use rigid PVC conduit underground, in corrosive areas, and surface mounted in wet areas not subject to damage.
- .7 Minimum conduit size for lighting and power circuits: 19mm.
- .8 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .9 Install fish cord in empty conduits.
- .10 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .11 Dry conduits out before installing wire.
- .12 Conduit bends shall be made with no more than 10% flattening of the conduit. Bends shall be smooth throughout deformations.
- .13 On surface wall runs, all conduit shall be installed in true vertical or horizontal direction and on ceilings in true 90 degree angles or parallel to the walls. Crossings of conduits shall also be made at 90 degree angles. Parallel running conduit shall be kept on equal spacing on the entire length of run including bends.
- .14 All conduits shall be fastened to structure with steel straps (no cast type straps allowed).

# 3.2 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Run conduits in flanged portion of structural steel.
- .3 Group conduits wherever possible on suspended or surface channels.
- .4 Do not pass conduits through structural members except as indicated.
- .5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

# 3.3 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.

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.3 Do not install conduits in terrazzo or concrete toppings.

# 3.4 CONDUITS UNDERGROUND

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

# 3.5 FIRE STOPPING

- .1 Apply ULC approved fire stopping assembly to all conduit penetrations passing through fire rated walls and floors.
- .2 Provide shop drawings showing details for each type of application on the project. Shop drawings shall include catalogue data and installation details.
- .3 For all communication sleeves accessible via ceilings or in stacked closets/rooms passing through floors, provide 2 hour rated STI EZ-PATH assembly. Where quantity is not indicated on plans, provide minimum two sleeves between each floor and each communication closet/room.

#### 1.1 SECTION INCLUDES

.1 This section specifies materials and installation for low voltage control systems for lighting equipment.

# 1.2 SCOPE OF WORK

.1 Provide a low voltage lighting control system as shown on the drawings and as specified herein, complete with all hardware and software required for a complete and fully operating system.

# 1.3 SYSTEM DESCRIPTION

- .1 System shall utilize proven networking technology and shall be able to operate as a stand-alone entity with the option of using a web server device so that programming and viewing of status can be accomplished by any PC connected to the same LAN.
- .2 Low voltage control system designed to provide remote switching of lighting loads by use of:
  - .1 Low voltage momentary contact switches
  - .2 Low voltage relays.
  - .3 Control transformers
  - .4 Low voltage rectifiers
  - .5 Dimming switches
  - .6 Occupancy sensor lighting control
  - .7 Photosensitive daylighting control
  - .8 Interior lighting time clock control
  - .9 Exterior lighting combination time clock and photoelectric control
  - .10 Manual switch control.

#### 1.4 PRODUCT DATA

- .1 Submittal package: Submit shop drawings and product data as specified below in accordance with Section 01 33 00 Submittal Procedures.
- .2 Provide a composite wiring and/or schematic diagram of the complete lighting control system complete with all components, indicating relay panels, master switches, local switches, occupancy sensors and daylight sensors. Indicate the building location reference for all components.
- .3 Provide manufacturers catalogue sheets, specifications and installation instructions for all system components.

# 1.5 COMPONENTS

- .1 All system components shall be of the same manufacturer.
- .2 Designed for lighting control up to and including 600V 20 amp.
- .3 Certified to make or break under full rated load.
- .4 Cable sets consisting of starter cables, joiner cables, and control cables.

# 1.6 OCCUPANY SENSOR LIGHTING CONTROLS

- .1 Wall mounted wall switch
  - .1 PIR occupancy sensor.
  - .2 Adjustable delayed-off time setting 30 seconds to 30 minutes.
  - .3 180° field of view.
  - .4 120V or 347V supply as required.
- .2 Ceiling mounted controls 120V supply
  - .1 PIR occupancy sensor.
  - .2 Adjustable delayed-off time setting 20 seconds to 15 minutes.
  - .3 360° field of view.
  - .4 120V supply.
  - .5 Built-in isolated relay.
- .3 Ceiling mounted controls 24V supply
  - .1 PIR occupancy sensor.
  - .2 Adjustable delayed-off time setting 15 seconds to 30 minutes.
  - .3 360° field of view.
  - .4 24VDC supply.
  - .5 Built-in isolated relay.
  - .6 With range suitable for coverage area.

# 1.7 EXTERIOR LIGHTING ELECTRONIC TIMECLOCK/PHOTOCELL CONTROL L.V. RELAYS

- .1 Microprocessor controlled low voltage lighting control panel with adjustments and indications built into face of controller.
- .2 Two output groups, each with three outputs (max two 20Arelays per output) and two on/off momentary outputs.
- .3 Master override buttons built into the control panel.
- .4 Memory backup (7 days).
- .5 Astronomical Clock.
- .6 Complete with NEMA 1 enclosure with lockable door and transformer.
- .7 Remote photo sensor complete with weatherproof mounting package.

# 1.8 EXTERIOR LIGHTING COMBINATION TIMECLOCK AND PHOTOCELL CONTROL

- .1 Recessed mounted adjustable photocell capable of switching 1500 watt load.
- .2 365 day electronic timing control centre complete with photo control feature.
- .3 Time clock controls 3 circuits independently, complete with manual bypass switch for each circuit.
- .4 Complete with 24 hour reserve power timing mechanism

#### Part 2 Execution

# 2.1 INSTALLATION

.1 Install system panels and components at locations shown on the drawings and in strict accordance with manufacturer's instructions.

# 2.2 Relay panels and conduit.

.1 Ensure that conduit for line voltage wires enters panel in line voltage areas and conduit for low voltage control wires enters panel on low voltage areas. Check manufacturer's drawings for location of line and low voltage areas.

# 2.3 Daylight Sensors

- .1 Locate daylight sensors at locations indicated on the drawings and per manufacturer's recommendations for closed loop and open loop applications. Ensure there is no artificial light shining directly into the sensor head.
- .2 Adhere to manufacturer's recommendations for wiring and programming.

# 2.4 Occupancy Sensors

- .1 Locate sensors in rooms indicated on the drawings. Locate sensors so there are no objects blocking the infra red sensor from viewing all of the coverage area. Keep away from HVAC vents and direct light from light fixtures.
- .2 Adhere to manufacturer's recommendations for location, wiring and programming.

# 2.5 Low Voltage Wiring

- .1 For low voltage wiring, provide wire type as recommended by the manufacturer.
- .2 Adhere to manufacturer's recommendations as to maximum wire length and maximum quantity of relays per switch.
- Data line shall be #16 twisted pair Belden #8471 or equal. Data line switches require 2 pair #16 Belden #8472 or equal.

# 2.6 Line Voltage Wiring

- .1 Use wire gauges from #10AWG to #12AWG as appropriately sized for the circuit.
- .2 If a LonWorks system is being installed and being integrated with another LonWorks system the system integrator shall be responsible for setting up and programming the system.

# 2.7 FIELD QUALITY CONTROL

On completion of installation, manufacturer representative shall be notified to carry out site inspection and report any inconsistencies in the installation or system operation to the Department Representative. Corrections are to be implemented to comply with required installation and operational parameters defined in the drawings and specifications.

# 1.1 SECTION INCLUDES

.1 This Section specifies standard and custom panelboards and their installation.

#### 1.2 SCOPE OF WORK

- .1 Provide and install panelboards as indicated on the drawings, single line diagram, panel schedules and these specifications.
- .2 Types of panelboards in this section include the following:
  - .1 CDP type Power distribution panelboards.
  - .2 Lighting and power panelboards

#### 1.3 PRODUCT INFORMATION

- .1 Submit shop drawings in accordance with Section 01 33 00 Submittal Procedures.
- .2 Shop drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.
- .3 Shop drawings to include matching tub and trim details for factory installed low voltage relay cabinets where specified.

# 1.4 PLANT ASSEMBLY

- .1 Install circuit breakers in panelboards before shipment from plant.
- .2 In addition to CSA requirements, manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .3 All panelboards to be of a common manufacturer.

# 1.5 FINISH

- .1 Panel finish in electrical and equipment rooms and closets to be standard ASA Grey baked enamel. Confirm with Department Representative prior to shop finishing panels.
- .2 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 Department 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 Department Representative prior to paint finishing panels.

#### Part 2 Products

# 2.1 PANELBOARDS, DOORS AND TRIMS

- .1 Panelboards: to CSA C22.2 No. 29 and product of one manufacturer.
- .2 Bus and breakers unless otherwise indicated on the drawings and in the specifications, shall be rated for:
  - .1 Minimum 10 kA at 208Y/120V.
  - .2 Minimum 22 kA at 600Y/347V.
- .3 Tin plated aluminum bus with full size neutral.

- .4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number.
- .5 Mains capacity, number of circuits and number and size of branch circuit breakers as indicated.
- .6 Provide all necessary connectors and mounting hardware in every space to facilitate installation of future breakers. Provide blank fillers for all spaces.
- .7 Concealed hinges and concealed trim mounting screws, hinged locking door with flush catch.
- .8 Panelboards to have flush doors. (Gasketted where required for damp locations).
- .9 Provide two keys for each panelboard and key similar voltage and system panelboards alike.
- .10 Panel tubs to be typically 600mm wide.
- .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 Panels to have integral Surge Protection Device (SPD) where indicated. See drawings for quantities and locations.
- .13 Provide 200% rated neutrals for panelboards with 5 conductor feeders, where indicated on single line diagram.

# 2.2 BREAKERS

- .1 All breakers to be:
  - .1 For Lighting Panelboards: Bolt on type molded case, non-adjustable and non- interchangeable trip, single, two and three pole, 120/208V or 347/600V and with trip free position separate from "On" or "Off" positions.
  - .2 For Power Distribution Panelboards: Bolt on type molded case, adjustable and interchangeable trip, single, two and three pole, 120/208V 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.
- .3 Main breaker (where required) 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 or the Single Line Diagram.
- .5 Provide spare circuit breakers as indicated on panel schedules or single line diagram as applicable. Provide minimum 10% spare breakers.
- .6 Provide breaker type Ground Fault Interrupter(s) (GFI) as indicated.

#### 2.3 PANELBOARD IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 Common Work Results Electrical.
- .2 Nameplate for each panelboard size 5 (2 line) engraved as indicated and include panel designation and voltage/phase.
- .3 Complete updated 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 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.

# 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.

#### 1.1 SECTION INCLUDES

.1 This Section specifies switches, receptacles, wiring devices, cover plates and their installation.

# 1.2 PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 330 00 – Submittal Procedures.

#### 1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
  - .1 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.
  - .2 CSA-C22.2 No.42.1, Cover Plates for Flush Mounted Wiring Devices.
  - .3 CSA-C22.2 No.55, Special Use Switches.
  - .4 CSA-C22.2 No.111, General Use Snap Switches.

# Part 2 Products

# 2.1 COLOUR AND STYLE

.1 All devices to be **DECORA** style white.

#### 2.2 SWITCHES

- .1 Heavy duty commercial grade.
- .2 20 A, 120 V, single pole, double pole, three-way, four-way switches as indicated.
- .3 Manually-operated general purpose ac switches as indicated and with following features:
  - .1 Terminal holes approved for No.10 AWG wire.
  - .2 Silver alloy contacts.
  - .3 Urea or melamine molding for parts subject to carbon tracking.
  - .4 Suitable for back and side wiring.
  - .5 White toggle (red toggle for emergency power circuits).
- .4 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rating capacity of motor loads.
- .5 Switches of one manufacturer throughout project.
- .6 Standard of acceptance:
  - .1 Hubbell 20A series
  - .2 Leviton 20A 120V series 20A 347V
  - .3 Pass & Seymour 120V series or 347V Series

# 2.3 RECEPTACLES – GENERAL

- .1 Heavy duty commercial grade.
- .2 Duplex receptacles, CSA type L5-15 R, 125 V, 15 A, U ground, with following features:
  - .1 White nylon molded housing (red for emergency power circuits)
  - .2 Suitable for No.10 AWG for back and side wiring.
  - .3 Break-off links for use as split receptacles.
  - .4 Eight back wired entrances, four side wiring screws.
  - .5 Triple wipe contacts and non riveted grounding contacts.
- .3 Receptacles of one manufacturer throughout project.
- .4 Standard of acceptance:
  - .1 Hubbell heavy duty, construction series
  - .2 Leviton series
  - .3 Pass & Seymour series

# 2.4 RECEPTACLES – PARTICULAR APPLICATION

- .1 <u>Surge Suppression</u> TVSS 15 Amp, 125 volt duplex receptacles to be 2 pole, 3 wire hospital grade, blue face, parallel blade, U ground, impact resistant nylon face audible and LED alarm. Equal to:
  - .1 Hubbell heavy duty series with LED.
  - .2 Leviton 8280 series
  - .3 Pass & Seymour 8200SP series (Décor)
- .2 <u>Isolated Ground</u> type to be 15 Amp, 125 volt duplex receptacles to be 2 pole, 3 wire hospital grade, orange face, parallel blade, U ground, impact resistant nylon face. Equal to:
  - .1 Hubbell series
  - .2 Pass & Seymour series (Décor)
- .3 <u>Ground Fault Interrupter</u> type to be 15 Amp, 125 volt duplex receptacles to be 2 pole, 3 wire hospital grade, white face, parallel blade, U ground, impact resistant nylon face, complete with breaker and reset button. Equal to:
  - .1 Hubbell GF8200 series
  - .2 Leviton 7599HG series
  - .3 Pass & Seymour series (Décor)
- .4 20 Amp Receptacles (Housekeeping) Duplex receptacles T-slot type CSA type L5-20R 125V. 20 Amp u ground with features matching 15 Amp rated Receptacles.
- .5 Safety Tamper Resistant Receptacles. Receptacles indicated with an 'S' on the drawings shall be Tamper Resistant type. Hubbell RR15xx.TR series.
- .6 All other single outlet and special purpose receptacles to be similar to the grade and series indicated above. Confirm ampacity, voltage and pin configuration prior to installation.
- .7 Range receptacle to be 250V, 50A with a 40A, 2P breaker per outlet.
- .8 Dryer receptacle to be 250V, 40A with a 30A, 2P breaker per outlet.

#### 2.5 DIMMERS

- .1 Flush mounted Specification grade.
- .2 Incandescent application: 600-1500 watts based on connected load plus 25% spare.
- .3 Electronic ballast application: compatible with ballasts specified.
- .4 Radio interference suppression.
- .5 Thin profile: slide to OFF feature.
- .6 Finished in white or as indicated.
- .7 Standard of acceptance:
  - .1 Lutron 'NOVA-T' NT series.
  - .2 Leviton 'Illumatech' series

#### 2.6 COVER PLATES

- .1 Stainless steel: Type 302 or 304, No. 4 finish, 1mm thick, accurately die cut, protective cover for shipping. Outlets in labs or as indicated in the drawings or specifications.
- .2 Nylon plates: Heavy duty, unbreakable and flush. All nylon plates to match wiring device colour.
- .3 Steel: sheet steel hot dip galvanized with rolled edges for surface mounted utility boxes.
- .4 Wall plates to be flush mounting with "positive bow" feature to ensure that all edges of plate are flush with wall or surface box when installed.
- .5 All plates to be beveled type with smooth rolled outer edge and smooth face. Exposed sharp edges are not acceptable.
- .6 Cast metal: die cast profile, ribbed for strength, flash removed, primed with grey enamel finish and complete with four mounting screws to box for special purpose wiring devices.
- .7 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for wiring devices as indicated. Double doors for standard duplex receptacles. Cover plates to fasten to box by four screws.
- .8 Gaskets: resilient rubber or close cell foam urethane.
- .9 Cover plates for all wiring devices to be from one manufacturer throughout project.

#### Part 3 Execution

#### 3.1 INSTALLATION GENERAL

- .1 Mount wiring devices to height specified in Section 26 05 00 or as indicated.
- .2 Upper edge of plates located on separate outlets immediately alongside one another to be at exactly the same height above finished floor.
- .3 All plates to be installed parallel or perpendicular to building lines.

#### 3.2 INSTALLATION PARTICULAR

# .1 Switches:

- .1 Install single throw switches with handle in "UP" position when switch closed.
- .2 Install switches in gang type outlet box when more than one switch is required in one location.

# .2 Receptacles:

- .1 Install all receptacles in the vertical plane unless otherwise noted.
- .2 Generally install the L5-15/20R U ground pin down unless otherwise noted. Neutral up when receptacle in mounted horizontal.
- .3 Install receptacles vertically in gang type outlet box when more than one receptacle is required in one location.
- .4 Where split receptacles has one portion switched, mount vertically and switch the upper portion.
- .5 Surge suppression duplex receptacles to be provided for all communication and computer terminal equipment backboards and cabinets including fire alarm, telephone, public address, door security, nurse call, central dictation, RF television, security television, etc. Provide dedicated neutral conductors for each surge suppression receptacle.
- .6 Ground fault interrupter duplex receptacles to be used, adjacent sinks or water sources.

# .3 Cover plates:

- .1 Protect cover plate finish with paper or plastic film until painting and other work is finished.
- .2 Install suitable common cover plates where wiring devices are grouped.
- .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

#### 1.1 SECTION INCLUDES

- .1 This section specifies the materials and installation for luminaires for the entire project including exterior lighting fixtures.
- .2 Refer to the Luminaire Schedule on the electrical drawings.

# 1.2 REFERENCES

- .1 CAN/CSA C22.1-09, Canadian Electrical Code, Part I.
- .2 CAN/CSA C22.2 No.9.0, General Requirements for Luminaires.

# 1.3 PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 Submittal Procedures.
- .2 Submit complete photometric and heat dissipation data prepared by independent testing laboratory for proposed luminaires.
- .3 Photometric data shall include VCP Table and spacing criterion.

#### 1.4 INTENT

- .1 Provide lighting fixtures and accessories for all outlets as listed in the Luminaire 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 Ground 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 Department representative before ordering fixtures.
- .5 Fixtures of the same or similar type shall be supplied by the same manufacturer.

# Part 2 Products

# 2.1 BALLASTS

- .1 All ballasts shall be supplied with a rated voltage matching the supply voltage indicated on the drawings. Ballast output current and voltage shall match the current and voltage ratings of the lamp or lamps they are designed to operate. All ballasts to be built to CSA Standard C22.2 No.74.
- .2 Ballasts shall comply with FCC and NEMA limits covering EMI and RFI and shall not interfere with operation of other normal electrical equipment.
- .3 Minimum requirements for electronic ballasts:
  - .1 Sound rating of 'A'.
  - .2 High frequency operation (25 KHz or higher).
  - .3 Total harmonic distortion to be less than 10%.
  - .4 Current crest factor to be less than 1.7.

- .5 Rated lamp life shall be maintained.
- .6 High power factor of 90% or higher.
- .7 High efficiency programmed start ballasts for linear fluorescent lamps.
- .8 120 Volt input, or otherwise indicated on the drawings.
- .9 Ballast to operate no more than two linear fluorescent lamps.
- .10 Ballasts used in exterior luminaires to have minimum starting temperature of -18°C.
- .4 Minimum requirements for electromagnetic ballasts:
  - .1 Pulse start type for metal halide.
  - .2 Current crest factor to be less than 1.7.
  - .3 Epoxy encased "super quiet" ballast assemblies for all interior fixtures ballast.
  - .4 Ballasts used in exterior luminaires to have minimum starting temperature of -30°C.

# 2.2 FIXTURES

- .1 Accessories and components shall comply with relevant CSA Standards.
- .2 Recessed downlight fixtures shall be of the approved prewired type with junction box forming an integral part of the fixture assembly and so located in relation to the fixture that the junction box is CSA approved for 60 degree C wire. The electrical trade shall supply and install all necessary plaster rings, supports, etc., required for complete and proper installation.
- .3 Except where otherwise noted in the Luminaire Schedule, depth of recessed fluorescent fixtures shall not exceed 150 mm, including mounting yokes, or bridges and the distance from the back face of the diffuser or lens to the centre of the lamp shall be not less than 75 mm. Design of reflector and lamp position shall be to provide high efficiency, even brightness and lack of lamp lines.
- .4 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.
- .5 Fixtures shall incorporate adequate gasketting, stops and barriers to form light traps and prevent light leaks.
- .6 Fixtures shall be designed for adequate dissipation of ballast and lamp heat to avoid short ballast life, nuisance thermal tripping and decreased lamp output. Heat test reports by independent laboratories shall be provided where required by the Department representative.
- .7 Construction of all fixtures shall be such as to provide a rigid well aligned fixture. Formed or ribbed backplates, end plates, reinforcing channel, heavy gauge sockets, straps, etc., shall be used where required to accomplish this.

#### Part 3 Execution

#### 3.1 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 Luminaire Schedule shall be the overall length from the ceiling to the lowest point of the fixture body, reflector or glassware in its hanging position.
- .6 Metal inserts, expansion bolts or toggle bolts in concrete slabs for stems which do not carry wiring must be accurately located in relation to the outlet boxes, to allow perfect alignment and spacing of suspension stems.
- .7 Where fixtures are surface mounted on the underside of an inverted tee bar ceiling, the fixture shall be supported either directly from the building structure by means of rod hangers and inserts or by means of metal angle headers, supported from the tee bar framing structure above the tile. Fixtures shall be supported from the quarter points.
- .8 Wiring from outlet boxes to fluorescent fixtures and wiring through fluorescent fixture channels shall be rated for 90 degrees C.
- .9 Connection to incandescent fixtures shall be by means of approved fixture type wiring.
- 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.
- .11 Install fixture lenses as late as possible to protect from dirt and dust. Remove and clean or replace lenses to the satisfaction of the Department representative.

#### 1.1 SECTION INCLUDES

.1 This section specifies materials and installation for emergency lighting systems.

# 1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.141-M1985(R1999), Unit Equipment for Emergency Lighting.

# 1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 Submittal Procedures.
- .2 Data to indicate system components, mounting method, source of power and special attachments.

#### Part 2 Products

# 2.1 EQUIPMENT

- .1 Emergency lighting equipment: to CSA C22.2 No.141.
- .2 Supply voltage: 120
- .3 Output voltage: 24 V dc.
- .4 Operating time: 30 min.
- .5 Battery: sealed, maintenance free.
- .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations.
- .7 Solid state transfer circuit.
- .8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .9 Signal lights: solid state, for 'AC Power ON' and 'High Charge'.
- .10 Lamp heads: integral mounted on unit. Remote twin heads, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: tungsten, 9 W.
- .11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .12 Provide Lexan covers on all remote twin head units mounted in gymnasiums, storage rooms, multiple purpose rooms and other areas where units subject to damage.
- .13 Finish: white.
- .14 Auxiliary equipment:
  - .1 Ammeter.
  - .2 Voltmeter.
  - .3 Test switch.
  - .4 Time delay relay.
  - .5 Battery disconnect device.

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# Hartley Bay B.C.

- .6 AC input and DC output terminal blocks inside cabinet.
- .7 Bracket.
- .8 Hardwire connection for AC.
- .9 RFI suppressors.

