



# Public Works and Government Services Canada

## Volume 1

Requisition No. R.103948.001

DRAWINGS & SPECIFICATIONS  
for

**RCMP Anahim Lake  
Housing Renovations**

for

**Issued for Tender 2019-12-09**

Issued For Tender

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## SPECIFICATION

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SU SURVEY BY PWGSC

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E1 LEGEND AND SCHEDULES  
E2 FLOOR PLAN ELECTRICAL LAYOUT

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**Part 1            General**

**1.1                WORK COVERED BY CONTRACT DOCUMENTS**

- .1        Work of this Contract comprises of Demolition, Decommissioning, and Renovations, to RCMP structures located at, or about, 6661 Christensen Road, Anahim Lake; BC

**1.2                DESCRIPTION OF WORK**

This project consists of three components:

- .1        Renovation of the ex-detachment structure into a single family residence. All hazardous waste remediation of existing structure will be completed as part of the contract, prior to selective building demolition. Demolition work includes, but is not limited to, removal of exterior cladding, windows, doors and roofing membrane. Interior demolition work includes, but is not limited to, removal of gypsum partitions and ceiling, CMU partitions containing reinforcing, and concrete ceiling assembly, flooring, utilities, etc.
  - .1        Hazard material remediation of the ex-detachment to be completed prior to the remediation of the abandoned residences.
- .2        Demolition and removal of two abandoned residences 6652, & 6665 Christensen Rd. This includes structures basements, footings, utilities, and all other associated items. All Hazardous waste remediation of existing buildings will be completed as part of the contract, prior to building demolition.
- .3        Site Rehabilitation: This includes selective demolition and removal of items occurring throughout the site. After demolition activities are completed, the site is to be rehabilitated, graded and landscaped.

**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.

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**1.5 TIME OF COMPLETION**

- .1 Complete all work associated with the project and have the facility ready for use within 26 weeks after Contract Award.
- .2 The contractor to work full 8.5 hour shifts, 5 days a week in order to complete the project within the allotted time.
- .3 Time is of the essence. Completion of the work on schedule is of the utmost importance to the owner.

**1.6 HOURS OF WORK**

- .1 Construction work will occur during normal working hours.

**1.7 SITE MEETINGS**

- .1 Site meetings between PWGSC Departmental Representatives and the Contractor will be arranged on a bi weekly basis to review project progress and upcoming work.
- .2 Contractor to arrange project meetings and to be responsible for arranging times, location, and recording and distributing meeting minutes.

**1.8 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.

**1.9 CONTRACTORS USE OF PREMISES**

- .1 Contractor to maintain lines of security at all times.
- .2 Ensure construction site is safe, secure and properly separated from areas accessible to the public.
- .3 Minimize service disruptions. Coordinate any required service shutdowns to occur outside occupied/operational hours.

**1.10 OWNER OCCUPANCY**

- .1 Co-operate with Departmental Representative in scheduling operations to minimize conflict with existing adjacent single family residences.

**1.11 ADDITIONS OR REPAIRS TO EXISTING BUILDING**

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

**1.12 EXISTING SERVICES**

- .1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical

service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to tenant operations.

- .3 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .4 Provide temporary services as directed, to maintain critical existing systems.
- .5 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .6 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .7 Record locations of maintained, re-routed and abandoned service lines.

### **1.13 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 List of Outstanding Shop Drawings.
  - .6 Change Orders.
  - .7 Other Modifications to Contract.
  - .8 Field Test Reports.
  - .9 Copy of Approved Work Schedule.
  - .10 Health and Safety Plan and Other Safety Related Documents.
  - .11 Other documents as required as submittals in individual specification sections.

### **1.14 AS-BUILT DOCUMENTS**

- .1 The Departmental Representative will provide 2 sets of drawings, 2 sets of specifications, and 2 copies of the original AutoCAD files for “as-built” purposes.
- .2 As work progresses, maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings and shop drawings as changes occur.
- .3 Refer to Section 01 78 10 Closeout Procedures.

### **1.15 ADDITIONAL DRAWINGS**

- .1 The Departmental Representative may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with plans referred to in the Contract documents.
- .2 Upon request, Departmental Representative may furnish up to a maximum of 10 sets of Contract documents for use by the Contractor at no additional cost. Should more than 10

sets of documents be required the Departmental Representative will provide them at additional cost.

**1.16 SUBMISSION OF TENDER**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1            General**

**1.1                SCHEDULES REQUIRED**

- .1            Construction Schedule

**1.2                SCHEDULE FORMAT**

- .1            Prepare schedule in form of a horizontal bar chart. (Gantt)
- .2            Provide a separate bar for each major operation
- .3            Provide horizontal time scale identifying first Working Day of each week.
- .4            Identification of listings
- .5            By specific task
- .6            Identify work by phase
- .7            Include all milestones and identify critical paths

**1.3                SCHEDULE SUBMISSION.**

- .1            Submit initial schedule within seven working days after award of Contract.
- .2            Submit schedules in electronic format, forward through e-mail - .pdf files.
- .3            Departmental Representative will review schedule and return review copy within three days after receipt.
- .4            Resubmit finalized schedule within three days after return of review copy.
- .5            Submit revised progress schedule with each application for payment.
- .6            Distribute copies of revised schedule to:
  - .1            Subcontractors.
  - .2            Other concerned parties.
- .7            Instruct recipients to report to Contractor within five working days, any problems anticipated by timetable shown in schedule.

**1.4                SCHEDULING**

- .1            Show complete sequence of construction by activity, identifying Work of separate stages and final completion of the entire project within the time period required by the Contract documents. The schedule must clearly show the partial substantial completion of each phase. Substantial completion of a phase will be essential before the area can be occupied and construction may continue to the next phase. Indicate the following:
  - .1            Submission of Shop Drawings, product data, MSDS sheets and samples
  - .2            Indicate estimated percentage of completion for each item of Work at each submission.
  - .3            Include dates for commencement and completion of each phase of the construction.

- .4 Indicate the anticipated date of substantial completion for each of the phases.
- .5 Allow for 5 business days time period between phases to allow the airport to reconfigure operations.
- .6 Indicate final completion date within the time period required by the contract documents.
- .7 Indicate projected percentage of completion of each item as of first day of the week.
- .8 Indicate progress of each activity to date of submission schedule.
- .9 Indicate changes occurring since previous submission of schedule:

### **1.5 PROGRESS REPORTS**

- .1 Maintain an accurate record of the Construction work. Submit progress report when requested by the Departmental Representative and with each Request for Progress Payment.
- .2 Include in reports, the dates of commencement and percentage of work completed for different aspects of the work.

### **1.6 CHANGES IN THE SCHEDULE**

- .1 Whenever proposing a change in the construction schedule, submit proposed revised schedule to the Departmental Representative, together with such analyses thereof as are required to clearly indicate the purpose and anticipated results of such changes.
- .2 If, in the opinion of the Departmental Representative, any proposed change in construction scheduled is inadequate to secure completion of the Work within the specified time, or is otherwise not in accordance with the specifications, or if the Work is not being adequately or properly prosecuted in any respect, the Departmental Representative reserves the right to require a revised schedule together with such analyses thereof as are required to indicate the anticipated results of such revision.
- .3 Claims for additional compensation or extension of Contract Time on account of such requirements will not be considered.

**END OF SECTION**

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**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.
- .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 Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

#### **1.4 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.
- .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: excavation, foundation, framing and services before concealment.

**1.6 CERTIFICATES AND TRANSCRIPTS**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**PWGSCC Update on Asbestos Use**

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

**Further information can be found at <http://www.tpsgc-pwgsc.gc.ca/comm/vedette-features/2016-04-19-00-eng.html>**

**Part 1            General**

**1.1                REFERENCES**

- .1        Government of Canada:
  - .1        Canada Labour Code - Part II
  - .2        Canada Occupational Health and Safety Regulations.
  
- .2        National Building Code of Canada (NBC):
  - .1        Part 8, Safety Measures at Construction and Demolition Sites.
  
- .3        Canadian Standards Association (CSA) as amended:
  - .1        CSA S269.1-1975(R2003), Falsework for Construction Purposes.
  - .2        CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
  - .3        CSA Z797-2009, Code of Practice for Access Scaffold.
  
- .4        Fire Protection Engineering Services, HRSDC:
  - .1        FCC No. 301, Standard for Construction Operations.
  - .2        FCC No. 302, Standard for Welding and Cutting.
  
- .5        American National Standards Institute (ANSI):
  - .1        ANSI/ASSE A10.3-2006, American National Standard - Construction and Demolition Operations- Safety Requirements for Powder-Actuated Fastening Systems.
  
- .6        Province of British Columbia:
  - .1        Workers' Compensation Act Part 3-Occupational Health and Safety.
  - .2        Occupational Health and Safety Regulation.

**1.2                RELATED SECTIONS**

- .1        Refer to the following sections as required:
  - .1        Section 02 41 16 – Structure Demolition: Health and Safety requirements specific to demolition.
  
  - .2        Section 02 81 01 – Hazardous Materials
  
  - .3        Stantec Pre-Demolition Hazardous Building Materials Assessments (Appendix A1,A2,A3)

### **1.3 WORKERS COMPENSATION BOARD COVERAGE**

- .1 Comply fully with Workers' Compensation Act, regulations and orders made pursuant thereto and any amendments up to completion of work.
- .2 Maintain Workers' Compensation Board coverage during term of Contract, until and including date that Certificate of Final Completion is issued.

### **1.4 COMPLIANCE WITH REGULATIONS**

- 1 PWGSC may terminate Contract without liability to Canada where Contractor, in the opinion of PWGSC, refuses to comply with a requirement of Workers' Compensation Act or Occupational Health and Safety Regulations.
- .2 It is Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform work as required by Workers' Compensation Act or Occupational Health and Safety Regulations.

### **1.5 SUBMITTALS**

- .1 Submit to Departmental Representative submittals listed for review, in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Work effected by submittal will not proceed until review is complete.
- .3 Submit following:
  - .1 Health and Safety Plan.
  - .2 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.
  - .3 Copies of incident and accident reports.
  - .4 Complete set of Material Safety Data Sheets (MSDS) and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
  - .5 Emergency Procedures.
- .4 Departmental Representative will review Contractor's site-specific project Health and Safety Plan and emergency procedures and provide comments to Contractor within 5 working days after receipt of plan. Revise plan as appropriate and re-submit to Departmental Representative.
- .6 Submission of Health and Safety Plan and any revised version to Departmental Representative is for information and reference purposes only. It will not:
  - .1 Be construed to imply approval by Departmental Representative.
  - .2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.
  - .3 Relieve Contractor of his legal obligations for provision of health and safety on project.

## **1.6 RESPONSIBILITY**

- .1 Assume responsibility as 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 HEATH AND SAFETY CO-ORDINATOR**

- 1 Health and Safety Co-ordinator must:
  - .1 Be responsible for completing all health and safety training and ensuring that personnel that do not successfully complete required training are not permitted to enter site to perform work.
  - .2 Be responsible for implementing, daily enforcing and monitoring site-specific Health and Safety Plan.
  - .3 Be on site during execution of work.

## **1.8 GENERAL CONDITIONS**

- .1 Provide safety barricades and lights around work site as required to provide safe working environment for workers and protection for pedestrian and vehicular traffic.
- .2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of work site.
  - .1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel and temporary lighting as required.
  - .2 Secure site at night time as deemed necessary to protect site against entry.

## **1.9 PROJECT/SITE CONDITIONS**

- .1 Work at site will involve contact with:
  - .1 Thermal, acoustic and ductwork insulation.
  - .2 Energized electrical services.
  - .3 Reference: Division 02- Existing Conditions - Section 02 81-01 Hazardous Materials
  - .4 Reference: PSPC Preliminary Hazard Assessment Form Appendix F

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## **1.10 REGULATORY REQUIREMENTS**

- .1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.
- .2 In event of conflict between any provision of above authorities, the most stringent provision will apply. Should dispute arise in determining the most stringent requirement, the Departmental Representative will advise on course of action to be followed.

## **1.11 WORK PERMITS**

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

## **1.12 FILING OF NOTICE**

- .1 Complete and submit Notice of Project as required by Provincial authorities.
- .2 Provide copies of all notices to Departmental Representative.

## **1.13 HEALTH AND SAFETY PLAN**

- .1 Conduct site-specific hazard assessment based on review of Contract documents, required work and project site. Identify known and potential health risks and safety hazards.
- .2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including but not limited to following:
  - .1 Primary requirements:
    - .1 Contractor's safety policy.
    - .2 Identification of applicable compliance obligations.
    - .3 Definition of responsibilities for project safety/organization chart for project.
    - .4 General safety rules for project.
    - .5 Job-specific safe work, procedures.
    - .6 Inspection policy and procedures.
    - .7 Incident reporting and investigation policy and procedures.
    - .8 Occupational Health and Safety.
    - .9 Occupational Health and Safety meetings.
    - .10 Occupational Health and Safety communications and record keeping procedures.
  - .2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of work.

- .3 List hazardous materials to be brought on site as required by work.
  - .4 Indicate engineering and administrative control measures to be implemented at site for managing identified risks and hazards.
  - .5 Identify personal protective equipment (PPE) to be used by workers.
  - .6 Identify personnel and alternates responsible for site safety and health.
  - .7 Identify personnel training requirements and training plan, including site orientation for new workers.
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- .3 Develop plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in plan.
  - .4 Submit to Departmental Representative as indicated in **1.5 Submittals**

#### **1.14 EMERGENCY PROCEDURES**

- .1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:
  - .1 Designated personnel from own company.
  - .2 Regulatory agencies applicable to work and as per legislated regulations.
  - .3 Local emergency resources.
  - .4 Departmental Representative.
- .2 Include following provisions in emergency procedures:
  - .1 Notify workers and first-aid attendant, of nature and location of emergency.
  - .2 Evacuate all workers safely.
  - .3 Check and confirm safe evacuation of all workers.
  - .4 Notify fire department or other emergency responders.
  - .5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond workplace.
  - .6 Notify Departmental Representative.
- .3 Provide written rescue/evacuation procedures as required for, but not limited to:
  - .1 Work at high angles.
  - .2 Work in confined spaces or where there is risk of entrapment.
  - .3 Work with hazardous substances.
  - .4 Underground work.
  - .5 Work on, over, under and adjacent to water.
  - .6 Workplaces where there are persons who require physical assistance to be moved.
- .4 Design and mark emergency exit routes to provide quick and unimpeded exit.
- .5 Revise and update emergency procedures as required and re-submit to Departmental Representative.

#### **1.15 HAZARDOUS PRODUCTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System



(WHMIS) regarding use, handling, storage and disposal of hazardous materials and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Departmental Representative and in accordance with Canada Labour Code.

- .2 Where use of hazardous and toxic products cannot be avoided:
  - .1 Advise Departmental Representative beforehand of product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00 Submittal Procedures - Shop Drawings, Product Data and Samples.
  - .2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when tenants have left building.
  - .3 Provide adequate means of ventilation in accordance with Section 01 51 00 - Temporary Utilities.

#### **1.16 ELECTRICAL SAFETY REQUIREMENTS**

- .1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.
  - .1 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with Departmental Representative.
  - .2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

#### **1.17 ELECTRICAL LOCKOUT**

- .1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.
- .2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by Departmental Representative.
- .3 Keep documents and lockout tags at site and list in log book for full duration of Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

#### **1.18 OVERLOADING**

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

#### **1.19 SCAFFOLDING**

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

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**1.20            CONFINED SPACES**

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

**1.21            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.

**1.22            ASBESTOS HAZARD**

- .1        Carry out any activities involving asbestos in accordance with applicable Provincial / Federal Regulations.
- .2        Removal and handling of asbestos will be in accordance with applicable Provincial / Federal Regulations.

**1.23            PCB REMOVALS**

- .1        Mercury-containing fluorescent tubes and ballasts which contain polychlorinated biphenyls (PCBs) are classified as hazardous waste.
- .2        Remove, handle, transport and dispose of in accordance with applicable Provincial/Federal Regulations.

**1.24            REMOVAL OF LEAD CONTAINING PAINTS**

- .1        All paints containing TCLP lead concentrations above 5 ppm are classified as hazardous.
- .2        Carry out demolition and/or remediation activities involving lead-containing paints in accordance with Worksafe BC Regulations.
- .3        Dry Scraping/Sanding of any materials containing lead is strictly prohibited.
- .4        The use of Methylene Chloride based paint removal products is strictly prohibited.

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**1.25 SILICA**

- .1 Carry out work in accordance with Worksafe BC regulations

**1.26 POWDER ACTUATED DEVICES**

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

**1.27 FIRE SAFETY AND HOT WORK**

- .1 Obtain Departmental Representative's authorization before 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.

**1.28 FIRE SAFETY REQUIREMENTS**

- .1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC-approved, sealed containers and remove from site on daily basis.
- .2 Handle, store, use and dispose of inflammable and combustible materials in accordance with the National Fire Code of Canada.

**1.29 FIRE PROTECTION AND ALARM SYSTEMS**

- .1 Fire protection and alarm systems not to be:
  - .1 Obstructed.
  - .2 Shut off.
  - .3 Left inactive at the end of a working day or shift.
- .2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.
- .3 Be responsible/liable for costs incurred from fire department, Departmental Representative and tenants, resulting from false alarms.

**1.30 UNFORSEEN HAZARDS**

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

**1.31 POSTED DOCUMENTS**

- .1 Post legible versions of following documents on site:
  - .1 Health and Safety Plan.
  - .2 Sequence of work.
  - .3 Emergency procedures.
  - .4 Site drawing showing project layout, location(s) of first-aid station(s), evacuation route and marshalling station and emergency transportation provisions.
  - .5 Notice of Project.
  - .6 Floor plans or site plans.
  - .7 Notice as to where a copy of Workers' Compensation Act and Regulations are available on work site for review by employees and workers.
  - .8 Workplace Hazardous Materials Information System (WHMIS) documents.
  - .9 Material Safety Data Sheets (MSDS).
  - .10 List of names of Joint Health and Safety Committee members or Health and Safety Representative, as applicable.
    - .1 Name of "qualified co-ordinator" responsible for co-ordination of health and safety activities in accordance with Section 118 of Workers' Compensation Act.
- .2 Post all Material Safety Data Sheets (MSDS) on site, in common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.
- .3 Postings to be protected from weather and be visible from street or exterior of principal construction site shelter provided for workers and equipment or as approved by Departmental Representative.

### **1.32 MEETINGS**

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

### **1.33 CORRECTION OF NON COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance with health and safety issues identified.
- .3 Departmental Representative may issue "stop work order" if non-compliance of health and safety regulations is not corrected immediately or within posted time. General Contractor will be responsible for costs arising from such "stop work order".

**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            FIRE DEPARTMENT BRIEFING**

- .1      Departmental Representative will co-ordinate arrangements for Pre-Commencement Meeting following contract award. Contractors will be briefed on Fire Safety by the Fire Chief or his designated representative before work starts.

**1.3            REPORTING FIRES**

- .1      The Contractor shall inform the Departmental Representative and the Fire Chief of all fire incidents at the construction site, regardless of size.
- .2      Know location of nearest fire alarm pull station and telephone, including emergency phone number.
- .3      Report immediately fire incidents to Fire Department as follows:
  - .1      Activate nearest fire alarm pull station.
  - .2      Telephone, by calling **911**
- .4      Person activating fire alarm pull station will remain at the front entrance to direct Fire Department to scene of fire.
- .5      When reporting fire by telephone, give location of fire, name or number of building and be prepared to verify location. Ensure caller informs the 911 operator that they are calling from “Port Hardy Airport, 3675 Byng Road” as required.

**1.4            FIRE SAFETY PLAN**

- .1      Submit a fire safety plan for the construction site prior to commencement of construction work. The fire safety plan shall conform to the National Fire Code of Canada.
- .2      The fire safety plan shall be submitted to the Departmental Representative for review by local fire department. Any comments by local fire department shall be implemented by the Contractor.
- .3      The fire safety plan shall be limited to the area of construction only. Contractor is not responsible for amending fire safety plans in existing buildings.
- .4      Post the fire safety plan at the entrance to the construction site or near the construction site’s health and safety board.
- .5      The fire safety plan shall conform to the National Fire Code of Canada, and shall contain, at minimum:
  - .1      Emergency procedures to be used in case of fire, including

- .1 Sounding the fire alarm;
  - .2 Notifying the fire department;
  - .3 Instructing occupants on procedures to be followed when the fire alarm sounds;
  - .4 Evacuating occupants, including special provisions for persons requiring assistance; and
  - .5 Confining, controlling and extinguishing fires.
- .2 The appointment and organization of designated supervisory staff to carry out fire safety duties.
  - .3 The training of supervisory staff and other occupants in their responsibilities for fire safety.
  - .4 Documents including diagrams, showing the type, location and operation of building fire emergency systems.
  - .5 The holding of fire drills (where applicable).
  - .6 The control of fire hazards in the building.
  - .7 The inspection and maintenance of building facilities provided for the safety of occupants.

#### **1.5 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 building.

#### **1.6 EXTERIOR FIRE PROTECTION SYSTEMS**

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

#### **1.7 FIRE PROTECTION SYSTEM IMPAIRMENT**

- .1 Notify the Departmental Representative and the Fire Chief 48 hours prior to shutting down any active fire protection system, including water supply, fire suppression, fire detection and life safety systems.
- .2 Implement all fire protection system impairments in accordance with the National Fire Code of Canada and Airport Fire Orders. Fire Orders will be provided at the Pre-Commencement Meeting.

#### **1.8 FIRE EXTINGUISHERS**

- .1 In addition to other requirements of this specification, supply fire extinguishers, as scaled by the Fire Chief, necessary to protect work in progress and contractor's physical plant on site.
- .2 Fire extinguishers may be required in the following areas as directed by the Fire Chief
  - .1 Adjacent to hot works;
  - .2 In areas where combustibles are stored;
  - .3 Near or on any internal combustion engines;

- .4 Adjacent to areas where flammable liquids or gases are stored or handled;
  - .5 Adjacent to temporary oil fired or gas fired equipment; and
  - .6 Adjacent to bitumen heating equipment.
- .3 Extinguishers shall be sized as 4-A:40-B:C (20 lbs) unless otherwise directed by the Fire Chief.
  - .4 Extinguishers shall be of the dry chemical type unless otherwise required by the hazard being protected.
  - .5 The Contractor may assume the quantity of extinguishers based on a maximum travel distance between extinguishers of 75 feet.

### **1.9 ACCESS FOR FIRE FIGHTING**

- .1 Access for firefighting shall be provided in accordance with the National Fire Code of Canada.
- .2 Advise the Fire Chief of work that would impede fire apparatus response. This includes violation of minimum horizontal and overhead clearance, as prescribed by the Fire Chief, erecting of barricades and digging of trenches.
- .3 Minimum horizontal clearance: clear width of not less than 5m, or as defined by the Chief.
- .4 Minimum vertical clearance: overhead height of not less than 6m, or as defined by the Fire Chief.

### **1.10 SMOKING PRECAUTIONS**

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

### **1.11 RUBBISH AND WASTE MATERIALS**

- .1 Keep rubbish and waste materials at minimum quantities.
- .2 Burning of rubbish is prohibited.
- .3 Remove rubbish from work site at end of work day or shift or as directed.
- .4 Storage:
  - .1 Store oily waste in approved receptacles to ensure maximum cleanliness and safety.
  - .2 Deposit greasy or oily rags and materials subject to spontaneous combustion in approved receptacles and remove specified.

### **1.12 FLAMMABLE AND COMBUSTIBLE LIQUIDS**

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

- .2 Keep flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing Underwriters' Laboratory of Canada or Factory Mutual seal of approval. Obtain written authorization from Port Hardy Fire Chief for storage of quantities of flammable and combustible liquids exceeding 45 litres.
- .3 Do not transfer flammable or combustible liquids inside buildings or on jetties.
- .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 Port Hardy District Fire Chief when disposal is required.

### **1.13 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 The Contractor shall obtain from the Fire Chief a "Hot Work" permit for all hot works in the construction area. Frequency of renewal for hot works permits is at the discretion of the Fire Chief.
- .3 When Work is carried out in dangerous or hazardous areas involving use of heat; provide fire watchers equipped with sufficient fire extinguishers. Determination of dangerous or hazardous areas along with level of protection necessary for Fire Watch is at discretion of the Fire Chief.
- .4 Provide fire watch service for work on scale established and in conjunction with the Port Hardy District Fire Chief as defined in the Fire Department Briefing. Fire watchers shall be trained in the use of fire extinguishing equipment.
- .5 Area of hot works
  - .1 Hot works shall be carried out in an area free of combustible and flammable content.
  - .2 Where 1.14.5.1 is not possible,
    - .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 unless otherwise directed by the Port Hardy District Fire Chief;
    - .3 A final inspection of the hot work area shall be conducted not less than 4 hours after the completion of hot works unless otherwise directed by the Fire Chief.
  - .3 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
- .2 Sentence 1.14.5.2 shall apply for those areas.
- .6 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.
- .7 Fire extinguisher
  - .1 A fire extinguisher shall be provided within 3 m of all hot works. Minimum size shall be 20lbs ABC unless otherwise directed by the Fire Chief.

#### **1.14 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 Port Hardy District t Fire Chief prior to and at completion of such work.

#### **1.15 QUESTIONS AND/OR CLARIFICATION**

- .1 Direct questions or clarification on Fire Safety in addition to above requirements to the Departmental Representative.
- .2 Departmental Representative is responsible to obtain clarifications from the Fire Chief. The Contractor is not to liaise directly with the Fire Chief for notification, authorization or any requests unless the situation constitutes an immediate emergency.

#### **1.16 FIRE INSPECTION**

- .1 Co-ordinate site inspections by the Fire Chief through Departmental Representative.
- .2 Allow the Fire Chief unrestricted access to work site.
- .3 Co-operate with the Fire Chief during routine fire safety inspection of work site.
- .4 Immediately remedy unsafe fire situations observed by the Fire Chief.

#### **Part 2 Products**

##### **2.1 NOT USED**

- .1 Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 31 23 33.01 Excavating, Trenching and Backfilling.

**1.2 REFERENCES**

- .1 Definitions:
  - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
  - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.
- .2 Reference Standards:
  - .1 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 Rating System Addenda for New Construction and Major Renovations LEED Canada-NC Version 1.0-Addendum 2007
    - .3 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
    - .4 LEED Canada 2009 for Design and Construction-2010, LEED Canada 2009 for Design and Construction Leadership in Energy and Environmental Design Green Building Rating System Reference Guide
    - .5 LEED Canada for Existing Buildings, Operations and Maintenance-2009, LEED Canada 2009 Leadership In Energy and Environmental Design Green Building Rating System Reference Guide.
  - .2 U.S. Environmental Protection Agency (EPA)/Office of Water
    - .1 EPA 832/R-92-005-92, Storm Water Management for Construction Activities, Chapter 3.
    - .2 EPA General Construction Permit (GCP) 2012.
  - .3 Stormwater Management Manual for Western Washington, Volume II, 2014, Chapter 4

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures and Section 01 35 21 – Sustainability Requirements.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for any stormwater rehabilitation unit and associated flocculants, including product characteristics, performance criteria, environmental data including toxicity, physical size, and limitations.
  - .2 Submit WHMIS MSDS in accordance with Section 01 35 30 - Health and Safety Requirements.