# Part 3 Execution

# 3.1 INSTALLATION

- .1 Install unit equipment.
- .2 Direct heads.
- .3 Mount Lexan covers over units where units subject to damage.

#### 1.1 SECTION INCLUDES

.1 This section specifies materials and installation for exit signs complete with directional arrows.

# 1.2 TYPE OF EXIT SIGN

- .1 Install specification grade LED type exit signs in general public areas where indicated on drawings.
- .2 Install specification grade weatherproof LED type exit signs where designated 'WP' where indicated on drawings.

# 1.3 PRODUCT DATA

- .1 Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data: submit manufacturer's product data sheets indicating dimensions, materials, and finishes, including classifications and certifications.

#### Part 2 Products

# 2.1 EXIT SIGN TYPES

- .1 General Public Areas:
  - .1 Thin line, LED type with white finish thermoplastic housing.
- .2 Weatherproof Type
  - .1 White polycarbonate housing with gasketted polycarbonate clear faceplate, LED type, connect to life safety emergency power supply.
- .3 All exit signs shall comply with CAN/CSA C860.
- .4 Exit signs shall be complete with 10 year warranty.

#### 2.2 MOUNTING TYPE

- 1.1 Exit signs to be suitable for universal mounting. Allow for exit signs to be mounted as to best suit ceiling/wall type and architectural features:
  - .1 surface wall mounted
  - .2 end wall mounted double face
  - .3 recessed wall mounted
  - .4 ceiling mounted single face
  - .5 ceiling mounted double face
- .2 Exit signs to have direction arrows where indicated.
- .3 Provide steel rod pendant supports for exit signs to mount to +3.5m A.F.F. in high ceiling areas as required.

# Part 3 Execution

# 3.1 INSTALLATION

- .1 Install exit signs as shown on plans complete with double face units where indicated.
- .2 Connect to life safety emergency power circuit as indicated on the plans.
- .3 Exit signs must be clear of all visual obstruction.
- .4 Contractor to confirm locations before final installation.

# 3.2 LOCATION

.1 Review locations of exit signs with department representative to ensure effectiveness and compatibility with decor before rough in. Failure to do so may result in relocation at no extra charge to the project.

# 3.3 MOUNTING HEIGHT

- .1 Wall mounted signs shall be clear above doors and, if space allows, 2.4 metres to centre, but with 25mm clearance of ceiling.
- .2 Ceiling mounted signs shall be mounted directly on ceiling, unless it is obstructed from view. Stem mount using two fixture rods (9.5mm white smooth type).

# 3.4 SPARE

.1 Provide quantity of twelve (12) spare exit signs and allow for installation to within 5 meter radius of nearest exit sign shown on plans to suit final fit-up requirements.

# 1.1 SCOPE

- .1 Provide a complete data/communications cabling as indicated on plans.
- .2 Contractor to install all communications conduit, boxes, and equipment as per CSA-T1A standards: 568.0, 568.1, 569, 606. 607.

# 1.2 DESCRIPTION OF SYSTEM

- .1 This contract includes a complete cabling system, including but not necessarily limited to:
  - .1 Raceway and cabling system installation.
  - .2 Connectors tying down all cable ends.
  - .3 Wire management components.
  - .4 Testing all cables and providing test results
- .2 The complete installed system shall meet all performance criteria for Category 6.

# 1.3 PRODUCT DATA AND SHOP DRAWINGS

- .1 Submit product data and shop drawings in accordance with Section 26 05 00. This includes all test results, for each pair, from an independent laboratory.
- .2 Shop drawings to include dimensions of equipment, circuit diagrams, protection, and power requirements.

# 1.4 GENERAL REQUIREMENTS

- .1 All workmanship, materials and/or installation practices and activities shall be equal to or better than the standards established by the CAN/CSA T529, T530 Standards, EIA/TIA 568 Standards, BiCSi-TDM, and CSA Standard C22.1 Canadian Electrical Code Part 1.
- .2 Installers must be authorized, trained, and certified by the manufacturer or BCIT.
- .3 There must also be a minimum of one year warranty on all components and equipment proposed and installed by the vendor. The one year warranty period begins upon substantial performance or when the system is fully functional, whichever is later.
- .4 The system installer must be prepared, trained and equipped to properly test the cable system. The tests will include continuity, near end, crosstalk, attenuation and return loss. All horizontal data cables will be tested individually and will only be accepted if they operate within the specified Category 6 service limits. All horizontal cables will be tested individually and must meet or exceed performance requirements of EIA/TIA-568-A, TSB67 and SPA4195-3.
- .5 All systems will be inspected visually by the Department representative prior to the commencement of functional and electrical performance testing. The installation and interface equipment will be inspected for compliance with the industry standards quoted above and particular attention shall be given to the following criteria:
  - .1 Neatness, clamping and harnessing of cables and wiring.

- .2 Wire and cable identification and labeling.
- .3 Cable and wire connections, ground clamps and terminal strips.
- .4 Completeness.
- .5 Construction and finishes.
- .6 Safety.
- .7 Grounding.
- .8 Continuity and polarity.
- Vendors will source their cabling and components from a manufacturer with a reputation for high quality and reliability.

# 1.5 AS-BUILT DRAWINGS

.1 Contractors will supply the Department representative with a complete, current and accurate set of As-Built drawings showing all data/communication outlets complete with addresses at job completion.

#### Part 2 PRODUCTS

# 2.1 RACEWAYS

- .1 Raceways and wireways shall be as specified in Section 26 05 28.
- .2 All cables to be installed in EMT conduit

| Pair |   | Pin No. | Pin Co       | lour  | Colour Code |
|------|---|---------|--------------|-------|-------------|
| 1    | T | 5       | Green        | Wh-B  | lue         |
|      | R | 4       | Red          | Blue  |             |
| 2    | T | 3       | Black        | Wh-O  | range       |
|      | R | 6       | Yellow       | Orang | e           |
| 3    | T | 1       | Blue         | Wh-G  | reen        |
|      | R | 2       | Orange Green |       |             |
| 4    | T | 7       | Brown        | Wh-B  | rown        |
|      | R | 8       | Slate(Grey)  | Brown | ı           |

# 2.2 CABLING AND WIRE

- .1 Each UTP cable will consist of four unshielded twisted pairs of 23 AWG, 100-ohm nominal characteristic impedance, solid round annealed copper conductors insulated with flame retardant polymer.
- .2 All cables will be certified/approved by CSA standard PCC FT4 flammability test, and UL CMR.
- .3 UTP Cables shall be rated Category 6 and meet or exceed the requirements in the proposed National Electrical Manufacturers Association (NEMA) Standard for Low-loss Extended Frequency Premises Telecommunications Cable. The cable will meet the performance requirements of EIA/TIA-568-B Enhanced Category 6 and ISO 11801 2002 specifications, and cable surface markings shall indicate this classification.
- .4 CAT6 data cable jackets to be white. Amp #TE620R-WTxx

#### 2.3 LABELLING

- .1 Labels on wall plates and patch panels to be Brother P-Type or equivalent, black lettering on white tape. Label to the Saanich standard included in the appendix.
- .2 Raceway Labels
  - .1 All empty raceways shall be clearly and permanently marked at both ends to indicate destination and function. The markings shall be clearly visible after construction is completed.
- .3 Each cable shall be clearly marked with a permanent sequential identifier at each end of the cable. All horizontal cable terminations will be labelled at patch panels and at data/comm. outlets. Labelling of wiring to be the same identifier as the termination point label.

#### Part 3 EXECUTION

#### 3.1 INSTALLATION

- .1 Install wiring and devices as indicated on plans
- .2 Leave a pullstring in each data/communications outlet conduit.
- .3 Provide bushings on all conduit ends.
- .4 <u>**DO NOT**</u> install data/voice cabling in conduit placed underground or in slab-on-grade unless the cable is specifically rated for wet location.

#### 3.2 HORIZONTAL CABLING

- .1 Communications raceway shall be minimum 21mm EMT conduit or as indicated on the drawings. All cabling is to be installed in conduit through-out the building.
- .2 Wires and cable shall be as short as practical except that sufficient slack shall be provided to:
  - .1 Prevent undue stress on cable forms, wires, and connections.
  - .2 Enable network components to be removed and replaced during servicing without disconnecting other parts.
  - .3 Facilitate movement of equipment for maintenance purposes.
- .3 Wires and cables shall be placed and protected to avoid contact with rough surfaces or sharp edges. Where wires or cables run through holes in metal, they shall be protected by suitable grommets or bushings.
- .4 Clearance between cables and heat emitting or interference generating devices shall be such as to avoid deterioration of these wires and cables due to heat dissipation from these devices, and to comply with industry standards. In particular cables shall have a minimum separation of 150mm from unshielded power lines and 600mm from fluorescent lighting.
- .5 The horizontal wiring shall be continuous with no splice points. Bridged taps are not permitted and there will be no cross-connects between the outlet and the patch panel.

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- .6 Each cable shall be clearly marked with a permanent sequential identifier at each end of the cable. All horizontal cable terminations will be labelled at cross-connects and at telecommunications outlets. Labelling will include room number or patch panel as per labelling requirements reference.
- .7 Horizontal conduit fill must comply with the Canadian Electrical Code requirements.

#### 3.3 TESTING

- .1 All data/communications cables shall be tested using testing equipment approved for Category 6 installations.
- .2 Testing shall be conducted by authorized representative of cable and hardware manufacturer.
- .3 Testing set-up shall be for a permanent link test, maximum length of 90m.
- .4 Testing shall include verification of labelling integrity.
- .5 Test results shall be documented and shall include the following information in addition to the cable parameters:
  - .1 Cable ID
  - .2 Transmit and Receive locations
  - .3 Test Equipment used to complete the test
  - .4 Contractor's name
  - .5 Technician's name and signature
  - .6 Date test was performed
  - .7 Relevant additional comments
- Provide test results to Department representative and Owner's representative for approval and system acceptance, presented in electronic disk format (CSV format).

#### 3.4 **DOCUMENTATION**

- .1 Provide documentation in accordance with EIA/TIA 606 CSA T528.
- .2 Documentation shall include, but is not limited to:
  - .1 Complete as-built drawings with outlet identification.
  - .2 Test results.
  - .3 Manufacturer's warranty documentation.

#### **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 ANSI/TIA 607-D Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
- .2 ANSI/TIA-606-C Administration Standard for Telecommunications Infrastructure.

#### 1.3 SYSTEM DESCRIPTION

- .1 The facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, equipment, raceways, and other associated hardware that has the potential for acting as a current carrying conductor. The TBB shall be installed independent of the buildings electrical and building ground and shall be designed in accordance with the recommendations contained in the ANSI/TIA-607-D Telecommunications Bonding and Grounding Standard.
- .2 Provides ground reference for telecommunications systems within building and bonding to it of telecommunications rooms.
- .3 Metallic pathways, cable shields, conductors, and hardware within telecommunications spaces are bonded to telecommunications grounding and bonding system.

#### PART 2 PRODUCTS

#### 2.1 TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB)

- .1 Predrilled copper bus-bar, listed by NRTL, electro-tin plated with holes 8 mm diameter for use with standard-sized lugs to: ANSI/TIA 607-D.
- .2 Dimensions 6mm thick, 100 mm wide, 300 mm long to: ANSI/TIA 607-D.

#### 2.2 BONDING CONDUCTOR FOR TELECOMMUNICATIONS

.1 3/0 AWG copper conductor, green insulated to: ANSI/TIA 607-D.

#### 2.3 TELECOMMUNICATIONS BONDING BACKBONE (TBB)

.1 3/0 AWG copper conductor, green insulated to: ANSI/TIA 607-D.

#### 2.4 WARNING LABELS

.1 Non-metallic warning labels in English and French to: ANSI/TIA 607-D. Identify labels with wording "If this connector is loose or must be removed, please call the building telecommunications manager".

#### PART 3 EXECUTION

#### 3.1 TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB)

- .1 Install TMGB in entrance room on insulated supports 50 mm high at location close to electrical power panel if one is installed in same room as indicated.
- .2 Install #6 AWG copper bonding conductor from TMGB to alternating current equipment ground (ACEG) enclosure of serving electrical power panel (panelboard).

#### 3.2 BONDING CONDUCTORS GENERAL

- .1 When placed in ferrous metallic conduit or EMT longer than 1 m, bond to each end of conduit or EMT using grounding bushing 6 AWG copper conductor.
- .2 Where metallic panels attached to the rack to not have sufficient metal to metal contact to provide an adequate path to ground, they shall be bonded to the rack using a minimum #14 AWG copper conductor. The copper conductor size shall be upgraded based on the largest power conductor feeding any rack mount equipment. The conductor shall be continuous; attaching all isolated components in a daisy chain fashion from top to bottom and bonded to the rack using an appropriate compression connector.

#### 3.3 BONDING CONDUCTOR FOR TELECOMMUNICATIONS

- .1 Install bonding conductor for telecommunications from TMGB to service equipment (power) ground.
- .2 Use exothermic welding, approved 2-hole compression lugs for connection to TMGB.

#### 3.4 BONDING TO TMGB

- .1 Bond metallic raceways in telecommunications entrance room to TMGB using #6 AWG green insulated copper conductor.
- .2 For cables within telecommunications entrance room having shield or metallic member, bond shield or metallic member to TMGB using #14 AWG green insulated copper conductor.
- .3 Bond equipment racks and cabinets located in telecommunications entrance room to TMGB using #6 AWG green insulated copper conductor.
- .4 All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the Communication rooms shall be grounded

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to the respective TGB using a minimum #6 AWG stranded copper bonding conductor and compression connectors.

#### 3.5 LABELLING

- .1 All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape. All cables and bus bars shall be identified and labelled in accordance with the System Documentation Section of this specification.
- .2 Apply additional administrative labels to: ANSI/TIA-606C.

#### **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.

#### 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.

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- .4 All conduits 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.
- 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.
- .5 Section 03 10 00 Concrete Forming and Accessories.

#### 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 Appendix A:
  - .1 Geotechnical Site Assessment: Hartley Bay SAR Residence Lot 59 Preliminary Geotechnical Assessment, August 24 2020.
- .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 <sup>3</sup>) (600 kN- m/m <sup>3</sup>).
  - .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 1.00m³, 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 Materials excavated from the building site are to be spread in the area directly behind the area of construction.
- .2 Remove trees and brush on area of construction as indicated.
- .3 Remove trees and brush in soil storage area as required.
  - .1 Final location as directed by the 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.
- .3 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

#### 1.6 QUALITY ASSURANCE

- .1 Do not use soil material until written report of soil test results are reviewed and approved by Departmental Representative.
- .2 Health and Safety Requirements:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 30 Health and Safety Requirements.

#### 1.7 WASTE MANAGEMENT AND DISPOSAL

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

#### 1.8 EXISTING CONDITIONS

- .1 Carefully examine existing mapping of site utilities prior to excavation.
- .2 Buried services:
  - .1 Maintain and protect from damage, water, sewer, electric, telephone and other utilities and structures encountered.
    - .1 Refer to drawings for approximate locations.
  - .2 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing.
  - .3 Record location of maintained, re-routed and abandoned underground lines.
  - .4 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
  - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, survey bench marks and monuments which may be affected by Work.

- .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
- .3 Existing pilings:
  - .1 Previously installed pilings exist within the new building footprint.
    - .1 Pilings are pressure treated material.
    - .2 Pilings are to be removed under the work of this contract and disposed of at an appropriate off site facility. Refer to Section 01 74 19 Construction Waste Management and Disposal.

#### .4 Existing Boardwalk:

- .1 Existing boardwalk at East end of property to be maintained during the course of construction.
- .2 Existing boardwalk at West end of property to removed as required to complete excavation and construction activities and reinstated at completion of construction.

#### .5 Site access:

- .1 Access to site for excavation and construction purposes is by way of existing boardwalk structure. There is a load capacity of 2,268 Kg (5,000 lbs). All equipment used for excavation and construction must be able to use this boardwalk to access the site.
  - .1 Contractor to provide protection for boardwalk during construction activities.
  - .2 Proposals to increase the load capacity of the boardwalk for construction purposes will be considered by the Departmental Representative.

#### PART 2 Products

#### 2.1 MATERIALS

- .1 Gravel to be composed of inert, durable material, reasonably uniform in quality and free from soft or disintegrated particles. In absence of satisfactory performance records over a five year period for particular source of material, soundness to be tested according to ASTM C88 or latest issue. Maximum weight average losses for course and fine aggregates to be 30% when magnesium sulphate is used after five cycles.
- .2 All crushed gravel when tested according to ASTM C136 and ASTM C117 to have a generally uniform gradation and conform to MMCD gradation limits and 60% of the material passing each sieve must have one or more fractured faces. Determination of amount of fractured material shall be in accordance with BC Ministry of Transportation and Highways Specification I-11, Fracture Count for Coarse Aggregate, Method 'A', which determines fractured faces by count. The Plasticity Index for crushed gravel to not exceed 6.0.
- .3 Granular base and sub-base to MMCD (Master Municipal Contract Documents 2009, British Columbia), Section 31 05 17 Aggregates and Granular Materials.
- .4 Granular pipe bedding to MMCD ((Master Municipal Contract Documents 2009, British Columbia), Section 31 05 17 Aggregates and Granular Materials.
- .5 Drain rock to MMCD ((Master Municipal Contract Documents 2009, British Columbia), Section 31 05 17 Aggregates and Granular Materials.

- .6 Structural fill to be in approved by a geotechnical engineer and 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.
- .2 Remove West boardwalk if required.

#### 3.3 PREPARATION/PROTECTION

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

#### 3.4 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as indicated after area has been cleared of brush, weeds, grasses and removed from site.
- .2 Strip topsoil to depths as indicated.
  - .1 Do not mix topsoil with subsoil.

- .3 Stockpile in locations as directed by Departmental Representative.
  - .1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .4 Retain topsoil for reinstatement.

#### 3.5 STOCKPILING

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

#### 3.6 SHORING, BRACING AND UNDERPINNING

- .1 Contractor is responsible for the protection and temporary support of all project excavations.
- .2 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 30 Health and Safety Requirements and WorkSafe BC.
  - .1 Where conditions are unstable, Contractor to retain and pay costs for geotechnical engineer to review condition and provide recommendations.

#### 3.7 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 43 Environmental Procedures to approved runoff areas or containment facilities and in manner not detrimental to public and private property, or portion of Work completed or under construction.
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

#### 3.8 EXCAVATION

- .1 All or any existing underground utilities are not necessarily shown on the Contract Drawings. Existing Underground utilities shall be located and all utility companies contacted, prior to installing any new underground services.
- .2 Test holes may be required to be excavated to determine exact depths of existing utilities. Any discrepancy in elevation or location shall be referred to the Departmental Representative prior to construction.

- .3 Advise Departmental Representative at least 7 days in advance of excavation operations. Excavate to lines, grades, elevations and dimensions as indicated.
- .4 All trenches to conform to WorkSafeBC Guidelines and Regulations and MMCD standard drawing G4.
- .5 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation offsite.
- .6 Excavation must not interfere with bearing capacity of adjacent foundations and slabs. Contractor to notify Departmental Representative immediately where undermining of slabs of foundations occurs. Contractor responsible for devising and executing a remediation plan for filling all voids associated with undermining of slabs and foundations.
- .7 Keep excavated and stockpiled materials safe distance away from edge of trenches as directed by Departmental Representative.
- .8 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.

#### 3.9 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.

#### 3.10 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Departmental Representative has inspected and approved installations.

- .2 Departmental Representative has inspected and approved of construction below finish grade.
- .3 Inspection, testing, approval, and recording location of underground utilities.
- .4 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Backfill materials:
  - .1 Boulevards and easements: for areas not subject to vehicle or building loading and outside ditch lines, backfill with approved native material Compact to 95% modified proctor density.
- .5 The contractor shall employ a professional geotechnical engineer with experience in geotechnical engineering for performance of in-place density and sieve testing. The site material shall fall within one of the granular backfill material specifications as per MMCD Section 31 05 17. Refer also to Civil drawings.
- .6 Install drainage system in backfill as indicated.

#### 3.11 RESTORATION

- .1 Existing underground utilities may need to be lowered or rose to suit the final design grades in accordance with minimum and maximum cover requirements for each utility.
- .2 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 19 Construction Waste Management and Disposal, trim slopes, and correct defects as directed by Departmental Representative.
- .3 Replace topsoil as indicated.

#### 3.12 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 SECTION INCLUDES

#### 1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA-C83 latest edition, Communication and Power Line Hardware.

#### 1.3 REGULATORY REQUIREMENTS

.1 Co-ordinate and meet requirements of power supply authority. Ensure availability of power when required.

#### Part 2 Products

#### 2.1 MATERIAL

- .1 Service mast: rigid [tubular metal] [heavy duty, galvanized steel], suitable for attachment of support clamps, insulator rack, weatherhead, service drop fittings.
- .2 Service mast support devices: to CSA 22.1.
- .3 Insulator rack: to CAN/CSA-C83, [one] [two] [three] [four] wire, heavy duty.
- .4 Weatherhead: cast or plastic
- .5 Rigid steel galvanized conduit
- .6 [Weatherproof] metre socket: Hydro approved Meter/CT enclosure.

#### Part 3 Execution

#### 3.1 INSTALLATION

- .1 Install service mast, insulator rack, weatherhead.
- .2 Install metre socket and conduit.
- .3 Install service drop conductors allowing sufficient conductor length for connection to service equipment.
- .4 Allow sufficient conductor length for connection to supply by power supply authority.
- .5 Allow sufficient conductor length for drip loops.
- .6 Make grounding connections in accordance with Section [16062] [26 05 28] Grounding Secondary.

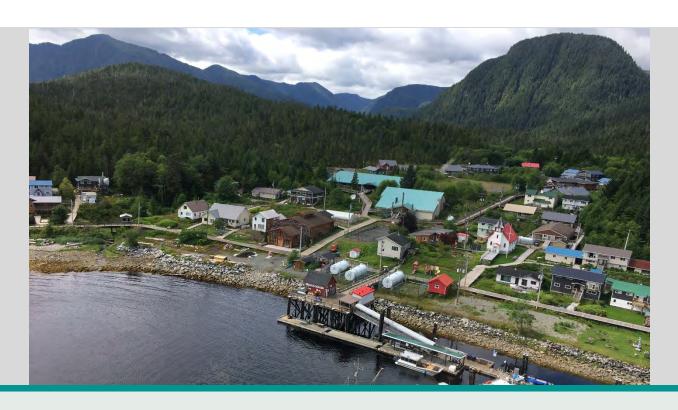
#### END OF SECTION

## **APPENDIX A**

Geotechnical Site Assessment: Hartley Bay SAR Residence Lot 59 Preliminary Geotechnical Assessment, McElhanney - August 24 2020.







# **Hartley Bay SAR Residence Lot 59** -**Preliminary Geotechnical Assessment**

August 24, 2020 | Revision #0

Submitted to: Canadian Coast Guard Prepared by: McElhanney Ltd.

Contact

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Our file: 2321-22441-01

# Your Challenge. Our Passion.



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### 1. Introduction

McElhanney Ltd. (McElhanney) was retained by the Canadian Coast Guard (the Client) to conduct a preliminary geotechnical assessment for a proposed Search and Rescue (SAR) Residence in Hartley Bay, British Columbia. The purpose of the preliminary geotechnical assessment was to identify the expected subsurface conditions, assess site suitability, and provide geotechnical recommendations as input to the planning, design, and construction of the proposed development.

The results of the geotechnical assessment, analysis, and recommendations on geotechnical aspects of site development and foundation design and construction, are provided in this report.

The geotechnical services provided by McElhanney were carried out in general accordance with our Proposal No. 2321-91168-00 dated December 4, 2019. Authorization to proceed was provided by the Client with Purchase Order F7044-190138 dated December 9, 2019.

In conducting this geotechnical assessment and submitting this report, McElhanney has:

- Conducted a geotechnical field program comprising 5 test pits;
- Performed laboratory testing on select soil samples; and,
- Prepared this report summarizing the findings of the preliminary geotechnical assessment and providing preliminary geotechnical recommendations for foundation and site design, and construction.

This report is subject to Limitations of Report – Geotechnical Services in Section 8 of this report.



## 2. Background

#### 2.1. SITE LOCATION

The site is located on Lot 59 in Hartley Bay, BC. Hartley Bay, BC is located at the south end of Douglas Channel, approximately 80 km southwest of Kitimat, BC and the townsite is accessed only by air or by water. The approximate site location is shown on Figure 1. The Client also provided the proposed building location, which is shown on Drawing No. G-01 in Appendix A.



Figure 1. Approximate site location (red outline) [Image source: Google Earth accessed August 5, 2020].

#### 2.2. PROPOSED DEVELOPMENT

The proposed SAR Residence development is planned to be a three-storey wood-framed residential structure. The Client provided preliminary architectural plans for the development prepared by Number Ten Architectural Group (Drawings No. A02 to A05, Job No. 2018552 dated October 14, 2019). The drawings show the proposed 3-storey structure constructed using the existing wooden piles at the site (shown on Drawing G-01) for the foundation; however, the Client has since determined that the piles will not be considered for re-use. Instead, the preferred foundation is understood to be shallow concrete



footings with crawl space. Based on discussions with the Client, it is understood that the proposed development will be covered under Part 9 of the BC Building Code 2018 (BCBC2018), will not be a high importance or post disaster structure, and will not require seismic site classification.

The geotechnical recommendations provided in this report are based on the understanding of proposed preliminary development plans and site location as described above. The geotechnical design will depend on the structural design of the proposed building, the civil design of the site, and the subsurface conditions encountered on site. Once preliminary design has been completed by other disciplines, or if there are any changes to the proposed development or site location from those described above, it is recommended that McElhanney be notified and retained to assess the applicability of the recommendations provided herein and/or provide recommendation for further geotechnical assessment, if required.

#### 2.3. DESKTOP REVIEW

#### 2.3.1. Geological Setting

Only a small-scale surficial geology map published by the Geological Survey of Canada (GSC) was available to review surficial geology and soil types at the Site. Map 1880A - Surficial Materials of Canada published by the GSC was reviewed. The map shows the Site and surrounding area to comprise alpine complexes of rock, colluvium, and till characterized by alpine and glacial landforms.

Bedrock geology was reviewed on GSC's Map 23-1970 Geology – Douglas Channel and Hecate Strait. The map shows that the site is likely underlain by plutonic quartz diorite rock.

#### 2.3.2. Previous Reports

A previous report and a record drawing set with information about the site were provided by the Client for background review, which are included in Appendix B. These included:

- Geotechnical Evaluation of Proposed Hartley Bay Subdivision by Levelton Associates Consulting Engineers (Levelton Associates Consulting Engineers, 1995).
- Hartley Bay Band Kilkaya IR No. 4 & 4A Site 2 Subdivision, Record Drawings, by David Nairne & Associates (David Nairne and Associates Ltd., 2001).

The Levelton geotechnical evaluation (Levelton Associates Consulting Engineers, 1995) included a field program comprising a series of soundings using a steel rod at locations in and around the site location. It noted that the soils at the site generally comprised very soft and wet peat overlying a variety of loose to compact alluvial soils, dense to very dense glacial till, and/or bedrock. The report showed that the soft peat overburden thickness near Lot 59 ranged from 0.6 m to 2.5 m overlying hard soil or bedrock; however, the underlying soils at this location were not characterized due to the type of field investigation. The report also discusses global stability of the general area and indicates that the flat to relatively gentle native slopes appeared stable and no indications of large-scale soil movement or instability were observed.

The record drawing set for the Site 2 Subdivision (David Nairne and Associates Ltd., 2001) showed asbuilt conditions for the site. It is noted that the lot numbering on the drawings differs from the current-day lot numbering and that the site is numbered Lot 26 on the drawing package. The drawings show that the site had 16 timber posts installed to for foundation support for a future proposed wood-framed house. The as-installed conditions of specific piles are not shown on the drawings; however, the wood posts were reportedly installed through the overburden soils to hard underlying soils comprising glacial till or bedrock with a design allowable bearing pressure of 400 kPa and 700 kPa, respectively. The drawings also show that the site has an existing water and sanitary service installed.

#### 2.3.3. Past Projects

McElhanney has previous experience with residential construction in Hartley Bay from 2015. Several single-storey residential homes were constructed in the village utilizing a combination of the existing wooden timber posts (previously installed in 2001) and small helical piles as per recommendations by a memorandum by EXP Services Inc. (EXP Services Inc., 2014) which is included in Appendix B. The approximate site location is shown in Figure 2 below. The memorandum also includes preliminary discussion regarding optional use of "mini piles", which are 50 mm steel pipe piles driven with a pneumatic hammer using hand labour or small equipment. The soil conditions were reportedly an average of 1.2 m of muskeg overlying dense to very dense till soil.



Figure 2. Approximate locations of recent past projects in Hartley Bay (image source: Google Earth accessed August 10, 2020)

Based on information provided by McElhanney's structural engineer for the project, Paul Bjorn, P. Eng, there were challenges with helical pile installation due to the hard ground conditions of the till soil underlying the muskeg. Challenges included:

- Difficulty installing piles in the design location due to hard installation conditions in till soil, resulting in the need to use extensive blocking and shimming of the pile caps;
- Difficulty achieving the design vertical or battered alignment of piles;
- Low lateral capacity of piles given small size of piles available to install with small equipment and difficulty achieving battered angles of piles; and,
- Pile refusal due to hard ground conditions, cobbles, and boulders in the till.

Mr. Bjorn also noted anecdotal information from other projects in the village that utilized various other foundation options successfully. The existing hatchery building used mini-pile foundation methodology and the fire hall utilized shallow concrete footing foundations.



## 3. Site Assessment

#### 3.1. UTILITY LOCATES

Utility locating involved the completion of a BC One Call, review of record drawings provided by the Client, and review of on-site utilities with a representative of the Hartley Bay Maintenance Department on July 17, 2020. McElhanney personnel were on site during the utility locating and test pit locations were determined to avoid conflict with the underground utilities, the existing boardwalks, vegetated areas, and existing timber posts while having as much spatial coverage of the site as possible.

#### 3.2. SUBSURFACE ASSESSMENT

A test pit program was completed on July 17, 2020, and comprised five (5) test pits (TP20-01 to TP20-05) at locations shown on Drawing No. G-01 (Appendix A). The test pits were excavated by the Hartley Bay Maintenance Department using a tracked mini-excavator.

During advancement of the test pits, subsurface conditions were visually observed and recorded by a McElhanney representative following the Modified Unified Soil Classification System (Appendix C). Grab samples were collected from the excavated materials or from the walls of the shallow test pits. Soil density was estimated based on excavation effort required and visual observations. Sample frequency depended on field observations, including changes in stratigraphy. Groundwater monitoring instrumentation was not installed as part of this assessment; however, groundwater conditions were noted throughout excavation. Each test pit was backfilled with the excavated materials and compacted and graded immediately upon completion to the best ability of the backhoe used. The locations of the test pits were measured using a reel tape measure from landmarks such as power poles as requested by the Client. Geotechnical test pit logs describing the subsurface soil and groundwater conditions encountered are appended in Appendix C. Laboratory testing was conducted on select samples as follows:

- Moisture content determination on 9 samples; and,
- Gradation analysis (ASTM C117 and C136) on 4 samples;

Testing was completed in the McElhanney Laboratory in Terrace and the results of the laboratory tests are shown in the test pit logs and included in Appendix D.





## 4. Site Assessment

#### 4.1. VISUAL OBSERVATIONS

The site was accessed by foot via the existing wooden boardwalk as shown on Drawing G-01 and Photo 1. A secondary boardwalk access was available on the west side of the cleared portion of the site. There were 16 wood timber posts with cross bracing installed at the end of the boardwalk access as shown on the as-built drawings provided by the Client (David Nairne and Associates Ltd., 2001) and Photo 2. Assessment of the condition of the existing timber posts is covered under a separate technical memo by McElhanney





Photo 1. Boardwalk access to site.

Photo 2. Existing wood timber posts with cross bracing, facing south.

The portion of the site to the west of the existing boardwalk access was generally flat and vegetated with small bushes and grasses. The surface was soft to walk on and for the mini-excavator to operate. To the west of the secondary boardwalk, the site was treed with small conifers and bushes (Photo 3). From the edge of the boardwalk access to the east, there was a small slope down to the east of approximately 1.5 m height over a horizontal distance of approximately 15 m (Photo 4).



Photo 3. Secondary boardwalk access on the west side of site with treed area to the west (facing north).



Photo 4. 1.5 high slope towards the west at TP20-05 location.

#### 4.2. SOIL CONDITIONS

#### Pear

Peat was encountered at surface in all test pits with an average thickness ranging from 1.9 m to 2.3 m around the existing wood timber posts (TP20-01 to TP20-04, inclusive) and 1.1 m in TP20-05 near the toe of the small slope on the east property boundary. The peat was described as very soft, dark brown, and wet to saturated and it contained occasional decomposed wood, stump, and root inclusions. The moisture content of peat samples ranged from 338% to 884%.

#### Gravel and Sand

Gravel and sand of varying gradation was encountered below the peat in all test pits at the site. The gradation varied between test pits, but generally comprised sand and/or gravel as the primary component(s), and silt to some silt, trace cobbles, and occasional trace boulders up to 1 m. The gravel, cobble, and boulder particles were subrounded to rounded and the layer was inferred to be compact in all test pits. The moisture content of the gravel and sand samples collected ranged from 11% to 20%. Three samples were submitted to the laboratory for Washed Sieve Analysis, and the results are summarized on Table 1.

Table 1. Summary of gradation testing for Gravel and Sand

| Testpit<br>No. | Sample<br>ID | Depth<br>(m) | Test Type                      | Gravel<br>(%) | Sand<br>(%) | Fines<br>(%) |
|----------------|--------------|--------------|--------------------------------|---------------|-------------|--------------|
| TP20-01        | GB 1-2       | 2.1 – 2.7    | Gradation (excluding oversize) | 36            | 49          | 15           |
| TP20-03        | GB 3-2       | 2.0 – 2.7    | Gradation (excluding oversize) | 53            | 28          | 19           |
| TP20-04        | GB 4-2       | 1.9 – 2.6    | Gradation (excluding oversize) | 10            | 50          | 39           |

#### Till

Till was encountered underlying the gravel and sand layer only in TP20-05. The till comprised silt that was sandy with some sub-angular gravel and some cobble up to 300 mm size. It was inferred compact, non-plastic, grey, and moist. One sample of the till had a moisture content of 19%.

Table 2. Summary of gradation testing for Till

| Testpit | Sample | Depth     | Test Type                      | Gravel | Sand | Fines |
|---------|--------|-----------|--------------------------------|--------|------|-------|
| No.     | ID     | (m)       |                                | (%)    | (%)  | (%)   |
| TP20-05 | GB 5-2 | 1.4 – 1.9 | Gradation (excluding oversize) | 11     | 31   | 58    |

#### 4.3. GROUNDWATER CONDITIONS

Groundwater monitoring instrumentation was not installed as part of this scope of work; however, groundwater conditions were observed during the advancement of test pits. Seepage was observed in from the peat layer in all test pits except TP20-05. Pooling of water at the base of the test pit was only observed in TP20-03 at a level of 2.5 meters below ground surface (mbgs). No seepage or other groundwater was encountered in TP20-05.

Note that groundwater levels will fluctuate seasonally and are expected to be higher during periods of rain or snow melt, particularly in the wet to saturated peat layer overlying the less-permeable till soil layer which may cause a perched water table condition.

## 5. Discussion and Recommendations

#### 5.1. SITE SUITABILITY

Based on the results of our geotechnical assessment, the proposed site is considered suitable for the proposed building development from a geotechnical perspective with consideration of the recommendations and discussions provided in this report. Given the remote location and limited access for conventional construction equipment and materials to Hartley Bay, construction logistics are likely to be the primary factor in determining the most technically feasible and cost-effective foundation support option for the proposed development. At time of preparation of this report, it is understood that the Client prefers to utilize a conventional shallow concrete foundation with crawl space to support the proposed SAR residence structure. The geotechnical discussion and recommendations in this report are based on the Client's preferred foundation system, but do not wholly consider the economic and logistical factors for this method of construction at this site. Alternative foundation types may be considered suitable at this site, but are not discussed under this current scope of work.

For construction of shallow concrete foundations at this site, removal of up to 2.3 m of peat overburden will be required to expose the compact sand and gravel and/or till soils underlying this site that are considered suitable for subgrade support for the proposed development. Water infiltration can be expected to the excavation and excavation slopes may need to extend onto or beyond the edges of the property to provide safe working conditions during construction. Specific recommendations for site preparation and shallow concrete footing foundations are provided in the following sections.

#### 5.2. STRIPPING, SUB-EXCAVATION, AND SUBGRADE PREPARATION

Topsoil, vegetation, peat, and any existing fill materials are considered unsuitable below building foundations and other subgrade-supported/load-bearing features of the proposed development. Based on the test pit observations, the depth of unsuitable soils that would require sub-excavation appeared to range between 1.9 and 2.3 m depth in the proposed building area. Considering the soft nature of the peat at the site, a wide track excavator with low contact pressure is recommended for site preparation works.

Note that the subsurface conditions may vary across the site and sub-excavation of unsuitable soils may be required to depths beyond those encountered at the test pit locations in areas not specifically tested.

McElhanney recommends the following for site preparation for all proposed buildings and any other subgrade supported development features:

- Any organic materials, loose/soft, wet, softened/weakened soils, debris, existing wood post foundations, and any other deleterious materials must be removed.
- The unsuitable soils and materials must be excavated to expose the underlying gravel and sand or till soils observed during this assessment.



- At the design subgrade elevation, the exposed subgrade should be covered with a 300 mm thick layer of Engineered Fill placed and compacted in accordance with the recommendations below in Section 5.3.
- If unsuitable soils are encountered at the design subgrade depth, the materials should be removed (sub-excavated) to expose acceptable conditions before commencing construction activities. All prepared subgrades must be inspected in the field by a geotechnical engineer or their representative, to confirm that the subgrade conditions are consistent with the design conditions assumed in this report.
- Subject to field review at the time of construction, approved sub-excavated surfaces should be backfilled to design subgrade with approved Engineered Fill (see Section 5.3), moisture conditioned to -/+2% of optimum moisture, placed in uniform layers and compacted to a minimum of 100% Standard Proctor Maximum Dry Density (SPMDD), unless otherwise defined in this report.
- The final subgrade surface within proposed buildings should be carefully graded to prevent ponding and to direct water away from building areas. For additional protection of buildings, McElhanney recommends continuous perimeter drains (see Section 5.6).

#### 5.3. ENGINEERED FILL

Any site grading fills, fill placed for trafficable surfaces, and fill placed to support building foundations shall be considered Engineered Fill. Recommendations for Engineered Fill are summarized as follows:

- Engineered Fill soils should comprise clean (less than 5% passing the 0.075 mm sieve) well-graded sand and gravel with a maximum particle size of 75 mm and be approved by the Geotechnical Engineer.
- The in-situ peat, gravel and sand, and till soils encountered during this assessment did not appear suitable for re-use as Engineered Fill due to high organic and/or fines content.
- Engineered fill should be placed only on subgrade surfaces prepared as per the recommendations
  provided in Section 5.2 and approved by the Geotechnical Engineer or their representative prior to fill
  placement.
- Engineered Fill materials should be placed in uniform layers of thickness suitable for the compaction equipment onsite but not exceeding 300 mm thickness.
- Engineered Fill used to support load-bearing structures (i.e. foundations), underground utilities, or any
  other component that may be settlement sensitive should be compacted to a minimum of 100%
  SPMDD. In other areas where only landscaping is present, site grading fills, including engineered fill
  or select native excavation materials, may be compacted to a minimum of 95% SPMDD.
- Continuous Quality Control (QC) compaction testing and construction reviews must be performed by the Geotechnical Engineer's representative or a qualified testing agency during placement of all Engineered Fill to verify compliance with the above recommendations.
- Engineered Fill zones should extend down and out from the proposed foundation at a minimum of a one horizontal to one vertical (2H:1V) slope to allow for the distribution of stresses, starting at least 0.3 m horizontal beyond the footprint of the load-bearing area.

#### 5.4. SITE DRAINAGE AND DEWATERING

The following recommendations for site drainage and dewatering are provided:



- The prepared subgrade surfaces for the site should be sloped to prevent ponding of water on the site.
   Excess water must be diverted away from the excavation and shall not be allowed to pond and should be drained or pumped from the site as quickly as possible both during and after construction.
- Within 2 m of building perimeters, the exterior should be graded to slope away from the building. A
  gradient of 4% or more should be used wherever possible. Roof and other drains should discharge
  well clear of the buildings.
- A perimeter drain is recommended around building foundations to prevent groundwater buildup. Detailed recommendations for perimeter drainage for foundations is given in Section 5.6 below.

#### 5.5. TEMPORARY EXCAVATIONS

In order to protect existing utilities and adjacent infrastructure during construction, and to allow for safe worker access, temporary excavation slopes shall be constructed as per most current applicable Worksafe BC regulations.

It is expected that temporary excavation slopes up to 2.5 m depth may be required for foundation construction. For planning purposes, it is recommended that temporary excavation slopes up to 2.5 m in height be sloped no steeper than 3 Horizontal to 1 Vertical (3H:1V) within the peat soils encountered at this site. It is expected that there will be water seepage into excavations from the saturated surficial peat soils encountered during the test pit assessment and the Contractor must be prepared to dewater temporary excavations during construction. A conventional sump and pump system or other suitable means are expected to be suitable to dewater the excavation.

If excavations are planned to extend below 2.5 m at this site, groundwater inflow and seepage cannot be controlled by the proposed means, and/or if other poor/saturated/unstable soil conditions are encountered, a qualified geotechnical engineer should review the excavation plans.

#### 5.6. BUILDING FOUNDATIONS

Conventional spread footings founded on Engineered Fill placed over the native sand and gravel soils encountered during the test pit assessment are considered suitable for the development. Strip footings should be a minimum 450 mm wide and pad footings should be a minimum of 600 mm wide and long. Based on the soil conditions encountered in the test pits, the recommended limit state bearing pressures are provided in Table 3.

Table 3. Limit State Bearing Capacity Recommendations

| Subgrade Type               | Foundation<br>Depth (m) | Maximum Width<br>of Foundation<br>(m) | Recommended Bearing Capacity <sup>1</sup> (kPa) |  |  |
|-----------------------------|-------------------------|---------------------------------------|---|--|--|
|                             |                         |                                       | Serviceability<br>Limit State <sup>2</sup>      | Ultimate<br>Limit State <sup>3</sup><br>(Factored) |  |
| Engineered Fill over Native | 2.0                     | 0.45                                  | 50  | 75   |  |
| Sand and<br>Gravel          | 2.0                     | 0.6                                   | 75  | 100  |  |

<sup>&</sup>lt;sup>1</sup> Canadian Foundation Engineering Manual, 4th Edition, Canadian Geotechnical Society, Bitech Publishing Ltd., Richmond, BC.

The following recommendations are provided for foundation design and construction:

- Shallow concrete footing foundations may be constructed minimum 300 mm Engineered Fill placed directly on the native sand and gravels soil prepared in accordance with Section 5.2.
- If unsuitable materials are encountered at the foundation level, the unsuitable soils should be removed as per Section 5.2 and the underside of footing elevation shall be lowered to the elevation of suitable underlying material, or the frost depth, whichever is deeper;
- To reduce the potential for frost heaving of foundations, heated foundations for buildings in soil should be provided with a minimum 1.2 of cover and minimum of 1.8 m of cover for unheated foundations. Thermal insulation should be considered if spread footings are founded at shallower depths with soil cover less than recommended above. McElhanney can provide thermal insulation recommendations and revised footing burial depths, if desired.
- Foundation walls must be backfilled with Engineered Fill with minimum 1 m horizontal thickness from
  the edge of the wall, sloped upward at an angle no steeper than 1H:1V. Non-woven geotextile should
  be used to separate the Engineered Fill for foundation walls from the adjacent native peat soils. The
  non-woven geotextile should have minimum grab tensile strength of 900 N, CBR puncture resistance
  of greater than 2,300 N, and permittivity of greater than 1.5.
- Given the wet to saturated peat conditions encountered at the site and potential for perched groundwater conditions, a conventional perimeter drain should be installed along the outside the building foundations at and below the foundation grade to collect groundwater seepage and prevent pore pressure built-up behind the foundation walls. The drain should consist of a perforated pipe installed with perforations facing down, surrounded by drain rock and wrapped by a non-woven geotextile to provide a separator between the native soils and drain rock material. The perimeter drainpipe should be allowed to collect, transport and discharge groundwater seepage to an appropriately designed water collection sump or drainage ditch.
- If a crawl space is considered, the building designer should include adequate provisions to control and remove moisture due to potential groundwater infiltration.
- If other foundation options are being considered for the proposed buildings, McElhanney should be notified of the proposed design for geotechnical review and comment.



<sup>&</sup>lt;sup>2</sup> For expected settlements of less than 25 mm, assuming Minimum SPT N<sub>60</sub>1=10 for the Engineering Fill

<sup>&</sup>lt;sup>3</sup> Geotechnical Resistance Factor of 0.5 applied



# 6. Design and Construction Review

Once a final detailed development plan and/or preliminary design has been prepared, it is recommended that the design be reviewed by the Geotechnical Engineer to verify that the geotechnical recommendations have been included in the design.

In order to issue applicable Building Code Schedules and/or construction QA/QC letters, all foundation, backfill and Engineered Fill subgrade must be reviewed by the Geotechnical Engineer as specified in this report. McElhanney can provide these construction reviews as well as material testing services during construction if requested.