- .3 Before commencing construction activities or delivery of materials to site, submit Construction Activity Pollution Prevention Plan for review and approval by Departmental Representative.
- .4 Construction Activity Pollution Prevention Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
- .5 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .6 Include in Construction Activity Pollution Prevention Plan:
  - .1 Names of persons responsible for ensuring adherence to Construction Activity Pollution Prevention Plan.
  - .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
  - .3 Names and qualifications of persons responsible for training site personnel.
  - .4 Descriptions of environmental protection personnel training program.
  - .5 Erosion and Sediment Control Plan for construction activities associated with the project. The plan must incorporate practices such as phasing, seeding, grading, mulching, filter socks, stabilized site entrances, preservation of existing vegetation, and other best management practices (BMPs) to control erosion and sedimentation in runoff from the entire project site during construction. The plan must list the BMPs employed and describe how they accomplish the following objectives:
    - a) Prevent loss of soil during construction by stormwater runoff and/or wind erosion, including but not limited to stockpiling of topsoil for reuse.
    - b) Prevent sedimentation of any affected stormwater conveyance systems or receiving streams.
    - c) Prevent polluting the air with dust and particulate matter.
- .1 The BMPs to be selected from the Washington State Department of Ecology's Stormwater Management Manual for Western Washington, Volume II, Construction Stormwater Pollution Prevention (2005 edition), or a locally approved equivalent, whichever is more stringent, and must comply with all federal, state (provincial/territorial), and local erosion and sedimentation control regulations.
- .2 The Erosion and Sediment Control Plan must describe how the project team will do the following:
  - d) Preserve vegetation and mark clearing limits.
  - e) Establish and delineate construction access.
  - f) Control flow rates.
  - g) Install sediment controls.
  - h) Stabilize soils.
  - i) Protect slopes.
  - j) Protect drain inlets.
  - k) Stabilize channels and outlets.
  - l) Control pollutants.
  - m) Control dewatering.
  - n) Maintain the BMPs.
  - o) Manage the erosion and sedimentation control plan.

- .6 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
- .7 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.
  - .1 Plans to include details and measures to minimize amount of material transported onto paved public roads by vehicles or runoff.
- .8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
  - .1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
- .9 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
- .12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .13 Waste Water Management Plan identifying methods and procedures for management and discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

#### **1.4 FIRES**

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

#### **1.5 DRAINAGE**

- .1 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .2 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.
- .3 Contractor shall install, monitor and maintain catch basin sediment traps in the catch basins indicated on the plan. Installation, maintenance and removal of the catch basin sediment trap is to be in accordance with the manufacturers specifications. Install sediment trap until unit is removed as part of excavation and service is abandoned. Records of inspection and maintenance to be completed by the Contractor.
- .4 Sediment control structures to be installed in accordance with details on the Contract Drawing prior to commencement of construction activity.
- .5 Pumped water discharged to municipal storm drain must meet max 50 NTU turbidity. Contractor may utilize methods/technologies as part of a stormwater rehabilitation unit (SWRU) including & in addition to those listed below:
  - .1 settling pond
  - .2 settling tankage

- .3 filtration units
- .4 flocculants (product must be in conformance with Ministry of Environment, federal fisheries and the requirements of municipal bylaws)
- .5 centrifugal-action separator
- .6 filter bags
- .7 dewatering bags
- .8 vector trucks (material removed from site must be disposed of in accordance with applicable regulations)
- .9 bark mulch (hog fuel)
- .6 Provide a water supply complete with approved reduced pressure backflow assembly (RPBA) to facilitate washing truck wheels to prevent the migration of silt onto adjacent streets. All wash activities are to be contained within the site.
- .7 Contractor shall provide personnel as required to sample and test site runoff. Samples to be collected and submitted to an approved testing facility. Cost of collection and testing to be at Contractors expense.
- .8 Contractor to cover erodible stockpiled material or exposed cut slopes with anchored polyethylene sheeting to prevent displacement by wind or rainwater runoff.
- .9 Contractor is responsible to take measures onsite to minimize tracking of sediment onto existing roads and road cleaning as required or as recommended by the Departmental Representative.
- .10 A supply of erosion and sediment control materials shall be kept on construction site at all times to provide for minor unexpected erosion or sediment control needs, routine control replacements, and/or sediments emergencies.
- .11 Install sediment control structures at times and locations noted or as directed by Departmental Representative.
- .12 Contractor shall ensure that all excavation and construction procedures are undertaken in such a manner as to prevent sediment-laden runoff from site entering the municipal storm drainage system.
- .13 During periods of heavy rain, all works associated with large machine traffic (e.g. hauling) should be stopped to minimize tracking of debris offsite.
- .14 During the construction period the erosion prevention and sediment control facilities shown on the Contract Drawings are the minimum requirements for anticipated site conditions. These structures shall be upgraded as needed for unexpected storm events or site conditions, and to ensure that sediment and sediment-laden water do not leave the site. Contractor to notify Departmental Representative of revisions to the approved plan.
- .15 All control measures are to be restored at the end of the day everyday, in the event of a rainfall while the site is not supervised.
- .16 Design Criteria:
  - .1 Water quality test parameters:
  - .2 Turbidity - 50 NTU (max)
  - .3 Oil and grease - 15.0 mg/l (max)
  - .4 Total phosphorus - 1.0 mg/l (max)
  - .5 75 mg/l - suspended solids

- .17 Reporting and documentation
  - .1 Contractor to provide water quality samples every 2 weeks for turbidity and total suspended solids at stormwater discharge points of active work areas.
  - .2 Additional samples to be taken after significant rainfall events with intensities greater than 30 mm in a 24 hour period.
  - .3 Contractor to provide monthly reports on sediment and erosion control measures including any modifications to structures, maintenance provided, observations, and performance information. The report is to include photographs of the facilities.

## **1.6 SITE CLEARING AND PLANT PROTECTION**

- .1 Protect trees and plants on site and adjacent properties by erecting snow fence around the drip zone.
- .2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
  - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.

## **1.7 WORK ADJACENT TO WATERWAYS**

- .1 Construction equipment to be operated on land only.
- .2 Watercourses to be kept free of excavated fill, waste material and debris.
- .3 Do not skid logs or construction materials across watercourses.
- .4 Avoid indicated spawning beds when constructing temporary crossings of waterways.

## **1.8 POLLUTION CONTROL**

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment in accordance with local authorities' emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.
  - .1 Provide temporary enclosures where indicated.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

## **1.9 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 Construction Activity Pollution Prevention Plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action.
  - .1 Take action only after receipt of written approval by Departmental Representative.
- .3 Departmental Representative may issue stop order of work until satisfactory corrective action has been taken.

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 CLEANING**

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

END OF SECTION



**Part 1 General**

**1.1 REFERENCES AND CODES**

- .1 Perform Work in accordance with National Building Code of Canada (NBC) 2015 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Comply with applicable local bylaws rules and regulations enforced at the location concerned. This includes Transport Canada – Civil Aviation Authority for any work airside.
- .3 Provide inspection authorities having jurisdiction with plans and information required for issue of acceptance certificates
- .4 Pay fees and obtain certificates and permits required
- .5 Furnish inspection certificates in evidence that the work installed conforms to the requirements of the authority having jurisdiction
- .6 Conform to the Canada Labour Code II, Canada Occupational Safety and Health regulations.
- .7 FCC, Fire Commissioner of Canada.
  - .1 Standard No. 301, "Construction Operations" , June 1982.
- .8 WCB, Worker's Compensation Act, B.C., Reg. 185/99
- .9 Meet or exceed requirements of:
  - .1 Contract documents.
  - .2 Specified standards, codes and referenced documents.

**1.2 BUILDING SMOKING ENVIRONMENT**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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**Part 1            General**

**1.1                INSPECTION**

- .1     Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2     Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative or law of Place of Work.
- .3     If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

**1.2                PROCEDURES**

- .1     Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2     Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3     Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

**1.3                REJECTED WORK**

- .1     Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2     Make good other Contractor's work damaged by such removals or replacements promptly.
- .3     If in opinion of Departmental Representative, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents. Departmental Representative will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents.
- .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 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Refer to individual specification sections for definitive requirements.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                INSTALLATION AND REMOVAL**

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

**1.2                WATER SUPPLY**

- .1    Departmental Representative will provide continuous supply of potable water for construction use.
- .2    Exercise conservation. Turn off water when not in use.
- .3    Provide all equipment and temporary hoses to bring water supply to site, at no additional cost to the contract.

**1.3                TEMPORARY POWER AND LIGHT**

- .1    Electrical power is available for construction purposes at no cost.
- .2    Departmental Representative will determine delivery points and quantitative limits. Departmental Representative written permission is required before any connection is made. Connect to existing power supply in accordance with Canadian Electrical Code.
- .3    Provide all equipment and temporary lines to bring these services to the work, at no additional cost to the contract.
- .4    Exercise conservation whenever using temporary electrical power supply.

**1.4                TEMPORARY HEATING AND VENTILATION**

- .1    Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2    Construction heaters used inside building must be vented to outside or be flameless type. Solid fuel salamanders are not permitted.
- .3    Provide temporary heat and ventilation in enclosed areas as required to:
  - .1    Facilitate progress of Work.
  - .2    Protect Work and products against dampness and cold.
  - .3    Prevent moisture condensation on surfaces.
  - .4    Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
  - .5    Provide adequate ventilation to meet health regulations for safe working environment.
- .4    Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
- .5    Ventilating:

- .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
- .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
- .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Ventilate temporary sanitary facilities.
- .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Permanent heating system of building, not to be used for construction heating.
- .7 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
  - .1 Conform with applicable codes and standards.
  - .2 Enforce safe practices.
  - .3 Prevent abuse of services.
  - .4 Prevent damage to finishes.
  - .5 Vent direct-fired combustion units to outside.
- .8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

**1.5 FIRE PROTECTION**

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

**Part 2 Products**

**2.1 NOT USED**

**Part 3 EXECUTION**

- .1 NOT USED

**END OF SECTION**

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**Part 1            General**

**1.1                INSTALLATION AND REMOVAL**

- .1    Provide construction facilities in order to execute work expeditiously.
- .2    Remove from site all such work after use.

**1.2                SCAFFOLDING**

- .1    Scaffolding in accordance with CAN/CSA-S269.2.
- .2    Provide and maintain scaffolding ladders and platforms necessary for the performance of the work.

**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.

**1.4                SITE STORAGE/LOADING**

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

**1.5                CONSTRUCTION PARKING**

- .1    Parking is permitted on site in areas directed by Departmental Representative.
- .2    Existing roads may be used for access to project site. Maintain construction parking area clean and free of construction-related debris, spillage and soiling.
- .3    Make good damage resulting from Contractor use of parking areas and roads, at no additional cost to the Contract.

**1.6                SECURITY**

- .1    Contractor is responsible for providing on site security at all times during the construction phases.

**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.

**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.

**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, and dispose of off site on completion of project or earlier if directed by DCC Representative.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 Not Used**

- .1 Not Used

**END OF SECTION**

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**Part 1            General**

**1.1                GENERAL**

- .1        Section 01 55 00 addresses general requirements for temporary vehicle movement, site access and parking not incorporated into the final or permanent work, as well as traffic control during construction. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.
- .2        During progress of the Work, make adequate provision to accommodate normal traffic along onsite roads immediately adjacent to or crossing the Works so as to minimize inconvenience to site operations.
- .3        Give minimum 48 h notice or as otherwise required by Departmental Representative to local police, fire departments, emergency services, and site operations staff prior to beginning construction on roadways and comply in all respects with their requirements.
- .4        Inform Departmental Representative and tenants where access is affected at least 24 hours in advance of proposed road and/or sidewalk closures.

**1.2                SUBMITTALS**

- .1        Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Contractor to submit traffic control plan to Departmental Representative for review and approval prior to construction.

**1.3                EXISTING SITE CONDITIONS AND ENVIRONMENTAL PROTECTION**

- .1        The contractor shall be held responsible for any damage caused to existing streets or services by construction equipment and/or trucks hauling materials to the site. This shall include daily cleaning or sweeping all existing roads or dirt and debris caused by construction activity.
- .2        A truck wash may be required at the discretion of the Departmental Representative.
- .3        All work areas, roadways, and site accesses to be restored to as-found or better condition once work is complete.
- .4        Mats will be used when operating tracked equipment on all paved areas, with the exception of areas stipulated for re-pavement.

**1.4                TEMPORARY ACCESS ROADS**

- .1        Provide and maintain temporary access roads at locations approved by the Departmental Representative.

**1.5                TEMPORARY PARKING AREAS**

- .1        Provide and maintain temporary parking areas as shown in the construction documents.



## **1.6 CONTRACTOR LAYDOWN AREA**

- .1 The Contractor may use the area specified in the construction documents for a laydown area including equipment and material storage, site offices, first aid facilities, washrooms, and other required site facilities.
- .2 The existing ground surface is to be protected and restored to as-found or better condition once construction is complete.
- .3 Fencing, signage, and security are to be provided by the Contractor. Any vandalism is to be removed or repaired within 24-hours.
- .4 The Contractor is responsible for any theft or incidental damage in the laydown area.

## **1.7 TRAFFIC CONTROL AND SIGNAGE**

- .1 Refer to Contract Documents for both temporary and permanent signage requirements.
- .2 Comply with requirements of the "Traffic Control Manual for Work on Roadways", published by the British Columbia Ministry of Transportation, for regulation of vehicle and pedestrian traffic or use of roadways upon or over which it is necessary to carry out work or haul materials or equipment.
- .3 Regulate traffic in general accordance for uninterrupted access to all parts of this site except where specified otherwise and in compliance with specific requirements stipulated herein.
- .4 Provide and maintain access to corridors specified on Contract Drawings.
- .5 Provide and maintain reasonable road and pedestrian access to all temporary facilities, cargo requirements, and emergency access.
- .6 Keep travelled way well graded, free of pot holes and of sufficient width that required number of lanes of traffic may pass.
- .7 When working on travelled way:
  - .1 Place equipment in such position as to present a minimum of interference and hazard to the travelling public.
  - .2 Keep equipment units as close together as working conditions will permit and preferably on same side of travelled way.
  - .3 Provide lighting as required based on seasonal variations and hours of work.
  - .4 Do not leave equipment on travelled way overnight.
- .8 Traffic Control Informational and Warning Devices
  - .1 Meet with Departmental Representative prior to commencement of work to prepare list of signs and other devices required for project.
  - .2 Provide and maintain signs and other devices required to indicate construction activities or other temporary and unusual conditions resulting from project work which may require road user response.

- .3 Supply and erect signs, delineators, barricades and other miscellaneous warning devices in accordance with Departmental Representative requirements.
- .4 Place signs and other devices in additional locations as appropriate or as directed by the Departmental Representative.
- .5 Continually maintain traffic control devices in use by:
  - .1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
  - .2 Removing or covering signs which do not apply to conditions existing from day to day.
- .9 Control of Traffic Using Flaggers
  - .1 Provide flag persons, trained and properly equipped for the following situations:
    - .1 When it is necessary to institute one-way traffic system through construction area or other blockage where the typical traffic control plant is not in use.
    - .2 When workers or equipment are employed on travelled way.
    - .3 Where temporary protection is required while other traffic control devices are being erected or taken down.
    - .4 For emergency protection when other traffic control devices are not readily available.
    - .5 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.
- .10 Provide and maintain suitable detours or temporary hard surfaced access routes for pedestrian traffic, complete with suitable warning and advisory signs.
- .11 Maintain existing conditions for traffic throughout period of contract except that, when required for construction under contract and when measures have been taken as specified herein and approved by Departmental Representative to protect and control public traffic, existing conditions for traffic may be restricted.

END OF SECTION

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**Part 1            General**

**1.1                QUALITY**

- .1    Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2    Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3    Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4    Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .5    Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6    Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

**1.2                STORAGE, HANDLING AND PROTECTION**

- .1    Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2    Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3    Store products subject to damage from weather in weatherproof enclosures.
- .4    Store cementitious products clear of earth or concrete floors, and away from walls.
- .5    Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6    Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7    Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8    Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

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

### **1.3 TRANSPORTATION**

- .1 Pay costs of transportation of products required in performance of Work.  
.2 Transportation cost of products supplied by Departmental Representative will be paid for by Departmental Representative. Unload, handle and store such products.

### **1.4 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.  
.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions. Departmental Representative will establish course of action.  
.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

### **1.5 QUALITY OF WORK**

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed.  
.2 Do not employ anyone unskilled in their required duties.  
.3 Decisions as to 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.

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**1.9 LOCATION OF FIXTURES**

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Departmental Representative of conflicting installation. Install as directed.

**1.10 FASTENINGS**

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

**1.11 FASTENINGS - EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

**1.12 PROTECTION OF WORK IN PROGRESS**

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

**1.13 EXISTING UTILITIES**

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

**Part 2            Products**

**2.1                NOT USED**

.1            Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

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**Part 1            General**

**1.1                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 and use marked separate bins for recycling. Refer to Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .6    Provide on-site dump containers for collection of waste materials and debris.
- .7    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.
- .8    Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .9    Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

**1.2                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    Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .8    Remove dirt and other disfiguration from exterior surfaces.

- .9 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .10 Sweep and wash clean paved areas.
- .11 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .12 Clean roofs, downspouts, and drainage systems.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**



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**Part 1            General**

**1.1            DEFINITIONS**

- .1        Waste Source Separation Program (WSSP): implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.
- .2        Separate Condition: refers to waste sorted into individual types.
- .3        Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.
- .4        Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials generated by project. Specifies diversion goals, implementation and reporting procedures, anticipated results and responsibilities.

**1.2            DOCUMENTS**

- .1        Post and maintain in visible and accessible area at job site, one copy of following documents:
  - .1        Waste Reduction Workplan.
  - .2        Waste Source Separation Plan.

**1.3            ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Prepare and submit following prior to project start-up:
  - .1        Completed Waste Reduction Workplan (WRW).
  - .2        Completed Waste Source Separation Program (WSSP) description.
- .3        Prepare and submit at intervals agreed to by DCC Representative the following:
  - .1        Bills of lading and destination receipts for all waste removed from the site.

**1.4            WASTE REDUCTION WORKPLAN (WRW)**

- .1        Prepare and submit WRW prior to project start-up.
- .2        WRW identifies strategies to optimize diversion through reduction, reuse, and recycling of materials and comply with applicable regulations, based on information acquired from WA.
  - .1        Destination of materials identified.
  - .2        Deconstruction/disassembly techniques and sequencing.
  - .3        Schedule for deconstruction/dissassembly.
  - .4        Details on materials handling and removal procedures.
- .5        Quantities of materials to be salvaged for reuse or recycled and materials sent to landfill.

- .6 Names and addresses of proposed recycling and landfill sites
- .3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .4 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.
- .5 Post WRW or summary where workers at site are able to review content.
- .6 Monitor and report on waste reduction by documenting total volume (in tonnes) and cost of actual waste removed from project.
- .7 Outline procedures to be put in place to handle, store and dispose of identified hazardous wastes.

### **1.5 WASTE SOURCE SEPARATION PROGRAM (WSSP)**

- .1 As part of Waste Reduction Workplan, prepare WSSP prior to project start-up.
- .2 WSSP will detail methodology and planned on-site activities for separation of reusable and recyclable materials from waste intended for landfill. Contractor to provide list indicating material types to be diverted from landfill. This list to contain, but is not limited to, the following: metals, glass, concrete, clean untreated wood, plastics, paper.
- .3 Provide sufficient on-site facilities and containers for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide containers for the deposit of
  - .1 Reuseable and recycleable materials
  - .2 Materials to be sent to landfill
- .5 Collect handle and store on-site and transport off-site recycleable materials in separated condition.
- .6 Locate separated materials in areas which minimizes material damage and with the least interference with day to day activities. Location to be approved by Departmental Representative
- .7 Clearly and securely label containers to identify types/conditions of materials accepted.
- .8 On-site sale of salvaged materials is not permitted.

### **1.6 USE OF SITE AND FACILITIES**

- .1 Execute Work with minimal interference and disturbance to normal use of adjacent RCMP property.

### **1.7 DISPOSAL OF WASTES**

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste into waterways, storm, or sanitary sewers.
- .3 Do not dispose of waste in ocean
- .4 Remove materials on-site as Work progresses.

.5 Transportation and disposal of hazardous waste must be in accordance with applicable legislation.

.6 Submit bills of lading and destination receipts for all waste removed from site.

### **1.8 HAZARDOUS AND TOXIC WASTES**

.1 Refer to Specification Appendices A1, A2, & A3 for Hazardous Building Materials Assessments at the site.

.1 Dispose of identified Hazardous Materials according to applicable regulations at no cost to RCMP.

.2 Refer to Section 01 35 43 Environmental Procedures

### **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 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 Departmental Representative and designated airport staff.
    - .5    Work is complete and ready for final inspection.
  - .4    Declaration of Substantial Performance: When Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
  - .5    Commencement of warranty period: Date of Departmental Representatives acceptance of substantial performance to be the date for commencement for warranty period.
  - .6    Payment of Holdback: after issuance of Substantial Performance of work, submit application for payment of holdback amount in accordance with contractual agreement.
  - .7    Final Inspection:
    - .1    When completion tasks are done, request final inspection of Work by Departmental Representative.
    - .2    If work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
  - .8    Final Payment

- .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of contract met, make application for final payment.
- .2 When work deemed incomplete by Departmental Representative complete outstanding items and request re-inspection.

**1.2 FINAL CLEANING**

- .1 Clean in accordance with section 01 74 11
  - .1 Remove surplus materials, excess materials, rubbish tools and equipment.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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**Part 1            General**

**1.1                SECTION INCLUDES**

- .1      Closeout submittals
- .2      Operation and maintenance manual format.
- .3      Contents each volume.
- .4      Recording actual site conditions.
- .5      Record (as-built) documents and samples.
- .6      Record documents.
- .7      Final survey.
- .8      Warranties and bonds.

**1.2                RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.

**1.3                CLOSEOUT SUBMITTALS**

- .1      Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2      Copy will be returned with Departmental Representative's comments.
- .3      Revise content of documents as required prior to final submittal.
- .4      Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, 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.
- .5      Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .6      If requested, furnish evidence as to type, source and quality of products provided.
- .7      Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8      Pay costs of transportation.

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**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 Contractor and Subcontractors with name of responsible parties; and
  - .3 schedule of products and systems, indexed to content of volume.
- .2 For each product or system, list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- .4 Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

**1.6 RECORDING ACTUAL SITE CONDITIONS**

- .1 Record information on set of black line opaque drawings, and within the Project Manual, provided by Departmental Representative.
- .2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.

- .3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately recorded.
- .4 Contract drawings and shop drawings: legibly mark each item to record actual construction, including:
  - .1 Measured depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .4 Field changes of dimension and detail.
  - .5 Changes made by change orders.
  - .6 Details not on original Contract Drawings.
  - .7 References to related shop drawings and modifications.
- .5 Specifications: legibly mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain inspection certifications, field test records, required by individual specifications sections.

## 1.7 RECORD DOCUMENTS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site for Departmental Representative, one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to the Contract.
  - .5 Reviewed shop drawings, product data, and samples.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with section number listings in List of Contents of the Project Manual. Label each document "RECORD DOCUMENTS" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative's.



**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Not used

**1.2 REFERENCES**

- .1 CSA International
  - .1 CSA S350-M1980 (R2003), Code of Practice for Safety in Demolition of Structures.
- .2 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
  - .2 Canadian Environmental Protection Act (CEPA), 1993, C.33.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Hazardous Materials:
  - .1 Provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.

**1.4 SITE CONDITIONS**

- .1 This specification refers only to civil-related demolition works outside the building envelope.
- .2 Take precautions to protect environment and undertake works in conformance with Contract Documents for siltation control and pollution prevention.
- .3 If material resembling asbestos or other designated substance listed as hazardous is encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
  - .1 Proceed only after receipt of written instructions have been received from Departmental Representative.
- .4 Notify Departmental Representative before disrupting building access or services.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Store and manage hazardous materials in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Storage and Protection.
  - .1 Protect in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
  - .2 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost.
  - .3 Remove and store materials to be salvaged, in manner to prevent damage.
  - .4 Store and protect in accordance with requirements for maximum preservation of material.
  - .5 Handle salvaged materials as new materials.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.

**3.2 PREPARATION**

- .1 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .2 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to: requirements of authorities having jurisdiction.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during demolition.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work.
- .3 Protection of In-Place Conditions:
  - .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features and parts of building to remain in place. Provide bracing and shoring required.
  - .2 Keep noise, dust, and inconvenience to occupants to minimum.
  - .3 Protect building systems, services and equipment.
  - .4 Provide temporary dust screens, covers, railings, supports and other protection as required.
  - .5 Do Work in accordance with Section 01 35 30 - Health and Safety Requirements.

**3.3 REMOVAL OF HAZARDOUS WASTES**

- .4 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

**3.4 DEMOLITION/REMOVAL:**

- .1 Remove items as indicated.
- .2 Disconnect, cap, plug or divert, as required, existing utilities within the property where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.
  - .1 Coordinate any service disruptions with Departmental Representative for hours of work, duration of shutdown, and emergency procedures in case of prolonged outage.
  - .2 Immediately notify Departmental Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.
  - .3 Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.
- .3 Excavate at least 200mm below pipe invert, when removing pipes under existing or future pavement area.

- .4 Removal of Pavements, Concrete Slabs, Curbs and Gutters:
  - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.
  - .2 Protect adjacent joints and load transfer devices.
  - .3 Protect underlying and adjacent granular materials.
  - .4 Use cold milling, planning or grinding equipment with automatic grade controls capable of operating from stringline, and capable of removing part of pavement surface to depths or grades indicated.
- .5 Expose, cut, remove, and dispose of any asbestos cement pipe in accordance with all applicable WorkSafeBC guidelines and regulations.

### **3.5 STOCKPILING**

- .1 Proper stockpiling will help maintain the value of salvaged materials.
- .2 Label stockpiles, indicating material type and quantity.
- .3 Designate appropriate security resources/measures to prevent vandalism, damage and theft.
- .4 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.
- .5 Stockpile in locations as directed by Departmental Representative.
  - .1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .6 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

### **3.6 RESTORATION AND 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.
- .2 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work areas clean at end of each day.
- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .5 Refer to demolition drawings and specifications for items to be salvaged for reuse.
- .6 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 19 - Construction Waste and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

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**Part 1      General**

**1.1      REFERENCES**

- .1 Refer to the following reports (further referred to herein as the “Assessment Reports”), attached in the Appendix of the Project Specifications, for information pertaining to hazardous building materials that have been identified and will require disturbance (removal and disposal) during the Work:
  - .1 Old Detachment #1
    - .1 “Hazardous Building Materials Assessment; RCMP Detachment 6661 Christensen Road, Anahim Lake, BC”, prepared by Pinchin West, dated July 18, 2016
    - .2 “Pre-Demolition Hazardous Building Materials Assessment; RCMP Old Detachment #1, 6661 Christensen Road, Anahim Lake, BC”, prepared by Stantec Consulting Ltd., dated Sept 16, 2019
  - .2 RCMP Mobile Home #4
    - .1 “Hazardous Building Materials Assessment RCMP Residence 6665 Christensen Road, Anahim Lake, BC,” prepared by Pinchin West Ltd., dated July 18, 2016
    - .2 “Pre-Demolition Hazardous Building Materials Assessment; RCMP Mobile Home #4, 6665 Christensen Road, Anahim Lake, BC”, prepared by Stantec Consulting Ltd., dated Sept 16, 2019
  - .3 RCMP Mobile Home #5
    - .1 “Hazardous Building Materials Assessment; RCMP Residence 6652 Christensen Road, Anahim Lake, BC”, prepared by Pinchin West, dated July 19, 2016
    - .2 “Pre-Demolition Hazardous Building Materials Assessment; RCMP Mobile Home #5, 6652 Christensen Road, Anahim Lake, BC”, prepared by Stantec Consulting Ltd., dated Sept 16, 2019

**1.2      DEFINITIONS**

- .1 Dangerous Goods: product, substance, or organism that is specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
- .2 Hazardous Building Material: component of a building or structure that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when altered, disturbed or removed during maintenance, renovation or demolition.
- .3 Hazardous Material: product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .4 Hazardous Waste: any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment or disposal.