## 7. References

- BC Ministry of Transportation and Infrastructure. (2016). *Standard Specifications for Highway Construction, Volume 1.*
- David Nairne and Associates Ltd. (2001). Hartley Bay Band Kilkayu IR No. 4 & 4A, Site 2 Subdivision, INAC CPMS No. 2266.
- EXP Services Inc. (2014). Piles to Support One-Storey Residential Dwelling, Hartley Bay, BC.
- Geological Survey of Canada. (1983). Map 1557A, Surficial Geology Skeena River-Bulkley River Area, Sheet 2.
- GeoNorth Engineering Ltd. (2017). Geotechnical Report, Proposed New Entrance to and Seismic Evaluation of Northwest Community College Terrace Campus Trades Building.
- Levelton Associates Consulting Engineers. (1995). *Geotechnical Evaluation of Proposed Hartley Bay Subdivision.*
- McElhanney Ltd. (2019). Facilities and Storage Building Geotechnical Assessment, Coast Mountain College, Terrace, British Columbia.



## 8. Limitations of Report

Use of this Report. This Report was prepared by McElhanney Ltd. ("McElhanney") for the particular site, design objective, development and purpose (the "Project") described in this Report and for the exclusive use of the client identified in this Report (the "Client"). The data, interpretations and recommendations pertain to the Project and are not applicable to any other project or site location and this Report may not be reproduced, used or relied upon, in whole or in part, by a party other than the Client, without the prior written consent of McElhanney. The Client may provide copies of this Report to its affiliates, contractors, subcontractors and regulatory authorities for use in relation to and in connection with the Project provided that any reliance, unauthorized use, and/or decisions made based on the information contained within this Report are at the sole risk of such parties. McElhanney will not be responsible for the use of this Report on projects other than the Project, where this Report or the contents hereof have been modified without McElhanney's consent, to the extent that the content is in the nature of an opinion, and if the Report is preliminary or draft. This is a technical Report and is not a legal representation or interpretation of laws, rules, regulations, or policies of governmental agencies. The professional services retained for this Project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in this Report. In particular, environmental conditions such as surface and subsurface contamination are outside the scope of this Report.

**Standard of Care and Disclaimer of Warranties**. This study and Report have been prepared in accordance with generally accepted engineering and scientific judgments, principles and practices. McElhanney expressly disclaims any and all warranties in connection with this Report including, without limitation, any warranty that this Report and the associated site review work has uncovered all potential geotechnical liabilities associated with the subject property.

Effect of Changes. All evaluations and conclusions stated in this Report are based on facts, observations, site-specific details, legislation and regulations as they existed at the time of the site assessment. Some conditions are subject to change over time and the Client recognizes that the passage of time, natural occurrences, and direct or indirect human intervention at or near the site may substantially alter such evaluations and conclusions. Construction activities can significantly alter soil, rock and other geologic conditions on the site. McElhanney should be requested to re-evaluate the conclusions of this Report and to provide amendments as required prior to any reliance upon the information presented herein upon any of the following events: a) any changes (or possible changes) as to the site, purpose, or development plans upon which this Report was based, b) any changes to applicable laws subsequent to the issuance of the Report, c) new information is discovered in the future during site excavations, construction, building demolition or other activities, or d) additional subsurface assessments or testing conducted by others.

**Subsurface Risks**. Soil, rock and groundwater data were collected in general accordance with the standards and methods described in the Report. The classification and identification of soils, rocks and



geologic formations was based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Interpretations of groundwater levels and flow direction are based on water level observations at selected test hole locations and are expected to fluctuate. Observations at test holes indicate the approximate subsurface conditions at those locations only. Subsurface conditions between test holes were based, by necessity, on judgement and assumptions of what exists between the actual locations sampled, and may vary significantly from actual site conditions and all persons making use of this Report should be aware of, and accept, this risk. Even a comprehensive sampling and testing program, implemented in accordance with appropriate equipment by experienced personnel, may fail to detect all or certain conditions.

**Information from Client and Third Parties**. McElhanney has relied in good faith on information provided by the Client and third parties noted in this Report and has assumed such information to be accurate, complete, reliable, non-fringing, and fit for the intended purpose without independent verification. McElhanney accepts no responsibility for any deficiency, misstatements or inaccuracy contained in this Report as a result of omissions or errors in information provided by third parties or for omissions, misstatements or fraudulent acts of persons interviewed.

**Underground Utilities and Damages**. In the performance of the services, McElhanney has taken reasonable precautions to avoid damage or injury to subterranean structures or utilities. Subsurface sampling may result in unavoidable contamination of certain subsurface areas not known to be previously contaminated such as, but not limited to, a geologic formation, the groundwater or other hydrous body. McElhanney will adhere to an appropriate standard of care during the conduct of any subsurface sampling.

**Independent Judgments.** McElhanney will not be responsible for the independent conclusions, interpretations, interpolations and/or decisions of the Client, or others, who may come into possession of this Report, or any part thereof. This restriction of liability includes decisions made to purchase, finance or sell land or with respect to public offerings for the sale of securities.

Construction. The subsurface information contained in this Report were obtained for the owner's information and design. The extent and detail of assessments necessary to determine all relevant conditions that may affect construction costs would normally be greater than the assessments carried out for this Report. Accordingly, a contingency fund to allow for the possibility of variations of subsurface conditions should be included in the construction budget to cover costs associated with modifications of the design and construction procedures resulting from conditions that vary from the assumptions in this Report. If during construction, subsurface conditions are found to be other than those described in this Report, McElhanney is to be notified and may alter or modify the geotechnical Report recommendations. If McElhanney is not retained to provide services during construction, then McElhanney is not responsible for confirming or recording that subsurface conditions do not materially differ from those interpreted conditions contained in this Report or for confirming or recording that construction activities have not adversely affected subsurface conditions or the recommendations contained in this Report.



## 9. Closure

McElhanney appreciates the opportunity to provide geotechnical services to the Canadian Coast Guard and we look forward to working with you for the duration of this assignment. If you have any questions regarding the information within, please do not hesitate to contact the undersigned.

Yours Truly,

McELHANNEY LTD.

Prepared By:

Reviewed By:

Tyler Wilkes, EIT Project Engineer Ryan Gibbard, P. Eng Senior Geotechnical Engineer

Ryn Siller

Dr. G. Z. ZHOU
# 28958

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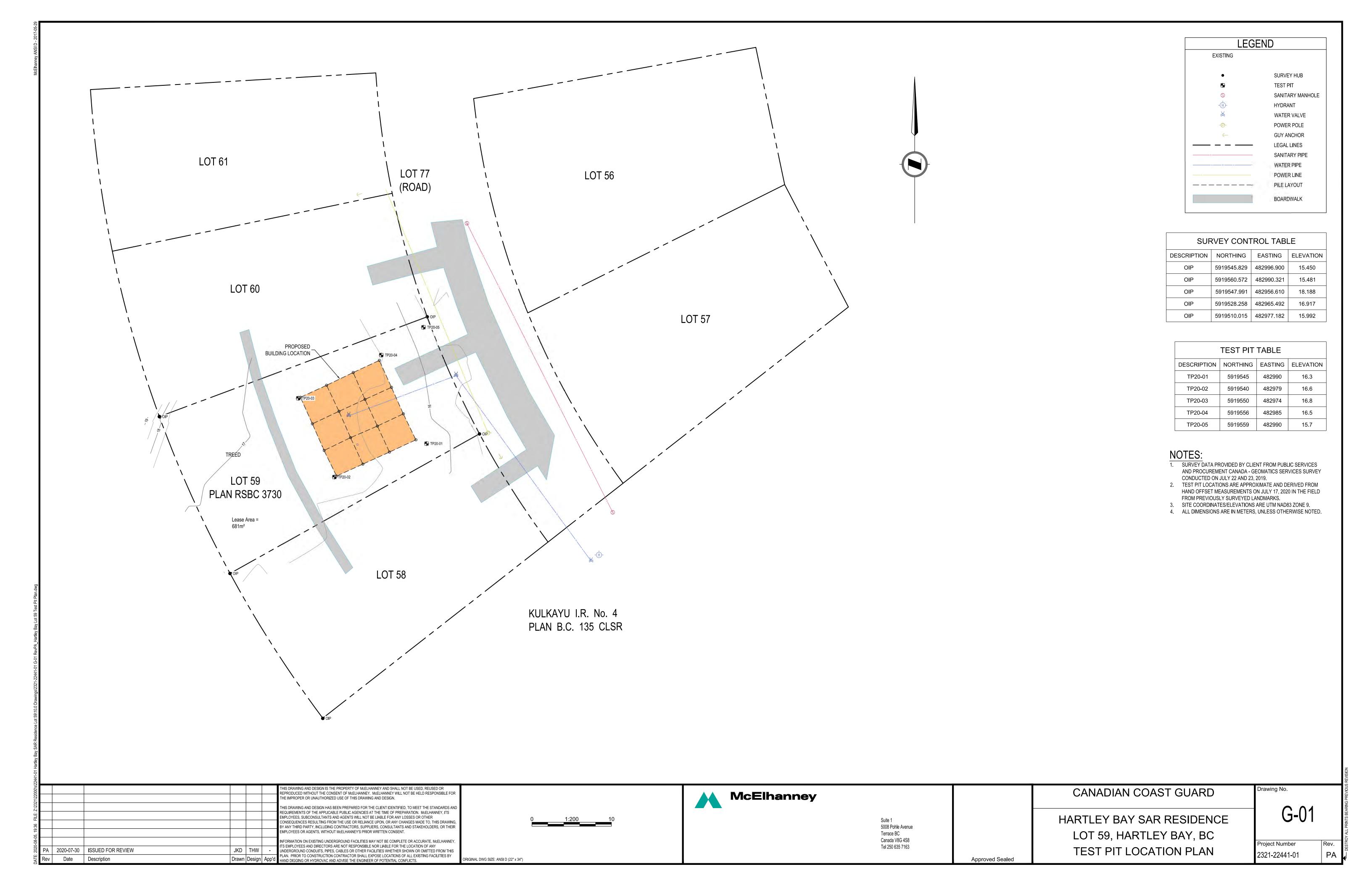
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2020-08-25

George Zhou, P. Eng, PhD Senior Geotechnical Engineer

# APPENDIX A - DRAWINGS

Drawing No. G-01



# APPENDIX B - REFERENCED DATA

(David Nairne and Associates Ltd., 2001)

(Levelton Associates Consulting Engineers, 1995)

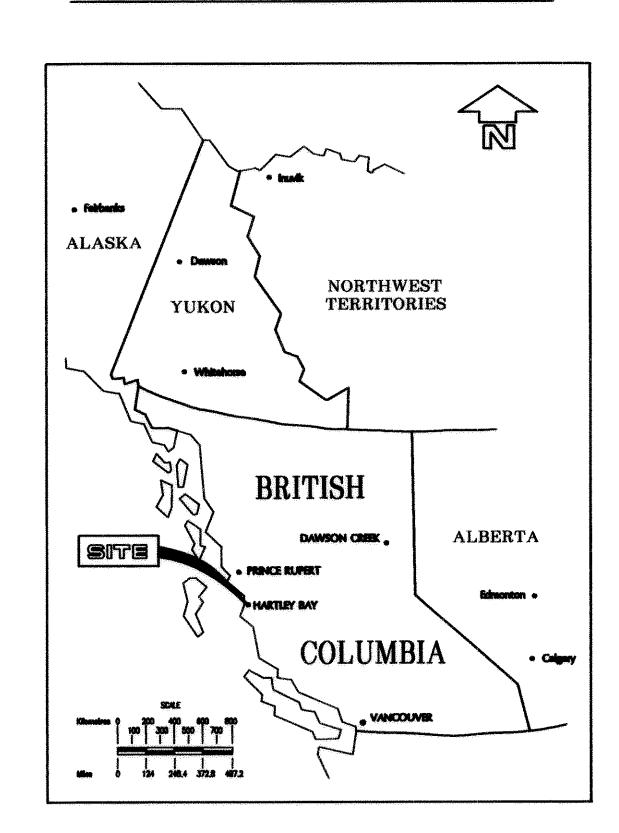
(EXP Services Inc., 2014)

# HARTLEY BAY BAND KULKAYU I.R. NO. 4 & 4A SITE 2 SUBDIVISION INAC CPMS NO. 2266

# LEGEND

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| ***************************************  | BOARDWALK           |          |

# LOCATION MAP



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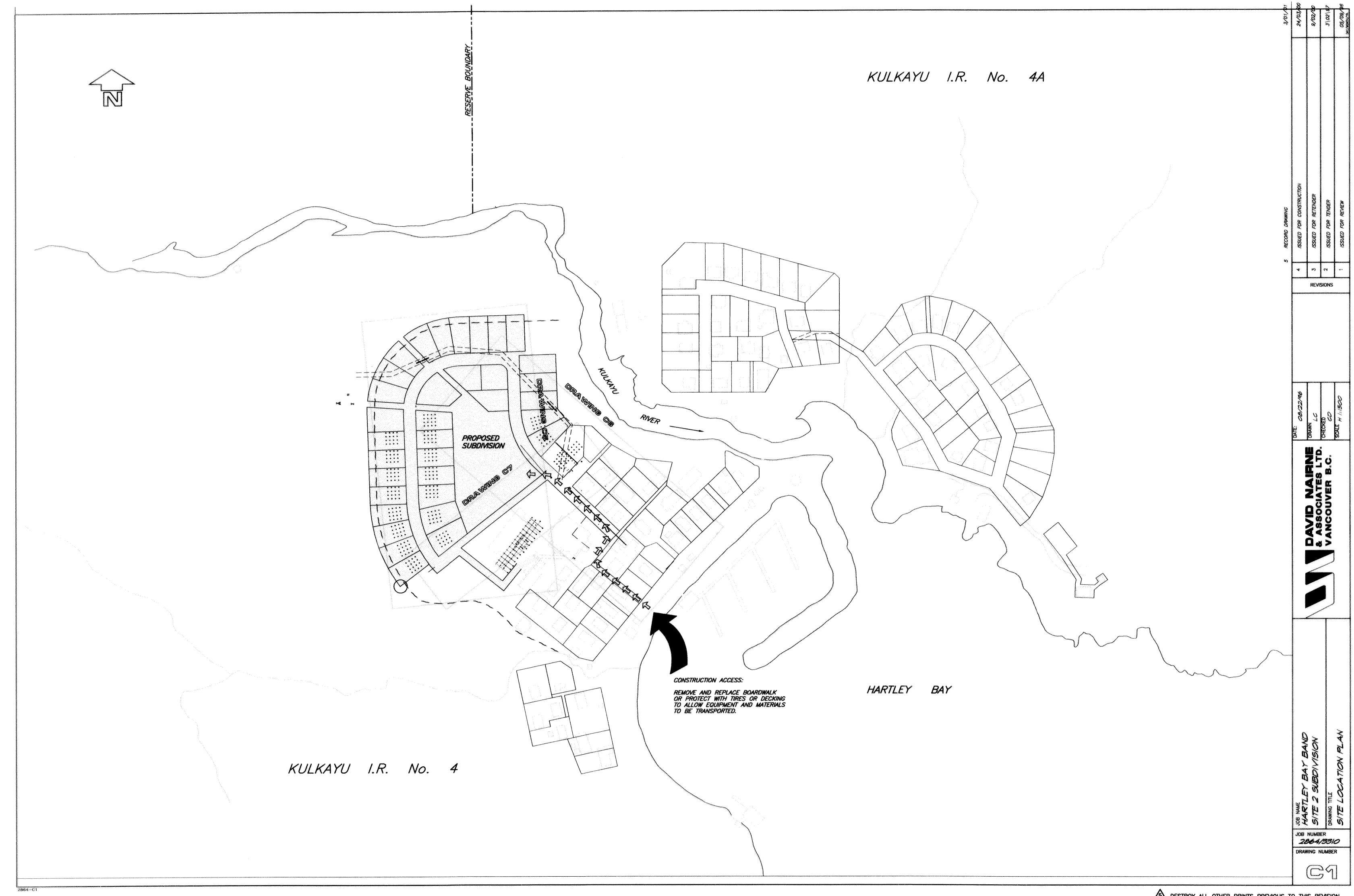
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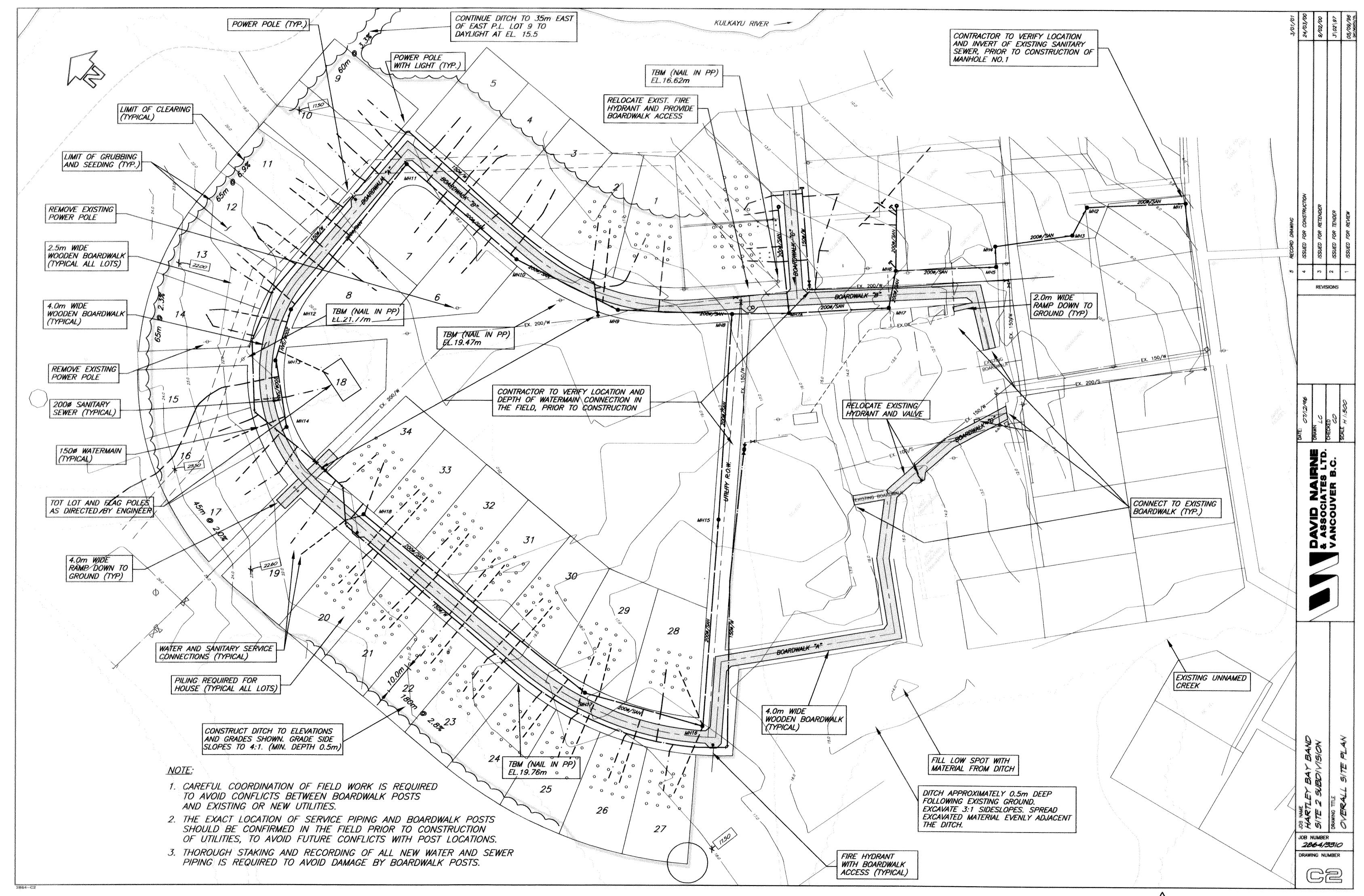
- C1 SITE LOCATION PLAN
- C2 OVERALL SITE PLA
- C3 GEOMETRY PLAN
- C4 GEOTECHNICAL INFORMATION PLAN

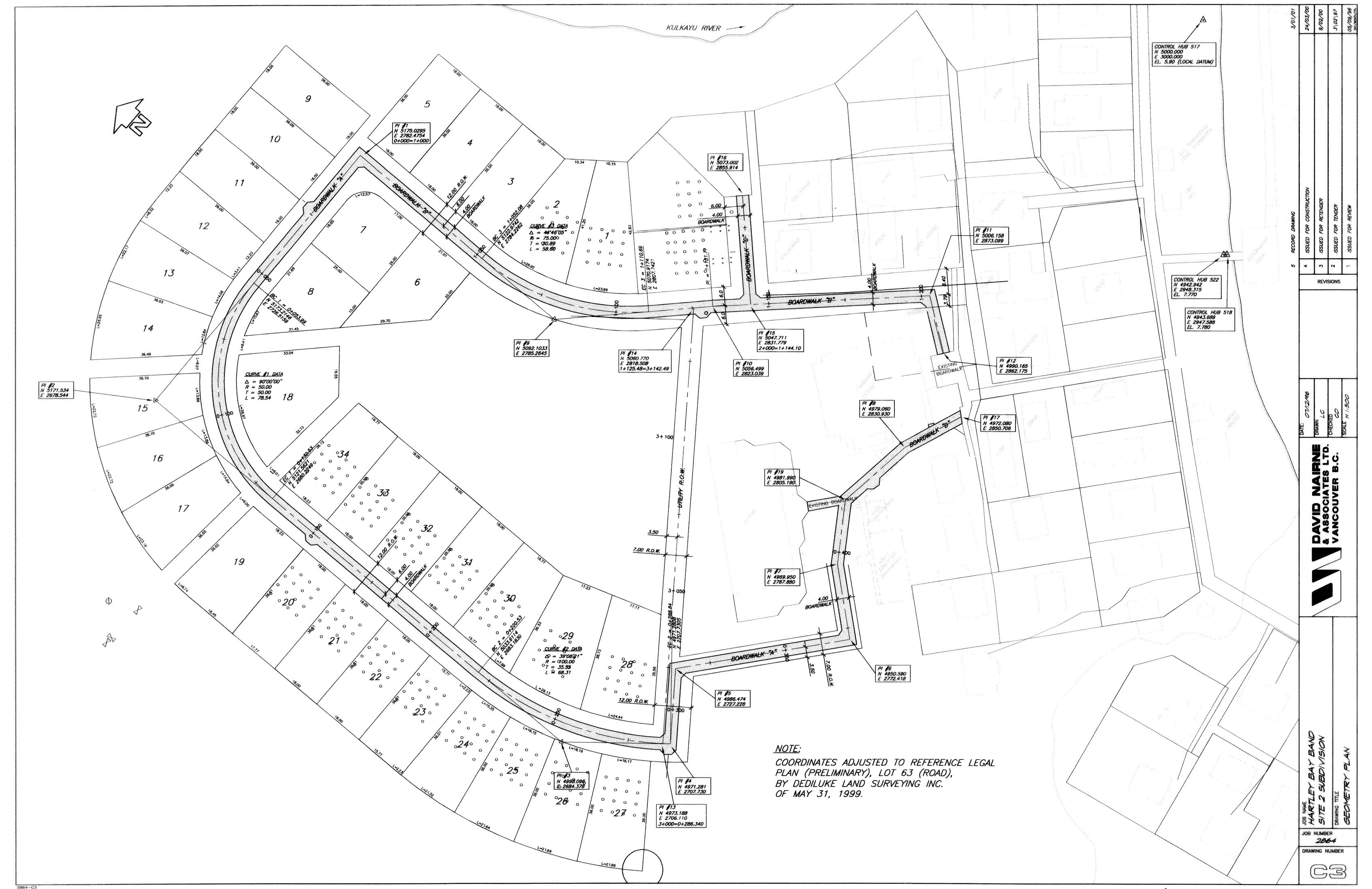
# PLANS & PROFILES

- C5 BOARDWALK "A" AND UTILITIES
- C6 BOARDWALK "B' AND UTILITIES
- C7 UTILITY R.O.W., BOARDWALK "C" & "D" AND UTILITIES
- C8 WATER, SEWER AND TRENCHING DETAILS

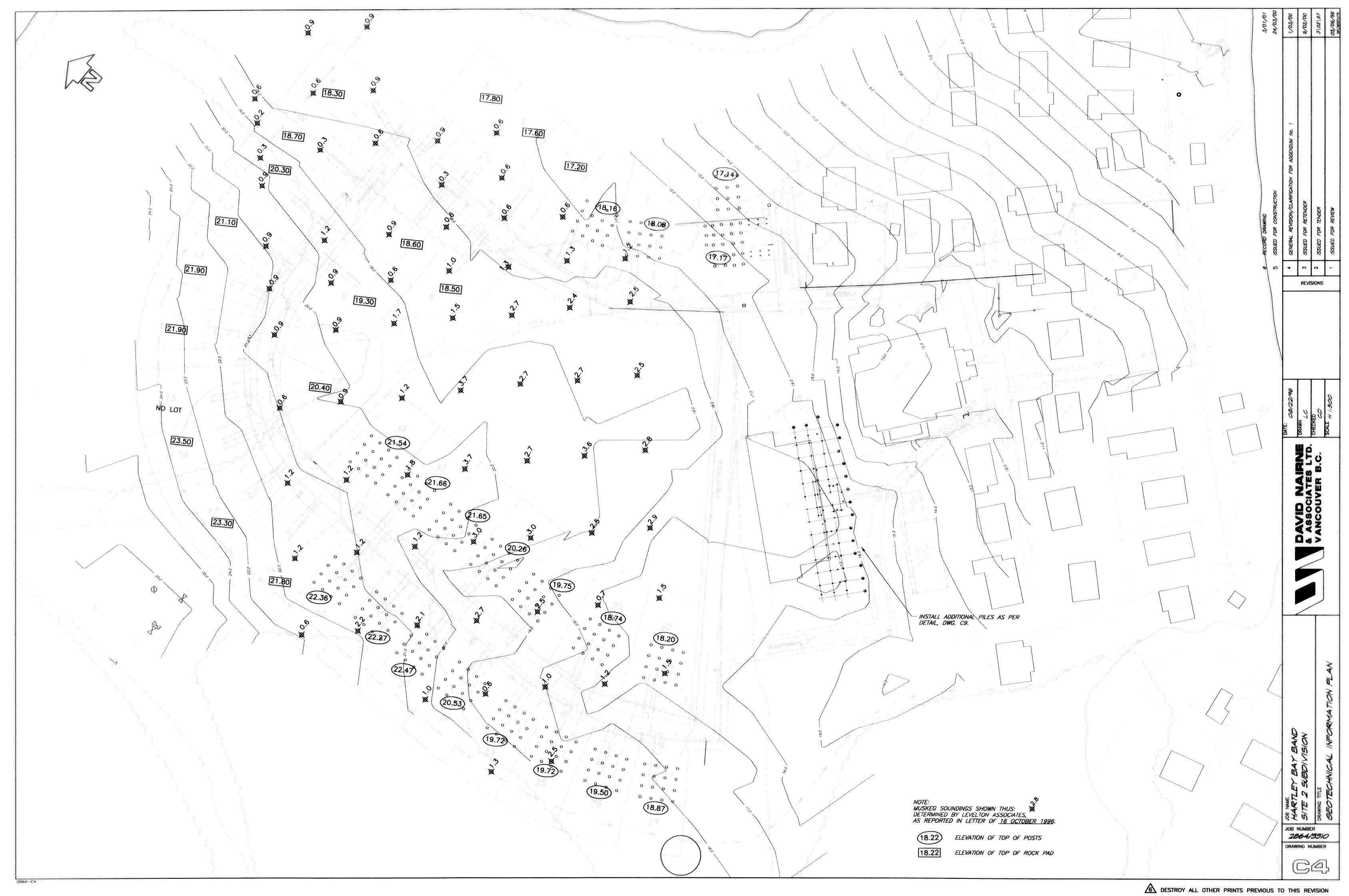
  C9 BOARDWALK GENERAL NOTES AND DETAILS
- CTO BOARDWALK STRUCTORAL DETAIL
- C12 BOARDWALK BOARDWALK CONNECTION TO EXISTING
- E1 ELECTRICAL SITE PLAN

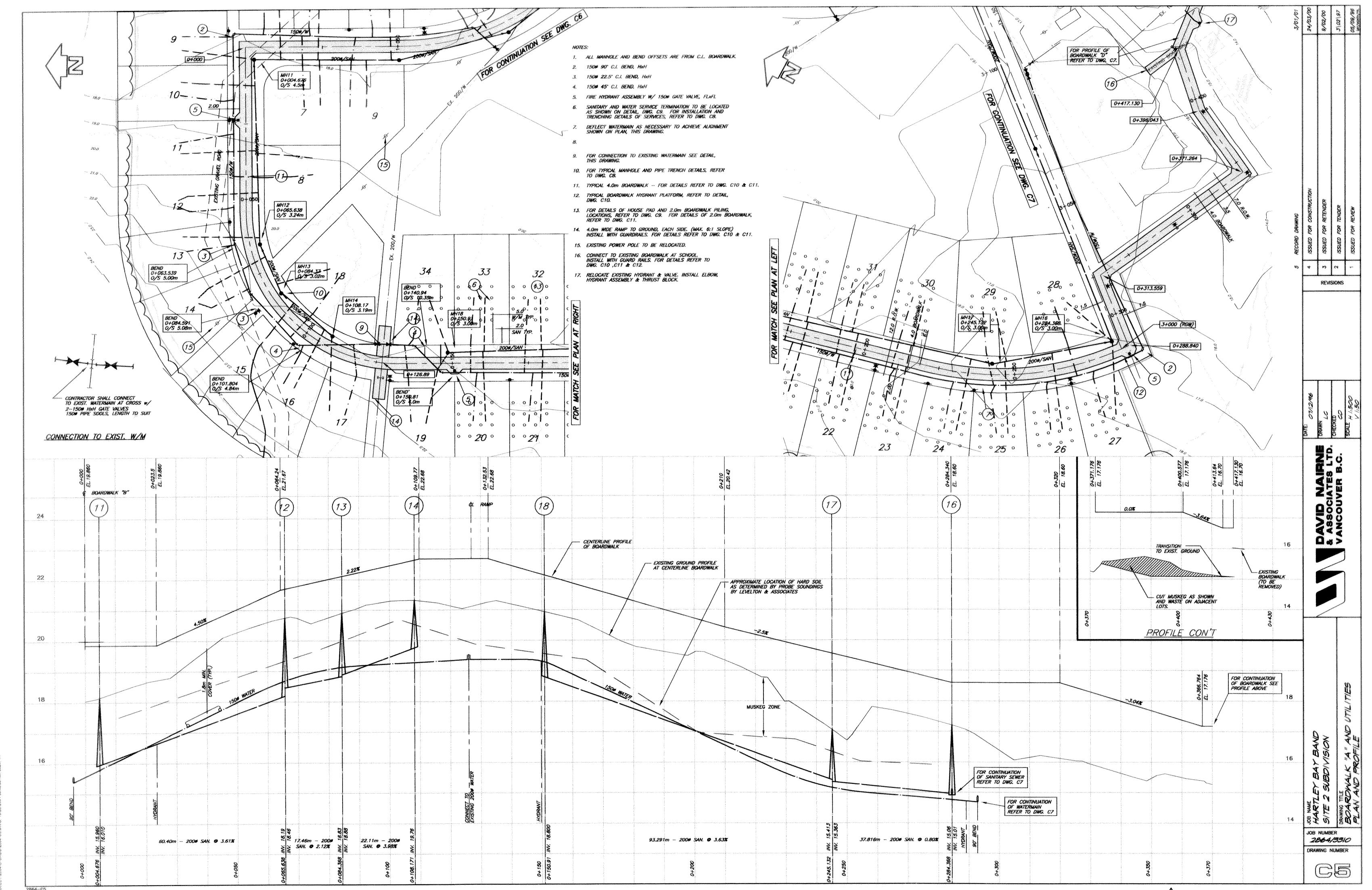


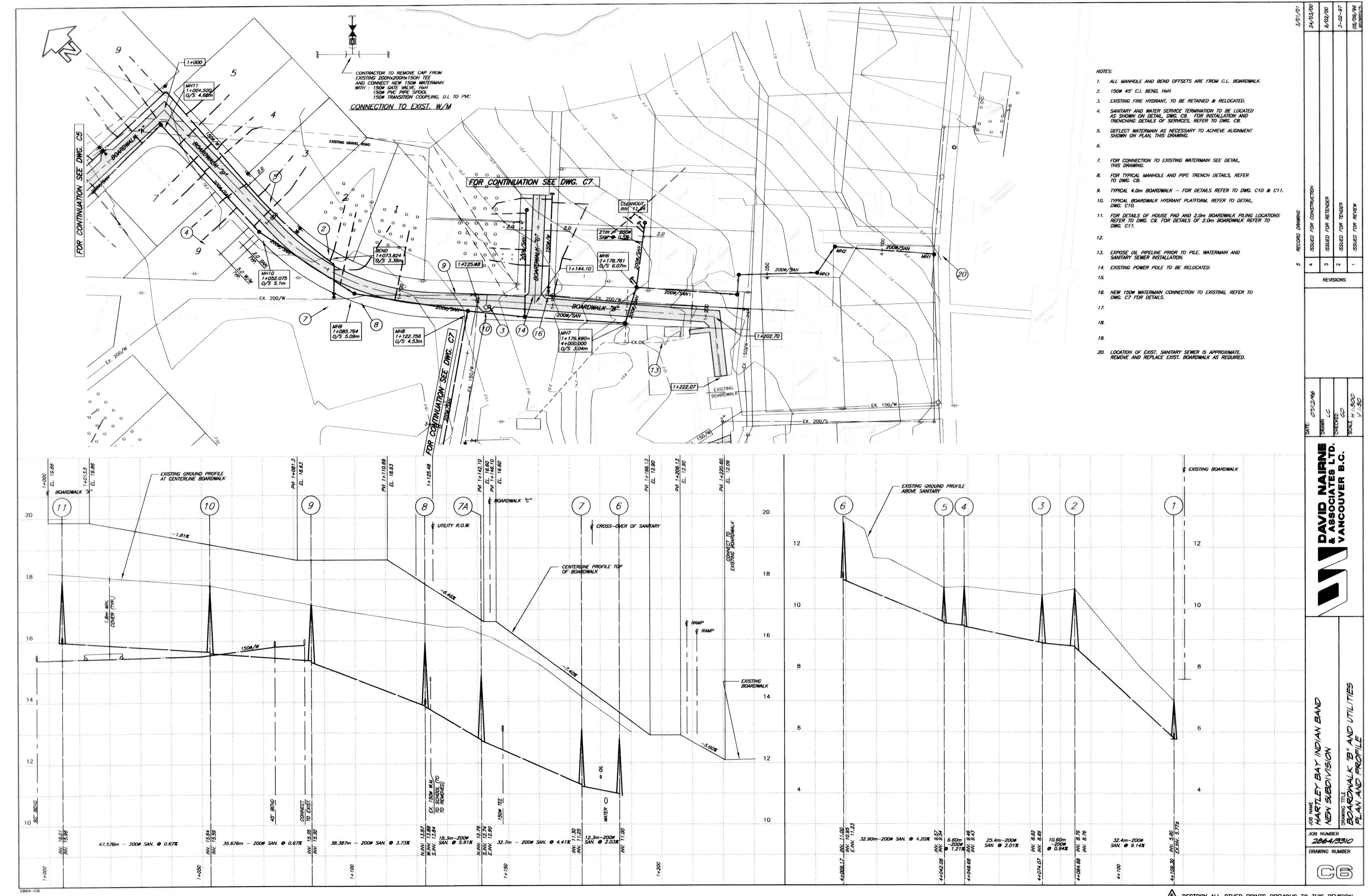


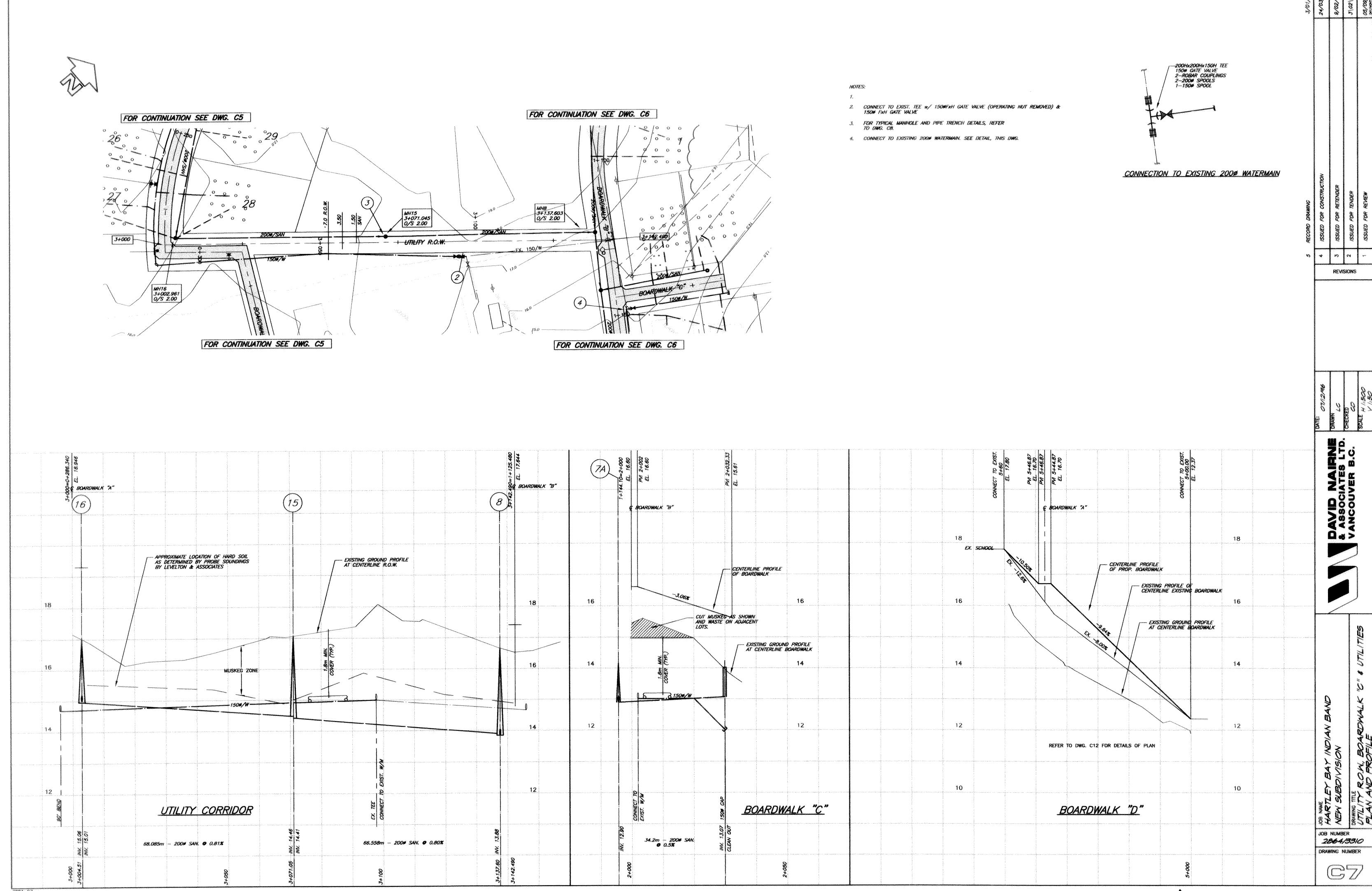


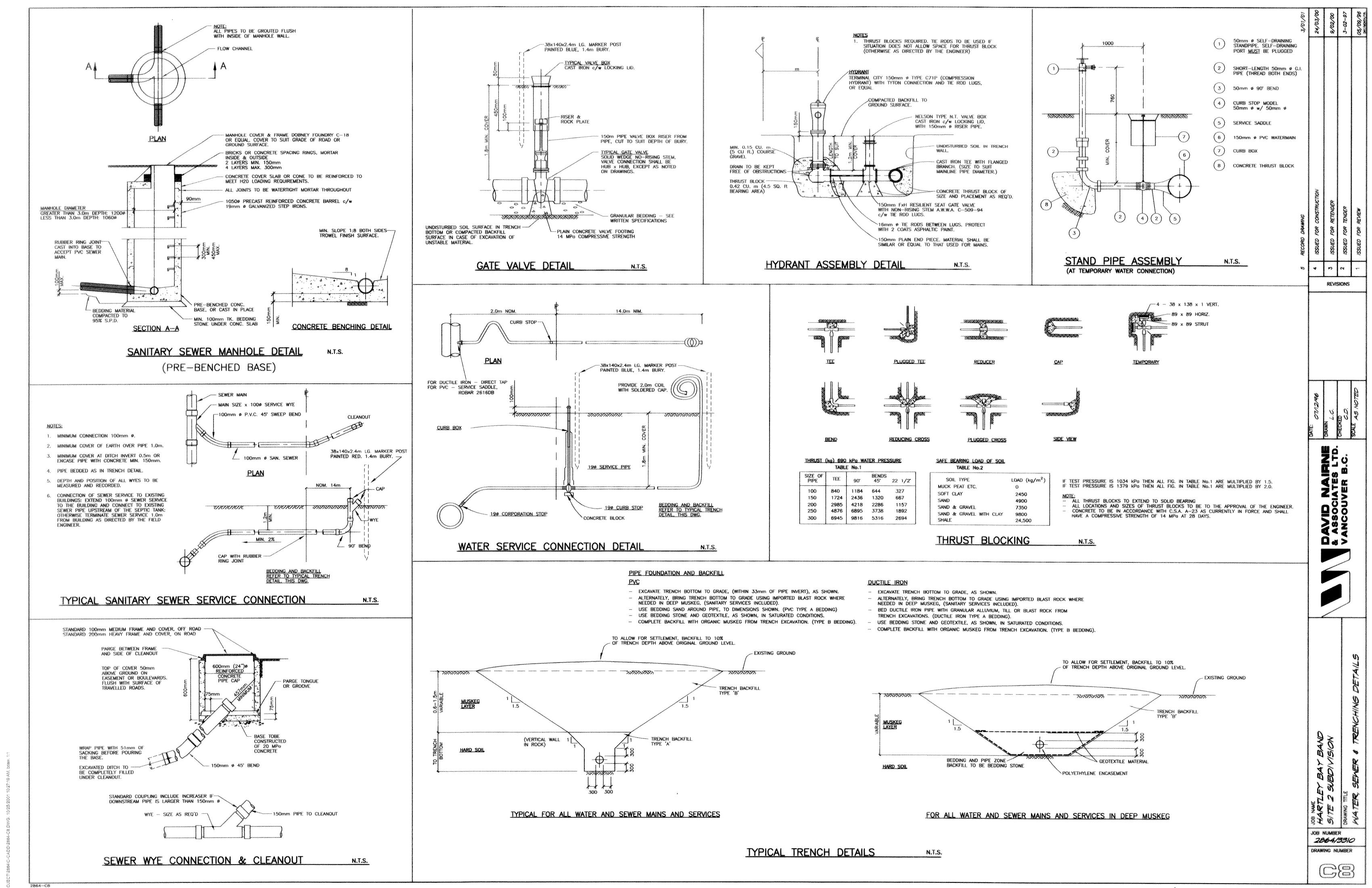
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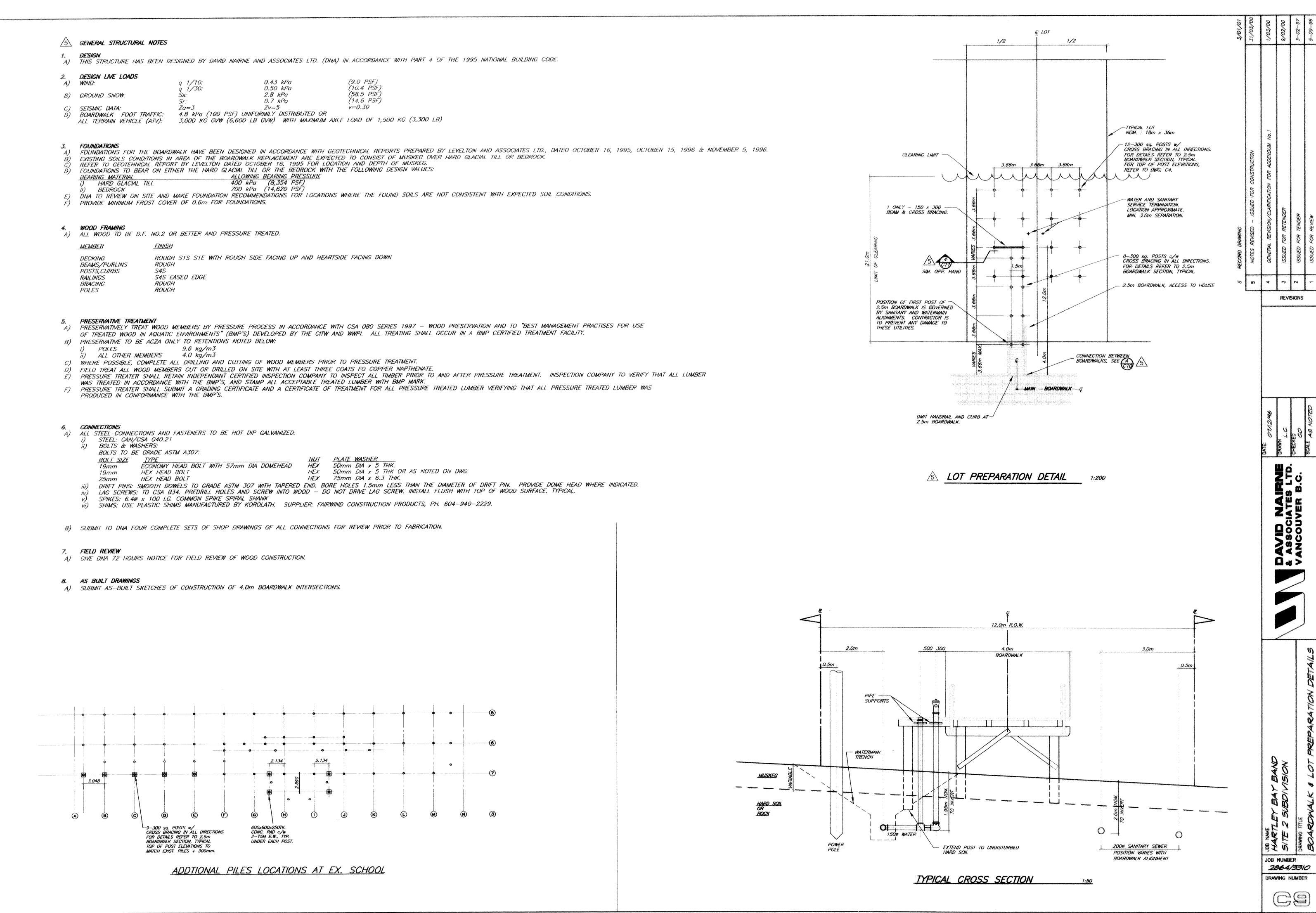