### 1.3 REFERENCE STANDARDS

- .1 Canadian Environmental Protection Act, 1999 (CEPA 1999).
  - .1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .3 National Research Council Canada Institute for Research in Construction (NRC-IRC)
  - .1 National Fire Code of Canada 2015.
- .4 Department of Justice Canada
  - .1 Transportation of Dangerous Goods Act (TDG Act) 1999, (c. 34).
  - .2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2003-400).
- .5 WorkSafe BC
  - .1 British Columbia's Occupational Health and Safety Regulation (BC Reg. 296/97), including amendments to date of work
  - .2 "Safe Work Practices for Handling Asbestos" (2017)
  - .3 "Lead-Containing Paints and Coatings; Preventing Exposure in the Construction Industry" (2011)
  - .4 "Safe Work Practices for Handling Lead" (2017)
- .6 Government of Canada
  - .1 The Canada Labour Code, Part II, Canada Occupational Health and Safety Regulations (COHSR)
  - .2 The Federal PCB Regulations (SOR/2008-273).
  - .3 The Federal Halocarbons Regulation (July 2003).
- .7 Government of British Columbia
  - .1 British Columbia Hazardous Waste Regulation (BC Reg. 63/88)
- .8 Canadian Construction Association
  - .1 Standard Construction Document CCA 82 "Mould Guidelines for the Canadian Construction Industry" (2004 – further referred to herein as "CCA 82").

### 1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
    - .1 Submit to Departmental Representative current Material Safety Data Sheet (MSDS) for each hazardous material required prior to bringing hazardous material on site.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Co-ordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labelling and storage of materials and wastes.
- .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
- .3 Store and handle flammable and combustible materials in accordance with current National Fire Code of Canada 2015 requirements.
- .4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.
  - .1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.
  - .2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.
- .5 Transfer of flammable and combustible liquids is prohibited within buildings.
- .6 Do not transfer of flammable and combustible liquids in vicinity of open flames or heat-producing devices.
- .7 Do not use flammable liquids having flash point below 38 degrees C, such as naphtha or gasoline as solvents or cleaning agents.
- .8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.
- .9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.
- .10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:
  - .1 Store hazardous materials and wastes in closed and sealed containers.
  - .2 Label containers of hazardous materials and wastes in accordance with WHMIS.
  - .3 Store hazardous materials and wastes in containers compatible with that material or waste.
  - .4 Segregate incompatible materials and wastes.
  - .5 Ensure that different hazardous materials or hazardous wastes are not mixed.
  - .6 Store hazardous materials and wastes in secure storage area with controlled access.
  - .7 Maintain clear egress from storage area.
  - .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.
  - .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
  - .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.

- .11 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
- .12 Report spills or accidents immediately to Departmental Representative. Submit a written spill report to Departmental Representative within 24 hours of incident.

## **1.6 TRANSPORTATION**

- .1 Transport hazardous materials and wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
- .2 If hazardous waste is generated on site:
  - .1 Co-ordinate transportation and disposal with Departmental Representative.
  - .2 Ensure compliance with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.
  - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
  - .4 Prior to shipping material obtain written notice from intended hazardous waste treatment or disposal facility that it will accept material and that it is licensed to accept this material.
  - .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
  - .6 Ensure that trained personnel handle, offer for transport, or transport dangerous goods.
  - .7 Provide photocopy of shipping documents and waste manifests to Departmental Representative.
  - .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide a photocopy of completed manifest to Departmental Representative.
  - .9 Report discharge, emission, or escape of hazardous materials immediately to Departmental Representative and appropriate provincial authority. Take reasonable measures to control release.

## **1.7 EXISTING CONDITIONS**

- .1 Reports and information pertaining to hazardous building materials present within the building that are to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification in Appendices A1, A2, A3.
- .2 Notify Departmental Representative of suspected hazardous building material discovered during Work and not apparent from drawings, specifications, or reports pertaining to the Work. Do not disturb such material pending instructions from Departmental Representative.



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## Part 2 Products

### 2.1 MATERIALS

- .1 Only bring on site quantity of hazardous materials required to perform work.
- .2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

## Part 3 Execution

### 3.1 HAZARDOUS MATERIALS ABATEMENT

- .1 Abatement shall be conducted to handle, alter, remove and dispose of hazardous building materials as identified in the Assessment Reports in accordance with applicable regulations, guidelines, standards and/or best practices for such work, prior to building demolition.
- .2 Contractor is responsible for reviewing plans, specifications and reports such that they understand the locations and amounts of hazardous building materials that will be will require removal.
- .3 The listing below is a summary of the identified hazardous building material categories that are anticipated to require disturbance, along with the associated removal and disposal regulations, guidelines and/or standards. If there are discrepancies between the information summarized below and that provided in the Assessment Reports, the information in the Assessment Reports will be considered correct.
  - .1 Asbestos-Containing Materials (ACMs)
    - .1 Refer to the Assessment Reports for identities and locations of ACMs. Although the Contractor is responsible to review this information in light of their proposed methods for completing the Work, a preliminary review indicates that the following ACMs will require removal and disposal:
      - .1 Old Detachment #1
        - .1 Gold sink/toilet under coating within cell #1 and cell #2.
        - .2 Brown vent mastic applied to various roof vents.
        - .3 Black window pane caulking applied between glass and frame throughout exterior windows.
        - .4 Grey cement panel applied to lower exterior walls.
      - .2 RCMP Mobile Home #4
        - .1 Grey vinyl sheet flooring concealed as 2nd layer in the kitchen, laundry room and washroom #2.
        - .2 Grey vinyl sheet flooring concealed as 3rd layer in washroom #2.
        - .3 Black sticky window pane caulking applied between window glass and frames on windows throughout.
        - .4 Grey mastic applied to perimeter seams of rooftop vents.
        - .5 Grey cement panel applied to lower exterior walls

- .3 RCMP Mobile Home #5
  - .1 Silver sink undercoating applied to the underside of the kitchen sink.
  - .2 Grey cement panel applied to lower exterior walls.
  - .3 12"x12" cream stone patter vinyl floor tile in the main floor furnace room.
  - .4 12"x12" white vinyl floor tile concealed under two layers of sheet flooring in the entrance stairwell.
- .2 Removal of identified ACMs is to be conducted in accordance with the requirements of the 2017 WorkSafe BC publication "Safe Work Practices for Handling Asbestos", by appropriately trained personnel.
  - .1 Contractor is to conduct an appropriate risk assessment and document site-specific work procedures for removal and disposal of all identified ACMs.
  - .2 Contractor is to submit the documented work procedures to the Departmental Representative for review, at least 10 days prior to initiation of asbestos abatement work.
  - .3 Contractor must not proceed with work that will impact identified ACMs without approval from Departmental Representative.
  - .4 If air monitoring is required as part of the Contractor's work procedures, the Departmental Representative will provide the required air monitoring and inspections.
  - .5 If, in the opinion of the Departmental Representative, the work procedures developed by the Contractor do not meet the intent of the 2017 WorkSafeBC publication "Safe Work Practices for Handling Asbestos", revisions will be required, at no cost to the Owner, and at no impact to the schedule.
- .3 Waste transportation to be conducted in accordance with BC Reg. 63/88 and the Federal Transportation of Dangerous Goods Regulation.
- .4 Waste disposal to be conducted in accordance with BC Reg. 63/88.
- .5 Notify Departmental Representative of suspected ACM discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material pending instructions from Departmental Representative
- .2 Lead and Lead-Containing Paints (LCPs)
  - .1 Refer to the Assessment Reports for identities and locations of LCPs. Although the Contractor is responsible to review this information in light of their proposed methods for completing the Work, a preliminary review indicates that the following LCPs will require consideration and appropriate disposal during the Work:
    - .1 Old Detachment #1
      - .1 Grey coloured paint on metal front/rear entrance door and frame.
      - .2 Light tan coloured paint on metal door and frames throughout.
      - .3 Off-white coloured paint on drywall throughout.

- .4 Brown coloured paint on metal gutters and downspouts throughout.
- .2 RCMP Mobile Home #4
  - .1 Light yellow/beige coloured paint on metal exterior siding.
  - .2 Orange coloured paint on wood door and door trim.
  - .3 Red coloured paint on metal roofing.
  - .4 Tan coloured paint on metal canopy roofing.
- .3 RCMP Mobile Home #5
  - .1 Brown coloured paint on wood exterior stairs of the rear porch.
- .2 Actions that will disturb lead-containing materials (including paints and materials coated with paints) are to be conducted in accordance with the requirements of the 2017 WorkSafe BC publication “Safe Work Practices for Handling Lead”, keeping airborne exposure to lead dust to less than COHSR and BC Reg. 296/97 regulated 8-hour Occupational Exposure Limit (OEL) for lead of 0.05 milligram per cubic metre ( $\text{mg}/\text{m}^3$ ).
  - .1 Actual methods to maintain exposures within applicable limits are to be determined by the contractor through their own risk assessment, which will take into account the lead content of the paints as indicated in the Assessment Reports, along with their planned disturbance methods (and associated dust control), tools, PPE and the overall duration of the work.
- .3 Although paints and items coated with paints will be disturbed and/or removed for disposal during the Work, unless deemed necessary through risk assessment or cost analysis conducted by the Contractor, comprehensive removal of paints from items or surfaces is not expected to be required during the Work.
- .4 Refer to the provisions of the 2017 WorkSafeBC document “Safe Work Practices for Handling Lead” for removal of LCPs from surfaces before any welding and torch-cutting, should the Contractor plan to use such methods to complete the Work.
  - .1 If such work is required on painted materials, Contractor will be responsible for verification testing of surfaces where LCPs have been removed. Confirmation of acceptable results is to be provided to the Departmental Representative for review before proceeding with any welding or torch-cutting on surfaces where LCPs were present.
- .2 Waste transportation to be conducted in accordance with BC Reg. 63/88 and the Federal Transportation of Dangerous Goods Regulation.
- .3 Waste disposal to be conducted in accordance with BC Reg. 63/88.
  - .1 Based on the information provided in the Assessment Reports, waste from materials coated with LCPs is not expected to contain lead in a dispersable form such that their leachates contains greater than 5.0 milligrams per litre lead.
  - .2 If additional testing is required for landfill or other purposes, arranging and paying for such additional testing is to be the

responsibility of the Contractor, once waste streams and waste disposal locations are determined.

- .3 Polychlorinated Biphenyls (PCBs)
  - .1 Refer to the Assessment Reports for identities and locations of potential PCB-containing items. Although the Contractor is responsible to review this information in light of their proposed methods for completing the Work, a preliminary review indicates the following with respect to potential PCB-containing items that require consideration:
    - .1 Old Detachment #1
      - .1 Approximately 70 fluorescent light fixtures present. Ballasts unlikely to contain PCBs based on investigation of ballasts within two fixtures.
    - .2 RCMP Mobile Home #4
      - .1 No PCB-containing equipment identified.
    - .3 RCMP Mobile Home #5
      - .1 No PCB-containing equipment identified.
  - .2 When decommissioned, verify the PCB content of fluorescent lamp ballasts as per the Environment Canada 1991 publication "Identification of Lamp Ballasts Containing PCBs, Report EPS2/CC/2", or equivalent reference.
    - .1 Separate PCB-containing ballasts from non-PCB ballasts.
    - .2 If PCB-containing ballasts are found, costs for appropriate disposal of up to 10 PCB-containing ballasts are to be included in the Contractor's bid. Extra costs will not be considered unless more than 10 PCB-containing ballasts are identified.
  - .3 Should a material suspected to contain PCBs become uncovered during renovation activities (i.e., dielectric fluids, hydraulic fluids), all work in the areas that may disturb the material should be stopped. Samples of the suspect material should be submitted for laboratory analysis to determine if PCBs are present.
  - .4 PCB-containing items identified for removal and disposal must be handled, transported, stored and disposed of in accordance with the following:
    - .1 The transportation and disposal requirements of BC Reg. 63/88.
    - .2 The transportation requirements of the Federal Transportation of Dangerous Goods Regulation.
    - .3 The Federal PCB Regulations (SOR/2008-273)
- .4 Mould
  - .1 Refer to the Assessment Reports for identities and locations of potential mould-contaminated items. Although the Contractor is responsible to review this information in light of their proposed methods for completing the Work, a preliminary review indicates the following with respect to potential mould-contaminated items that require consideration:
    - .1 Old Detachment #1
      - .1 Moisture-stained ceiling tiles in various locations.
    - .2 RCMP Mobile Home #4

- .1 No mould and/or moisture-impacted building materials observed.
- .3 RCMP Mobile Home #5
  - .1 No mould and/or moisture-impacted building materials observed.
- .2 When demolition work within the subject building proceeds, the potential exists that mould and/or moisture-impacted building materials will be encountered and require removal, particularly with respect to moisture-impacted ceiling tiles. If impacted materials are identified and to be removed by hand, Contractor is responsible to notify workers of the potential presence of mould, and provide workers with respiratory protection and/or other personal protective equipment as deemed necessary for the work that they will be conducting.
- .3 If significant mould contamination is identified in concealed locations, an experienced mould abatement contractor may be required to assist with removal in accordance with applicable guidelines and standards for such work.
- .5 Mercury
  - .1 Refer to the Assessment Reports for identities and locations of mercury-containing items. Although the Contractor is responsible to review this information in light of their proposed methods for completing the Work, a preliminary review indicates the following with respect to potential mercury-containing items that require consideration:
    - .1 Old Detachment #1
      - .1 Mercury vapour is present in the light tubes within approximately 70 fluorescent light fixtures.
      - .2 One mercury-containing thermostat was identified on the main floor, general office, on the wall adjacent to the male washroom.
    - .2 RCMP Mobile Home #4
      - .1 Mercury vapour is present in compact fluorescent light bulbs within approximately 10 fluorescent light fixtures.
      - .2 One mercury-containing thermostat was identified in the living room on the wall opposite to the front door.
    - .3 RCMP Mobile Home #5
      - .1 No mercury-containing items observed.
  - .2 When mercury-containing items are removed (e.g. fluorescent light tubes and thermostats), ensure all mercury waste is handled, stored and disposed of in accordance with the requirements the following:
    - .1 The transportation and disposal requirements of BC Reg. 63/88.
    - .2 The transportation requirements of the Federal Transportation of Dangerous Goods Regulation.
  - .3 Precautions should be taken if workers may potentially be exposed to mercury or mercury vapours to ensure that workers exposure levels do not exceed the occupational exposure limit of 0.025 mg/m<sup>3</sup> as per the COHSR and BC Reg. 296/97. This can be achieved by providing respiratory and skin protection applicable to the hazard and task to be completed.

- .6 Ozone-Depleting Substances (ODSs)
  - .1 Refer to the Assessment Reports for identities and locations of potential ODS-containing equipment. Although the Contractor is responsible to review this information in light of their proposed methods for completing the Work, a preliminary review indicates the following with respect to ODS-containing items that require consideration:
    - .1 Old Detachment #1
      - .1 Climette wall mounted A/C unit (R-22/18oz) within the main floor, general office on the exterior perimeter wall
    - .2 RCM Mobile Home #4
      - .1 No ODS-containing equipment identified.
    - .3 RCM Mobile Home #5
      - .1 No ODS-containing equipment identified.
  - .2 When ODS-containing equipment is to be removed, ODSs must be recovered, handled, recycled, stored, and/or disposed of in accordance with the requirements of the following:
    - .1 British Columbia Waste Management Act—Ozone Depleting Substances and Other Halocarbons Regulation (BC Reg. 387/99 as amended by BC Reg. 109/2002)
    - .2 Transportation requirements of the Federal Transportation of Dangerous Goods Regulation
    - .3 Federal Halocarbons Regulations (July 2003)
- .7 Silica
  - .1 Refer to the Assessment Reports for identities and locations of silica-containing materials. Although the Contractor is responsible to review this information in light of their proposed methods for completing the Work, a preliminary review indicates the following with respect to silica-containing materials that require consideration:
    - .1 Old Detachment #1
      - .1 Silica is expected to be present in cement products such as: concrete—foundations, floors, walls, blocks, masonry units and associated mortar, cement panels, gypsum and associated wall/ceiling finish materials, suspended ceiling tiles and asphalt and asphalt products containing rock or stone (e.g., roof membrane).
    - .2 RCMP Mobile Home #4
      - .1 Silica is expected to be present in cement products such as: concrete—foundations, floors, panels, gypsum and associated wall/ceiling finish materials.
    - .3 RCMP Mobile Home #5
      - .1 Silica is expected to be present in cement products such as: concrete—foundations, floors, panels, gypsum and associated wall/ceiling finish materials, ceiling tiles and asphalt and asphalt products containing rock or stone (e.g., roof shingles).
  - .2 When silica-containing materials are to be disturbed and/or removed (e.g., demolition of concrete slabs, masonry or concrete units, removal of

gypsum board/plaster walls, impacts to stucco-like wall or ceiling coatings, etc.), ensure dust control measures are employed such that airborne silica dust concentrations do not exceed the exposure limit as stipulated by the COHSR and BC Reg. 296/97. (Cristobalite and Quartz – each 0.025 mg/m<sup>3</sup>). This would include, but not be limited to, the following:

- .1 Providing workers with respiratory protection
- .2 Wetting the surface of the materials, use of water or dust suppressing agents to prevent dust emissions
- .3 Providing workers with facilities to properly wash prior to exiting the work area.

### **3.2 DISPOSAL**

- .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
- .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
- .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
- .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
- .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
- .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
- .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.
- .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
  - .1 Hazardous wastes recycled in manner constituting disposal.
  - .2 Hazardous waste burned for energy recovery.
  - .3 Lead-acid battery recycling.
  - .4 Hazardous wastes with economically recoverable precious metals.

### **3.3 CLEANING**

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

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1      Section 03 20 00: Concrete Reinforcing.
- .2      Section 03 30 00: Cast-in-Place Concrete.

**1.2                REFERENCES**

- .1      All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2      Canadian Standards Association (CSA International):
  - .1      CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2      CSA O86, Engineering Design in Wood.
  - .3      CSA O121, Douglas Fir Plywood.
  - .4      CSA 0141, Softwood Lumber.
  - .5      CSA O151, Canadian Softwood Plywood.
  - .6      CSA O153, Poplar Plywood.
  - .7      CSA O325.0, Construction Sheathing.
  - .8      CSA O437 Series, Standards for OSB and Waferboard.
  - .9      CSA S269.1, Falsework and Formwork
- .3      American Concrete Institute (ACI):
  - .1      ACI 117, Specification for Tolerances for Concrete Construction and Materials.
  - .2      ACI 347, Guide to Formwork for Concrete.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

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

**Part 2            Products**

**2.1                DESIGN REQUIREMENTS**

- .1      Design in accordance with CSA S269.1 - Falsework and Formwork.
- .2      The Departmental Representative accepts no responsibility for structural adequacy of formwork, falsework and re-shoring and will not review its design.

**2.2                MATERIALS**

- .1      Formwork materials: to CSA S269.1 - Falsework and Formwork.
  - .1      Use wood and wood product formwork materials to CSA O121, CSA 0141, CSA O437 or CSA-O153.
  - .2      Form liner: high density overlay plywood to CSA O121 or other special materials to achieve the required concrete finish.



- .3 Form stripping agent: colourless mineral oil, non-toxic, low VOC, free of kerosene, with viscosity between 15 to 24 mm<sup>2</sup>/s (70 and 110s Saybolt Universal) at 40°C, flashpoint minimum 150°C, open cup.
- .4 Grooves, reglets and chamfers: White pine selected for straightness and accurately dressed to size.
- .2 Compressible filler: flexible polyethylene closed cell expansion joint filler to ASTM D 4819, type II.

### **Part 3 Execution**

#### **3.1 FABRICATION AND ERECTION**

- .1 Confirm to CSA A23.1 - Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 Fabricate and erect formwork in accordance with CSA S269.1 - Falsework and Formwork to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1/A23.2.
- .3 Make formwork tight and flush faced to prevent the leakage of mortar and the creation of unspecified fins or panel outlines.
- .4 Do not permit loads from formwork to be transmitted to adjacent existing structure.
- .5 Apply a form coating and release agent uniformly to the contact surface of formwork panels before reuse.
- .6 Use 25 mm (1") chamfer strips on external corners and 25 mm (1") fillets at interior corners, unless specified otherwise.
- .7 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated on Architectural and Structural drawings.
- .8 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
- .9 Clean formwork in accordance with CSA A23.1/A23.2, before placing concrete.

#### **3.2 JOINTS**

- .1 Refer to Drawings Notes for locations, detailing and maximum spacing requirements of all concrete joints.
- .2 Refer to Section 03 30 00 - Cast-in-Place Concrete for construction joints and isolation joints.

#### **3.3 FIELD QUALITY CONTROL**

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

**END OF SECTION 03 10 00**

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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

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

**1.2                REFERENCES**

- .1    All referenced standards shall be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2    Canadian Standards Association (CSA International):
  - .1    CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2    CSA A23.3, Design of Concrete Structures.
  - .3    CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.
  - .4    CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .5    CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .3    Reinforcing Steel Institute of Canada (RSIC):
  - .1    Reinforcing Steel Manual of Standard Practice.
- .4    American Concrete Institute (ACI):
  - .1    SP-66, ACI Detailing Manual.
- .5    ASTM International Inc.:
  - .1    ASTM A1064/A1064M, Standard Specification for Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
  - .2    ASTM A775/A775M, Standard Specification for Epoxy-Coated Reinforcing Steel.
  - .3    ASTM D3963 / D3963M, Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
  - .4    ASTM A1044 / A1044M, Standard Specification for Steel Stud Assemblies for Shear Reinforcement of Concrete.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

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

**Part 2            Products**

**2.1                MATERIALS**

- .1    Reinforcing steel: carbon steel, deformed bars to CSA G30.18., unless indicated otherwise.
- .2    Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M.

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

**Part 3 Execution**

**3.1 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice.
- .2 Provide standard hooks at ends of all hooked bars.
- .3 Substitute different size bars only if permitted in writing by the Departmental Representative.

**3.2 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by the Departmental Representative.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure. Use tools which will limit bend radii to the values given in CSA A23.1.
- .3 Replace bars which develop cracks or splits.

**3.3 PLACING REINFORCEMENT**

- .1 Place reinforcing steel in accordance with CSA A23.1/A23.2.
- .2 Remove all loose scale, dirt, oil or other coatings which would reduce bond.
- .3 Ensure cover to reinforcement is maintained during concrete pour.
- .4 Support bars, chairs and spacers:
  - .1 Provide sufficient support bars, chairs, carriers and side form spacers as necessary to secure against displacement of reinforcement and maintain concrete cover before and during concrete placement. Support devices contacting surfaces exposed to the exterior to be non-corroding. Bars which are not shown on Structural Drawings and whose only function is supporting other reinforcing in lieu of other supporting devices to be considered accessories.
  - .2 Use bar supports for slabs.
  - .3 Use precast concrete chairs where supports rest on the ground.
- .5 Do not cut reinforcement without the Departmental Representative's written approval.
- .6 Obtain the Departmental Representative's field review of all reinforcing materials and placement before pouring concrete.

**END OF SECTION 03 20 00**

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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 03 10 00: Concrete Forming and Accessories.
- .2    Section 03 20 00: Concrete Reinforcing.

**1.2                REFERENCES**

- .1    All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2    Canadian Standards Association (CSA International):
  - .1    CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2    CSA A283, Qualification Code for Concrete Testing Laboratories.
  - .3    CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .3    ASTM International Inc.:
  - .1    ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - .2    ASTM C920 – Standard Specification for Elastomeric Joint Sealants
  - .3    ASTM D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
  - .4    ASTM E1155M Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Number (Metric)
- .4    Canadian General Standards Board (CGSB):
  - .1    CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

**1.3                QUALITY ASSURANCE**

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

**1.4                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2    Minimum 2 weeks prior to starting concrete work, submit concrete mix design.
- .3    Minimum submission requirements for each concrete mix design shall include the following:
  - .1    Minimum specified compressive strength at 28 days (or at the time specified on drawings).
  - .2    Maximum aggregate size.

- .3 CSA exposure class.
- .4 Percentage and type of supplemental cementing materials.
- .5 Maximum water/cementitious materials ratio.
- .6 Corrosion inhibitor (name and quantity, if applicable).
- .7 Maximum time from batching to placing concrete (if retarding admixtures are used).

## **Part 2 Products**

### **2.1 DESIGN CRITERIA**

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

### **2.2 PERFORMANCE CRITERIA**

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

### **2.3 MATERIALS**

- .1 Portland cement: to CSA A3001.
- .2 Cementitious hydraulic slag: to CSA A3000.
- .3 Fly ash: to CSA A3001, Type CI.
- .4 Water: to CSA A23.1.
- .5 Aggregates: to CSA A23.1/A23.2. Do not use recycled concrete as aggregate.
- .6 Admixtures: not to contain chlorides.
- .7 Corrosion-inhibiting admixture: calcium nitrite solution.
- .8 Curing/sealing compound: to CSA A23.1/A23.2 and ASTM C309, Type 1, Class B, water based acrylic, compatible with surface hardener where hardener is used.
- .9 Pre-moulded joint fillers: min. 12 (1/2") bituminous impregnated fiber board to ASTM D1751.
- .10 Joint Sealants: to AST C920, class 100/50.
- .11 Penetrating sealer: water based, clear water repellent, at least equivalent to AT&U Type 1b as specified in Alberta Infrastructure and Transportation Publication B388.
- .12 Crack Filler: low viscosity epoxy resin

### **2.4 CONCRETE MIXES**

- .1 Use ready-mix concrete. Proportion concrete in accordance with CSA A23.1, Alternative 1 - Performance Method for Specifying Concrete.
- .2 Set performance characteristics of concrete in plastic state in coordination with all trades involved.
- .3 Meet performance criteria of concrete in hardened state as shown on Structural Drawings and provide verification of compliance.
- .4 Do not use admixtures containing chlorides.

- .5 Supplementary cementing materials (SCM):
  - .1 Conform to CSA A23.1.
  - .2 Follow slag and fly ash manufacturers' directions for proportioning and mixing of concrete.
  - .3 Do not use concrete with more than 40% of SCM when ambient temperature is forecast to be below +10°C at the time of concrete pour and during the seven days after the pour.