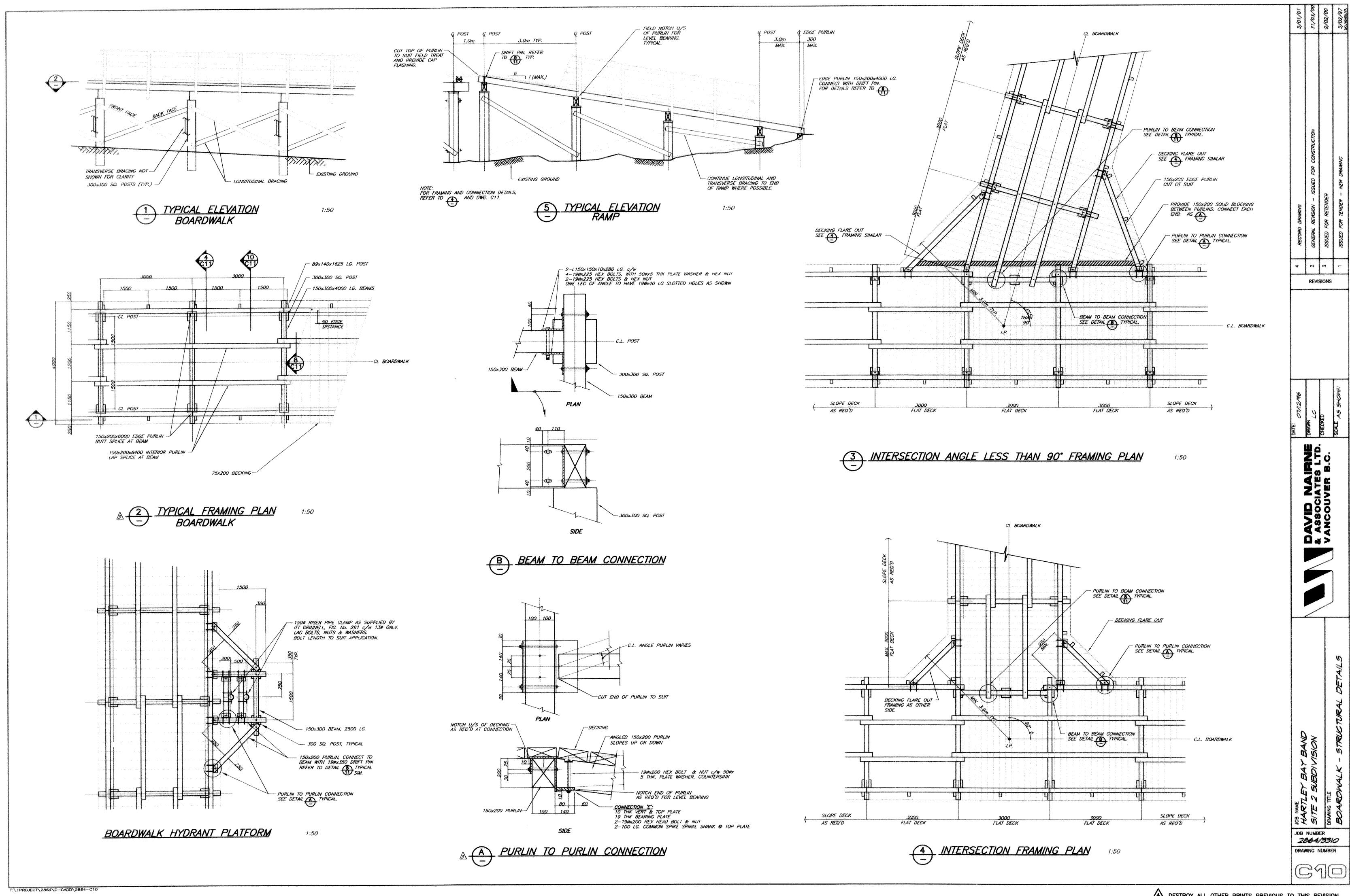


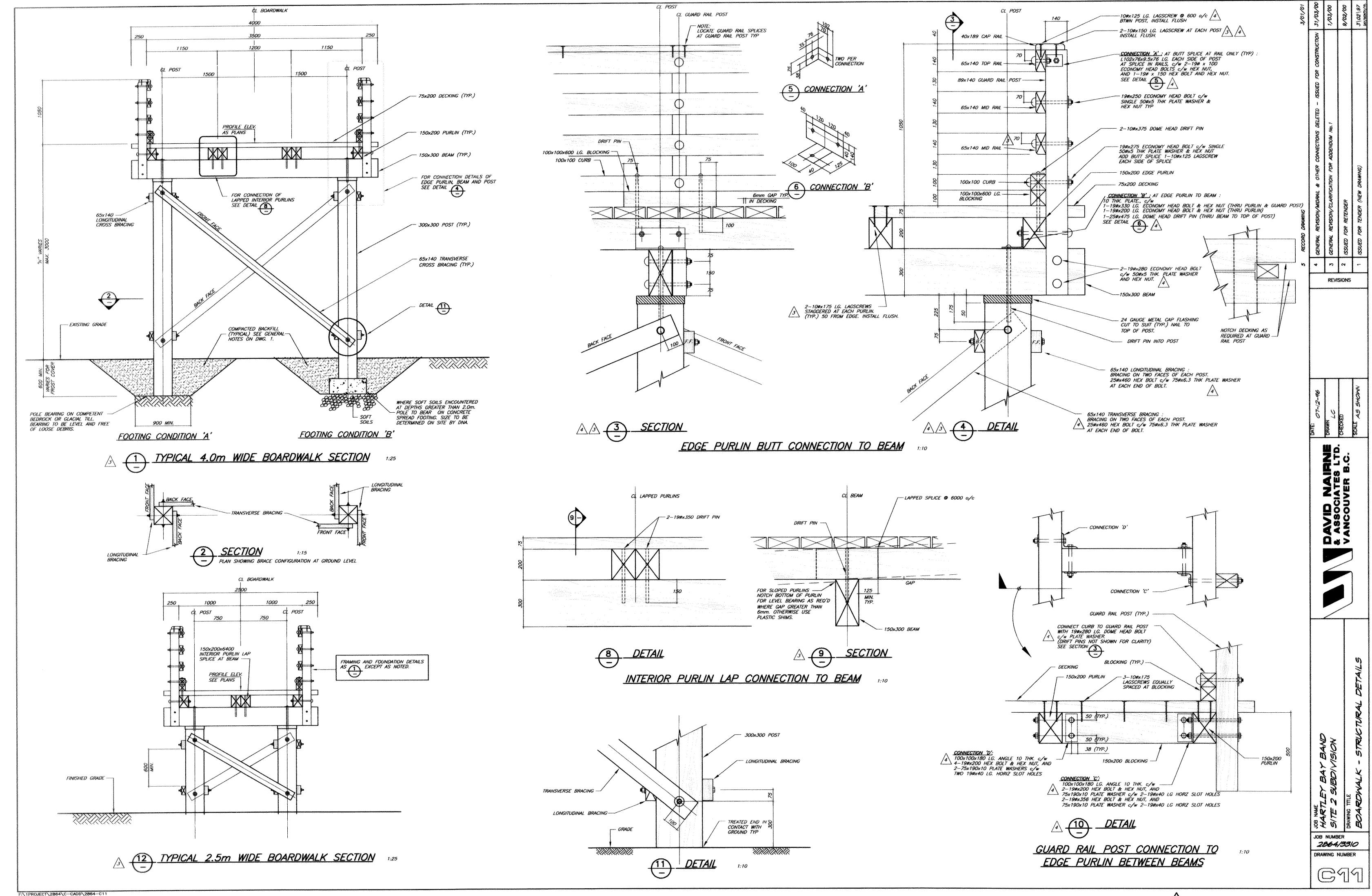


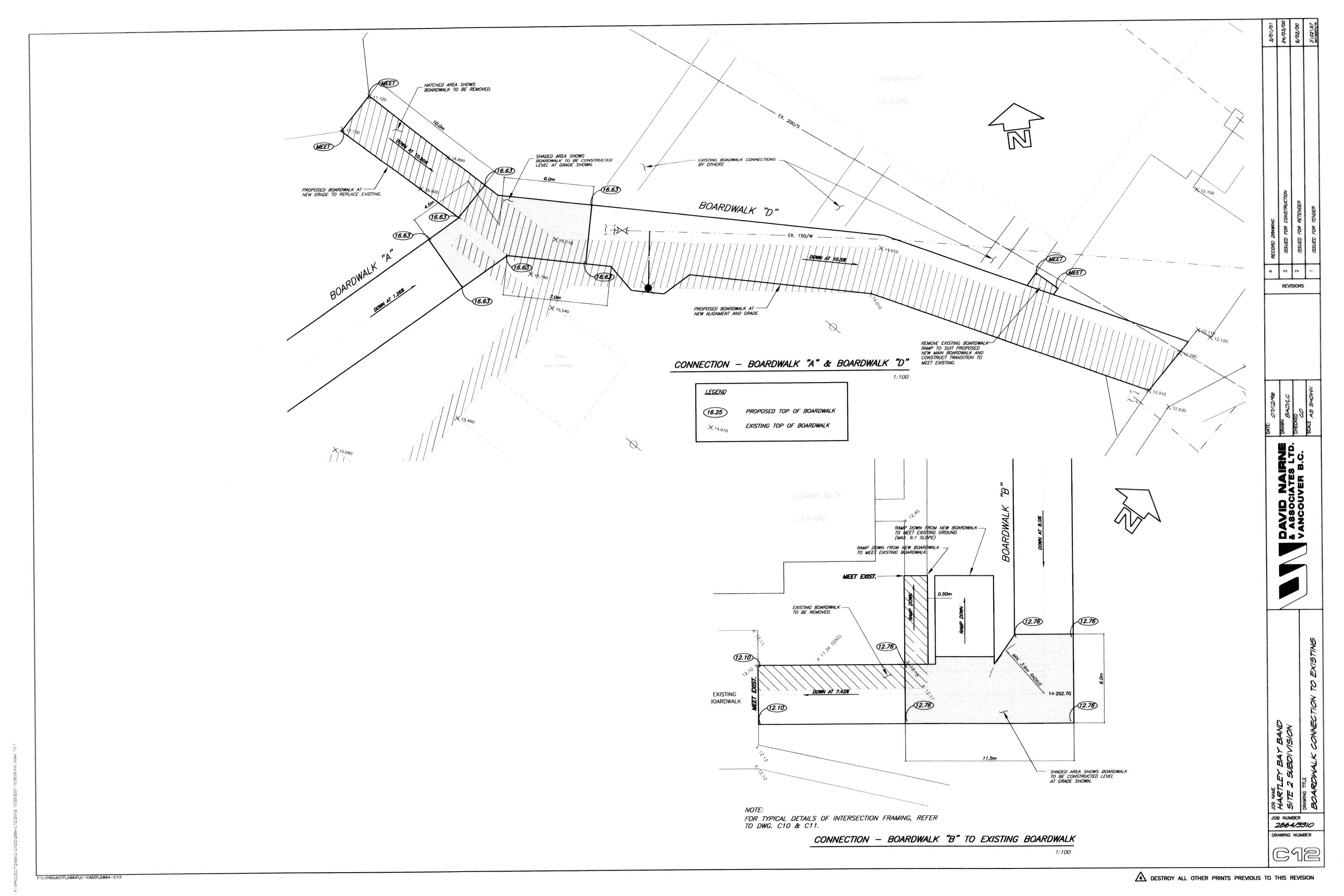


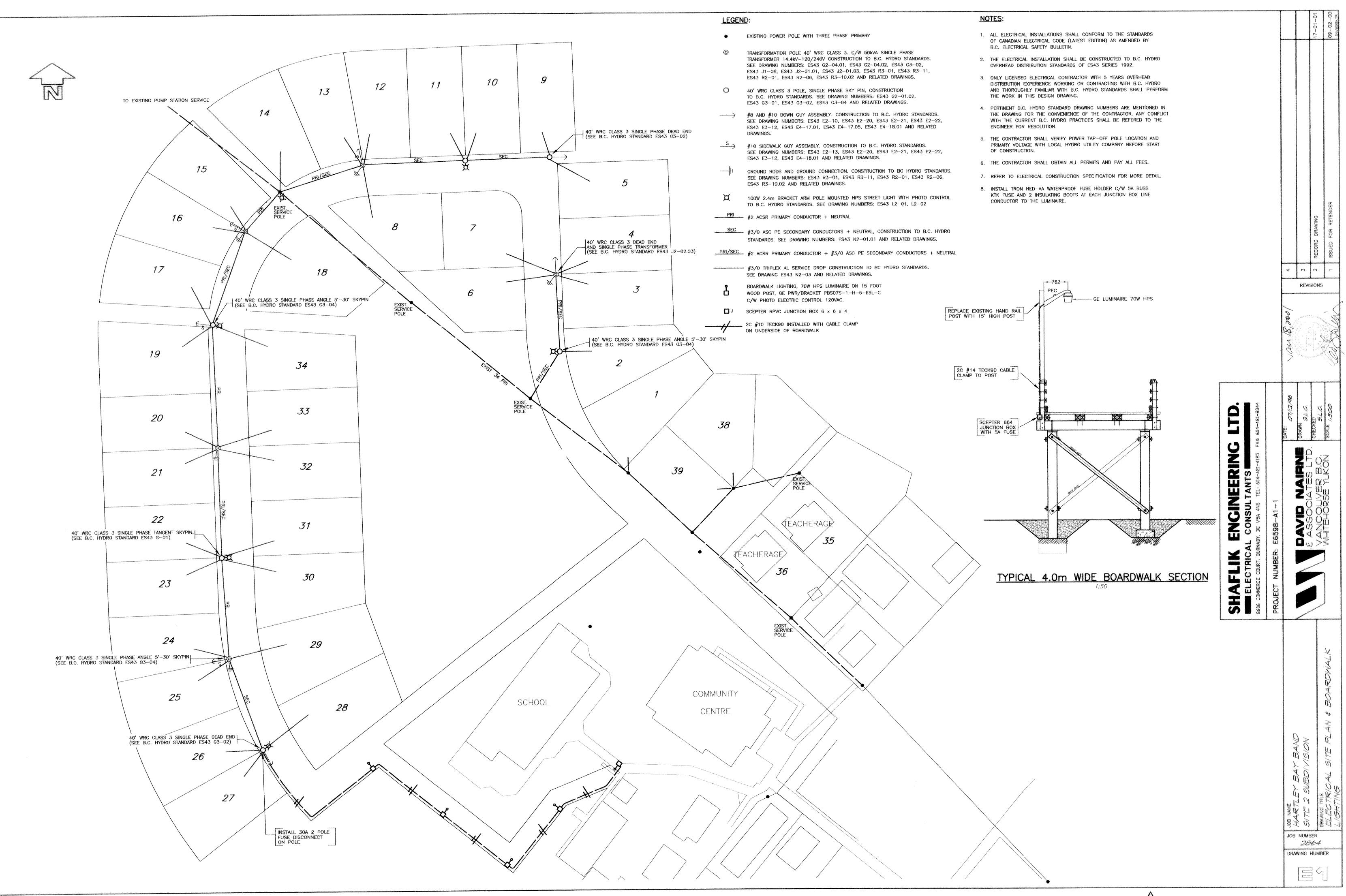














# LEVELTON ASSOCIATES CONSULTING ENGINEERS

RICHMOND

VICTORIA

ΝΔΝΔΙΜΌ

COMPTENAY

SUBBEY

ABECTSFORD

PRICE RUPERT

October 16, 1995 File 795-062

David Nairne & Associates Ltd. 250 - 171 West Esplanade North Vancouver, B.C. V7M 3J9

Attention:

Mr. Craig J. Dusel, P.Eng.

Re:

Geotechnical Evaluation of Proposed Hartley Bay Subdivision

Hartley Bay, B.C.

Dear Sirs:

PART A:

**BACKGROUND INFORMATION** 

### 1.0 INTRODUCTION

As requested, Levelton Associates has conducted a geotechnical evaluation of the subsurface soil conditions at the Hartley Bay Community.

The purpose of this evaluation was to investigate the soil conditions in the proposed development area to assist in the provision of the design.

This evaluation was conducted in accordance with our proposal of August 2, 1995.

### 2.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The proposed development will consist of the construction of a 33 lot subdivision which will be located to the northwest of the existing community. The structures to be placed on the lots will comprise of conventional wood-frame houses. A Water Treatment Plant and Secondary Treatment Contactor would also be constructed to north of the subdivision. In order to construct the Water Treatment Facilities, an access road extending from the existing community would be required.

### 3.0 FIELD INVESTIGATION

The field investigation was conducted on August 27, 1995. Personnel from Levelton Associates conducted a site reconnaissance. Equipment was not available to conduct detailed subsurface investigation. A series of soundings were performed to determine the depth of overburden soil. See attached drawing 62-1 for locations of the soundings. It is known that

the soil conditions consist of very soft wet muskeg which overlies either bedrock or hard soil deposits.

The results of the soundings confirm that the anticipated conditions are present. A steel rod could be penetrated into the ground by-hand with relative ease in the upper elevations. It was not possible to advance the probe further when the tip encountered the underlying bedrock or hard soil.

The proposed development will also include a Water Treatment Plant (WTP) and a Secondary Limestone Contactor (SLC). The location of the access road, WTP and SLC are shown on the drawing 62-1

Soundings were also conducted at the proposed locations for the WTP and SLC. The soundings in the area of WTP indicated the muskeg thickness varies from a nominal thickness to a maximum of about 2 metres. The SLC site had muskeg deposits which ranged from about 0.3 to 1.2 metres with an average of about 0.5 metres. Bedrock was exposed at the surface in some areas.

The soundings in the proposed 33 lot subdivision indicate that the muskeg is a maximum thickness of 4.3 metres.

### PART B COMMENTS & RECOMMENDATIONS

### 1.0 GENERAL

The muskeg which overlies the area of the proposed subdivision, access road, SLC and the WTP is very soft, wet, organic matter which is not capable of supporting even very light loads. The material would likely experience bearing failure when subjected to the magnitude of loads which would be typical of vehicle wheels, building footings, and any other structures. In addition, the material would experience large scale consolidation settlement when subjected to an increase in vertical stress. Post-construction settlement would also occur due to decomposition of the organic matter.

Large scale removal of the muskeg and other soft soil is not, at this stage, considered to be feasible. The excavation of the organic matter would require a dumping site. Based on our reconnaissance, we were not able to identify a suitable site to deposit large quantities of muskeg. Disposal of the material into the water would require the approval of the relevant regulatory authorities and we expect that such approval would not be granted. In addition, the mechanics of removing and transporting the muskeg would require temporary roadways and platforms to support the necessary equipment.

Therefore, we suggest that design of the development consider that the muskeg remain inplace. Details with regard to the geotechnical parameters for the various aspects of the development are provided below.

### 2.0 ROAD CONSTRUCTION

### 2.1 Construction Materials

It is our understanding that approximately 2000 cubic metres of processed aggregate will be required for the development of the subdivision and access roads. A rock quarry is located approximately 700 metres east of the site. The quarry consists of competent rock and it is estimated that sufficient quantities of material exist. The rock would likely be rated with a high rock quality index (RQD), as such a drill and blasting operation would usually require blast patterns with small spacings between drill holes and rows. Also we expect the shot rock would contain significant amounts of oversize rock requiring further processing. This would include screening and crushing of the larger pieces to obtain properly graded gravel.

At this preliminary stage, it is our opinion that blasting and processing from the quarry could be conducted without impact to existing structures. However, prior to any blasting, a detailed slope stability study of the neighbouring mountains would be required. This type of study would require geological data collection such as mapping of the mineralogy, lithology and structural discontinuities such as faults, shears, joints, contacts, etc.

There are two creek crossings that exist between the quarry and the proposed site. The existing bridges that link the quarry to the site do not have the structural capacity for haul trucks. Therefore the processed material would have to be either loaded onto a barge and transported across the bay or the existing crossings would require upgrading to accommodate the necessary loads.

Alternatively, processed material could be barged to Hartley Bay from suitable gravel sources such as Sechelt. Road aggregates, geotextiles/geogrid and road construction equipment could be included on the barge payload. The off loading of barged material would be done by a ramp type barge and coordinated with tidal fluctuations. We estimate that a maximum of 1000 cubic metres of material could be stockpiled on the beach in the area to the west of the breakwater.

Prior to final selection of a source of material, we recommend that an experienced contractor be included in a site visit. The purpose of the visit would be to examine the quarry and assess optimal blasting, processing and transportation techniques. The unit cost of the processed rock may vary widely depending on the conditions of the quarry with respect to the type and nature of the rock, previous blasting practices (ie. controlled of uncontrolled blasting) and material processing requirements. This assessment of the quarry should consider the logistics for its use as a source of gravel (ie. processing, excavation, material and equipment transportation, etc.)

### 2.2 Road Design

In order to reduce the volume of gravel which would be necessary to form the access roadways, we recommend the subdivision design minimize the extent of roads. We have conducted a preliminary road design which incorporates geotextile fabrics (see Figure 1). The purpose of the geotextile is to provide reinforcement due to the reduced strength of the

muskeg. In addition, the geotextile will provide separation of the gravel from the soft native soil and will reduce the required volume of gravel which must be transported to the site.