### **Part 3 Execution**

#### **3.1 PREPARATION**

- .1 Provide advanced notice as indicated on drawings to allow the Departmental Representative's field review of reinforcing prior to placing of concrete.
- .2 Obtain the Departmental Representative's written approval before placing concrete.
- .3 Remove water and disturbed soil from excavations before placing concrete.
- .4 Before placing slab-on-grade, confirm that subgrade and backfill meet specifications and are free of frost and surface water.
- .5 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

#### **3.2 PLACING CONCRETE**

- .1 Place concrete in accordance with CSA A23.1.
- .2 Delivery and place concrete with minimum re-handling.
- .3 If concrete is pumped or placed pneumatically, control discharge velocity to prevent separation or scattering of concrete mix ingredients.
- .4 Place concrete in a continuous operation without cold joints. If cold joints develop inadvertently, notify the Departmental Representative to obtain instructions for required remedial work.
- .5 Cast slabs with a top surface that is level or sloping as required by the Drawings.
- .6 Concrete exposed to view:
  - .1 Exposed surfaces to be dense, even, uniform in colour, texture and distribution of exposed aggregate.
  - .2 Defects such as honeycombing, voids, loss of fines, visible flow lines, cold joints or excessive bug holes may be cause for rejection at the discretion of the Architect.

#### **3.3 FINISHING CONCRETE**

- .1 Finish concrete to CSA A23.1/A23.2.
- .2 Cooperate with any trade applying finishes to concrete surfaces and provide surfaces which will ensure adequate bond.
- .3 Finishing Flatwork:
  - .1 Protect concrete during finishing process. Use evaporation reducer during severe drying conditions.
  - .2 Provide final finish in accordance with proposed use and as follows:

- .1 Wood float finish with brooming for exterior exposed slabs.
- .4 Finishing Formed Surfaces:
  - .1 Do not patch surfaces until instructed in writing by the Departmental Representative.
  - .2 Concrete exposed to view:
    - .1 Provide smooth-form finish.
    - .2 Rub exposed sharp edges with carborundum to produce 3 mm (1/8") radius edges unless otherwise indicated.

### **3.4 CONCRETE CURING AND PROTECTION**

- .1 At a minimum cure and protect concrete in accordance with CSA A23.1
- .2 For concrete containing supplementary cementing materials, curing and protection times may need to be extended beyond those outlined by CSA A23.1 to achieve the required structural properties.
- .3 Cure slab surfaces immediately after finishing is completed.
- .4 Concrete exposed to view:
  - .1 Protect during construction period from wear, damage, marking, discolouration, staining and becoming coated with concrete leakage.
  - .2 Unless rejected, repair damage and remove marks and stains to the approval of the Architect.
- .5 Do not load concrete until sufficient strength is developed.

### **3.5 SLABS ON GRADE**

- .1 Isolation Joints:
  - .1 Unless otherwise shown on structural drawings, provide min. 10 mm (3/8") thick pre-moulded joint filler of the same depth as the thickness of the concrete wherever slabs-on-grade abut foundation walls, and where noted. Omit if slab is chased or dowelled into structure.
  - .2 Furnish filler for each joint in single piece for depth and width required for joint.
  - .3 When more than one piece of filler is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .2 Cracks in Slabs-on-Grade:
  - .1 Extensive cracking of slabs-on-grade or cracks in excess of 3 mm (1/8") in width may be cause for rejection of slab or portion of slab at the Architect's discretion.
  - .2 Protect edges of cracks in slabs-on-grade from breakage.
  - .3 Exposed slab on grade: Unless slab is rejected, repair cracks that are over 0.4 mm (0.016") wide:
    - .1 Fill cracks with a sand-cement grout after concrete is at least 120 days old.
    - .2 Seven days later, cut out top 20 mm (3/4") of crack for a width of 5 mm (3/16") and fill with control joint filler.

### **3.6 PENETRATING SEALER**

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

- .2 Surfaces to be treated with the sealer to be dry and free of dirt and other contaminants.
- .3 Completely remove all curing compounds before the sealer application.
- .4 Follow manufacturer's recommendations for coverage rate and application procedure.
- .5 Do not apply in inclement weather or if ambient air temperature or concrete surface temperature is less than 5°C or more than 38°C.

### **3.7 EXISTING STRUCTURE**

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

### **3.8 INSPECTION AND TESTING**

- .1 An independent Inspection and Testing Agency (certified under CSA A283 with category to suit testing provided) paid for by the Contractor will be appointed to carry out inspection and testing of concrete and concrete materials and check conformance with applicable Standards and Contract documents.
- .2 Assist the Inspection and Testing Agency in its work. Notify as to the Work Schedule and provide safe access to the work area as required. Provide concrete samples.
- .3 The Agency will submit reports covering the work inspected and the testing performed. The reports will include the Supplier's mix design numbers, locations in structure to which the tests relate and comments on abnormal results and conditions. The reports will be provided not later than five working days after the testing is completed.
- .4 Sampling, storing, curing and testing of concrete will be in accordance with CSA A23.1/A23.2.
- .5 The Agency will review all submittals pertaining to concrete mix designs and certification of plant, equipment and materials.
- .6 Compressive Strength Testing:
  - .1 One test is required for each 100 cubic meters of placed concrete, but not less than one test for each concrete mix placed each day.
  - .2 A group of three cylinders for each test will be provided, Location of concrete placement will be recorded for each cylinder set. One specimens will be tested at 7 and one at 28 days. The third specimen will be tested at 56 days if the required strength at 28 days is not achieved.
  - .3 If the final concrete strength is specified at 56, 90 or 120 days, a group of four cylinders will be provided. One specimen will be tested at 7 and one at 28 days, with the third specimen tested at the time the final concrete strength is specified. If the required strength is not achieved at the time specified, the fourth specimen will be tested 28 days later.
  - .4 One additional cylinder will be provided for each concrete mix during cold weather concreting. The specimens will be cured on site adjacent to and under the same conditions as the work they represent, and will be tested prior to form removal.
- .7 Inspection and testing by the Agency will not augment or replace the Contractor's quality control nor relieve him of his contractual responsibility.

**END OF SECTION 03 30 00**



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**Part 1            General**

**1.1                SUMMARY**

- .1    Section Includes: drilled in anchors for concrete.
- .2    Related Sections:
  - .1    Division 6 Wood, Plastics, and Composites.

**1.2                SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
  - .1    Product specifications with recommended design values and physical characteristics for mechanical anchors.
  - .2    Quality Assurance Submittals:
    - .1    Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
    - .3    Manufacturer's installation instructions.
    - .4    Installer Qualifications & Procedures: Submit installer qualifications as stated in Section 1.3.2. Submit a letter of procedure stating method of drilling, the product proposed for use, the complete installation procedure, manufacturer training date, and a list of the personnel to be trained on anchor installation.
  - .2    Closeout Submittals: Submit the following:
    - .1    Record Documents: Project record documents for installed materials in accordance with Division 1 Closeout Submittals Section.

**1.3                QUALITY ASSURANCE**

- .1    Installer Qualifications:
  - .1    Drilled-in anchors shall be installed by a contractor with at least three years of experience performing similar installations.
- .2    Installer Training: Conduct a thorough training with the manufacturer or the manufacturer's representative for the contractor on the project. Training to consist of a review of the complete installation process for drilled-in anchors, to include but not limited to:
  - .1    hole drilling procedure
  - .2    hole preparation & cleaning technique

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1    Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

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**Part 2            Products**

**2.1                MATERIALS**

- .1    Fasteners and Anchors:
  - .1    Carbon and Alloy Steel Nuts: ASTM A563.
  - .2    Carbon Steel Washers: ASTM F436.
  - .3    Carbon Steel Threaded Rod: ASTM A36; or ASTM A193 Grade B7; or ISO 898 Class 5.8.
  - .4    Wedge Anchors: ASTM A510; or ASTM A108.
  - .5    Stainless Steel Bolts, Hex Cap Screws, and Studs: ASTM F593.
  - .6    Stainless Steel Nuts: ASTM F594.
  - .7    Zinc Plating: ASTM B633.
  - .8    Metric Anchor Bolts, Screws, and Studs: ISO 898 Part 1.
  - .9    Metric Anchor Nuts: EN 24033.
  - .10   Metric Anchor Stainless Steel Bolts, Screws, and Studs: ISO 3506 Part 1.
  - .11   Metric Anchor Stainless Steel Nuts: ISO 3506 Part 2.

**2.2                DRILLED-IN ANCHORS**

- .1    Wedge Expansion Anchors: Wedge type, torque-controlled, with impact section to prevent thread damage complete with required nuts and washers. Provide anchors with length identification markings. Type and size as indicated on Drawings.
  - .1    Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1).
  - .2    Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 316 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. Stainless steel nuts shall conform to ASTM F594 unless otherwise specified.
- .2    Screw Anchors: screw type. Pre-drilling of the hole requires a standard ANSI drill bit with the same diameter as the anchor and installing the anchor will be done with an impact wrench. Provide anchors with a diameter and anchor length marking on the head. Type and size as indicated on Drawings.
  - .1    Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors with zinc plating equivalent to DIN EN ISO 4042 (8µm min.).

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**Part 3 Execution**

**3.1 INSTALLATION**

.1 Drilled-In Anchors:

.1 Drill holes with rotary impact hammer drills using carbide-tipped bits, hollow drill bit system, or core drills using diamond core bits, and as per manufacturer's instructions. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.

.1 Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in drilling to avoid damaging existing reinforcing or embedded items. Notify the Departmental Representative if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging electrical and telecommunications conduit, and gas lines.

.2 Perform anchor installation in accordance with manufacturer instructions.

.3 Wedge Anchors: Protect threads from damage during anchor installation. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10% of the specified torque, 100% of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Departmental Representative .

**3.2 REPAIR OF DEFECTIVE WORK**

.1 Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 05 05 19 Post-installed Concrete Anchors

**1.2                REFERENCE STANDARDS**

- .1            All referenced standards shall be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2            CSA Group (CSA)
  - .1            CSA B111, Wire Nails, Spikes and Staples.
  - .2            CSA O121, Douglas Fir Plywood.
  - .3            CSA O141, Softwood Lumber.
  - .4            CSA O151, Canadian Softwood Plywood.
  - .5            CAN/CSA-O325, Construction Sheathing.
  - .6            CAN/CSA-Z809, Sustainable Forest Management.
- .3            National Research Council Canada (NRC)
  - .1            National Building Code of Canada (NBC).
- .4            Forest Stewardship Council (FSC)
  - .1            FSC-STD-01-001, FSC Principle and Criteria for Forest Stewardship.
- .5            Green Seal Environmental Standards (GS)
  - .1            GS-11, Paints and Coatings.
- .6            National Lumber Grades Authority (NLGA)
  - .1            Standard Grading Rules for Canadian Lumber.
- .7            South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1            SCAQMD Rule 1113, Architectural Coatings.
- .8            Sustainable Forestry Initiative (SFI)
  - .1            SFI Standard.

**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 rough carpentry work and include product characteristics, performance criteria, physical size, finish and limitations.

#### **1.4 QUALITY ASSURANCE**

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by grade mark in accordance with applicable CSA standards.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect wood from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of packaging materials as specified in accordance with Section 01 74 19 – Construction Waste and Disposal.

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
  - .1 CAN/CSA-O141.
  - .2 NLGA Standard Grading Rules for Canadian Lumber.
  - .3 CAN/CSA-Z809 or FSC or SFI certified.
- .2 Panel Materials:
  - .1 Douglas fir plywood (DFP): to CSA O121, standard construction.
    - .1 Urea-formaldehyde free.

#### **2.2 ACCESSORIES**

- .1 Fasteners: to CAN/CSA-G164, for exterior work unless noted otherwise.
- .2 Nails, spikes and staples: to CSA B111.
- .3 Bolts: 12.7 mm diameter unless indicated otherwise, complete with nuts and washers.

**Part 3 Execution**

**3.1 EXAMINATION**

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

**3.2 PREPARATION**

- .1 Treat material where indicated on drawings.
- .2 Treat surfaces of material with wood preservative, before installation.
- .3 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and 1 minute soak on plywood.
- .4 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

**3.3 INSTALLATION**

- .1 Comply with requirements of National Building Code of Canada (NBC), supplemented by the following paragraphs.
- .2 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.
- .3 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .5 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.
- .6 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation for roof hopper.
- .7 Install sleepers as indicated.
- .8 Use caution when working with particle board. Use dust collectors and high-quality respirator masks.
- .9 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .10 Countersink bolts where necessary to provide clearance for other work.

**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.

**END OF SECTION**

**PART 1 General**

**1.1 SECTION INCLUDES**

- .1 Interior running wood trim, Window casings. Wood paneling

**1.2 RELATED SECTIONS**

- .1 Section 06 10 00 - Rough Carpentry.
- .2 Section 09 91 23 - Interior Painting.

**1.3 REFERENCES**

- .1 CAN/CSA O141-91(R1999), Softwood Lumber.
- .2 NLGA (National Lumber Grades Authority) - Standard Grading Rules for Canadian Lumber.
- .3 AWI / AWMAC QSI - Quality Standards Illustrated.
- .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

**1.4 SUBMITTALS**

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, surface graining elevations of sheet paneling, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- .3 Submit product data for Low-Emitting materials (coatings, composite wood products) for inclusion in Sustainability Binder. See section 01 35 21 Sustainability Requirements.

**1.5 QUALITY ASSURANCE**

- .1 Perform work in accordance with AWI /AWMAC QSI Custom Quality.
- .2 Health and safety requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- .1 Protect work from moisture damage.
- .2 Store materials in ventilated interior locations with constant minimum temperatures of 16 degrees C and maximum relative humidity of 55 percent.



## **1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal to the maximum extent economically possible.
- .2 Do not burn scrap at project site.

## **1.8 COORDINATION**

- .1 Coordinate the work with plumbing and electrical rough-in, installation of associated and adjacent components.

## **1.9 FIELD MEASUREMENTS**

- .1 Verify that field measurements are as on shop drawings instructed by the manufacturer.

## **PART 2 Products**

### **2.1 LUMBER MATERIALS**

- .1 Softwood lumber to CAN/CSA O141-91(R1999), Softwood Lumber.
- .2 Softwood lumber graded to NLGA standard grading rules for Canadian lumber
- .3 Standing and running trim: Kiln dried, pre primed, in profiles as indicated.

### **2.2 FASTENERS**

- .1 Fasteners: Of size and type to suit application

### **2.3 ACCESSORIES**

- .1 Wood Filler.

## **PART 3 Execution**

### **3.1 EXAMINATION**

- .1 Verify adequacy of backing and support framing.
- .2 Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

### **3.2 INSTALLATION**

- .1 Install work in accordance with AWI /AWMAC QSI Custom Quality Standard.
- .2 Set and secure materials and components in place, plumb and level.
- .3 Carefully scribe work abutting other components. Do not use additional overlay trim to conceal larger gaps.
- .4 Wood trim and bases shall be installed using the longest possible lumber lengths. Adjacent boards shall be selected and positioned for matching colour and grain. Butting joints shall be scarfed. Nails shall be set and holes filled to match wood colour.
- .5 Caulk all edge joints prior to finishing.

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### 3.3 STANDING AND RUNNING TRIM

- .1 Interior standing/running trim:
  - .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 Caulk junctions between standing/running trim and adjacent walls with sealant make junctions filled and smooth for "painting out".
  - .8 Co-ordinate application of 1st coat of finishes prior to installation.

### 3.4 ERECTION TOLERANCES

- .1 Maximum Variation from True Position: 1.5mm.
- .2 Maximum Offset from True Alignment with Abutting Materials: 0.7 mm.

END OF SECTION

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**Part 1            General**

**1.1                SECTION INCLUDES**

- .1      Custom shop fabricated cabinet units.
- .2      Countertops.
- .3      Cabinet hardware.

**1.2                RELATED SECTIONS**

- .1      Section 06 20 00 - Finish Carpentry
- .2      Section 09 91 23 - Interior Painting.

**1.3                REFERENCES**

- .1      BHMA A156.9-2010 - Cabinet Hardware.
- .2      NPA A208.2-2009 - Medium Density Fibreboard (MDF) for Interior Applications.
- .3      AWMAC - Architectural Woodwork Standards (AWS) – 1st Edition, 2009.
- .4      CAN/CSA O141-91(R1999), Softwood Lumber.
- .5      NLGA (National Lumber Grades Authority) - Standard Grading Rules for Canadian Lumber.
- .6      NEMA LD3-2005 - High Pressure Decorative Laminates (HPDL).
- .7      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
- .8      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.

**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 Section 01 61 00 - Common Product Requirements.

**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.
- .3 Softwood Lumber
  - .1 Kiln dried

**2.2 SHEET MATERIALS**

- .1 Sheet Materials: To the requirements of AWMAC custom grade.
- .2 Medium Density Fibreboard (MDF): NPA A208.2; composed of wood fibres, medium density, of grade to suit application.

**2.3 LAMINATE MATERIALS**

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

**2.4 ACCESSORIES**

- .1 Adhesive: Type recommended by laminate 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.

**2.5 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, curved profile, matt nickle finish; 127 mm length.
- .5 Catches: Magnetic.

- .6 Drawer Slides: Galvanized steel construction, ball bearings separating tracks, full extension type.
- .7 Hinges: European type, satin finish.

## **2.6 PLASTIC LAMINATE CASEWORK**

- .1 Cabinet Construction: Flush overlay, adjustable shelving MDF core.
- .2 Exposed Surfaces:
  - .1 Drawers and Drawer Fronts: High pressure laminate.
  - .2 Edges: PVC.
- .3 Semi-exposed Surfaces:
  - .1 Surfaces (other than drawer bodies) Thermofused melamine.
  - .2 Shelves: High pressure laminate.
  - .3 Edges: PVC.
  - .4 Drawer Sides and Backs: Edgebanded.
  - .5 Drawer Bottoms: Melamine.

## **2.7 PLASTIC LAMINATE COUNTERTOPS**

- .1 Comply with AWMAC Quality Standards, Custom grade requirements for counter construction supplemented as follows:
- .2 High Pressure Laminate: high pressure laminate, solid from standard colour range, with matte finish.
- .3 Edge Treatment: Solid wood, Bullnose profile.
- .4 Core Material: MDF.

## **2.8 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.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install Work to AWMAC Custom Grade.
- .2 Set and secure casework in place; rigid, plumb, and level.

- .3 Use fixture attachments in concealed locations for wall mounted components.
- .4 Use concealed joint fasteners to align and secure adjoining counter tops.
- .5 Secure cabinet to floor using appropriate angles and anchorages.

**3.2 ADJUSTING**

- .1 Test installed work for rigidity and ability to support loads.
- .2 Adjust moving or operating parts to function smoothly and correctly.

**3.3 CLEANING**

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

**END OF SECTION**

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**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.
- .3    Underwriters Laboratories of Canada (ULC)
  - .1    CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.

**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/Demolition 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    Blanket
  - .1    Pre formed semi rigid Mineral Wool insulation in batt form, unfaced, friction fit, to ASTM C665.
  - .2    Thermal resistance and sizes as indicated.
- .2    Board
  - .1    Mineral fibre board: to CAN/ULC-S702
    - .1    Type: 1
    - .2    Density: 128 kg/m<sup>3</sup>
    - .3    Surfaces: unsurfaced
    - .4    Thickness: 38.1mm
    - .5    Size: as detailed

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**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 GENERAL**

- .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.
- .3 Cut flat on table, do not trim in place
- .4 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .5 Fit insulation tight to windows and doors and other penetrations.
- .6 Do not compress insulation to fit into spaces.
- .7 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

**3.3 INSULATION INSTALLATION BOARD**

- .1 Install board installation inboard of batt insulation on interior of exterior wall assemblies.
- .2 Refer to details.

**3.4 INSULATION INSTALLATION BATT**

- .1 Install 7.5" mineral batt insulation in between trusses in the ceiling assembly.
- .2 Install 3.5" mineral batt insulation above 7.5" insulation- batts to be place perpendicular to the 7.5" batts.
- .3 Install 5.5" mineral batt insulation in all exterior wall cavities

**3.5 CLEANING**

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

**END OF SECTION**



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**Part 1            General**

**1.1                SECTION INCLUDES**

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

**1.2                RELATED SECTIONS**

- .1     Section 06 10 00 Rough Carpentry.
- .2     Section 07 92 00 Joint Sealant.
- .3     Section 07 21 13 Board Insulation

**1.3                REFERENCES**

- .1     American Society for Testing and Materials (ASTM):
  - .1     ASTM E 1745-09 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
  - .2     ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials.
- .2     Canadian General Standards Board (CGSB).
  - .1     CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
  - .2     CAN/CGSB 37-GP-56M, Standard for Modified Bituminous Sheet Membranes.
  - .3     CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
- .3     ASTM C1193 - Standard Guide for Use of Joint Sealants.
- .4     ASTM E96 - Test Methods for Water Vapour Transmission of Materials.

**1.4                DEFINITION**

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

**1.5                SUBMITTALS**

- .1     Section 01 33 00: Submission procedures.
- .2     Product Data: Provide data indicating material characteristics, performance criteria and limitations.
- .3     Manufacturer's Installation Instructions: Indicate preparation and installation requirements, techniques.

**1.6                WHMIS**

- .1     Comply with WHMIS requirements when handling 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.

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**Part 2            Products**

**2.1                SELF ADHESIVE MEMBRANE**

- .1    Modified Bituminous Membrane: Asphalt and polymer modifiers of styrene-butadiene-styrene (SBS) type, reinforced with non-woven cross laminated polyethylene; smooth surfaced; .8 mm thick; 920 mm wide roll. To CAN/CGSB 37-GP-56M.

**2.2                VAPOUR BARRIER**

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

**2.3                AIR BARRIERS**

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

**2.4                ACCESSORIES.**

- .1    Primer: Water based surface conditioner as recommended by self-adhesive membrane manufacturer.
- .2    Seam tape- proprietary moisture resistant pressure sensitive adhesive tape.

**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                SELF ADHESIVE MEMBRANE**

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

**3.4                VAPOUR BARRIER**

- .1    Install on interior wall and ceiling after installation of insulation.
- .2    Install preformed polyethylene vapour barrier box behind all electrical boxes in exterior wall. Staple and seal flanges to film vapour barrier.
- .3    Attach a 600 mm wide vertical strip of poly film on exterior wall at all locations where interior partitions will intersect.

- .4 Install vapour barrier using as large a sheet as possible to minimize seams.
- .5 Prior to installing vapour barrier, provide a continuous bead of acoustical sealant to perimeter of opening being covered and bed vapour barrier in sealant.
- .6 Attach with staples.
- .7 Provide a bead of sealant between all laps in vapour barrier and over solid blocking at all penetrations of vapour barrier.
- .8 Use of tape as a primary seal for vapour barrier is not acceptable.

### **3.5 AIR BARRIER**

- .1 Install one layer of air barrier to the exterior of the sheathing prior to cladding installation.
- .2 Install air barriers to produce both continuous water shedding barrier over sheathing, down onto metal wall flashings.
- .3 Install air barrier horizontally, starting from bottom of wall with each subsequent course shingle lapped over previous course to shed moisture down building/sheathing paper surface.
- .4 Overlap subsequent courses minimum 200 mm over previous courses and provide minimum 100 mm overlaps at course ends laps.
- .5 Attach air barrier to sheathing using sufficient quantities of staples to hold paper in place until covered by subsequent construction.
- .6 Seal vertical lap joints of each layer using continuous applications of tape.
- .7 Repair rips and tears in air barrier using continuous strips of tape. Repair large holes using patches of building/sheathing paper stapled in place with all edges tape sealed.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

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

**1.2 REFERENCES**

- .1 ASTM International Inc.
  - .1 ASTM D3018-03(2009), Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules.
  - .2 ASTM D3161-09, Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method).
  - .3 ASTM D3462-09, Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
  - .4 ASTM E108-07a, Standard Test Methods for Fire Tests of Roof Coverings.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-A123.1/A123.5-05, Asphalt Shingles Made From Organic Felt and Surfaced With Mineral Granules / Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules.
- .4 NBC, National Building Code of Canada (issue date listed in Section 01 41 00 - Regulatory Requirements).
- .5 Roofing Contractors Association of British Columbia (RCABC).
  - .1 RGC, RCABC Guarantee Corporation.
  - .2 RGC Manual, RGC Roofing Practices Manual published by RCABC.
- .6 Underwriters Laboratories' of Canada (ULC)
  - .1 UL2218-2002, Impact Resistance of Prepared Roof Covering Materials.

**1.3 QUALITY ASSURANCE**

- .1 Do Work in accordance with latest standards published in RGC Manual.
- .2 Follow respective asphalt shingle manufacturer installation requirements in order to provide required product guarantees wherever such requirements are more stringent than those published in RGC Manual.
- .3 Health and safety requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

#### **1.4 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide copies of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Provide copies of WHMIS MSDS in accordance with Section 01 35 30 - Health and Safety Requirements and indicate VOC content for all products used in the work.
    - .1 Indicate precautions for workers when handling roofing materials, sealants and mastics.
- .3 Samples: submit samples of accessories proposed for use in Work upon Departmental Representatives request.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and the requirements of Section 01 61 00 Common Product Requirements.
- .2 Storage and Handling Requirements:
  - .1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.
  - .2 Provide and maintain dry, off-ground weatherproof storage.
  - .3 Store shingles in heated enclosures prior to use where climatic conditions necessitate and as recommended by the manufacturer; bring only enough bundles for immediate use to work area.
  - .4 Remove only in quantities required for same day use.
  - .5 If required place plywood runways over completed Work to enable movement of material and other traffic.
  - .6 Store sealants at +5 degrees C minimum.
  - .7 Lay out base and cap sheets and allow to flatten uncurl before attempting installation.
  - .8 Avoid prolonged exposure of light and heat sensitive materials to sunlight.
  - .9 Store combustible materials away from heat and open flame.
  - .10 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
  - .11 Fold up metal banding, flatten and place in designated area for recycling.

#### **1.6 WHMIS**

- .1 Comply with WHMIS requirements when handling primers and mastics.

#### **1.7 SITE CONDITIONS**

- .1 Do not perform work during inclement weather.

- .2 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.
- .3 Do not expose material vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
- .4 Consult shingle manufacturer minimum ambient application temperature for cold weather applications and do not carry out roofing work when ambient temperature is less than 0 degrees C.

## **1.8 PROJECT REQUIREMENTS**

- .1 Protect surrounding surfaces from damage during roofing work. Where hoisting is necessary, hang tarpaulins to protect walls during delivery of materials from ground to roof level. Protect existing roofing from traffic damage by installing temporary mats or plywood.
- .2 Where work must continue over new installed roofing, protect surfaces with plywood sheets. Arrange sheets to avoid tripping hazards. Weigh down sheets to prevent dislocation by wind uplift.
- .3 Do not store materials on roof in concentrations which exceed roof design live load.
- .4 Locate equipment and roofing materials to provide minimum interference and maximum useable space around job site.

## **1.9 WASTE MANAGEMENT**

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

## **1.10 WARRANTY**

- .1 For Work of this Section 07 31 13 – Asphalt Shingle Roofing, 12 months warranty period is extended to:
  - .1 60 months for installations remaining in place and maintaining leakproof assemblies.
  - .2 Warranty to be in form of manufacturers warranty.
  - .3 120 months for shingle materials being free from manufacturing defects. Defective products to be corrected, replaced or maintained without cost to Canada as necessary to enable such products to perform as warranted.
- .2 Start warranties at date of Final Certificate of Completion.

## **1.11 CLOSEOUT SUBMITTALS**

- .1 Provide following in accordance with Section 01 78 00 - Closeout Submittals.
  - .1 2 unopened bundles of each colour of asphalt shingles installed for maintenance use.

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**Part 2            Products**

**2.1                MATERIALS**

- .1 Asphalt shingles: to ASTM D3018 Type 1 and CAN/CSA-A123.1/A123.5.
  - .1 Description: styrene butadiene styrene (SBS) coated glass fibre mat, laminated design, with heat-activated self-sealing and algae-block coating.
  - .2 Exposure: 140 mm to 145 mm.
  - .3 Fire resistance (ASTM E108): Class A.
  - .4 Wind resistance (ASTM D3161Class F): passes 177 km/h (110 mph) test.
  - .5 Impact resistance (UL2218): Class 4.
  - .6 Additional features:
    - .1 Larger nailing area design to eliminate troughing effect which allows water to run sideways creating a source for leaks.
    - .2 2 rubber modified rain seals to prevent water from blowing up behind shim.
  - .7 Colours: selected by Departmental Representative.
  
- .2 Ridge/hip shingles:
  - .1 Description: styrene butadiene styrene (SBS) coated glass fibre mat high profile decorative cap.
  - .2 Width: 254 mm.
  - .3 Fire resistance (ASTM E108): Class A.
  - .4 Wind resistance (ASTM D3161Class F): passes 177 km/h (110 mph) test.
  - .5 Additional features: integral seal down strips.
  - .6 Colours: selected by Departmental Representative.
  
- .3 Ever protection underlayment: 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; incorporating an edge bead of rubberized asphalt, or sealant at laps to seal at joints, top surface embossed (textured) to provide some slip resistance for workers during installation, bottom protected with silicone release sheet, with companion surface primer for attachment to substrates.

**2.2                ACCESSORIES**

- .1 Fasteners
  - .1 Roofing nails: styles, sizes and lengths recommended by shingle manufacturer for conditions and substrates applicable, stainless steel alloy only.
  
- .2 Cement: Cement: CGSB 37-GP-5M plastic cement, compatible with shingle.

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**Part 3 Execution**

**3.1 PREPARATION**

- .1 Ensure roof is clean and dry before application of membrane.

**3.2 MANUFACTURER INSTRUCTIONS**

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

**3.3 WORKMANSHIP**

- .1 All materials must be dry (as manufactured) at time of application.
- .2 Complete roofing on same day started.
- .3 Perform moisture checks using an electronic moisture meter if work underway has become wet. Do not continue roofing until moisture content is reduced to acceptable levels.
- .4 Ensure that inspections have been completed and defects corrected before starting each subsequent stage of roofing.

**3.4 INSTALLATION**

- .1 Eave protection:
  - .1 Install over primed and prepared wooden roof decks using self adhesive properties, with all laps sealed.
- .2 Drip flashings, drip edges:
  - .1 Accommodate installation of purpose-made metal flashings along roof edges.
  - .2 Refer to details.
- .3 Asphalt shingles:
  - .1 Start at lowest point with starter course.
  - .2 Install to meet RGC requirements and shingle manufacturer requirements, whichever more stringent.
  - .3 Form valleys using Open Valley method, in accordance with RGC Manual Figure 7.1.5.1.
  - .4 Install ridge shingles to manufacturer requirements to finish roof ridge lines.

**3.5 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**

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**Part 1            General**

**1.1                RELATED SECTIONS**

- .1        Section 07 62 00 – Sheet Metal Flashings and Trims: wall flashings.
- .2        Section 08 53 13 – Fiberglass Windows

**1.2                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).

**1.3                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.
- .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 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

**1.4                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 Include at least one window installation in mock up specified above.
- .3 Notify Departmental Representative at least 5 working days in advance to review mock-ups.
- .4 Allow 2 working days for Departmental Representative to inspect mock-ups.
- .5 Approved mock-ups will establish minimum acceptable standard for remaining work.
- .6 Approved mock-ups may form part of Work.

### **1.5 DELIVERY, STORAGE AND HANDLING**

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

### **1.6 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.

### **1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 Construction/Demolition Waste and Disposal.

### **1.8 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.

### **1.9 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 Lap siding.
  - .2 Thickness: 8 mm.

- .3 Exposed face: smooth.
- .4 Finish: pre-finished factory-applied 3 coat baked on paint system in standard available colour to be approved by Departmental Representative. Each board factory protected with plastic film prior to shipping.
  - .1 Pre finished siding to be “Stone Grey” or equivalent
- .2 Trim materials
  - .1 Lumber: softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
    - .1 CSA O141.
    - .2 NLGA Standard Grading Rules for Canadian Lumber.
    - .3 Tight grain, appearance grade, SPF
    - .4 Comb face appearance
    - .5 Factory pre primed on all 4 sides
    - .6 Refer to details for dimensions and profiles
  - .3 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.
  - .4 Screws:
    - .1 Ceramic coated steel alloy socket drive (Robertson) flat head deck screws of lengths recommended by panel manufacturer for permanent attachment of trims to substrates.
  - .5 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.
  - .6 Touch-up paint: siding/panel manufacturer formulation for exact touch-up/repair of pre-finished siding/panels.
  - .7 Accessories: Aluminum bug screen closure custom fabricated for soffit venting 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 Coordinate siding installation with the installation of flashing, doors and windows
- .2 Use maximum size material at each location to prevent or minimize joints.
- .3 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.
- .4 Remove factory protective film immediately after installation of each board to ensure full protection of pre-finish coating during siding/panel handling and installation.
- .5 Siding:
  - .1 Install to match approved site mock-ups.
  - .2 Blind nail in place.
  - .3 Stagger end joints in adjacent coursing so as not to be apparent in finished installation.
  - .4 Provide and install siding starter strips required for start of siding installations.
  - .5 Install horizontal and true to line of building with even aligned coursing across all wall planes.
  - .6 Install lap siding with 6" exposure.
- .6 Soffits
  - .1 Install soffit venting as detailed
  - .2 Face nail comb face material to manufacturers recommendations
- .7 Trim:
  - .1 Nail and screw in place as detailed
- .8 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 Progress Cleaning:
  - .1 Remove dirt and marks caused by installation.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

- .3 Waste Management: separate waste materials for recycling.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.4 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by mineral fibre reinforced panel installation.

**END OF SECTION**

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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 07 31 13 - Asphalt Shingles.
- .2    Section 07 44 56 - Fibre Reinforced Cementitious Siding.
- .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 D523-89(1999), Standard Test Method for Specular Gloss.
  - .4    ASTM D822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
  - .5    ASTM C920-08, Standard Specification for Elastomeric Joint Sealants.
- .2    Aluminum Association (AA)
  - .1    AA DAF 45-03(R2009), Designation System for Aluminum Finishes.
- .3    American Architectural Manufacturers Association (AAMA)
  - .1    AAMA 611-98, Voluntary Specifications for Anodized Finishes Architectural Aluminum.
- .4    Roofing Contractors Association of B.C. (RCABC)
  - .1    RGC Manual, RGC Roofing Practices Manual published by RCABC.
- .5    NBC, National Building Code of Canada (issue date listed in Section 01 41 00 Regulatory Requirements)

**1.3                SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1    Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Samples:
  - .1    Submit duplicate samples of each type of sheet metal material, finishes and colours for Departmental Representative colour selection.

#### **1.4 QUALITY CONTROL**

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

#### **1.5 PERFORMANCE REQUIREMENTS**

- .1 Provide metal flashings that will withstand wind uplift conditions listed in NBC for building location, unless more stringent values are identified on drawings.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements unless more stringent care is required by respective material manufacturer.
- .2 Protect pre-finished materials from scratching
- .3 Stack pre-formed materials in manner to prevent twisting, bending and rubbing.

#### **1.7 WASTE MANAGEMENT AND DISPOSAL:**

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

### **Part 2 Products**

- .1 Zinc coated sheet steel: to ASTM A653/A653M, commercial quality, Grade 33, with not less than Z275 designation zinc coating, pre-finished.
  - .1 Pre-finish: coil stock finished with polyvinylidene fluoride gloss paint on epoxy primer prior to profile fabrication, with colour coat containing not less than 70% pvdf resin. Include permanent-type treatment to reverse side of coil stock to prevent corrosion of backside surfaces.
    - .1 Specular gloss: 30 units +/- in accordance with ASTM D523.
    - .2 Coating thickness: not less than 22 micrometres
    - .3 Resistance to accelerated weathering for chalk rating of 8, colour fade 5units or less and erosion rate less than 20% to ASTM D822 as follows:
      - .1 Outdoor exposure period 2500 hours
      - .2 Humidity resistance exposure period 5000 hours
    - .4 Colours: As selected by Departmental Representative. Colours to match building
  - .2 Sheet steel to be produced by North American mills to ensure compliance with above-referenced standards. Submit evidence of North American mill source upon Departmental Representative request.
- .2 Touch-up paint: type compatible with and matching pre-finish paint/colour.
- .3 Flashing nails: annular ringed, with integral rubber sealing washers.
  - .1 Stainless steel alloy where used at pressure treated wood.
  - .2 Hot dip galvanized steel where used in untreated wood



- .4 Sealants: non-sag polyurethane, one part formulation, to ASTM C 920 Type S, Grade NS, Class 35, Use NT, M, A and O; colours selected by DCC Representative where exposed to view.
- .5 Self-adhesive SBS membrane: minimum 1 mm thick self-adhering composite sheet membrane comprised of 0.8 mm thick rubberized asphalt integrally bonded to 0.1 mm thick film of polyethylene, bottom surface protected with silicone release sheet.

## **2.2 FABRICATION OF FLASHING**

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

## **2.3 RAINWARE**

- .1 Gutters: continuous die formed pre-finished aluminum sheet fabrications, not less than 0.80 mm metal thickness. Dimensions; 100 mm width x 100 mm depth.
- .2 Downspouts: pre-finished aluminum sheet fabrications, profiles and sizes detailed/indicated, not less than 0.48 mm metal thickness. 4" diameter, round profile. Complete with flanged gutter output tube.
- .3 End caps, downspout outlets, straps, support brackets, downspout strainers: pre-finished aluminum sheet profiles to suit gutters and downspouts.
- .4 Anchorage devices: hot dip galvanized steel or stainless steel alloy screws and washers.
- .5 Gutter supports: designed to fit into, engage and support gutters; non-corroding plated finish stamped metal or aluminum alloy casting fabrications.
- .6 Downspout supports: stamped pre-finished aluminum sheet straps.
- .7 Finishes: aluminum sheet coil stock finished with high molecular weight polyester (hmp) gloss paint on epoxy primer prior to profile fabrication, colours selected by Departmental Representative.

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## Execution

### 2.4 INSTALLATION

- .1 Metal Flashings
  - .1 Install in accordance with detail drawings.
  - .2 Fit flashings together so that one end of each section is free to move in joint.
  - .3 Fit flashings secure in place. Make corners square, surfaces true and straight in all planes, and all lines accurate to profiles.
- .2 Gutter: install with flashings, as detailed.
- .3 Rainware:
  - .1 Install gutters, rainwater leaders and accessories.
  - .2 Provide gutter supports at intervals required to prevent gutter deformation caused by ladder loads against any point along gutters.
  - .3 Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.
  - .4 Slope gutters 5 mm/1000 mm minimum.
  - .5 Seal metal joints watertight.
  - .6 Install rainwater leaders plumb and tight to building face.
    - .1 Fix in place to resist loosening and pulling away using round-headed screws through washers through straps at top, bottom and at 915 mm intervals in between.
    - .2 Fix downspouts and elbow connections using round-headed screws. Make all connections secure and watertight without damaging pre-finished surfaces.
    - .3 Arrange downspouts to drain into concrete anchor blocks.

### 2.5 CLEANING

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

**END OF SECTION**

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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 07 28 00 Air and Vapour barriers
- .2    Section 07 62 00 Sheet Metal Flashing and Trim
- .3    Section 09 91 13 Exterior painting
- .4    Section 09 91 23 Interior Painting

**1.2                REFERENCES**

- .1    ASTM International
  - .1    ASTM C919-08, Standard Practice for Use of Sealants in Acoustical Applications.
- .2    Canadian General Standards Board (CGSB)
  - .1    CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
  - .2    CAN/CGSB-19.13- M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
  - .3    CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
  - .4    CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3    General Services Administration (GSA) - Federal Specifications (FS)
  - .1    FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.
- .4    Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1    Material Safety Data Sheets (MSDS).
- .5    Green Seal Environmental Standards
  - .1    Standard GS-36-00, Commercial Adhesives
- .6    South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1    SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

**1.3                SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1    Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.

- .2 Manufacturer's product to describe:
  - .1 Caulking compound.
  - .2 Primers.
  - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Samples:
  - .1 Submit samples of each type of material and colour.
  - .2 Cured samples of exposed sealants for each colour where required to match adjacent material.
- .4 Manufacturer's Instructions:
  - .1 Submit instructions to include installation instructions for each product used.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

#### **1.5 WHMIS**

- .1 Submit copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOCs during application.

#### **1.6 WASTE MANAGEMENT AND DISPOSAL**

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

#### **1.7 SITE CONDITIONS**

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

- .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
  - .1 Proceed with installation of joint sealants only after contaminants capable of
- .4 Where sealants are qualified with primers use only these primers.

## **Part 2 Products**

### **2.1 SEALANT MATERIALS**

- .1 Sealant materials to conform to the requirements of :
  - .1 Green Seal Environmental Standards
    - .1 Standard GS-36-00, Commercial Adhesives
  - .2 South Coast Air Quality Management District (SCAQMD), California State
    - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .2 VOC limit maximum 250 g/L for sealers used within the building envelope.
- .3 Where sealants are qualified with primers, use only these primers

### **2.2 SEALANT MATERIAL DESIGNATIONS**

- .1 Polyurethanes: colours selected by Departmental Representative.
  - .1 Non-sag formulation: 1-part, to CAN/CGSB-19.13, Type 2, MCG-2-25, MCG-2-40.
  - .2 Self-levelling formulation:
    - .3 1-part: to CAN/CGSB-19.13, Type 1.
    - .4 2-part: to CAN/CGSB-19.24, Type 1, Class B.
- .2 Silicones one part: to CAN/CGSB-19.13.
- .3 Acrylics one part: to CGSB 19-GP-5M.
- .4 Acrylic latex: one part, non sag siliconized acrylic polymer to CAN/CGSB-19.17. Paintable when cured
- .5 Acoustical sealant: to ASTM C919.
- .6 Preformed compressible and non-compressible back-up materials:
  - .1 Polyethylene, urethane, neoprene or vinyl foam:
    - .1 Extruded closed cell foam backer rod.
    - .2 Sized as required.
  - .2 Neoprene or butyl rubber:
    - .1 Round solid rod, Shore A hardness 70.
  - .3 High density foam:
    - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa,

extruded polyolefin foam, 32 kg/m<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 Junctions between counter tops and walls to produce permanent sanitary and watertight seal; junctions between plumbing fixtures and walls, floors and counter tops/vanities to produce permanent sanitary and watertight seal. Co-ordinate with plumbing trade to avoid omission/duplication.
  - .1 Mildew-resistant silicone.
- .4 Lap joint and perimeter sealant for polyethylene vapour barriers
  - .1 Acoustical sealant

### **2.4 JOINT CLEANER**

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.
- .2 Primer: in accordance with sealant manufacturer's written recommendations.

## **Part 3 Execution**

### **3.1 SURFACE PREPARATION**

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

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**3.2 PRIMING**

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

**3.3 BACKUP MATERIAL**

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

**3.4 MIXING**

- .1 Mix materials in strict accordance with sealant manufacturer's instructions.

**3.5 APPLICATION**

- .1 Sealant:
  - .1 Apply sealant in accordance with manufacturer's written instructions.
  - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
  - .3 Apply sealant in continuous beads.
  - .4 Apply sealant using gun with proper size nozzle.
  - .5 Use sufficient pressure to fill voids and joints solid.
  - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
  - .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
  - .8 Remove excess compound promptly as work progresses and upon completion.
- .2 Curing:
  - .1 Cure sealants in accordance with sealant manufacturer's instructions.
  - .2 Do not cover up sealants until proper curing has taken place.

**3.6 CLEANING**

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

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Non-rated, thermally insulated steel-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 91 23 - Painting: Field painting of frames.

**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.
- .3 Polyurethane core.
- .4 Pre hung in wood frame
- .5 Pre bored for lock set.
- .6 Main entry door to incorporate tempered glass sidelite.
  - .1 Refer to door schedule for sizes.

**2.2 FABRICATION FRAMES**

- .1 Coordinate hinge and hardware placement with the requirements of Section 08 14 16 Flush Wood Doors and Frames, 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.



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**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 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.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Pre hung flush wood doors.
- .2 Pre hung bypass closet doors
- .3 Bifold type closet doors.

**1.2 RELATED SECTIONS**

- .1 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 30 - 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 site waste management program.

## **PART 2 PRODUCTS**

### **2.1 DOOR TYPES**

- .1 Flush Interior Doors: Solid core: to CAN/CSA-O132.2.1.
- .2 Bypass closet doors, hollow core.
- .3 Bifold closet doors, hollow core

### **2.2 DOOR CONSTRUCTION**

- .1 Flush Doors:
  - .1 Non rated, solid particleboard core: stile and rail frame bonded to particleboard core with wood lock blocks 3-ply construction.
  - .2 Face Panels:
    - .1 Veneer Facing: QSI A Grade quality Birch veneer, quarter sliced with bookmatched grain, pre finished.
- .2 Hollow core: to CAN/CSA-O132.2.2.
  - .1 Construction: ladder core with lock blocks,
  - .2 Face Panels:
    - .1 Veneer Facing: QSI A Grade quality Birch veneer, quarter sliced with bookmatched grain, pre finished.

### **2.3 DOOR JAMBS**

- .1 Pre primed for paint finish.
- .2 Solid wood construction.

### **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 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.
- .6 Pre finish doors.
- .7 Pre hang doors.

## **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.

### **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.

**END OF SECTION**

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**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            .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            Panels: Flush steel with glazed panels.
- .2            Thermally insulated.
- .3            Operation-Manual.

**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            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 specializing in performing the work of this section with minimum 5years documented experience.
- .3 Furnish evidence of installer experience on request.

## **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 R9.0 insulation value through non-glazed door sections, minimum 1.6 mm metal thickness door section end caps.
- .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 matched to exterior cladding
- .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 and sashes constructed of fiberglass pultrusions.
- .2 Windows as pre-assembled units, including factory installation of glass and glazing.
- .3 Furnish all labour, materials, equipment and services required for the design, fabrication, supply and installation of windows as shown on the drawings and as specified. Furnishment to include, but not be limited to the following:
  - .1 Fully glazed 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.
  - .6 Assessment of the alignment of the existing façade elements as required to allow design and layout of the work in this section.
  - .7 All fastening of the window assemblies to the rough openings
- .4 Include also the following:
  - .1 Checking of building lines and levels as required for the proper layout and installation of all work included in this section.
  - .2 Shop painting of all steel shapes and ferrous metal used in attachment or reinforcing of window and field painting after steel shapes are installed.
- .5 Window systems of the following types:
  - .1 Single fixed lites.
  - .2 Double Hung window units.

### **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 DESIGN CRITERIA

- .1 Materials, fabrications, attachments, accessories, assembly and performance, other than 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 fiberglass 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.

### 1.4 PERFORMANCE REQUIREMENTS

- .1 This is a performance specification issued in conjunction with the drawings for the work. The drawings show the general arrangement of the finished work and these specifications described the minimum requirements of the finished system. The Contractor is responsible for designing and furnishing a window system that will fulfill the requirements of the specifications and drawings including items which may not be shown or specified but are required for performance of the system.
- .2 The window shall be designed, fabricated and installed to meet or exceed the criteria in this subsection.
- .3 Structural
  - .1 Wind Load Resistance to NAFS in conjunction with CSA A440.09.
  - .2 The window assembly and fasteners shall be designed to withstand negative and positive wind loads in accordance to BCBC using an annual probability factor of **1/50 years** for the reference wind velocity, and 8 per 1000 glass failure rate under this load.
  - .3 The glass and window frames shall be designed to withstand guard loads at locations required by the BCBC.
  - .4 The glass shall be designed to withstand thermal stresses imposed in service. In calculation, assume the use of blinds located not less than 50 mm from the inside surface of the glass.
  - .5 The window system shall be designed to limit deflection orthogonal to the plane of the glass under wind or guard loads to **L/175** in all clear span dimensions of glass and framing members.
  - .6 Anchors and fasteners shown on the drawings do not represent the required location or types required for installation of the new widow. Any attachment points must be shown on shop drawings for review by the 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.

## 1.5 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 design of the product and 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.
- .4 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.

## 1.6 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 from 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 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).
  - .2 Provide scaled elevations, sections, plans, dimensions and quantity of units. Indicate rough opening requirements and tolerances of adjacent construction.
  - .3 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.
  - .4 Provide manufacturer's assembly instructions for operable units if they will be supplied demounted from main frame.

- .5 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
- .6 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.
  - .2 One (1), 4'x 4' with 2' operable section, representative model of each type of window.
- .7 Provide complete set of physical samples of manufacturer's standard colour selection for selection of colour by the Departmental Representative.
- .9 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.
- .10 Warranties:
  - .1 Provide a written warranty signed and issued in the name of the Owner stating:
    - .1 All windows will be free from defects in material and workmanship for a period of two (2) years from the date of substantial Performance of the Work.
    - .2 All windows will continue to provide satisfactory resistance to water penetration for a period of five (5) years from the date of Substantial Performance of the Work.
    - .3 All insulating sealed double glazing units shall be covered for a period of 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.

## 1.7 QUALITY ASSURANCE

- .1 Sealed insulation unit manufacturer to be a member in good standing of the Insulating Glass Manufacturers Alliance (IGMA).
- .2 Glass and glazing work under this section to conform to IGMA standards.
- .3 Window manufacturer and installation contractor to be a member in good standing of the Glazing Contractors Association of BC (GCABC) and have a minimum of 5 years uninterrupted experience in successfully carrying out projects of similar size. Contractor to document past experience on request.

## 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.

### 2.3 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/m<sup>2</sup>•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 Double Hung: 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:
  - .4 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.
- .6 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
- .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.
- .5 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: Provide multi-point locking with single handle operation.
- .2 Hardware to be adjustable to accommodate compression set of weather and air seals.

## **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: minimum 1.6 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 10, as recommended for substrates.
- .5 Foam Backer Rod: extruded closed cell backer rod, oversize 30 to 50%.
- .6 Screens: To CAN/CGSB-79.1.
  - .1 Insect screening mesh: count 18 x 16.
  - .2 Fasteners: tamper proof.
  - .3 Screen frames: vinyl or aluminum, colour to match window frames.

## **2.10 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 fiberglass mullions with concealed stainless steel fasteners at maximum 300 mm o/c.
- .4 Continuously and uniformly compress length of gaskets during installation, to compensate

for linear shrinkage.

### 3.2 GLAZING

- .1 Clean sealing surfaces at perimeter of glass and sealing surfaces of rabbets and stop beads before applying tape, splines or gaskets. Use solvents and cleaning agents recommended by manufacturer of sealing materials.
- .2 Install glazing gaskets uniformly with accurately formed corners and bevels. Ensure that proper contact is made with glass and rabbet interfaces.
- .3 Support both lites of glass thermal units on levelled setting blocks, 4 or 6 mm minimum, spaced as recommended by glass manufacturer. Provide at least one setting block at quarter points from each corner. For casement windows, locate setting blocks closer to corners as recommended by manufacturer.
- .4 Centre glass thermal units in glazing rabbet to maintain 6 mm minimum clearance between edges of glazing and plastic framing at sill or 4 mm minimum clearance between edges of glazing and plastic framing at sill if glazing bite incorporates a drainage channel with depth of 3 mm minimum.
- .5 Size glass thermal units to ensure exposed face of spacer is in line with glazing stops.
- .6 Use spacers and shims in accordance with glass manufacturer's recommendations.
- .6 Immediately replace damaged or broken glass.

### 3.3 WINDOW INSTALLATION

- .1 Install in accordance with CAN/CSA-A440 and reviewed shop drawings.
- .2 Arrange components to prevent abrupt variation in colour.
- .3 Erect and secure window units in prepared openings, plumb and square, free from warp, twist or superimposed loads.
- .4 Secure work accurately to structure and in a manner not restricting thermal movement of materials.
- .5 Transfer window dead load to wall construction by anchors alone or in combination with plastic shims. Wood shims are not acceptable.
- .6 Place shims under sill frame at exact setting block locations, and as marked on frames by window frame manufacturer.
- .7 Conceal all anchors and fitments. Exposed heads of fasteners are not permitted.
- .8 Maintain dimensional tolerances after installation. Maintain alignment with adjacent work.

- .9 Provide seal around interior perimeter of window frame using foam joint sealant or foam backer rod, size as required to lightly compress between frame and rough opening, and sealant. Ensure continuity of air/vapour retarder and seal to window frame.
- .10 Provide seal at head and jamb of exterior perimeter of window frame using foam joint sealant or foam backer rod, size as required to lightly compress between frame and rough opening, and sealant. Do not seal sill at exterior.
- .11 Install jamb extensions, casings, brick moulds and trim as indicated on drawings.
- .12 Install sealant, in accordance with Section 07 92 10, 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.

### **3.5 CAULKING**

- .1 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates in bedding compound. Caulk butt joints in continuous sills.
- .2 Apply sealant in accordance with Section 07 92 00 - Sealants. Conceal sealant within window units except where exposed use is permitted by the Consultant.

### **3.6 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.

### **3.7 ENERGY CERTIFICATE**

- .1 Site certificates to be supplied in accordance with the British Columbia Energy Efficiency Act.
- .2 Certificates to include the following information:
  - .1 The whole-product U-value for each fenestration product provided on site (in W/m<sup>2</sup>K).
  - .2 The overall average U-value for the whole project, averaged over every fenestration product in the scope of work (in W/m<sup>2</sup>K).
  - .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**

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**Part 1            General**

**1.1                SECTION INCLUDES**

- .1     Hardware for wood and metal clad doors.
- .2     Weatherstripping, seals, and door gaskets.

**1.2                RELATED SECTIONS**

- .1     Section 08 11 00 – Exterior Doors
- .2     Section 08 14 16 - Flush Wood Doors.

**1.3                REFERENCES**

- .1     American National Standards Institute (ANSI).
  - .1     ANSI/BHMA A156.1-2006, American National Standard for Butts and Hinges.
  - .2     ANSI/BHMA A156.2-2003, Bored and Preassembled Locks and Latches.
  - .3     ANSI/BHMA A156.3-2001, Exit Devices
  - .4     ANSI/BHMA A156.4-2000, Door Controls - Closers.
  - .5     ANSI/BHMA A156.5-2001, Auxiliary Locks.
  - .6     ANSI/BHMA A156.6-2005, Architectural Door Trim.
  - .7     ANSI/BHMA A156.13-2002, Mortise Locks and Latches Series 1000.
  - .8     ANSI/BHMA A156.15-2006, Release Devices - Closer Holder, Electromagnetic and Electromechanical.
  - .9     ANSI/BHMA A156.16-2002, Auxiliary Hardware.
  - .10    ANSI/BHMA A156.18-2006, Materials and Finishes.
  - .11    ANSI/BHMA A156.19-2002, Power Assist and Low Energy Power - Operated Doors.
- .2     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.

## **1.6 QUALITY ASSURANCE**

- .1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 10 years documented experience.