The parameters which were used in this preliminary road design consists of the following:

- 1. The native subgrade has a CBR value of 0.5 (unconfined compressive strength of less than 24 kPa).
- 2. The axle loads of the vehicles will not exceed 8,200 kilograms.
- The tire pressure will be 700 kPa.
- 4. The natural subgrade has occasional shallow depressions of less than 300mm.

Based on these parameters, our preliminary road design consists of the placement of a geotextile consisting of Amoco CEF 2016 Woven or equivalent. This geotextile should be placed directly on the surface of the native soil. The geotextile should be overlapped at joints by a distance of 1 metre. The road base should then be placed on the surface of the geotextile. The gravel used for the road will be limited by the availability of material. We have assumed that the gravel will consist of 50mm minus sub-rounded gravel fill. Our calculations indicate that the gravel fill should be at least 430mm thick to support the equipment as indicated above.

Figure 1 shows a typical cross-section of an unpaved road structure designed to withstand the above stated axle loads and tire pressures. Haul trucks on the road as shown will cause some rutting with wear and some periodic maintenance would be required. The road could be upgraded in the future to included a compacted base complete with asphaltic concrete overly.

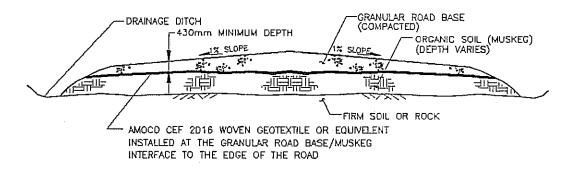


Figure 1

### 3.0 BUILDING FOUNDATIONS

We understand the existing buildings are supported on pile foundations. This type of foundation is consistent with the requirement to leave the muskeg in-place. Structural loads would then be directly transferred to the competent soil/bedrock which underlies the soft overburden.

It appears that in the majority of the area of the proposed houses, the thickness of the muskeg is relatively shallow. Therefore, it is possible that these structure could be constructed on footings or piers which extend through the soft soil and bear directly on the competent native soil/rock. The main floor would then be supported on floor joists which bear on beams which span across the individual piers.

Where significant thickness of muskeg is encountered (i.e. in excess of about 2 metres), we recommend structures be supported on treated timber piles. The length of the piles will be variable, dependent on the thickness of the muskeg. The minimum tip diameter of the piles should be 200mm. Based on the anticipated light loads, it is likely that the number and locations on the piles will be determined based on the allowable span of grade beams rather than the load capacity of the piles. However, timber piles can be designed for a vertical capacity of 18 tonne. The main floor of the structures should also be pile supported as the muskeg would not be capable of supporting a grade slab. We expect the structural design would incorporate wooden floor joists which are supported on a beam which is in-turn supported on the piles.

The British Columbia Building Code requires than piles be supervised during their installation so that they can be certified by a Registered Professional Engineer.

### 4.0 SLOPE STABILITY

In general, it appears the native site grade is either flat or has a relatively gentle slope and there were no indications of large scale soil movement or instability. The creek bank is relatively steep where it is adjacent to the proposed building lots. These lots may require some special consideration with respect to the location of the houses near the creek. For preliminary design, houses should be located beyond a line which rises upwards from the base of the creek at a slope of 3 Horizontal to 1 Vertical. Also a minimum building setback of 5 metres from the creek bank should be established.

In order to maintain the general stability of the development area, we recommend that steepening of any existing banks be avoided. Any slopes which are created by the development should not be any steeper than 2 Horizontal to 1 Vertical. Excavation in or near the existing water courses should also be avoided.

Temporary excavations for the installation of underground services should not be steeper 1.5 Horizontal to 1 Vertical. For excavations where horizontal cuts are restricted shoring will be required.

### 5.0 WALKWAYS

The existing walkways consist of wooden boardwalk which are supported on timbers which extend through the muskeg. The soft native soil is not considered to be capable of supporting the weight which would be associated with alternative types of walkways such as conventional concrete or asphalt sidewalks. It is recommended that pedestrian access which is remote from the required access road consist of similar timber boardwalk. The roadway

consisting of gravel over geotextile fabric would also serve as pedestrian access.

### 6.0 SERVICES

Underground services for the subdivision would consist of sewer and water lines. Services which are located under the roadway will be subjected to some settlement. The magnitude of this settlement is difficult to predict as it is dependent on the amount of compressible soil located under the service, the depth of fill placed to construct the road. However, we expect that a roadway which consists of 430mm of gravel may settle up to 250mm. The actual magnitude of settlement is expected to be variable so the differential settlement may also be in the order of 250mm.

Due to the potential settlement from the weight of the road, it is recommended that services which are sensitive to settlement be located remote from the road. The waterline will require adequate cover in order to prevent freezing.

The Muskeg found in Hartley Bay was variable in nature. The soil varied in colour, composition and texture as such concentrations of chloride, sulphate ions and pH would likely be variable. The chemical nature of the soil is dependent on the parent material, mineralogy of the surrounding rock/soil and regional groundwater conditions. Depending on the actual concentrations and pH levels the soil can present corrosive problems to ductile iron pipe.

Soil samples could be obtained from the site and analyzed for pH, electrical resistivity, redox potential, sulfides, moisture content, and groundwater for pH. With this type of testing conclusive information can be determined with respect to corrosive nature of the soil.

### 7.0 CLOSURE

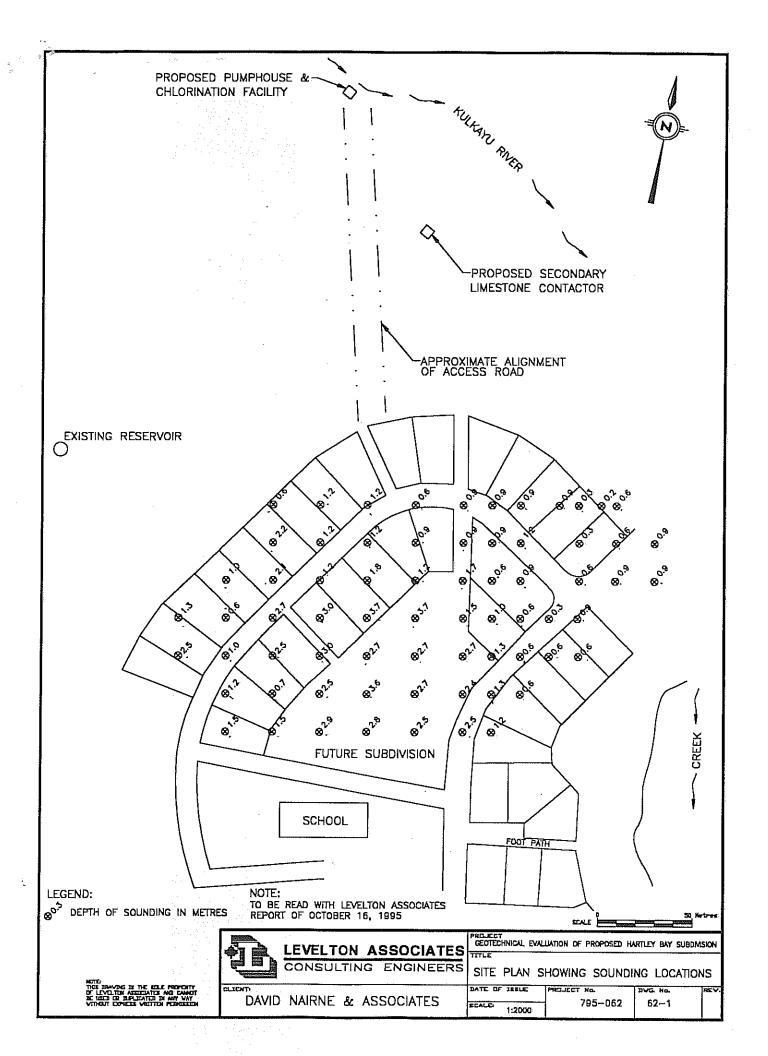
We trust this information meets with your immediate requirements. If you have any questions, or require any further information, please contact us.

Yours truly

**B.H. LEVELTON & ASSOCIATES LTD.** 

Darryl P. Hawkes, P.Eng.

attach.





### **Memorandum**

Date: December 3, 2014 Reference No.: VAN-00222971-A0

| To: | cc: | Company                             | Contact            | Email                 |
|-----|-----|-------------------------------------|--------------------|-----------------------|
|     |     | McElhanney Consulting Services Ltd. | Paul Bjorn, P.Eng. | pbjorn@mcelhanney.com |

From: Ben Weiss, P.Eng.

Total No. of Pages: 2

Subject: Piles to Support One-Storey Residential Dwelling, Hartley Bay, BC

### **COMMENTS:**

As requested, **exp** Services Inc. (**exp**) is providing geotechnical advice for design/installation of piles for support of a one-storey rancher type residential dwelling in Hartley Bay, BC. It was understood that the representatives of McElhanney had done some hand probing/augering and found that the proposed building area may be overlain by an average of about 1.2m of muskeg underlain by dense to very dense till-like soils, and that the muskeg thickness may vary considerably. The pile foundation types being considered are 2" diameter steel pipe "mini piles" driven with a jackhammer and 14" diameter single helix "screw" piles (helical augered piles) with 3-1/2" diameter shaft which would be "screwed" into the ground using a bobcat with special attachment. Both methods would essentially develop their compression capacity through end bearing into the dense to very dense till-like soils. It was understood that a specialty screw pile contractor had indicated that the 14" screw pile was rated for a capacity of 16,425 lbs. It was understood that McElhanney would design for an allowable load of 15,000 lbs at each pile cap location.

Based on our review of information provided, limited analysis, and past experience with similar foundation types, it is considered that the 15,000-lb capacity can be achieved with a single 14" screw pile (15,000 lb allowable capacity per pile) or four 2" diameter mini piles (3,750 lb allowable capacity per pile). Mini piles can be splayed at 10 to 15 degrees to obtain lateral capacity.

It is recommended that mini piles consist of 2" Schedule 80 (2.375" O.D) galvanized steel pipe. The piles should be driven into the dense to very dense till-like soils to a point of refusal using a pneumatic jack hammer, with refusal being defined as 1" or less of penetration during 1 minute of sustained driving. The mini piles should also achieve the minimum penetration into the till-like soil as outlined below. The pneumatic jack hammer should weigh at least 90 pounds and should have foot stirrups on which the operator can stand to apply downward pressure. Individual pipe sections typically range from 5 to 10 feet in length and are successively joined with butt welds or couplings as pile driving progresses. When refusal is achieved, the piles can be cut off to a predetermined height or elevation. Reinforcing bars with 90 degree bends can be welded to the top of the pipe or, alternatively, the top of the pipe can be splayed apart. Cast-in-place concrete pile caps or grade beams can then be constructed over the pile butts, incorporating the reinforcing bars or the splayed ends. The mini piles should not be driven closer than four pile diameters (centre to centre) from each other, although a minimum 1-foot spacing is typically used for ease of installation. It should be noted that mini pile installation is a specialized procedure requiring an experienced contractor.

Geotechnical Memorandum Piles to Support Residential Dwelling, Hartley Bay, BC Reference No.: VAN-00222971-A0 December 3, 2014

"Screw" piles or helical piles are a proprietary system that consists of a load-bearing steel, helix-shaped screw head attached to a galvanized steel rod that needs to be installed in accordance with the manufactures specifications by an approved installer. The helical pile is essentially screwed into the ground using a high torque hydraulic or electric drive head mounted on a bobcat or larger excavator. The equipment should have a calibration chart which correlates applied torque to allowable compressive load. The helical screw head is advance into the ground until the applied torque attains the required value to meet the load requirement and minimum penetration into the till-like soil as outlined below. Extensions should be added to the central shaft as needed in accordance with the manufacturer's requirements. Recommended minimum horizontal helical pile spacing (centre to centre) in groups is 3 helix diameters.

Mini piles or screw piles should penetrate a minimum of 2 feet into the till-like soils to prevent pile "kick-out", particularly where lateral resistance is required. The pile installation should be reviewed in the field by a representative of McElhanney to confirm that the design requirements are achieved.

This memorandum was prepared for the exclusive use of McElhanney Consulting Services Ltd. and their designated consultants/agents, and may not be used by other parties without written consent of **exp** Services Inc. The attached "Interpretation & Use of Study and Report" forms an integral part of this report and must be included with any copies of this memorandum.

We trust that this memorandum will meet your present requirements. Please contact us if you have any questions, or require further assistance.

Submitted by:

Reviewed by:

exp Services Inc.

Ben Weiss, P.Eng.

Senior Geotechnical Engineer

Ujjal Chakraborty, P.Eng.

Project Engineer

Attachment: Interpretation & Use of Study and Report

L:\2014 (Starting at 0216767-A0)\0222971-A0 BW McElhanney, Hartley Bay Mini Piles, Hartley Bay, BC\4.1 General Correspondence\Report\exp ME 2014-12-03 Geo Memo Piles, 1-Storey Res Dev, Hartley Bay,docx





### **INTERPRETATION & USE OF STUDY AND REPORT**

### 1. STANDARD OF CARE

This study and Report have been prepared in accordance with generally accepted engineering consulting practices in this area. No other warranty, expressed or implied, is made. Engineering studies and reports do not include environmental consulting unless specifically stated in the engineering report.

### 2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

### 3. BASIS OF THE REPORT

The Report has been prepared for the specific site, development, building, design or building assessment objectives and purpose that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to us unless we are specifically requested by the Client to review and revise the Report in light of such alteration or variation.

### 4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT. WE WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS "APPROVED USERS". The contents of the Report remain our copyright property and we authorise only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of the Report by those parties. The Client and Approved Users may not give, lend, sell or otherwise make the Report, or any portion thereof, available to any party without our written permission. Any use which a third party makes of the Report, or any portion of the Report, are the sole responsibility of such third parties. We accept no responsibility for damages suffered by any third party resulting from unauthorised use of the Report.

### 5. INTERPRETATION OF THE REPORT

- a. Nature and Exactness of Descriptions: Classification and identification of soils, rocks, geological units, contaminant materials, building envelopment assessments, and engineering estimates have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations, or building envelope descriptions, utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarising such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b. Reliance on Provided information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the report as a result of misstatements, omissions, misrepresentations or fraudulent acts of persons providing information.
- C. To avoid misunderstandings, **exp** Services Inc. (**exp**) should be retained to work with the other design professionals to explain relevant engineering findings and to review their plans, drawings, and specifications relative to engineering issues pertaining to consulting services provided by **exp**. Further, **exp** should be retained to provide field reviews during the construction, consistent with building codes guidelines and generally accepted practices. Where applicable, the field services recommended for the project are the minimum necessary to ascertain that the Contractor's work is being carried out in general conformity with **exp**'s recommendations. Any reduction from the level of services normally recommended will result in **exp** providing qualified opinions regarding adequacy of the work.

### 6.0 ALTERNATE REPORT FORMAT

When **exp** submits both electronic file and hard copies of reports, drawings and other documents and deliverables (**exp**'s instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by **exp** shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancy, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by **exp** shall be deemed to be the overall original for the Project.

The Client agrees that both electronic file and hard copy versions of **exp**'s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except **exp**. The Client warrants that **exp**'s instruments of professional service will be used only and exactly as submitted by **exp**.

The Client recognizes and agrees that electronic files submitted by **exp** have been prepared and submitted using specific software and hardware systems. **Exp** makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

# APPENDIX C - TEST PIT LOGS

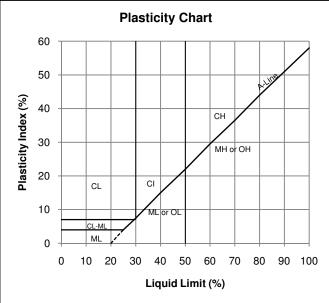
Modified Unified Soils Classification System for Soils Test Pit Logs TP20-01 to TP20-05, inclusive

|                      |                                   |                      | MODIFIED (                  | JNIFIED | CLASSIFIC | CATION SYSTEMS FOR SOILS                                | 3   |
|----------------------|-----------------------------------|----------------------|-----------------------------|---------|-----------|---|---|
|                      | IV                                | IAJOR DIVISIO        | ON                          | GROU    | PSYMBOL   | TYPICAL SOIL DESCRIPTION                                | LABORATORY<br>CLASSIFICATION<br>CRITERIA                        |
|                      | (ر                                |                      | Clean Gravels               | GW      |           | Well graded gravels, sandy gravels, trace or no fines   | $C_u=D_{60}/D_{10}>4$ ,<br>$C_C=(D_{30})^2/D_{10}D_{60}=1$ to 3 |
| COARSE GRAINED SOILS | (more than 50% larger than 75 μm) | GRAVELS              | (< 5% Fines)                | GP      |           | Poorly graded gravels, sandy gravels, trace or no fines | Not meeting the GW requirements.                                |
| S Q                  | than                              |                      | Dirty Gravels               | GM      | 199099    | Silty gravels, silty sandy gravels                      | Plasticity below A-Line or I <sub>P</sub> <4                    |
| Z                    | rger                              |                      | (> 12% Fines)               | GC      | 49/X9XI   | Clayey gravels, clayey sandy gravels                    | Plasticity above A-Line or I <sub>P</sub> >7                    |
| GRA                  | 0% laı                            |                      | Clean Sands                 | SW      |           | Well graded sands, gravelly sand, trace or no fines     | $C_u=D_{60}/D_{10}>4$ ,<br>$C_C=(D_{30})^2/D_{10}D_{60}=1$ to 3 |
| RSE                  | han 50                            | SANDS                | (< 5% Fines)                | SP      |           | Poorly graded sands, gravelly sand, trace or no fines   | Not meeting the SW requirements.                                |
| SOA                  | ore t                             | SANDS                | Dirty Sands (>              | SM      |           | Silty sands, sand and silt mixtures                     | Plasticity below A-Line or I <sub>P</sub> <4                    |
|                      | m)                                |                      | 12% Fines)                  | SC      |           | Clayey sands, sand and clay mixtures                    | Plasticity above A-Line or I <sub>P</sub> >7                    |
|                      | رر                                | SILTS                | W <sub>L</sub> <50%         | ML      |           | Inorganic silts, sandy silts with slight plasticity     |   |
| νį                   | 75 µm)                            | SILIS                | W <sub>L</sub> >50%         | МН      |           | Inorganic silts of high plasticity                      |   |
| SOII                 | than                              |                      | W <sub>L</sub> <30%         | CL      |           | Inorganic clay, silty clays of low plasticity           |   |
| INED                 | maller                            | CLAYS                | 30% <w<sub>L&lt;50%</w<sub> | CI      |           | Inorganic clay, silty clays of intermediate plasticity  | Classifcations are based upon Plasticity Chart.                 |
| GRA                  | 20% s                             |                      | W <sub>L</sub> >50%         | СН      |           | Inorganic clay, silty clays of high plasticity          |   |
| FINE GRAINED SOILS   | (more than 50% smaller than 75    | ORGANIC<br>SILTS AND | W <sub>L</sub> <50%         | OL      |           | Organic silts and silty clays of low plasticity         |   |
| ш.                   | more                              | CLAYS                | W <sub>L</sub> >50%         | ОН      |           | Organic silts and silty clays of high plasticity        |   |
|                      | )                                 | HIGHLY               | ORGANIC                     | PT      |           | Peat and other highly organic soils                     |   |
|                      |                                   | so                   | IL COMPONEN                 | TS      |           | Plasticity Ch   | art   |

|                      | SOIL COMPONENTS  |                         |                        |                      |  |  |  |  |  |  |  |  |  |  |
|----------------------|------------------|-------------------------|------------------------|----------------------|--|--|--|--|--|--|--|--|--|--|
| Fraction             | U.S. Standa      | rd Sieve Size           | Dawaanta               |                      |  |  |  |  |  |  |  |  |  |  |
| TTACHOIT             | Passing          | Retained                | Percentage (by weight) | Description          |  |  |  |  |  |  |  |  |  |  |
| Gravel               |                  |                         | (2) 110.911.7          |                      |  |  |  |  |  |  |  |  |  |  |
| Coarse               | 76 mm            | 19 mm                   | 35-50                  | AND                  |  |  |  |  |  |  |  |  |  |  |
| Fine                 | 19 mm            | 4.75 mm                 | 00 00                  | AND                  |  |  |  |  |  |  |  |  |  |  |
| Sand                 |                  |                         | 20-35                  | Y/EY                 |  |  |  |  |  |  |  |  |  |  |
| Coarse               | 4.75 mm          | 2.00 mm                 | 20-33                  | 1/ 🗀 1               |  |  |  |  |  |  |  |  |  |  |
| Medium               | 2.00 mm          | 425 μm                  | 10-20                  | SOME                 |  |  |  |  |  |  |  |  |  |  |
| Fine                 | 425 μm           | 75 μm                   | 10-20                  | SOIVIL               |  |  |  |  |  |  |  |  |  |  |
| Fines (Silt or Clay) | 75 μm            |                         | 1-10                   | TRACE                |  |  |  |  |  |  |  |  |  |  |
| Oversize             | Cobbles          | Cobbles 76 mm to 200 mm |                        |                      |  |  |  |  |  |  |  |  |  |  |
| Material             | Boulders         |                         | > 200 mm               |                      |  |  |  |  |  |  |  |  |  |  |
|                      | RELATIVE DI      | ENSITY AND C            | ONSISTENCY             |                      |  |  |  |  |  |  |  |  |  |  |
| Cohesion             | less Soils       | (                       | Cohesive Soils         |                      |  |  |  |  |  |  |  |  |  |  |
| Relative<br>Density  | SPT (N)<br>Value | Consistency             |                        | near Strength<br>Pa) |  |  |  |  |  |  |  |  |  |  |
| Very Loose           | 0-4              | Very Soft               | 0-                     | 10                   |  |  |  |  |  |  |  |  |  |  |
| Loose                | 4-10             | Soft                    | 10                     | -25                  |  |  |  |  |  |  |  |  |  |  |
| Compact              | 10-30            | Firm                    | 24                     | -50                  |  |  |  |  |  |  |  |  |  |  |
| Dense                | 30-50            | Stiff                   | 50-100                 |                      |  |  |  |  |  |  |  |  |  |  |
| Very Dense           | >50              | Very Stiff              | 100                    | -200                 |  |  |  |  |  |  |  |  |  |  |
|                      |                  |                         |                        |                      |  |  |  |  |  |  |  |  |  |  |