## **1.7 DELIVERY, STORAGE, AND PROTECTION**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements, unless more stringent care is required by respective material manufacturer.
- .2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .3 Store door hardware in locked, clean and dry area.
- .4 Include hardware templates and full installation/adjustment information.
- .5 Supply hardware complete with all factory supplied mounting fasteners required for installation.

## **1.8 WASTE DISPOSAL AND MANAGEMENT**

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

## **Part 2 Products**

### **2.1 MANUFACTURERS**

- .1 Hardware items to be of the best grade, free from defect and of first line quality production suitable for this level of project.
- .2 Use one hardware manufacturer product only for each similar hardware item.
- .3 Acceptable manufacturers:
  - .1 Hinges: McKinney, Stanley, Ives.
  - .2 Locks: Schlage, Sargent, Corbin/Russwin.
  - .3 Closers: LCN, Sargent, Corbin/Russwin.
  - .4 Exit Device: Von Duprin, Sargent, Corbin/Russwin
  - .5 Door stops, Overhead: Glynn Johnson, Sargent, Corbin/Russwin.
  - .6 Other wall and floor stops: CBH, Gallery, Ives
  - .7 Thresholds and weatherstrip: Draft Seal, Pemko, National
  - .8 Pocket track: Kris Track, de Jong, K N Crowder
  - .9 Pocket Lock: KN Krowder, Baldwin, Emtek
  - .10 Electric strikes/power supply: Von Duprin, Sargent, Corbin.

## **2.2 HARDWARE - GENERAL**

- .1 General: Refer to paragraph. **3.6 Hardware Schedule** for further description and finishes of following items.
- .2 Locks and latches:
  - .1 Bored and pre-assembled locks and latches: to ANSI/BHMA A156.2, series 2000 pre-assembled lock, grade 1, designed for functions scheduled.
  - .2 Escutcheons: designs scheduled.
  - .3 Normal strikes: box type, lip projection not beyond jamb.
  - .4 Cylinders: keyed into keying system directed by Departmental Representative.
  - .5 Finishes: scheduled.
- .3 Butts and hinges:
  - .1 Butts: to ANSI/BHMA A156.1, 5-knuckle, sizes x finishes scheduled, concealed bearing for scheduled doors, NRP for scheduled doors.
- .4 Thresholds: as scheduled, one length per door opening without joins or splices.
- .5 Weatherstripping/sound seals: durable, non-absorbing material, resistant to deterioration caused by aging, types and materials scheduled, one length per door head and side application without joins or splices.
- .6 Door stop: Wall mounted , metal construction, rubber tip to prevent damage to door.

## **2.3 KEYING**

- .1 Obtain final keying from Departmental Representative before ordering.
- .2 Prepare keying schedule in co-operation with Departmental Representative.

## **2.4 FINISHES**

- .1 Finishes: Identified in Door Schedules.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

### **3.2 INSTALLATION**

- .1 Install hardware in accordance with manufacturer's instructions.
- .2 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.
- .3 Use templates provided by hardware item manufacturer.
- .4 Use only manufacturer supplied fasteners. Failure to comply may void manufacturer warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.



**3.3 ADJUSTING**

- .1 Adjust hardware for smooth operation.

**3.4 PROTECTION OF FINISHED WORK**

- .1 Do not permit adjacent work to damage hardware or finish.

**3.5 CLEANING**

- .1 Proceed in accordance with section 01 74 11 Cleaning.  
.2 Perform cleaning after installation to remove construction and accumulated environmental dirt.  
.3 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer instructions.

**3.6 HARDWARE SCHEDULE**

- .1

**Hardware Group 1 (exterior doors)**

Exterior Levers - ND Series, Heavy Duty, Grade 1,  
ANSI/BHMA A156 certified, Athens Design,  
Polished Nickel Finish

Deadbolt - B Series, Heavy Duty, Grade 1,  
ANSI/BHMA certified, Polished Nickel Finish

Hinges ANSI/BHMA A156.1

Threshold- part of pre hung door assembly

Door stop

**Hardware Group 2 (interior doors)**

Interior Levers - AL Series, Medium Duty, Grade 2, ANSI/BHMA  
A156 certified, Athens Design, Polished Nickel  
Finish

Hinges ANSI/BHMA A156.1

Door stop

**Hardware Group 3 (sliding closet doors)**

Sliding door hardware - Heavy Sliding Doors (over 91 kg): Box Track,  
Hanger & Single Overhead Style Track Supports,  
Adjustable Stops

Closet pulls - Curved Metal Pull, 127mm Length, Matte Nickel Finish - Richelieu 1094DNV

**Hardware Group 4 (bifold closet doors)**

Bifold door hardware – ceiling mounted steel track, slide glide, door aligner, knob (nickel), jamb bracket, bottom pivot, top spring pivot. Weight capacity per door = max 15kg.

Basis of specification: Richelieu 14025WBC

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**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 31 16 – Blanket and Board Insulation.
- .3    Section 07 28 00 - Air and Vapour Barriers.
- .4    Section 07 92 00 - Joint Sealers
- .5    Section 09 91 23 – Interior 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 E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- .10    Association of the Wall and Ceilings Industries International (AWCI).

**1.4            WASTE MANAGEMENT AND DISPOSAL**

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

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**Part 2 PRODUCTS**

**2.1 GYPSUM BOARD MATERIALS**

- .1 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 Paperless face gypsum board: in compliance with applicable parts of ASTM C1396 and ASTM C1658, Type X.
  - .1 Composition: dense moisture-resistant gypsum core and fibreglass mats that replace paper facings on both sides to resist mould growth to ASTM D3273.
  - .2 Format: 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.
- .3 Steel drill screws: to ASTM C1002, designed for use with wood framing.
- .4 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.
- .5 Joint compound: to ASTM C475, asbestos-free.
- .6 Tape:
  - .1 Paper face gypsum board applications: spark perforated paper tape.
  - .2 Paperless face gypsum board applications: self-adhesive glass fibre mesh tape to further reduce risk of mould growth on face of board surfaces.

**Part 3 EXECUTION**

**3.1 GYPSUM BOARD INSTALLATION**

- .1 Ensure that insulation and vapour barrier 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.

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**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 American Society for Testing and Materials International (ASTM)
  - .1 ASTM E84-12c, Standard Test Method for Surface Burning Characteristics of Building Materials.
  - .2 ASTM F710-11, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
  - .3 ASTM F1913-19 Standard Specification for Vinyl Sheet Floor Covering Without Backing
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .3 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102-07, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide product data:
  - .1 Submit manufacturer's printed product literature, specifications and data sheets.
  - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets for each type of adhesive.
- .2 Provide samples:
  - .1 Submit duplicate 300 x 300 mm sample pieces of each flooring material specified.
  - .2 Departmental Representative to choose colour from manufacturer's standard range. Provide physical samples.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Operation and Maintenance Data: submit operation and maintenance data for installed products for incorporation into manual.
- .2 Warranty Documentation: submit warranty documents specified.

**1.4 QUALITY ASSURANCE**

- .1 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience.

**1.5 DELIVERY, STORAGE AND HANDLING**

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

- .2 Protect roll materials from damage by storing on end.

## **1.6 ENVIRONMENTAL CONDITIONS**

- .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 forty-eight (48) hours after installation of materials.

## **1.7 MAINTENANCE**

## **1.8 QUALITY ASSURANCE**

- .1 Qualifications: Provide proof of qualifications when requested by Consultant:
  - .1 Resilient Flooring Installer: Use an installer who is competent in heat welding and have a minimum of five (5) years documented experience in the installation of resilient sheet flooring and seams in accordance with manufacturer's training or certification program.
  - .2 Source Limitations: Obtain each type, colour, and pattern of flooring or accessories specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

## **1.9 WARRANTY**

- .1 Manufacturer's Warranty: provide a manufacturer's 10 year Limited Warranty.
  - .1 Submit manufacturer's standard warranty document executed by authorized company official for Consultant's acceptance.
- .2 Installation Warranty: provide a one (1) year installation warranty, covering labour, repair or replacement of defective components for one (1) year after date of substantial performance

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Vinyl Sheet Flooring to : to ASTM F1913.
  - .1 Material: Commercial Grade sheet vinyl, approx. 2mm material thickness.
  - .2 2 mil wear layer.
  - .3 Abstract Travertine pattern.
  - .4 2000mm width.
  - .5 Glue down installation.

### **2.2 ACCESSORIES**

- .1 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.

- .2 Sub-floor filler and leveller: as recommended by flooring manufacturer for use with their product.
- .3 Reducer strips: rubber, size to suit depth of adjacent materials, ADA and barrier free compliant.
- .4 External corner protectors: stainless steel, type recommended by flooring manufacturer.
- .5 Edging to floor penetrations: stainless steel, type recommended by flooring manufacturer.

### **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 sheets.

#### **3.2 SITE VERIFICATION OF CONDITIONS**

- .1 Ensure concrete floors are clean and dry by using test methods recommended by flooring manufacturer.

#### **3.3 PREPARATION**

- .1 Remove existing flooring.
- .2 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.
- .3 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.
- .4 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- .5 Surface Preparation: prepare surface in accordance with manufacturer's written recommendations.

#### **3.4 SHEET FLOORING INSTALLATION**

- .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 Terminate flooring at centreline of door openings where floor finish is dissimilar.
- .7 Install edge strips at unprotected or exposed edges, and where flooring terminates.
  - .1 Secure metal strips after installation of flooring with stainless steel screws.



- .8 Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

### **3.5 CLEANING**

- .1 Progress Cleaning:
  - .1 Remove waste materials from site daily. Do not burn waste materials on site.
  - .2 Leave Work area clean at end of each day.
- .2 Final Cleaning:
  - .1 Upon completion remove surplus materials, rubbish, tools and equipment.
  - .2 Remove excess adhesive from floor, base and wall surfaces without damage.
  - .3 Clean floor and base surface to flooring manufacturer's printed instructions.
- .3 Waste Management: separate waste materials for reuse and recycling.
  - .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 Prohibit traffic on new flooring for period of 48 hours minimum after installation and until adhesive is cured.
- .3 Protect new floors from time of final set of adhesive until final inspection.
- .4 Repair damage to adjacent materials caused by tile carpeting installation.

**END OF SECTION**

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**Part 1            General**

**1.1                REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM F710-19, Standard Practice for Preparing Floors to Receive Resilient Flooring.
  - .2 ASTM F1700-04(2018), Standard Specification for Solid Vinyl Floor Tile.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data:
  - .1 Submit manufacturer's printed product literature, specifications and data sheets.
  - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets for each type of adhesive.
- .3 Provide samples:
  - .1 Submit 300 x 300 mm sample pieces of sheet material.
  - .2 Provide physical samples of manufacturers standard colour range for colour selection.
- .4 Closeout Submittals:
  - .1 Provide maintenance data for resilient flooring for incorporation into manual specified in Section 01 78 10 - Closeout Submittals.

**1.3                DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Packaging Waste Management: remove for reuse of packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 19 – Construction/Demolition Waste Management and Disposal.

**1.4                AMBIENT CONDITIONS**

- .1 Maintain air temperature and structural base temperature at flooring installation area above 20 degrees for 48 hours before, during and 48 hours after installation.

**1.5                MAINTENANCE**

- .1 Extra Materials:
  - .1 Provide extra materials of resilient tile flooring and adhesives in accordance with Section 01 78 10 - Closeout Submittals.

- .2 Provide 6 m<sup>2</sup> of each colour, pattern and type flooring material required for project for maintenance use.
- .3 Extra materials one piece and from same production run as installed materials.
- .4 Identify each roll of sheet flooring and each container of adhesive.
- .5 Deliver to site, upon completion of the work of this section.

## **1.6 QUALITY ASSURANCE**

- .1 Qualifications: Provide proof of qualifications when requested by Consultant:
  - .1 Resilient Flooring Installer: Use an installer who is competent in heat welding and have a minimum of five (5) years documented experience in the installation of resilient sheet flooring and seams in accordance with manufacturer's training or certification program.
  - .2 Source Limitations: Obtain each type, colour, and pattern of flooring or accessories specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

## **1.7 WARRANTY**

- .1 Provide a manufacturer's Limited Lifetime Warranty.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Luxury vinyl plank: to ASTM F1700, heavy commercial traffic.
  - .1 Class III, Type B.
  - .2 5mm thickness.
  - .3 Glue down insulation.
  - .4 10 year warranty
- .2 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.
- .3 Sub-floor filler and leveller: as recommended by flooring manufacturer for use with their product.
- .4 Reducer strips: rubber, size to suit depth of adjacent materials, ADA and barrier free compliant.
- .5 External corner protectors: stainless steel, type recommended by flooring manufacturer.
- .6 Edging to floor penetrations: stainless steel, type recommended by flooring manufacturer.

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**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 sheets.

**3.2 SITE VERIFICATION OF CONDITIONS**

- .1 Ensure concrete floors are clean and dry by using test methods recommended by flooring manufacturer.

**3.3 PREPARATION**

- .1 Remove existing flooring.
- .2 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.
- .3 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.
- .4 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- .5 Existing surfaces shall be prepared in accordance with resilient flooring manufacturer's recommendations and requirements.

**3.4 APPLICATION: VINYL PLANK FLOORING**

- .1 Install flooring in accordance with manufacturer's written instructions.
- .2 Provide high ventilation rate, with maximum outside air, during installation, and for 72 hours after installation. If possible, vent directly to outside. Do not let contaminated air recirculate through district or whole building air distribution system. Maintain extra ventilation for at least one month following building occupation.
- .3 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .4 Lay flooring with seams parallel to building lines to produce a minimum number of seams. Border widths minimum 1/3 width of full material.
- .5 Install flooring to ashlar/staggered pattern with continuous joints flowing with direction of pattern as shown on drawings.
- .6 As installation progresses, and after installation roll flooring with 45 kg minimum roller to ensure full adhesion.
- .7 Cut flooring around fixed objects.
- .8 Continue flooring over areas which will be under built-in furniture.
- .9 Terminate flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.
- .10 Install rubber reducer strips at unprotected or exposed edges where flooring terminates.

**3.5 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Remove excess adhesive from floor, base and wall surfaces without damage.
- .3 Clean, seal and wax floor and base surface to flooring manufacturer's printed instructions.

**3.6 PROTECTION**

- .1 Protect new floors from time of final set of adhesive until final inspection.
- .2 Prohibit traffic on floor for 48 hours after installation.

**END OF SECTION**

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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    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 00 - 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 00 - 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/Demolition 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 SCAQMD Rule 1113-04, Architectural Coatings.

### 2.2 COLOURS

- .1 Departmental Representative to provide interior colour schedule after Contract award
- .2 Selection of colours from manufacturers full range of colours.
- .3 Where specific products are available in restricted range of colours, selection based on limited range.

### 2.3 GLOSS/SHEEN RATINGS

- .1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

	Gloss @ 60 degrees	Sheen @ 85 degrees
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Gloss Level 1 - Matte Finish (flat)	Max. 5	Max. 10
Gloss Level 2 - Velvet-Like Finish	Max.10	10 to 35
Gloss Level 3 - Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 - Satin-Like Finish	20 to 35	min. 35
Gloss Level 5 - Traditional Semi-Gloss Finish	35 to 70	
Gloss Level 6 - Traditional Gloss	70 to 85	
Gloss Level 7 - High Gloss Finish	More than 85	

## 2.4 PAINTING SYSTEMS

- .1 Exterior doors and frames (fiberglass).
  - .1 EXT 6.7c- W.B. Light industrial coating over solvent based bonding primer : G5 gloss level finish.
- .2 Exterior Trims (comb face)
  - .1 EXT 6.2A over factory installed primer. Gloss level 3
- .3 Dressed lumber: including, doors:
  - .1 INT 6.3E - Polyurethane varnish finish.
- .4 Interior running trim and 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).

## 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**

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**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    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.
- .3    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                DELIVERY, STORAGE AND HANDLING**

- .1    Deliver, store and handle materials in accordance with manufacturer's recommendations.

## **1.4 WASTE MANAGEMENT AND DISPOSAL**

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

## **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 Washrooms
  - .1 Toilet tissue dispenser: Single roll type, surface mount. Contemporary look to match towel bar. Chrome plated plastic spindle holds rolls up to 140mm in diameter. Projects 100mm from wall. Brushed Nickel finish.
  - .2 Towel Bar: Surface mount. Contemporary look to match tissue dispenser. 610mm length. 19mm square towel bar. Projects 100mm from wall. Brushed nickel finish
  - .3 Mirror: Silvered mirror glass to ASTM C1503. Mirror: Type 1B 5mm silvered float glass for high humidity use. Clear tint. Pencil polished edge sealed to prevent penetration of backing. 750mm width x 900 mm height.
  - .4 Curved shower curtain rod: 20 gauge 304 Stainless steel construction, satin finish, 25mm diameter. Chrome plated zinc die cast swivel brackets, Maximum 55 degree rotation.
  - .5 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.

### **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.
  - .2 Hollow masonry units, existing plaster or drywall: use toggle bolts drilled into cell or wall cavity.
- .3 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 Final locations directed by Departmental Representative.

**END OF SECTION**

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**Part 1            General**

**1.1                SECTION INCLUDES**

- .1            Dishwasher.

**1.2                RELATED SECTIONS**

- .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**

- .1            Dishwasher:
  - .1            Under countertype, nominal width 445 mm, depth to suit counter depth.
    - .1            Sound reduction package.
    - .2            Stainless steel exterior and interior.
    - .3            Two vinyl pull out dish racks.
    - .4            5 wash cycles

**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 Connect to utilities and make units operational.

**END OF SECTION**



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**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            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/Demolition 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: 50 mm wide with rounded corners and rough edges removed.
  - .1 Embossed synthetic wood material.
  - .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:
  - .1 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 all 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 16 – 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 specializing in performing the work of this section experienced with good trade practices.

## **1.7 CLOSEOUT SUBMITTALS**

- .1 Section 01 78 10: 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.
  - .6 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 master bedroom 105 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.

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**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 11: 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 non-abrasive 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 National Fire Codes
    - .1 NFPA 10 Portable Fire Extinguishers.
  - .3 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.
  - .4 Province of British Columbia
    - .1 BC Industrial Health & Safety Regulations, WorkSafeBC.
  - .5 SMACNA Publications
    - .1 HVAC Duct Construction Standards.
    - .2 Guidelines for seismic restraints of mechanical systems.
- .2 All specification references to the Building Code refer to the National Building Code.

**1.4 LIABILITY**

- .1 Be responsible for layout of work and for any damage caused by improper execution of work.
- .2 Be responsible for condition of materials and equipment supplied and protect all work until work completed and accepted.

## **1.5 PERMITS AND FEES**

- .1 Obtain all required permits and pay all fees including service connection fees as applicable to the work of this Section. Comply with all Provincial, Municipal and other legal regulations and bylaws applicable to the work.
- .2 Where Authorities Having Jurisdiction provide inspection, arrange for their inspection of all work. On completion of the work, furnish final unconditional certificates of approval by the inspecting authorities.

## **1.6 DRAWINGS AND MEASUREMENTS**

- .1 Except where precisely indicated, the contract documents are diagrammatic and generally indicate the scope of work and general arrangement and establish minimum quality and performance requirements. Where there are conflicting requirements the Contractor shall allow for and provide the better quality and/or greater quantity unless the conflicting requirements are interpreted otherwise in writing by the Departmental Representative.
- .2 Consult the Architectural drawings for exact locations of fixtures and equipment.

## **1.7 WARRANTY**

- .1 Provide the Owner with a written warranty that the equipment installed and the work performed under this contract will remain in serviceable condition for one (1) year from the date of final acceptance. Warranty shall include parts and labour.

## **1.8 WORKMANSHIP**

- .1 Workmanship shall be in accordance with well-established practice and with standards accepted and recognized by the Departmental Representative and the Trade.
- .2 The Departmental Representative may reject any work not conforming to the Contract Documents or to accepted standards of performance, quietness of operation, finish or appearance.
- .3 Employ only tradesmen with valid Provincial Trade Qualification Certificates to perform only work permitted by their certificates.

## **1.9 SHOP DRAWINGS**

- .1 Shop drawings/product data shall be reviewed, signed and processed as described by the Mechanical Contractors Association of British Columbia.
- .2 Provide an electronic copy or five (5) hard copies of shop drawings of all equipment on the drawings and specifications to the Departmental Representative for review.
- .3 Review or non-review of shop drawings does not alter the requirements of the equipment and materials provided to conform to the specification.

## **1.10 ASBESTOS**

- .1 All material/products provided shall be free of asbestos.
- .2 If existing asbestos is discovered which will be affected by the work of the Contract, immediately notify the Departmental Representative. All work related to existing asbestos shall be handled in accordance with the requirements of WorkSafeBC.

### 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.
- .2 Arrange and pay for the services of a structural Professional Engineer registered in British Columbia referred to here as the Seismic Engineer.
- .3 The Seismic Engineer shall review, seal and sign all submittals required for all components, assemblies, attachments and installation procedures for the seismic restraint of all piping, ductwork and equipment installed under this Section.
- .4 The Seismic Engineer shall provide all necessary direction to the contractor during installation of the seismic restraint installation and submit a statutory declaration that the final seismic restraint installation conforms to the submittal documents sealed by the Seismic Engineer and satisfies all regulatory requirements.
- .5 The Seismic Engineer shall submit Letters of Assurance for the seismic restraint to the Departmental Representative.
- .6 The Seismic Engineer shall coordinate attachment to the equipment with the equipment manufacturer to ensure the method and location of attachment of the seismic restraint to the equipment does not compromise the structural integrity of the equipment.
- .7 It is the entire responsibility of equipment manufacturers to design their equipment so that the strength and anchorage of the mounting points and internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure during a seismic event of code design magnitude.

### 1.12 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, CANNING AND CORING**

- .1 Lay out all cutting, patching, canning and coring required to accommodate the mechanical services. Coordinate with other Divisions. Be responsible for correct location and sizing of all openings required under this Section. Allow oversized openings for pipe penetrations where continuous insulation is specified.
- .2 Openings through structural members of the building shall not be made without the approval of the Departmental Representative.

**1.18 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.

**1.19 LUBRICATION OF EQUIPMENT**

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

**1.20 CLEANING AND FINAL ADJUSTMENT**

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

**1.21 DEMOLITION**

- .1 All piping, ducting and equipment which becomes redundant and is no longer required due to the work shall become the property of the Contractor and shall be completely removed from the site.
- .2 Demolition of existing air conditioning units shall include proper disposal of existing refrigerant. Contractor shall provide a halocarbon receipt from a registered collection facility.

**1.22 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.

**1.23 OPERATION AND MAINTENANCE MANUALS**

- .1 Provide maintenance data for incorporation into Operational and Maintenance manual.
- .2 Employ the Balancing Agency to prepare the manuals.
- .3 Allow sufficient time to provide the final reviewed manuals to the Departmental Representative before Substantial Performance.

- .4 Provide one draft copy of the manuals to the Departmental Representative for review. Make all required changes and resubmit to the Departmental Representative. Repeat until accepted. Then submit the following, identical to the accepted copy, to the Owner:
  - .1 Three (3) hard copies - organized in binders, refer to below.
  - .2 Two (2) PDF electronic copies (minimum of 600 DPI scanning quality) of full binder contents on CD, DVD, or flash drive.
- .5 Obtain a receipt and send a copy to the Departmental Representative. Allow ten days for the first submittal review by the Departmental Representative and seven days for each subsequent review.
- .6 The binders shall be 3-ring binder. The maximum overall thickness of the filled binder shall be 100 mm [4"]. Provide multiple binders for each manual as required.
- .7 Each binder shall have large clear lettering in a clear label insert on the front cover indicating the name of the project and "OPERATING AND MAINTENANCE MANUAL - MECHANICAL".
- .8 Provide an index and tab each section.
- .9 The manual shall include:
  - .1 Description of the operation of each system.
  - .2 Air balance report.
  - .3 Water balance report.
  - .4 Commissioning report.
  - .5 Copy of any required approvals, certifications and acceptance by Authorities Having Jurisdiction.
  - .6 List of local source of supply.
  - .7 Manufacturer's operating and maintenance literature and wiring and control diagrams.
  - .8 All shop drawings.

## 1.24 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 draftsman to the same standards as the original drawings.

## **1.25 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.

## **1.26 BALANCING AND COMMISSIONING**

- .1 Employ 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 Tape - self-adhesive, aluminum, reinforced, 50 mm [2"] wide.
  - .3 Vapour barrier jacket adhesive.
  - .4 Vapour barrier coating on reinforcing membrane or on insulating cement.
  - .5 PVC Jacket and Fitting Covers: Staples and PVC self-adhesive tape, plastic pop rivets, staples
  - .6 Thermocanvas:
    - .1 Cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
    - .2 Lagging adhesive: compatible with insulation.
  - .7 PVC Jacket and Fitting Covers:
    - .1 Staples and PVC self-adhesive tape, plastic pop rivets, staples
- .2 Scope: Warm/Hot Piping
  - .1 All domestic hot water supply 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.
  - .2 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 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 or thermocanvas jacket with fabric adhesive.
    - .2 On pipe fittings for thermocanvas insulated pipe apply PVC fitting covers. Over all other insulated components apply thermocanvas jacket with fabric adhesive. Finish fabric with one (1) coat of fabric coating.



## 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 Thermocanvas:
    - .1 Cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
    - .2 Lagging adhesive: compatible with insulation.
  - .6 PVC Jacket and Fitting Covers:
    - .1 Staples and PVC self-adhesive tape, plastic pop rivets, staples
- .2 Scope: Ductwork exterior thermal insulation
  - .1 All return, exhaust and supply ducts – 25 mm (1”) thickness.
  - .2 All outdoor air ductwork – 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 inside the building 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 - 25 mm [1”] thickness where indicated by single hatching and as otherwise noted.

## Part 3 Fire Protection

### 3.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS

- .1 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 Drainage Piping
  - .1 ABS drain and waste pipe and fittings.
  - .2 DWV copper pipe and fittings.
- .2 Water Piping
  - .1 Type 'L' copper pipe with cast brass or wrought copper fittings 95/5 Sn/Sb solder.
- .3 Hangers and Supports:
  - .1 Inside the building and in Crawlspace: Cadmium plated hangers and rods.
  - .2 For copper pipe: Copper plated or epoxy coated.
- .4 Install dielectric couplings at copper piping connections to plumbing equipment of dissimilar material.
- .5 Ball Valves:
  - .1 Lever handle, brass two piece body, blow-out proof stem, PTFE seats, brass ball chrome plated
  - .2 Sweat ends to ANSI/ASME B16.18, Class 150.
  - .3 Threaded ends to Class 150.
- .6 Strainers:
  - .1 Bronze body, screwed connections, bronze or stainless steel perforated screen.
- .7 Pressure Reducing Valve:
  - .1 Screwed, bronze or cast iron body.
- .8 Backflow preventers:
  - .1 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"].
  - .2 Double Check Valve Assembly (DCVA):
    - .1 Factory assembled station complete with inlet and outlet isolation valves.

- .9 Water Entry Station Assembly:
  - .1 Ball valve, strainer, union, DCVA backflow preventer, union, pressure reducing valve, ball valve, bypass with valve.
- .10 Hose Bibbs:
  - .1 Exterior - Frost proof complete with backflow preventer.
- .11 Trap Primers:
  - .1 Flow actuated devices piped to the closest plumbing fixture.
- .12 Water Hammer Arrestors:
  - .1 Piston style with stainless steel casing or bellows style with welded stainless steel nesting bellows, ANSI approved and PDI certified.
- .13 Cleanouts:
  - .1 Nickel bronze to suit floor finish.
- .14 Tankless Propane Fired Domestic Hot Water Heater (WH-1)
  - .1 Commercial grade tankless direct vent propane fired hot water heater, CSA certified, maximum hydrostatic working pressure 1034 kPa [150 psi]. Enamelled steel jacket.
  - .2 Heat exchanger: copper primary heat exchanger, stainless steel secondary heat exchanger. 5 year heating chamber warranty.
  - .3 Electronic spark ignition. Fully automatic controls, manually adjustable thermostat with 27-60°C [80-140°F], digital dual temperature readout.
  - .4 20mm inlet and outlet water connections. Inline flow regulator on outlet, 7.57 l/min [2.0 gpm]. 20mm gas connections. Condensate neutralizer.
  - .5 Electrical connection, 120/1/60.
  - .6 Performance: 6 kW [157,000 Btu/h] – 58 kW [199,000 Btu/h] modulating burner with variable speed blower fan.
  - .7 Provide complete concentric venting system for ventilation and combustion air intakes suitable for installation in British Columbia complete with heater adaptor, vent terminations, protective screen, etc.

### 4.3 FIXTURES

- .1 Water Closets (WC1) - Floor Mounted, Tank Ultra-low Flush
  - .1 Close coupled, vitreous china, elongated rim, 4.8 lpf [1.28 gpf].
  - .2 White closed front seat with cover. Seat shall be compatible with the fixture.
  - .3 12 mm [1/2"] cold water chrome plated supply with stop.
- .2 Lavatory Basin (LB1) - Counter Mounted
  - .1 Counter mounted, self-rimming, oval, vitreous china lavatory basin with front overflow, mounting assembly, punching to suit trim. Basin size: 394 x 289 mm [15-1/2" x 11-1/4"], overall size: 518 x 286 mm [20-3/8" x 17-3/4"].
  - .2 Single 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 Bathtub (T1)
  - .1 Skirted, one-piece acrylic sheet, reinforced with fiberglass.
  - .2 High gloss surface, chip and mar resistant, molded-in floor pattern, sound insulating package. Size 1518mm [59 3/4"] L x 762mm [30"] W x 572mm [22 1/2"] H.
  - .3 Waste: concealed pop-up waste and overflow fitting with lever-operated mechanism.
  - .4 Trim: pressure balancing, chrome plated brass combination shower and over-rim bath supply fittings with volume control, mixing valve, screwdriver stops, self-returning diverter spout, chrome plated shower head with bent shower arm and escutcheon.
  - .5 Waste fitting: integral stainless steel basket strainer/stopper, tailpiece, cast brass P-trap with cleanout.
  - .6 12 mm [1/2"] hot and cold with stops.
  - .7 Provide an acrylic tub surround to match the tub.
- .4 Sink (S1) - Double Compartment, Ledge-Back, 200 mm [8"] Deep
  - .1 Stainless steel double compartment sink with ledge back, 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 Single 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 Dishwasher (DW)
  - .1 Install the dishwasher.
  - .2 Pipe 12 mm [1/2"] hot with stop to dishwasher.
  - .3 Pipe drain to sink dishwasher drain connection.
- .6 Fridge
  - .1 Provide a 12 mm [1/2"] cold with stop under the sink for future connection to the fridge.
- .7 Clothes Washer (CW1)
  - .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.
- .8 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: Equipment drains and overflows.  
Material: DWV copper.
  - .2 Service: Propane.  
Material: Schedule 40 seamless Carbon Steel to ASTM A53/A53M and CSA B63 or Copper tube to ASTM B837.
- .2 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.
- .3 Hangers and Supports:
  - .1 Inside the building and Crawlspace: Cadmium plated hangers and rods.
  - .2 For copper pipe: Copper plated or epoxy coated.
- .4 Fittings
  - .1 Equipment drains and overflows:
    - .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.
  - .2 Propane:
    - .1 Steel pipe fittings, screwed, flanged or welded:
      - .1 Malleable iron: screwed, banded, Class 150.
      - .2 Steel pipe flanges and flanged fittings: to ASME B16.5.
      - .3 Welding: butt-welding fittings.
      - .4 Unions: malleable iron, brass to iron, ground seat, to ASTM A47/A47M.
      - .5 Bolts and nuts: to ASME B18.2.1.
      - .6 Nipples: schedule 40, to ASTM A53/A53M.
    - .2 Copper pipe fittings, screwed, flanged or soldered:
      - .1 Cast copper fittings: to ASME B16.18.
      - .2 Wrought copper fittings: to ASME B16.22.
- .5 Joints
  - .1 Equipment drains and overflows:
    - .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.
  - .2 Propane:
    - .1 Screwed fittings: Pulverized lead paste.
    - .2 Teflon tape is unacceptable.

- .6 Valves
  - .1 Propane:
    - .1 Install valves with stems upright or horizontal
    - .2 Provincial Gas Department approved and suitable for temperature to which they are exposed.

## 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.
  - .5 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
  - .1 Ductwork Galvanized steel shall be lock forming quality with galvanizing coat both sides to ASTM A525 G90.
  - .2 Provide 100 mm [4"] flexible connections where ducts connect to fans, equipment, 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**

- .1 All control system components to make a complete and operable system, except those supplied as part of packaged equipment controls, but including all auto-sequencing devices and electrical interlocks required to accomplish the sequences specified hereafter. Refer to the electrical equipment schedule, the electrical drawings and the electrical specification Division serving mechanical systems. Materials, equipment, connections and power not provided by the Electrical Division but required for the Control System shall be provided under this section.
- .2 All control circuit transformers (120/1/60 or 24/1/60 and as designated).
- .3 All control wiring and metallic conduit for mechanical system controls.
- .4 Supply, installation and connection of all electric control items.
- .5 All wiring and conduit from power distribution system to any control devices needing power.
- .6 Coordinate with the Electrical Contractor.
- .7 Electrical work installed under this Section shall be to the standards specified under Electrical Division.
- .8 Obtain electrical permit.
- .9 Carrier System:
- .1 All wiring in mechanical service spaces, where exposed to view and all 120 volt wiring shall be run in EMT conduit except the final 900mm [36"] of wiring to all operators and to all sensors subject to vibration shall be run in flexible metallic conduit.
- .2 Run wiring not installed in conduit parallel to building lines and support every one meter independent of piping, ductwork, and equipment.
- .3 Provide steel fittings with nylon throats for all conduit connections.
- .4 Identify each wire and cable at every termination point. Identify conduit with colour bands at no more than 7.5m [25'] intervals and on both sides of walls and floor

### **6.3 CALIBRATION AND DEMONSTRATION**

- .1 Set up and calibrate all sensors during the initial start-up of the systems and check, recalibrate and readjust operation as necessary.

- .2 Demonstrate the controls system to the satisfaction of the Departmental Representative.

#### **6.4 PRODUCTS**

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

#### **6.5 SEQUENCE OF OPERATION**

- .1 Domestic Hot Water System
  - .1 The internal controls of the Domestic Hot Water heater shall control the operation of the system to maintain a water delivery temperature of 60°C [140°F].
- .2 Furnace (F-1)
  - .1 The heat pump shall be controlled by a programmable thermostat to maintain room temperature set point.
  - .2 The furnace fan shall run continuously.
  - .3 Modulate the propane burner to maintain the room temperature set point.
- .3 Heat Recovery System and Washroom Exhaust (HRV-1)
  - .1 The HRV shall run continuously.
  - .2 Provide a duct mounted temperature sensor to modulate the electric heating coil (EHC-1) to maintain 20°C [68°F] supply air temperature.
- .4 Garage
  - .1 Provide a room thermostat.
  - .2 Cycle the unit heater (UH-113) to maintain room temperature set point.

### **Part 7 Equipment Schedules**

#### **7.1 TANKLESS PROPANE FIRED DOMESTIC HOT WATER HEATER (WH-1)**

- .1 Commercial grade tankless direct vent propane fired hot water heater, CSA certified, maximum hydrostatic working pressure 1034 kPa [150 psi]. Enamelled steel jacket.
- .2 Heat exchanger: copper primary heat exchanger, stainless steel secondary heat exchanger. 5 year heating chamber warranty.
- .3 Electronic spark ignition. Fully automatic controls, manually adjustable thermostat with 27-60°C [80-140°F], digital dual temperature readout.
- .4 20mm inlet and outlet water connections. Inline flow regulator on outlet, 7.57 l/min [2.0 gpm]. 20mm gas connections. Condensate neutralizer.
- .5 Electrical connection, 120/1/60.
- .6 Performance: 6 kW [157,000 Btu/h] – 58 kW [199,000 Btu/h] modulating burner with variable speed blower fan.
- .7 Provide complete concentric venting system for ventilation and combustion air intakes suitable for installation in British Columbia complete with heater adaptor, vent terminations, protective screen, etc.



## 7.2 **GAS FIRED FURNACE (F-1)**

- .1 Packaged gas fired condensing furnace, vertical discharge
- .2 Construction: Insulated cabinet with baked enamel finish.
- .3 Heating Section: propane fired, induced combustion furnace. Electronic ignition with flame sensor. Aluminized steel primary heat exchanger. Stainless steel secondary heat exchanger. Two-pipe sealed combustion. Suitable for Category-IV venting material. Condensate drain.
- .4 Blower Section: Direct drive, ECM or PSC multi-speed motor, forward curved centrifugal blower fan.
- .5 MERV 13 disposable filters. Provide spare filters.
- .6 Control: Remote programmable wall mounted thermostat.
- .7 Electrical: Single point electrical connection.
- .8 Provide complete concentric venting system for ventilation and combustion air intakes suitable for installation in British Columbia complete with heater adaptor, vent terminations, protective screen, etc.

## 7.3 **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.

## 7.4 **DUCT HEATERS – ELECTRIC (EHC-1)**

- .1 Coils:
  - .1 Flanged type for connecting to ductwork.
  - .2 CSA approved.
  - .3 Open coil resistance wire elements.
- .2 Control Panels:
  - .1 Factory attached panels.
  - .2 Power and control wiring terminals.
- .3 Unfused disconnect.
- .4 SCR controller complete with integral electronic air proving switch.
- .5 Control transformer with secondary fuse.

- .6 Overheat protection - manual reset with external button.
- .7 Automatic reset linear thermal cut-out.
- .8 Control wiring terminals for airflow proving switch and SCR controls.

#### **7.5 UNIT HEATERS – ELECTRIC (UH-113)**

- .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 or ceiling mounting.

#### **7.6 CEILING FAN (CF-\_)**

- .1 Fan Diameter: 1300mm [52"].
- .2 Housing color/finish: Brushed Nickel
- .3 Blades: Three, brown.
- .4 Integrated LED frosted glass light kit.
- .5 Three speed settings.
- .6 Remote control.
- .7 Reverse air flow allows change in fan direction according to the season.
- .8 Provides airflow up to 1490 l/s [3156 cfm] on high speed.
- .9 Installed without down-rod for close to ceiling installation.

#### **7.7 RANGE HOODS (RH-1)**

- .1 760 mm [30"] wide.
- .2 Three-speed pushbutton fan speed control with LCD.
- .3 Delay off with heat sensor.
- .4 Filter clean reminder.

- .5 ADA capable.
- .6 Lighting 3-level LED.
- .7 Aluminum washable filter.
- .8 ENERGY STAR rated.
- .9 Suitable for horizontal or vertical ducting.
- .10 Built-in backdraft damper and duct collar for use with 254 mm x 83 mm [10" x 3-1/4"] ducting.
- .11 Stainless steel finish
- .12 Roof cap.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED SECTIONS & SUMMARY**

- .1 The General Conditions, Supplements and Amendments shall govern this Section (read in conjunction with Instructions to Tenderers / Bidders). This section covers items common to all Electrical sections and is intended only to supplement the requirements of Division 01.
- .2 Reference to "Electrical Divisions" shall mean all sections of Divisions 26, 27, 28, 33 & 34 in the Master Format or the Canadian Master Specifications.
- .3 The word "Provide" shall mean "Supply and Install" the products and services specified. "As Indicated" means that the item(s) specified are shown on the drawings.
- .4 Provide materials, equipment and plant, of specified design, performance and quality; and, current models with published certified ratings for which replacement parts are readily available. Provide project management and on-site supervision to undertake administration, meet schedules, ensure timely performance, ensure coordination, and establish orderly completion and the delivery of a fully commissioned installation.
- .5 The most stringent requirements of this and other electrical sections shall govern.
- .6 All work shall be in accordance with the PROJECT Drawings and Specifications and their intent, complete with all necessary components, including those not normally shown or specified, but required for a complete installation.
- .7 Provide seismic restraints for all required fixtures, devices, equipment, pathway, and wiring systems as required by the BC Building Code.
- .8 Connect to equipment specified in other Sections and to equipment supplied and installed by other Contractors or by the Owner. Uncrate equipment, move in place and install complete; start-up and test. Include all field assembly of loosely/separately packaged accessories
- .9 "Consultant" shall mean WSP Canada Inc..

**1.2 CODES AND STANDARDS**

- .1 Comply with all laws, ordinances, rules, regulations and codes of all authorities having jurisdiction relative to this project.
  - .2 The project will be constructed to the current adopted edition of applicable standards, including:
    - .3 CSA C22.1, Canadian Electrical Code (CEC)
    - .4 British Columbia Building Code (BCBC)
    - .5 National Fire Code of Canada (NFCC)
    - .6 ASHRAE 90.1, Standard for Energy Efficient Design of New Buildings
    - .7 Provincial Fire Marshall Regulations
    - .8 WorkSafe BC Regulations
    - .9 Applicable NFPA Regulations
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### **1.3 REFERENCES**

- .1 Install in accordance with CSA C22.1 (current adopted edition) – except where specified otherwise.
- .2 Refer to CSA C22.1 Appendix A “Safety Standards for Electrical Equipment” for applicable codes and the related revisions
- .3 Refer to CSA C22.1 Pages xxix – xxxii for related ‘Reference Publications’
- .4 Refer to NBCC Table 1.3.1.2 for applicable codes and the related revisions.
- .5 Comply with Local Electrical Bulletins and by-laws relating to the Authority having Jurisdiction.
- .6 Install overhead and underground systems in accordance with CSA C22.3 No.1 (current adopted edition) – except where specified otherwise.
- .7 Preferred Voltage Levels for AC Systems, 0-50,000V in accordance with CAN3-C235 (current adopted edition)

### **1.4 PERMITS**

- .1 Submit to the Electrical Inspection Authority having jurisdiction the necessary number of drawings and specifications for review and approval prior to commencement of the project.
- .2 Pay all associated fees and obtain all permits, licenses etc. to complete the project.
- .3 Obtain a Certificated of Acceptance from the Inspection Authority having jurisdiction upon completion of the project and include in the O&M manual.

### **1.5 SCOPE OF WORK**

- .1 This project includes demolition of 2 existing residence buildings and the renovation of a existing RCMP detachment into a new residence. The new area will include living quarters complete with 3 bedrooms, a garage and exterior playground area. The upgrade includes power distribution to receptacles, mechanical equipment and other mechanical loads. The project also consists of providing CATV and telephone cabling in conduit from the telecom demarcation to device locations for all telecommunications and intrusion detection systems.

### **1.6 DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235- current edition
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 All electrical work to be installed with common work practices and methods.

### **1.7 SUBMITTALS**

- .1 Submittals to be in accordance with Division 01.
  - .2 Shop Drawings:
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- .1 The term “shop drawing” means drawings, diagrams, illustrations, schedules, performance characteristics, brochures and other data which are to be provided by the contractor to illustrate details of a portion of the work.
  - .2 Prior to submitting the shop drawings to the Consultant, the contractor shall review the shop drawings to determine that the equipment complies with the requirements of the specifications and drawings.
  - .3 Submit shop drawings, product data and samples for all electrical equipment and materials in accordance with Division 01. The submission shall be reviewed, signed and processed as described in Division 01.
  - .4 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.
  - .5 Where applicable, include wiring, line and schematic diagrams. Include wiring drawings or diagrams showing interconnection with work of other Sections.
  - .6 Manufacturer of products shall conform to revised shop drawings.
- .3 Content
- .1 Shop drawings submitted title sheet.
  - .2 Data shall be specific and technical.
  - .3 Identify each piece of equipment including specific options selected for each type to be included in the project.
  - .4 Information shall include all scheduled data.
  - .5 Advertising literature will be rejected.
  - .6 The project and equipment designations shall be identified on each document.
  - .7 The shop drawings/product data shall include:
    - .1 Dimensioned construction drawings with plans and sections showing size, arrangement and necessary clearances, with all equipment weights and mounting point loads.
    - .2 Mounting arrangements.
    - .3 Control explanation and internal wiring diagrams for packaged equipment.
    - .4 A written description of control sequences relating to the schematic diagrams.
    - .5 Copies of factory tests, where applicable.
- .4 Format
- .1 Shop Drawings to be submitted in PDF format; larger submittals may be submitted on flash drives or uploaded to an FTP site set up the contractor.
- .5 Coordination
- .1 Where electrical equipment requires support or backing by other trades or mechanical connections, the shop drawings shall also be circulated through the other "services" contractor(s) prior to submission to the Consultants.
- .6 Keep one [1] copy of shop drawings and product data, on site, available for reference.
- .7 Quality Control: in accordance with Division 01 - Quality Control
- .1 Provide CSA certified equipment and material. Where CSA certified equipment and/or material is not available, submit such equipment and/or material to the authority having jurisdiction for special approval before delivery to site.
-

- .2 Submit test results of installed electrical systems and instrumentation.
- .3 Submit, upon completion of Work, the electrical "load balance" report.
- .8 Permits and Fees:
  - .1 Submit to Electrical Inspection Department, Local Fire Authorities and Supply Authority the necessary number of drawings and specifications for examination and approval prior to commencement of work. Obtain all required permits and pay all fees.
  - .2 Arrange for inspection of all Work by the authorities having jurisdiction. On completion of the Work, furnish final unconditional certificates of approval by the inspecting authorities.

## **1.8 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Division 01 - Quality Control
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial and/or Territorial Act.
  - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
  - .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .3 Site Meetings: in accordance with Division 01 - Construction Progress Schedule
  - .1 Site Meetings: as part of Manufacturer's Field Services: schedule site visits, to review Work, at stages listed below:
    - .1 At time of initial shop drawing submission to confirm any existing conditions and to coordinate with the project schedule and any cross discipline requirements.
    - .2 After delivery and storage of products, and when preparatory Work is complete but before installation begins.
    - .3 During progress of Work at key schedule points as determined.
    - .4 At commissioning.
    - .5 Upon completion of Work, after cleaning is carried out.
- .4 Health and Safety Requirements: do construction occupational health and safety in accordance with Division 01 - Health and Safety Requirements.

## **1.9 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
- .4 Store materials ins in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .5 Store and protect equipment and materials from nicks, scratches, and damage. Protect from dust where applicable.

- .6 Replace defective or damaged materials with new.

### **1.10 OPERATING INSTRUCTIONS**

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
- .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
  - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
  - .3 Safety precautions.
  - .4 Procedures to be followed in event of equipment failure.
  - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions where directed.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

### **1.11 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Division 01 - Construction/Demolition Waste Management and Disposal and with the Waste Reduction Work plan.
- .2 Avoid using landfill waste disposal procedures when recycling facilities are available.
- .3 Place materials defined as hazardous or toxic waste in designated containers.

### **1.12 DRAWINGS AND MEASUREMENTS**

- .1 Drawings are generally diagrammatic and are intended to indicate the scope and general arrangement of work and are not detailed installation drawings. Do not scale the drawings. Obtain accurate dimensions from the Architectural and Structural drawings.
- .2 Consult the architectural drawings and details for exact locations of fixtures and equipment. Obtain this information from the Consultant where definite locations are not indicated.
- .3 Take field measurements, where equipment and material dimensions are dependent upon building dimensions.
- .4 Where imperial units have been indicated in brackets [ ] following the requirements in SI units, the conversion is approximate and provided for convenience. The SI units shall govern.

### **1.13 PROJECT COORDINATION**



- .1 Check drawings of all trades to verify space and headroom limitations for work to be installed. Coordinate work with all trades and make changes to facilitate a satisfactory installation. Make no deviations to the design intent involving extra cost to the Owner, without the Consultant's written approval.
- .2 The drawings indicate the general location and route to be followed by the electrical services. Where details are not shown on the drawings or only shown diagrammatically, the services shall be installed in such a way as to conserve head room and interfere as little as possible with the free use of space through which they pass. Service lines shall run parallel to building lines. All services in the ceiling shall be kept as tight as possible to beams or other limiting members at high level. All electrical services shall be coordinated in elevation to ensure that they are concealed in the ceiling or structural space provided unless detailed otherwise on drawings.
- .3 Work out jointly all interference problems on the site and coordinate all work before fabricating, or installing any material or equipment. Where necessary, produce interference/coordination drawings showing exact locations of electrical systems or equipment within service areas, shafts and the ceiling space. Distribute copies of the final interference/coordination drawings to the Architect and Consultant and all affected parties.
- .4 Ensure that all materials and equipment fit into the allotted spaces and that all equipment can be properly serviced and replaced, if and when required. Advise the Consultant of space problems before installing any material or equipment. Demonstrate to the Consultant on completion of the work that all equipment installed can be properly, safely serviced and replaced, if and when required.

#### **1.14 PROVISION FOR FUTURE EQUIPMENT AND CONSTRUCTION**

- .1 Leave clear spaces designated for future equipment or building expansion where indicated. Plan for the installation under this contract and ensure clear accessible, unhindered access to the space is allowed for.
- .2 Were contract documents don't clearly indicate the future expansion requirements, but known services are required, provide written "request for information" to the consultant before making assumptions as to intent.

#### **1.15 SPRINKLER PROOF REQUIREMENTS**

- .1 All equipment and wiring systems shall be sprinkler proof standard where sprinkler fire protection systems are installed.
- .2 In rooms where electrical equipment is installed surface mounted, electrical equipment contained in these rooms to be protected by non-combustible driphoods, shields, and gasketed doors as applicable to inhibit water ingress into electrical equipment. Exposed conduits connected to equipment to utilize watertight connectors. Top entry to be avoided where possible
- .3 In particular all unit substations, transformers, switchgear, motor control and panelboard shop drawings shall be certified 'sprinkler proof' design.

#### **1.16 EQUIPMENT RESTRAINT**

- .1 Related Section: 26 05 05 Seismic Restraint.

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

#### **1.17 PHASED CONSTRUCTION**

- .1 See Architectural specifications and drawings for construction phasing. Make all allowances to phase the work in accordance with the project phasing.
- .2 All trades in this Division shall make allowance for the implications of having to totally complete all work in the new addition before proceeding with work in the existing building.

#### **1.18 WARRANTY**

- .1 Use of installed equipment during construction shall not shorten or alter the warranty period as specified in the Division 01.
- .2 Take note of any extended warranties specified in other sections of this Division or in Division 27.
- .3 Furnish a written warranty stating that all work executed under this Division will be free from defects of material and workmanship for a period of one (1) year from the date of substantial performance and include in O&M manual.
- .4 Promptly investigate any electrical or control malfunction, and repair or replace all such defective work and all other damages thereby which becomes defective during the time of the warranty.

#### **1.19 TENDER INQUIRIES**

- .1 All contractor queries during the tender period shall be made in writing to the Consultant. Contractor queries will be collected and suitable addenda will be issued for clarification. No verbal information will be considered valid or issued by the Consultant's office during tender. All tender queries may be emailed, mailed or couriered to the Consultant's office. No telephone questions will be answered.

#### **1.20 RESPONSIBILITIES**

- .1 Provide temporary lighting, power and systems for construction services and remove after construction is complete.
  - .2 Ensure that equipment does not transmit noise and/or vibration to other parts of the building, as a result of poor installation practice.
  - .3 Where the Contract Documents do not contain sufficient information for the proper selection of equipment for bidding, notify the Consultant during the tendering period. If clarification is not obtainable, allow for the most expensive arrangement. Failure to do this shall not relieve the Contractor of responsibility to provide the intended equipment.
  - .4 Protect equipment and material from the weather, moisture, dust and physical damage.
  - .5 Cover equipment openings and open ends of conduit, piping and pullboxes as work progresses. Failure to do so will result in the Trade being required to adequately clean or replace materials and equipment at no extra cost to the Owner.
  - .6 Refinish damaged or marred factory finish to factory finish.
-

- .7 The specifications and drawings form an integral part of the Contract Documents. Neither the drawings nor the specifications shall be used alone. Work omitted from the drawings but mentioned or reasonably implied in the specifications, vice versa, shall be considered as properly and sufficiently specified and shall be provided. Misinterpretation of any requirement of either plans or specifications shall not relieve this Contractor of the responsibility of properly completing his trade to the approval of the Consultant.

#### **1.21 STANDARD OF ACCEPTANCE**

- .1 Standard of Acceptance means that the item named and specified by manufacturer and/or catalogue number forms part of specification and sets standard regarding performance, quality of material and workmanship and when used in conjunction with a referenced standard, shall be deemed to supplement the standard.
- .2 Where a manufacturer's equipment is listed, the manufacturer's listed equipment was used in preparing the base design. Tenders may be based on the listed equipment or preapproved alternate manufacturer's equivalent products, provided that they meet every aspect of the base design and every aspect of the drawings and specifications.
- .3 Where other than the listed manufacturer's equipment is selected or approved, include for the cost of any resulting work (both under this Division and other Divisions) and any necessary redesign of installation or structure. Submit redesign drawings for review with Shop Drawings. Maintain installation, access and servicing clearances. Equipment/materials shall not exceed the available space limitations. Redesign drawings shall be to scale and of a standard equal to the Project Drawings.
- .4 A visible manufacturer's nameplate shall indicate manufacturer's name, model number, serial number, capacity data, electrical characteristics and approval stamps.
- .5 All materials shall be new, of the quality specified and shall confirm to the standards of the Canadian Standards Association. Where equipment or materials are specified by technical description only, they shall be of the best quality for the listed application in which it is to be installed.
- .6 All work shall be executed in a neat and workmanlike manner by qualified tradespersons. Electrical contractor shall keep a competent foreman and necessary assistants all satisfactory to the consultant on the project during the progress of the work.

#### **1.22 ADDITION OF ACCEPTABLE MANUFACTURERS**

- .1 Material/products considered to satisfy the specification, but of a manufacturer other than those named may be submitted to the Consultant for consideration not later than five (5) working days prior to closing of tender or of bid depository subtrade tender whichever is earlier.
- .2 Alternate approvals will be given by written addendum only. No other substitution will be permitted after closing of tenders.
- .3 Alternate approvals granted before the closing of tenders will be limited to a manufacturer's system and/or series only. This limited approval will not preclude substitute equipment/material from complying with specific features included with equipment/material specified. Determine that the alternate product meets the specification intent before basing a tender on the product
- .4 Where alternate equipment/materials are selected, allow for effects on other parts of the work of this Trade and other Trades. Where substantial changes in arrangement are

required, submit shop drawings of the proposed changes with Plan and Section views and show effects on work of other Trades. Alternate equipment/materials shall not exceed the available space limitations. Maintain installation, access and servicing clearances. No extra will be allowed due to the use of alternate equipment/materials.