Hard

>200



### Notes:

- 1. Use dual symbols for coarse grained soils with 5 to 12% fines (i.e. GP-GM)
- 2. All sieves are U.S. Standard ASTM E11



|  |                     |  |                               |  |   |             |               |              | TE          | EST PIT LOG   |        |                | Test Pit #: TP2   | 0-01          |
|--|---------------------|--|-------------------------------|--|---|-------------|---------------|--------------|-------------|---|--------|----------------|---|---------------|
|  |                     | Elhanney   | Loca                          | ation:   | Lot 59                                      | , Hart      | ley Ba        |              | R Re        | sidence - Lot 59  |        | Exca           | e(s) Drilled: July 17, 2020<br>avating Company: Gitga'at Firs |               |
| Prepa  | red by:<br>McElh    | 2321-22441-0<br>anney Ltd.   |                               |  | AD83  |             |               | . 482        | 2990        | Alignment: Station/Offset:  |        | •              | rator:<br>avator: Mini-Excavator                              |               |
| Logge  | ed by: THW          | Reviewed by:   |                               | •  | 16.6  |             |               | ,            |             | Coordinates taken with GPS 7/17/2020  |        |                |   |               |
| DEPTH (m)  | DRILLING<br>DETAILS | X Pocket Penetrome 100 200  X DYNAMIC COI  + Natural Vane (KF  ▲ SPT "N"  Wp% 20 | 300<br>NE (BLOW:<br>'a) ⊕ Rem | IS/300 mr<br>nold Vane<br>00 mm)<br>W <sub>L</sub> % | 100<br>m) ₩<br>e (KPa)                      | SAMPLE TYPE | SAMPLE NO     | RECOVERY (%) | SOIL SYMBOL | SOIL<br>DESCRIPTION   |        | CLASSIFICATION | COMMENTS  | ELEVATION (m) |
| MCEHANNEY SOIL LOGS - 2220.08.08.69. MCEHANNEY TEMPLATE REV 2.601 20/8/10  ■ Solid |                     |  |                               |  |   | 885         |               |              |             | GRAVEL (subrounded) and SAND, some silt, trace cobble (max size 250 mm), inferred compact, blueish grey, wet. | 2.1m - | PT             | Sieve (Sa#1-2) Gravel:36% Sand:49% Fines:15%                  | 16-           |
| Legen<br>Sampl   | e Type:             | A-Auger S-Split Spoon  | -Core<br>-Odex<br>air rotary) | _  | <b>G</b> -Grab<br><b>W</b> -Wash<br>(mud re |             | □\<br>□\<br>! |              |             |   |        |                | Final Depth of Hole: 2<br>Depth to Top of F<br>Page 1         | Rock:         |

|  |  | -2 - 81 Y   |   |  |                                       |         |             |              |              | TI          | EST PIT LOG  |                | Test Pit #: <b>TP20</b>  | )-02                     |
|--|--|---|---|--|---------------------------------------|---------|-------------|--------------|--------------|-------------|--|----------------|--|--------------------------|
| Prep   | Mc   | 2321-22441  | Lo  | catio  | ot: <b>H</b> on: Lot                  | t 59, I | Hartl       | ey Ba        |              | R Re        | Alignment:   | Exc            | e(s) Drilled: July 17, 2020<br>avating Company: Gitga'at First l |                          |
|  |  | anney Ltd.  | No  | orthin   | g/Eas                                 | ting:   | 591         |              | , 48         | 32979       | Station/Offset:  |                | avator: Mini-Excavator   |                          |
| DEPTH (m)  | DRILLING 1569 peed 1569 pe | Reviewed by:  X Pocket Penetron 100 200  X DYNAMIC Ct + Natural Vane (F  Mp% 20 400 | eter X Sh<br>3<br>NE (BLO<br>Pa) ⊕ Ri<br>(BLOWS | hear Str<br>300<br>DWS/30<br>Remold \<br>5/300 m | 400<br>0 mm) <del>*</del><br>Vane (KF | Pa)     | SAMPLE TYPE | SAMPLE NO    | RECOVERY (%) | SOIL SYMBOL | SOIL DESCRIPTION   | CLASSIFICATION | COMMENTS   | ELEVATION (m)            |
| MCELHANNEY SOIL LOGS 22441-01 1P LOGS - 2020.08.05.65 J MCELHANNEY TEMPLATE REV. 2.6D1 20/8710 | Water-2.5m 2020/7/17   |   |   |  |                                       |         |             | 2-1          |              |             | PEAT: very soft, dark brown, wet to saturated, root and log inclusions, organic odor.  - At 2.3 m, seepage from interface of layers, pooling at base of test pit.  GRAVEL (subrounded) and SAND, silty, trace cobble, trace boulder, inferred compact, grey, wet At 2.5 m, boulders at base of test pit could not be excavated.  Test pit terminated at maximum reach for excavator.  Seepage observed at 2.3 m, no sloughing encountered.  Test pit backfilled with excavated material. | GM             | Final Depth of Hole: 2.  | 16-<br>15-<br>14-<br>12- |
| Lege<br>Sam  | <u>end</u><br>ple Type:<br><b>#</b> -Lab Sample  | A-Auger  S-Spoin  Spoon   | C-Core<br>O-Odex<br>air rotar                   | _  | <b>G</b> -G<br><b>W</b> -V<br>(mu     |         | rn)         | □\<br>:<br>: |              |             |  |                | Depth to Top of Role: 2.  Depth to Top of Role: 2.               | ock:                     |

|           |                                   | · ·                        |                                       |  |                          |   |   |   |                |               |           |               | TE                                     | EST PIT LOG  |                | Test Pit #: TP2   | 0-03          |
|-----------|-----------------------------------|----------------------------|---------------------------------------|--|--------------------------|---|---|---|----------------|---------------|-----------|---------------|--|--|----------------|---|---------------|
| Prepa     | ared by:                          | Elhan                      | 2321-2                                | <b>/</b><br>2441-01                                | Lo                       | catio                                   | on: l<br>: NA   | Lot 59<br>AD83                            | 9, Ha<br>3 Zor | artle<br>ne 9 | ey Ba     | ау, В         | R Re                                   | esidence - Lot 59  Alignment:  | Exc<br>Ope     | e(s) Drilled: July 17, 2020<br>avating Company: Gitga'at First<br>erator: |               |
|           |                                   | •                          |                                       |  | 1                        |   |   | astin                                     |                | 919           | 9550      | , 48          | 2974                                   | Station/Offset: Coordinates taken with GPS 7/17/2020   | Exc            | avator: Mini-Excavator  |               |
| DEPTH (m) | DRILLING DETAILS DETAILS          | **Poo<br>10<br>**E<br>+ Na | ket Pene<br>00<br>OYNAMI<br>atural Va | etromete<br>200<br>C CONE<br>Ine (KPa<br>PT "N" (B | E (BLO<br>) ⊕ Re<br>LOWS | near St<br>00<br>WS/30<br>emold 5/300 m | trength<br>40<br>00 mm<br>Vane<br>nm)<br>W <sub>L</sub> % | n (kPa)<br>00<br>n) <del>X</del><br>(KPa) |                | SAMPLE TYPE   | SAMPLE NO | RECOVERY (%)  | SOIL SYMBOL                            | SOIL<br>DESCRIPTION  | CLASSIFICATION | COMMENTS  | ELEVATION (m) |
| 0         | nd                                | <b>↑</b>                   | uger [                                |  | Core                     |   |   | 3-Gral                                    | 51b            |               | 3-1       | <i>I-</i> Van | 30000000000000000000000000000000000000 | PEAT: very soft, dark brown, saturated, decomposing wood and stump inclusions, organic odor.  - Seepage from peat layer between 0.5 and 2.0 m, no pooling in test pit.  - At 2.0 m, trace fibrous organic inclusions / for 150 mm.  GRAVEL (subrounded), sandy, some silt, trace cobble (rounded), trace boulder (>1 m), grey, inferred compact, wet.  Test pit terminated at maximum reach for excavator.  Seepage observed at between 0.5 and 2.0 m, no sloughing encountered.  Test pit backfilled with excavated material. | GM             | Sieve (Sa#3-2) Gravel:53% Sand:28% Fines:19%                              |               |
| Samp      | ole Type:<br><b>#</b> -Lab Sample |                            |                                       | 0-1<br>(air  |                          |   | _   | <b>N</b> -Was                             |                |               | IJŢ       |               |  |  |                | Depth to Top of F<br>Page 1   | Rock:         |

|   |                                    | -2 - 0.5  |                          |                                   |   |                                   |                |             |           |              | TI          | EST PIT LOG   |                | Test Pit #: <b>TP2</b>   | 0-04          |
|---|------------------------------------|---|--------------------------|-----------------------------------|---|-----------------------------------|----------------|-------------|-----------|--------------|-------------|---|----------------|--|---------------|
|   | Mc Mc                              | Elhanney  |                          | Loca                              | tion:   | Lot 5                             | 59, Ha         | artle       | ey Ba     |              | R Re        | sidence - Lot 59  | 1              | e(s) Drilled: July 17, 2020<br>avating Company: Gitga'at First |               |
|   |                                    | 2321-224<br>anney Ltd.<br>Reviewed by:                                    | 41-01                    | Datu<br>North<br>Eleva            | ning/E  | Eastir                            | ng: 5          |             |           | , 48         | 32985       | Alignment:  Station/Offset:  Coordinates taken with GPS 7/17/2020   |                | erator:<br>avator: Mini-Excavator                              |               |
| DEPTH (m)                                   | DRILLING                           | X Pocket Penetr 100 2  X DYNAMIC  + Natural Vane  ▲ SPT  W <sub>P</sub> % | 200<br>CONE (<br>(KPa) 6 | 300<br>(BLOWS<br>⊕ Remo<br>OWS/30 | 5/300 mi<br>old Vane<br>0 mm)<br>W <sub>L</sub> % | 400<br>m) <del>X</del><br>e (KPa) | )              | SAMPLE TYPE | SAMPLE NO | RECOVERY (%) | SOIL SYMBOL | SOIL<br>DESCRIPTION   | CLASSIFICATION | COMMENTS   | ELEVATION (m) |
| _ 0<br><br><br><br><br><br><br><br><br><br> | end<br>Into Type:                  |   |                          | ore                               |   | <b>G</b> -Gra                     |                |             | 4-1       |              | ne          | - At 1.9 m, seepage from interface of layers, on pooling at base of test pit.  SAND and SILT, some gravel (subrounded), trace cobble (max size 200 mm), inferred compact, grey, wet.  Test pit terminated at maximum reach for excavator. Seepage observed at 1.9 m, no sloughing encountered. Test pit backfilled with excavated material. | PT             | Sieve (Sa#4-2) Gravel:10% Sand:50% Fines:39%                   |               |
| Sam   | iple Type:<br><b>#</b> -Lab Sample |   | <b>□</b> 0-0<br>(air r   |                                   | _   | •                                 | ash<br>return) | -           | IIIT      |              |             |   |                | Depth to Top of F<br>Page 1                                    |               |

|   |                     | y - 10 V  |  |                                    |                   |                                 |      |             |           |              | TI          | EST PIT LOG  |                | Test Pit #: <b>TP2</b>                                | 0-05          |
|---|---------------------|---|--|------------------------------------|-------------------|---------------------------------|------|-------------|-----------|--------------|-------------|--|----------------|---|---------------|
|   | <b>▲</b> McI        | Elhanney  | Pr   | roje                               | ct:               | Har                             | tley | Ва          | ay S      | SAF          |             | sidence - Lot 59   | Dat            | e(s) Drilled: July 17, 2020                           |               |
|   |                     |   | _  |                                    |                   | Lot 59                          |      |             | у Ва      | ay, E        | BC          |  | Exc            | avating Company: Gitga'at Firs                        | t Nation      |
| Prepa   | ared by:<br>McFlh   | 2321-22441-<br>anney Ltd.                         |  |                                    |                   | AD83                            |      |             |           |              |             | Alignment:   | 1 .            | erator:   |               |
|   |                     | •   |  |                                    | -                 | astin                           | -    | 919         | 559       | , 48         | 32990       |  | Exc            | avator: Mini-Excavator                                |               |
| Logge   | ed by: THW          | Reviewed by:  X Pocket Penetrom                   |  |                                    |                   | 15.7                            | _    |             |           |              | 1           | Coordinates taken with GPS 7/17/2020   | -              |   | _             |
| DEPTH (m)   | DRILLING<br>DETAILS | 100 200  # DYNAMIC CC  + Natural Vane (K  SPT "N" | NE (BLO<br>Pa)⊕ Re                             | 300<br>DWS/30<br>demold<br>S/300 n | 00 mm<br>Vane     | 00<br>n) <del>**</del><br>(KPa) | i i  | SAMPLE IYPE | SAMPLE NO | RECOVERY (%) | SOIL SYMBOL | SOIL<br>DESCRIPTION  | CLASSIFICATION | COMMENTS  | ELEVATION (m) |
|   |                     | 20 40   | _  | 60                                 | ₩ <sub>L</sub> /₀ |                                 |      | Š           | ഗ         | RE           | S           |  | 귕              |   |               |
| MCELHANNEY SOIL LOG 22441-01 TP LOGS - 2020.08.05.GPJ MCELHANNEY TEMPLATE REV. 2.GDT 20/8/10   ■ SOIL 1 |                     | 19  |  |                                    |                   |                                 | 362  |             | 5-1       |              |             | PEAT: very soft, dark brown, wet, decomposed wood nclusions, organic odor.  GRAVEL (subrounded) and SAND, silty, trace cobble, inferred compact, brown, wet.  TILL: silt, sandy, some gravel (subangular), some cobble (max size 300 mm), inferred dense, non-plastic, grey, moist.  - At 1.9 m, difficulty excavating dense till at maximum reach for excavator on sloped area.  Test pit terminated at maximum reach for excavator.  No seepage or sloughing encountered. Test pit backfilled with excavated material. | GM<br>ML       | Sieve (Sa#5-2)<br>Gravel:11%<br>Sand:31%<br>Fines:58% | 15—           |
| EY SOIL LOG 22441-01 TP LOG   |                     |   |  |                                    |                   |                                 |      |             |           |              |             |  |                |   | 11-           |
| Leger   | nd                  | A-Auger   | C-Core   | ·                                  |                   | Grab                            |      |             | v         | _\/on        | 100         |  | -              | Final Depth of Hole: 1                                | 1.9 m         |
| Samp  | le Type:            |   | <b>0</b> -Core<br><b>0</b> -Odex<br>(air rotar | ry) [                              | _                 | <b>V</b> -Was<br>mud re         |      |             | v<br>∭⊺.  |              |             |  |                | Depth to Top of F                                     | Rock:         |

# APPENDIX D - LABORATORY TEST RESULTS

PROJECT NO. 2321-22441
CLIENT Canadian Coast Guard
C.C.

Canadian Coast Guard Seal Cove Prince Rupert, BC

ATTN: Don Storry

PROJECT Hartley Bay SAR Residence

CONTRACTOR

SIEVE TEST NO. 2 DATE RECEIVED 2020.Jul.18 DATE TESTED 2020.Jul.22 DATE SAMPLED 2020.Jul.17

SUPPLIER TP 20-01

SOURCE GB 1-2, Depth 2.3 m - 2.6 m

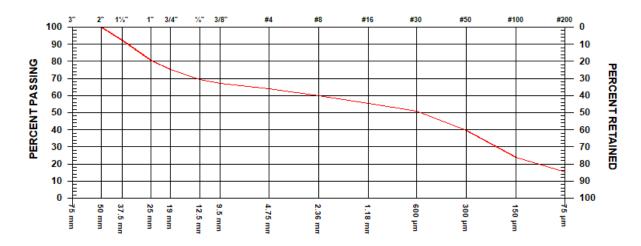
TESTED BY V. Whitaker

T. Wilkes

TEST METHOD WASHED

SAMPLED BY

SPECIFICATION TES MATERIAL TYPE Gravel: 36.1%, Sand: 48.5%, Fines: 15.4%



| GRAVEL                         | SIZES                                       |          | PERCENT<br>PASSING                            | GRADATION<br>LIMITS |
|--------------------------------|---|----------|---|---------------------|
| 3" 2" 1 1/2" 1" 3/4" 1/2" 3/8" | 75<br>50<br>37.5<br>25<br>19<br>12.5<br>9.5 | mm<br>mm | 100.0<br>92.4<br>80.6<br>75.4<br>69.4<br>67.3 |                     |

| 07                      | ND SIZE             | S AND FINE                                      | ES | PERCENT<br>PASSING                                   | GRADATION<br>LIMITS |
|-------------------------|---------------------|---|----|--|---------------------|
| No. No. No. No. No. No. | 8<br>16<br>30<br>50 | 4.75<br>2.36<br>1.18<br>600<br>300<br>150<br>75 | mm | 63.9<br>59.8<br>55.6<br>51.0<br>39.8<br>24.0<br>15.4 |                     |

MOISTURE CONTENT 16.9%

COMMENTS

Page 1 of 1 2020.Jul.23 McElhanney Ltd

PER.

PROJECT NO. 2321-22441-01
CLIENT Canadian Coast Guard
C.C.

TO Canadian Coast Guard Seal Cove Prince Rupert, BC

ATTN: Don Storry

PROJECT Hartley Bay SAR Residence

CONTRACTOR

**SPECIFICATION** 

SIEVE TEST NO. 3 DATE RECEIVED 2020.Jul.18 DATE TESTED 2020.Jul.22 DATE SAMPLED 2020.Jul.17

SUPPLIER TP 20-03

SOURCE GB 3-2, Depth 2.3 m - 2.7 m

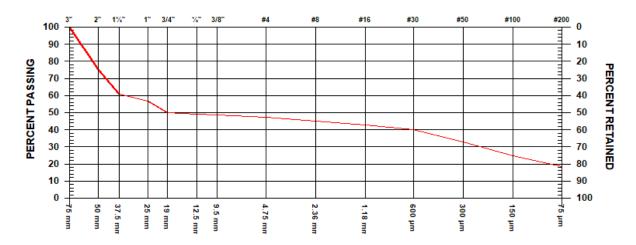
TESTED BY V. Whitaker

SAMPLED BY

TEST METHOD WASHED

T. Wilkes

MATERIAL TYPE Gravel: 52.9%, Sand: 28.4%, Fines: 18.7%



| GRAVE  | L SIZES                                     |          | PERCENT<br>PASSING                                    | GRADATION<br>LIMITS |
|--|---|----------|---|---------------------|
| 3"<br>2"<br>1 1/2"<br>1"<br>3/4"<br>1/2"<br>3/8" | 75<br>50<br>37.5<br>25<br>19<br>12.5<br>9.5 | mm<br>mm | 100.0<br>75.3<br>60.9<br>56.6<br>50.2<br>49.0<br>48.7 |                     |

| SAND SIZES AND FINES    |                     |   |    | PERCENT<br>PASSING                                   | GRADATION<br>LIMITS |
|-------------------------|---------------------|---|----|--|---------------------|
| No. No. No. No. No. No. | 8<br>16<br>30<br>50 | 4.75<br>2.36<br>1.18<br>600<br>300<br>150<br>75 | mm | 47.1<br>45.2<br>43.0<br>40.2<br>32.8<br>24.9<br>18.7 |                     |

MOISTURE CONTENT 11.3%

COMMENTS

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PROJECT NO. 2321-22441-01
CLIENT Canadian Coast Guard

TO Canadian Coast Guard Seal Cove Prince Rupert, BC

ATTN: Don Storry

PROJECT Hartley Bay SAR Residence

CONTRACTOR

SIEVE TEST NO. 4 DATE RECEIVED 2020.Jul.18 DATE TESTED 2020.Jul.22 DATE SAMPLED 2020.Jul.17

SUPPLIER TP 20-04

SOURCE GB 4-2, Depth 1.9 m - 2.6 m

TESTED BY V. Whitaker

T. Wilkes

TEST METHOD WASHED

SAMPLED BY

SPECIFICATION TEST METHOMATERIAL TYPE Gravel: 10.4%, Sand: 50.4%, Fines: 39.2%



| GRAVEL   | SIZES                                       |          | PERCENT<br>PASSING            | GRADATION<br>LIMITS |
|--|---|----------|-------------------------------|---------------------|
| 3"<br>2"<br>1 1/2"<br>1"<br>3/4"<br>1/2"<br>3/8" | 75<br>50<br>37.5<br>25<br>19<br>12.5<br>9.5 | mm<br>mm | 100.0<br>96.3<br>94.1<br>93.3 |                     |

| SAND SIZES | S AND FINES | PERCENT<br>PASSING | GRADATION<br>LIMITS |
|------------|-------------|--------------------|---------------------|
| No. 4      | 4.75 mm     | 89.6               |                     |
| No. 8      | 2.36 mm     | 85.9               |                     |
| No. 16     | 1.18 mm     | 82.3               |                     |
| No. 30     | 600 µm      | 78.2               |                     |
| No. 50     | 300 µm      | 66.8               |                     |
| No. 100    | 150 µm      | 51.9               |                     |
| No. 200    | 75 µm       | 39.2               |                     |

MOISTURE CONTENT 19.8%

COMMENTS

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Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of test results is provided only on written request.

T. Wilkes

V. Whitaker

PROJECT NO. 2321-22441-01
CLIENT Canadian Coast Guard

SAMPLED BY

TO Canadian Coast Guard Seal Cove Prince Rupert, BC

ATTN: Don Storry

PROJECT Hartley Bay SAR Residence

CONTRACTOR

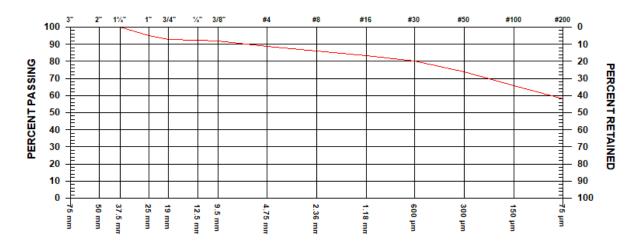
SIEVE TEST NO. 5 DATE RECEIVED 2020.Jul.18 DATE TESTED 2020.Jul.22 DATE SAMPLED 2020.Jul.17

SUPPLIER TP 20-05

SOURCE GB 5-2, Depth 1.4 m - 1.9 m TESTED BY

SPECIFICATION TEST METHOD WASHED

MATERIAL TYPE Gravel: 11.2%, Sand: 30.6%, Fines: 58.2%



| GRAVE  | L SIZES                                     |          | PERCENT<br>PASSING                    | GRADATION<br>LIMITS |
|--|---|----------|---------------------------------------|---------------------|
| 3"<br>2"<br>1 1/2"<br>1"<br>3/4"<br>1/2"<br>3/8" | 75<br>50<br>37.5<br>25<br>19<br>12.5<br>9.5 | mm<br>mm | 100.0<br>94.9<br>93.0<br>92.2<br>91.7 |                     |

| SAND SIZES AND FINES    |               |   |                            | PERCENT<br>PASSING                                   | GRADATION<br>LIMITS |
|-------------------------|---------------|---|----------------------------|--|---------------------|
| No. No. No. No. No. No. | 8<br>16<br>30 | 4.75<br>2.36<br>1.18<br>600<br>300<br>150 | mm<br>mm<br>µm<br>µm<br>µm | 88.8<br>86.1<br>83.3<br>80.2<br>73.8<br>65.7<br>58.2 |                     |
| INO.                    | 200           | 15  | μm                         | 30.2   |                     |

MOISTURE CONTENT 19.4%

COMMENTS

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