- .5 Where two or more items of equipment and/or material, of the same type, are required, provide products of a single manufacturer.
- .6 Install and test all equipment and material, in accordance with the detailed recommendations of the manufacturer.

### **1.23 CASH ALLOWANCES**

- .1 Coordinate cash allowances with bid documents. Allowances directly affecting this Division include: None.

### **1.24 PROGRESS CLAIM AND CHANGEORDER BREAKDOWNS**

- .1 In particular cases more detail may be necessary to properly assess a change order or progress claims. This additional information could include all suppliers and all sub-contractors when requested by the Consultant. Provide details for each section of the electrical work listed for each separate electrical change order item exceeding \$10,000.00.
- .2 Mark-up information is required for change orders but is optional on the original tender price.
- .3 Progress claims will not be certified nor payment made beyond 90% of the overall Electrical contract until commissioning and verification of the systems are complete. This procedure is to allow for any necessary deficiency holdbacks on items which do not become apparent until the systems are commissioned.

### **1.25 PROJECT CLOSE-OUT REQUIREMENTS**

- .1 Refer to detailed specifications in each section for detailed requirements. Record drawings to be submitted to Consultant and all life safety systems must be operational, verified and tested and demonstrated to Consultant prior to issuance of Schedule C.

### **1.26 SUBSTANTIAL PERFORMANCE REQUIREMENTS**

- .1 Before the Consultant is requested to make a site review for substantial performance of the work:
  - .1 Commission all systems and prove out all components, interlocks and safety devices.
  - .2 Submit a letter certifying that all work is complete for the intended use, operational, clean and all required submissions have been completed.
  - .3 A complete list of incomplete or deficient items shall be provided. If, in the opinion of the Consultant, this list indicates the project is excessively incomplete, a substantial completion review will not be performed.
- .2 The work will not be considered to be ready for use or substantially complete until the following requirements have been met:
  - .1 All reported deficiencies have been corrected.
  - .2 Operating and Maintenance Manuals completed.

- .3 "As Built" Record Drawing ready for review.
- .4 Systems Commissioning has been completed and has been verified by Consultant.
- .5 All demonstrations to the owner have been completed.
- .3 Consultants Letters of Assurance will not be issued until the following requirements have been met:
  - .1 All items listed in .1 above have been completed or addressed.
  - .2 Certificate of Penetrations through separations.
  - .3 Provincial or City Electrical Inspection - Certificate of inspection.
  - .4 Seismic Engineers letter of Assurance and final inspection report.
  - .5 Certificate of Substantial Performance.
  - .6 Signed off copy of Consultants final site review report.

## **1.27 DEFICIENCY HOLDBACKS AND DEFICIENCY INSPECTIONS**

- .1 Work under this Division which is still outstanding when substantial performance is certified will be considered deficient and a sum equal to at least twice the estimated cost of completing that work will be held back.
- .2 It is expected that outstanding work will be completed in an expeditious manner and the entire holdback sum will be retained until the requirements for Total Performance of Division 26, 27, 28, 33 (electrical) work have been met and verified.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS AND EQUIPMENT**

- .1 Provide materials and equipment in accordance with Division 01 and as follows.
- .2 Material and equipment to be CSA certified. Where CSA certified material or equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval.
- .3 Where equipment or materials are specified by technical description only, they are to be of the best quality available for the application for which it is to be installed.

### **2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS**

- .1 Provide all power and control wiring, conduit, wire, fittings, disconnect switches, motor starters, for all mechanical equipment unless otherwise specified.
- .2 Bond all motors to conduit system with separate bonding conductor in flexible conduit or bonding conductor in the flexible conduit.
- .3 Connections shall be made with watertight flexible conduit with watertight connectors.
- .4 Control wiring and conduit standards are specified in the Electrical Divisions. Refer to Section 26 24 21 – Mechanical Equipment Controls and the Mechanical Divisions for scope of work and particular details.

### **2.3 WARNING SIGNS**

- .1 Provide warning signs, as specified or to meet the requirements of Inspection Department, Authority having Jurisdiction, Engineer and Architect.
- .2 Use decal signs, minimum 175 x 250 mm [7" x 10"] size

## 2.4 EQUIPMENT IDENTIFICATION

- .1 Identify all electrical equipment including but not limited to starters, disconnects, remote ballasts and controls with nameplates and labels as follows:
- .2 Nameplates:
  - .1 Lamicoid 3 mm [0.125"] thick plastic engraving sheet, white face, black core, self adhesive unless specified otherwise. Provide white face, red core for all essential distribution equipment.
  - .2 Nameplate Sizes:

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters
  - .3 Typical Labelling:
    - .1 Panelboard & CDP – 5 lines
      - .1 Line 1 – Conditional/Vital – Size 4 lettering
      - .2 Line 2 – Panel/CDP designation – Size 4 lettering
      - .3 Line 3 – eg 225A, 120/208V, 3 phase 4W – Size 2 lettering
      - .4 Line 4 – Feeder: eg 4#3 – 35mm C – Size 2 lettering
      - .5 Line 5 – Origin eg: Main Elect. Room – Size 2 lettering
    - .2 Distribution Circuit Breakers – 4 lines
      - .1 Line 1 – Conditional/Vital – Size 4 lettering
      - .2 Line 2 – Main Circuit Breaker – Size 4 lettering
      - .3 Line 3 – Feeder: eg 4#3 – Size 2 lettering
      - .4 Line 4 – Origin: eg K1 Sub-station – Size 2 lettering
    - .3 Label colours unless otherwise indicated:
      - .1 Normal Power: white letters on black base.
      - .2 Vital Power labels: white letters on red base.
  - .4 Wording on nameplates to be approved prior to manufacture.
  - .5 Allow for average of twenty-five (25) letters per nameplate.
  - .6 Disconnects, starters and contactors: indicate equipment being controlled and voltage and CCT.
  - .7 Terminal cabinets and pull boxes: indicate system and voltage and source.
  - .8 Transformers: indicate capacity, primary and secondary voltages, source and lead.
- .3 Labels:
  - .1 Identify each outlet, starter, disconnect and all items of fixed equipment with the appropriate panel and circuit number origin by means of a small but good

quality vinyl, self-laminating label such as T & B E-Z Code WSL, Dymo Letratag or Brother P-Touch equivalent printable markers. Embossed Dymo or any labels with edges and corners that are prone to lift will be rejected. Confirm location of labels with Consultant before installing. Circuit number to agree with Record Drawings.

- .4 Provide plastic covered panel directory with circuits and areas served typed in, and mounted on inside of door. Directory to conform to Record Drawings.

**2.5 WIRING IDENTIFICATION**

- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour code: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

**2.6 CONDUIT, CABLE AND PULLBOX IDENTIFICATION**

- .1 Colour code conduits, metallic sheathed cables, pullboxes and junction boxes.
- .2 Code with 25 mm plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor and at 15 m intervals.
- .3 Colour coding to be as follows unless otherwise specified (note, not all systems may be present in this project):

SYSTEM	MAJOR BAND	MINOR BAND	CHARACTERS
High Voltage	Yellow	Purple	Nominal V
347/600V Normal	Dark Blue	Black	
347/600V Vital	Dark Blue	Red	
347/600V Delayed Vital	Dark Blue	L. Blue	
347/600V Conditional	Dark Blue	Yellow	
347/600V UPS	Dark Blue	Orange	
120/208V Normal	Light Blue	Black	
120/208V Vital	Light Blue	Red	
120/208V Delayed Vital	Light Blue	Light Blue	
120/208V Conditional	Light Blue	Yellow	
120/208V UPS	Light Blue	Orange	
Ground	Dark Green		GR
Fire Alarm	Red		FA
Emg Voice Paging	Red	Dark Green	EP
Fire Fighters Telephone	Red	Light Green	FFT
Computer/Data	Light Green		COM
Telephone	Light Green	Black	TEL
General Intercom	Light Green	Yellow	IC

Low Level Paging	Light Green	White	PA
Commercial TV	Dark Brown		TV
AV/TV Systems	Light Brown		AV/TV
Security Systems	Purple		SEC
Building Alarm	Purple	White	BA
CCTV	Purple	Yellow	CCTV
Door Intercom	Purple	White	DI
Door Lock Release	Purple	Black	ED
Master Clock System	Yellow		CS
BAS (Digital)	White	Green	BCD
BAS (110V)	White	Black	BCH
BAS (LV)	White	Blue	BCL
PLC (Digital)	White	Brown	PLC
Low Voltage Control	White	Yellow	LVC

## 2.7 FINISHES

- .1 Shop finish metal enclosure surfaces by removal of rust and scale, cleaning, application of rust resistant primer inside and outside and at least two coats of finish enamel.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original finish.
- .3 Clean and prime paint exposed hangers, racks, fastenings to prevent rusting. Finish painting shall be provided by Division 09.
- .4 Paint outdoor electrical equipment "equipment green" finish.
- .5 Paint indoor switchgear and distribution enclosures light gray unless otherwise indicated in particular specification sections for specialised or emergency power equipment.

## 2.8 ACCESS PANELS (DOORS)

- .1 Unless otherwise noted, access doors shall be minimum: 450mmx450mm [18"x18"] for body entry; 300mmx300mm [12"x 12"] for hand entry.
- .2 Access doors in fire separations of 3/4 hour rating, and higher, and firewalls shall have a compatible fire rating and a ULC label with tamper-proof latch, self closing.
- .3 Paint access panels to match wall colour. Contractor to coordinate with general contractor and painting trade to ensure all access panels are painted to match wall finishing.
- .4 Standard of Acceptance: Zurn, Wade, Acudor, Can-Aqua, Milcor, Maxam, Van-Met.

## 2.9 ANCHOR BOLTS AND TEMPLATES

- .1 Supply anchor bolts and templates for installation by other Divisions.

## 2.10 FASTENING TO BUILDING STRUCTURE

- .1 General:



- .1 Do not use inserts in base material with a compressive strength less than 13.79 MPa [2000 psi].
- .2 All inserts supporting conduit racks shall have a factor of safety of 5. All other inserts shall have a factor of safety of 4.
- .2 Types:
  - .1 Cast-in-place type:
    - .1 Channel type - Burndy, Canadian Strut, Unistrut, Cantruss or Hilti Channel.
    - .2 Wedge type galvanized steel concrete insert, Grinnell Fig. 281 for up to 200 mm [8"] pipe size.
    - .3 Universal type malleable iron body insert, Grinnell Fig. 282 for up to 200 mm [8"] pipe size.
  - .2 Drilled, mechanical expansion type:
    - .1 Hilti HSL or UCAN LHL heavy duty anchor for use in concrete with compressive strength not less than 19.6 MPa [2840 psi].
    - .2 Hilti Kwik-Bolt or UCAN WED stud anchor for concrete. (Do not use in seismic restraint applications).
    - .3 Hilti HDI or UCAN IPA drop-in anchor for concrete.
    - .4 Hilti or UCAN Sleeve Anchor (medium and light duty) for concrete and masonry.
    - .5 Hilti ZBP or UCAN Zamac pin bolt (light duty) for concrete and masonry.
  - .3 Drilled, adhesive type:
    - .1 Hilti HVA or UCAN Adhesive Anchor consisting of anchor rod assembly with a capsule containing a two-component adhesive, resin and hardener.
    - .2 Hilti HY150 consisting of anchor rod with a 2 part adhesive system.
    - .3 For use in concrete housekeeping bases (in vertical downward position) where the distance to the edge of the concrete base could cause weakness if a mechanical expansion type anchor were used.
    - .4 Rod assemblies shall extend a minimum of 50 mm [2"] into the concrete slab below the housekeeping bases.
- .3 Note:
  - .1 All drilling for inserts shall be performed using the appropriate tool specifically designed for the particular insert. The diameter and depth of each drilled hole shall be to the exact dimensions as specified by the insert manufacturer.
  - .2 Refer to manufacturer's recommendations for tightening torques to be applied to inserts.
  - .3 Where specifically called for, drills shall include a dust vacuum system, Hilti SAV Dust Vacuum System.

## 2.11 EQUIPMENT SUPPORTS

- .1 Provide stands and supports for equipment and materials supplied.
- .2 Lay out concrete bases and curbs required under Electrical Divisions. Coordinate with Concrete Divisions.
- .3 Concrete bases shall be a minimum of 100 mm [4"] thick, or as noted and shall project at least 150 mm [6"] outside the equipment base, unless otherwise directed. Bases and

curbs shall be keyed to the floor and incorporate reinforcing bars and/or steel mesh. Chamfer edges of bases at 45 degrees.

- .4 Equipment with bedplates shall have metal wedges placed under the edges of the bedplates to raise them 25mm [1"] above the base after levelling. The wedges shall be left permanently in place. Fill the space between the bedplate and the base with non-shrink grout - Embecco or In-Pakt.
- .5 Construct equipment supports of structural steel. Securely brace. Employ only welded construction. Bolt mounting plates to the structure.
- .6 Support ceiling hung equipment with rod hangers and/or structural steel.

## **2.12 MISCELLANEOUS METAL**

- .1 Be responsible for all miscellaneous steel work relative to Electrical Divisions of the Specifications, including but not limited to:
  - .1 Support of equipment.
  - .2 Hanging, support, anchoring, guiding and relative work as it applies to wiring raceways and electrical equipment.
  - .3 Earthquake restraint devices - refer also to "Seismic Restraint" sections
  - .4 Bridle rings - secure to structure or steel supports.
- .2 All steel work shall be prime and undercoat painted ready for finish under the related Division.

## **2.13 MAINTENANCE MATERIALS AND CABINET**

- .1 Provide maintenance materials in accordance with Division 01 and specified in appropriate Sections.
- .2 Provide a finished painted sheet steel "spare equipment cabinet". Cabinet to have a continuous hinge and complete with shelves and hasp to suit padlock. Minimum size 600 [24"] x 900 [36"] x 200 [8"] deep. Mount on wall in the Electrical Room. Provide a plastic covered typewritten list of spare parts and affix to the inside of the door.

## **2.14 OPERATION AND MAINTENANCE DATA**

- .1 Refer to Section 01 78 00 – Closeout Submittals for Operation and Maintenance Manual requirements.
- .2 Refer to Section 26 05 03 – Operation and Maintenance Manual for detailed submittal requirements.
- .3 Provide operation and maintenance data for incorporation into maintenance manual specified in Division 01 and as follows.
- .4 Include in operations and maintenance data:
  - .1 Details of design elements, construction features, component function and maintenance requirements, to permit effective operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.
  - .2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature not acceptable.
  - .3 Wiring and schematic diagrams.

- .4 Names and addresses of local suppliers for items included in maintenance manuals.
- .5 Include in the manual the following major sections:
  - .1 Title page (in plastic cover).
  - .2 Comprehensive description of the operation of the systems, including the function of each item of equipment within the system.
  - .3 Detailed instructions for the normal maintenance of all systems and equipment installed including procedures and frequency of operational checks and service and troubleshooting instructions.
  - .4 Local source of supply for each item of equipment.
  - .5 Wiring and control diagrams.
  - .6 Spare parts list.
  - .7 Copies of guarantees and certificates.
  - .8 Manufacturer's maintenance brochures and shop drawings.

## **2.15 PROJECT RECORD DRAWINGS**

- .1 Provide project record documents as specified in Division 01 as further called for in this Division.
- .2 The contractor shall keep a complete set of white prints at the site office, including all addendums, change orders, site instructions, clarifications and revisions for the purpose of record drawings. As the work on site proceeds, the contractor shall clearly record in Red all as-built conditions which deviate from the original contract documents. Record drawings to include cable runs (complete with number of cables and ID number) and locations of all telecommunications equipment.
- .3 Prior to substantial performance, the Contractor shall submit completed red-line record drawings to the Consultant. The Contractor shall certify, in writing that the as-built record drawings are complete and that they accurately indicate all electrical services and electrical pathway, including exposed as well as concealed items.
- .4 Contractor shall carry an allowance of \$250 per drawing. jol
- .5 Preparation of record drawings in AutoCAD shall be performed by the Contractor based on the red-line record drawings submitted by the Contractor.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

### **3.2 NAMEPLATES AND LABELS**

- .1 Ensure manufacturers nameplates and CSA labels to be visible and legible after equipment is installed.

### **3.3 CONDUIT AND CABLE INSTALLATION**

- .1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit and protruding 50 mm [2"].
- .2 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.
- .3 Install roof jacks where conduit and cables penetrate roofs. Apply sealant after installation. Install roof stand offs where conduit or teck is installed on roof.
- .4 All cables and conduits to be installed concealed in finished areas.

### 3.4 LOCATION OF OUTLETS

- .1 Do not install outlets back-to-back or in the same stud space in wall; allow minimum 400mm [16"] horizontal clearance between boxes.
- .2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000mm [10'- 0"] and information is given before installation.
- .3 Locate light switches on latch side of doors unless otherwise indicated.
- .4 Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

### 3.5 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not indicated verify before proceeding with installation. Confirm the height of devices in handicapped facilities before installation.
- .3 Adjust mounting heights to accessible heights to meet the BC Building Code where applicable.
- .4 Refer to detail on drawings; in the absence of a drawing detail or drawing note, use the following (note, not all devices may be present in this project):

Device	Height	Comment
Local switches	1200 [48"]	
Wall receptacles/data	300 [12"]	General
Wall receptacles/data	200 [8"]	Above top of continuous baseboard heater
Wall receptacles/data	175 [7"]	Above top of counters or counter splash backs – coordinate with Architectural detail
Wall receptacles/data	900 [36"]	In mechanical rooms
Wall receptacles/data Health Care	450 to 900 [18"] to [36"]	Confirm before installation
Exterior receptacles	600 [24"]	
Panelboards	2000 [80"]	Panelboards: as required by Code or as indicated.
Wall mtd telephone	1500 [60"]	
Card Readers/T'Stat	1200 [48"]	Confirm before installation

Device	Height		Comment
Fire alarm stations	1300	[52"]	ULC S524 requires not less than 1200mm or more than 1400mm.
Wall Mounted Luminaires	2140	[82"]	
Fire alarm horns/audio	2300	[92"]	ULC S524 requires not less than 1800mm to centre. In any event not closer than 50mm to the ceiling
Fire alarm visual devices	2000	[80"]	ULC S524 requires not more than 2000mm to centre. In any event not closer than 150mm to the ceiling
Fire alarm Annunciator	1800 Top	[72"]	ULC S524 requires not more than 1800mm above finished floor.
End of line resistors	1800	[72"]	
Television outlets			As receptacles –coordinate with equipment location
Wall mounted speakers & clocks	2300	[92"]	Coordinate with equipment location
Door bell pushbuttons	1500	[60"]	Coordinate with location
Emergency Lighting (wall mounted)			300mm below ceiling or 2300mm max.
Nurse call (NC) bed station	1350 to 1500	[54"] to [60"]	Coordinate with Architectural detail and/or bedhead layout
NC emergency station	1350	[54"]	
NC shower station	1650	[66"]	
NC staff/duty station	1500	[60"]	
Exit Lights			300mm below ceiling or 450mm max. above door.

### 3.6 COORDINATION OF PROTECTIVE DEVICES

- .1 Refer to Section 26 11 10 – Short Circuit Protective Device Coordination and Arc Flash Analysis.
- .2 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to the required values and settings to provide a fully coordinated system. Adjust and modify the protective devices to the recommendations of the Analysis to minimize available incident energy in arc flash situations and maximize the coordination of the protective devices.

### 3.7 FIELD QUALITY CONTROL

- .1 Load and Balance:

- .1 Measure voltage and phase & neutral currents to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase and neutral currents to dry-core transformers and motor control centres, operating under normal load,
- .3 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .2 Conduct and pay for the following tests:
  - .1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and its control to ASHRAE 90.1 – 10 requirements; this commissioning shall be conducted by the manufacture and the engineer shall receive a letter from the manufacturer detailing the commissioning and it's certification.
  - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
  - .5 Systems: fire alarm system and communications.
  - .6 Main ground resistance (at all grounding locations).
  - .7 Insulation resistance testing:
    - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
    - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
    - .3 Check resistance to ground before energizing.
- .3 Provide Consultant with at least one week's notice prior to testing.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Reports:
  - .1 Provide written reports in a timely manner upon completion of the testing and load balance. Indicate test hour and date.

### **3.8 CLEANING**

- .1 Do final cleaning in accordance with Division 01.
- .2 At time of final cleaning, clean lighting reflectors, lenses and other lighting surfaces that have been exposed to construction dust and dirt.
- .3 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .4 Clean and prime paint exposed non-galvanised hangers, racks, fastenings to prevent rusting. Coordinate finish painting with Division 09.
- .5 Clean Communication Rooms and equipment located therein with vacuum or similar compressed air/pressurized duster system.

### **3.9 WORKMANSHIP**

- .1 Workmanship shall be in accordance with well-established practice and standards accepted and recognized by the Consultant and the Trade.
- .2 The Consultant shall have the right to reject any item of work that does not conform to the Contract Documents and accepted standards of performance, quietness of operation, finish and appearance.
- .3 Employ only tradesmen holding valid Provincial Trade Qualification Certificates. Tradesmen shall perform only work that their certificate permits. Certificates shall be available for inspection by the Consultant.

### **3.10 PROTECTION OF WORK**

- .1 Protect equipment and materials, stored or in place, from the weather, moisture, dust and physical damage.
- .2 Mask machined surfaces. Secure covers over equipment openings and open ends of equipment and conduit, as the installation work progresses.
- .3 Equipment having operating parts, bearings or machined surfaces, showing signs of rusting, pitting or physical damage will be rejected.
- .4 Refinish damaged or marred factory finish.
- .5 All communication rooms shall be dust free at the time of installation of cabling and equipment. Communication rooms shall remain dust free during construction.

### **3.11 PROTECTION OF ELECTRICAL EQUIPMENT**

- .1 Protect exposed live equipment during construction for personnel safety.
- .2 Shield and mark live parts, e.g. "LIVE 120 VOLTS".
- .3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

### **3.12 CONCEALMENT**

- .1 Conceal wiring and conduit in partitions, walls, crawlspaces and ceiling spaces, unless otherwise noted.
- .2 Do not install wiring and conduit on outside walls or on roofs unless specifically directed.

### **3.13 SERVICE PENETRATIONS IN RATED FIRE SEPARATIONS**

- .1 All fire stopping materials shall be of one manufacturer; pre-approved manufactures are Hilti and STI.
- .2 All cabling, wiring, conduits, cable trays, etc. passing through rated fire separations shall be smoke and fire stopped to a ULC or cUL tested assembly system, in accordance with CAN4-S115-95, that meets the requirements of the Building Code in effect.
- .3 The scope includes new services which pass through existing rated separations and also all existing services which pass through a new rated separation or existing separations whose rating has been upgraded.
- .4 Firestop System installation must meet requirements of ASTM E 814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

- .5 Install firestopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions. The Applicator shall be approved, licensed and supervised by the manufacturer in the installation of firestopping and are to follow the requirements of a rated system; installer to be FM 4991 Approved Contractor, UL Approved Contractor or Hilti Accredited Fire Stop Specialty Contractor.
- .6 Contractors are expected to submit system information detailing firestopping product, backing, penetrant, penetrated assembly, Fire (F) and Temperature (T) rating, and ULC or cUL system number during shop drawing stage.
- .7 Provide fire stopping material and system information in the maintenance manuals and via labels at major penetrations that are likely to be re-penetrated.
- .8 All penetrations for communication cabling are to be firestopped using re-penetrable EZ Path System (Specified Technologies Inc - STI) or re-penetrable Hilti Firestop Systems designated and installed for each specific application.
- .9 Allow openings for 100% capacity of raceway or 200% capacity of J-hooks (if applicable).
- .10 Provide Firestopping approval certificate in including a Building Code / By-Law Schedule B & C-B signed by a BC registered Professional Engineer. Submit a letter certifying that all work is complete and in accordance with this specification.
- .11 A manufacturer's direct representative (account manager, fire protection specialist, not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details. Manufacturer's fire protection specialist to work with consultant to determine frequency of site walk-throughs to be submitted to construction manager and consultant.
- .12 Inspection of through-penetration firestopping by the manufacturer shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard and a field report shall be issued by the manufacturer to the consultant.
- .13 Electrical Contractor to provide for a 10% deconstruction test by the Engineer during walk-through.

### **3.14 SERVICE PENETRATIONS IN NON-RATED SEPARATIONS**

- .1 All cabling, wiring, conduits, cable trays, etc. passing through non-rated fire separations and non-rated walls and floors shall be tightly fitted and sealed on both sides of the separation with caulking or silicon sealant to prevent the passage of smoke and/or transmission of sound.

### **3.15 CONDUIT SLEEVES**

- .1 Provide conduit sleeves for all conduit and wiring passing through rated walls and floors. Sleeves to be concentric with conduit or wiring.
- .2 Except as otherwise noted conduit sleeves are not required for holes formed or cored in interior concrete walls or floors.
- .3 Conduit sleeves shall extend 50 mm [2"] above floors in unfinished areas and wet areas and 6 mm [1/4"] above floors in finished areas.



- .4 Conduit sleeves shall extend 25 mm [1"] on each side of walls in unfinished areas and 6 mm [1/4"] in finished areas.
- .5 Conduit sleeves shall extend 25mm [1"] beyond exterior face of building. Caulk with flexible caulking compound.
- .6 Sleeve Size: 12 mm [1/2"] clearance all around, between sleeve and conduit or wiring.
- .7 Paint exterior surfaces of ferrous sleeves with heavy application of rust inhibiting primer.
- .8 Packing of Sleeves:
  - .1 Where sleeves pass through foundation walls and perimeter walls the space between sleeve and conduit shall be caulked with waterproof fire retardant non-hardening mastic.
  - .2 Pack future-use sleeves with mineral wool insulation and then seal with ULC approved fire stop sealant for rated fire separations.

### **3.16 ACCESSIBILITY AND ACCESS PANELS**

- .1 Install all equipment, controls and junction boxes so as to be readily accessible for future modification, adjustment, operation and maintenance as appropriate.
- .2 Provide access panels where required in building surfaces. Do not locate access panels in panelled or special finish walls, without prior approval of the Consultant.
- .3 Access panels in U.L.C. fire separations and fire walls shall have a compatible fire rating and U.L.C. label. Acquire approval in writing from the local fire authority if required.
- .4 Access panels shall be painted with a primer coat if applicable and then with a finish coat, colour and type to the Consultant's approval.
- .5 Locate equipment and junction boxes in service areas wherever possible.

### **3.17 EQUIPMENT INSTALLATION**

- .1 Provide means of access for servicing equipment.
- .2 CSA identification and equipment labels to be clearly visible after installation.

### **3.18 CUTTING, PATCHING, DIGGING, CANNING, CORING & CONCRETE**

- .1 Lay out all cutting, patching, digging, canning and coring required to accommodate the electrical services. Coordinate with other Divisions. The performance of actual cutting, patching, digging, canning and coring is specified under other Divisions.
  - .2 The Electrical Contractor shall be responsible for all cutting, patching, digging, canning and coring required to accommodate the electrical services.
  - .3 The Electrical Contractor shall be responsible for correct location and sizing of all openings required under Electrical Divisions, including piped sleeves.
  - .4 Verify the location of existing and planned service runs and structural components within concrete floor and walls prior to core drilling and/or cutting.
  - .5 Openings through structural members of the building shall not be made without the approval of the Structural Consultant.
-

- .6 Openings in Concrete:
  - .1 Be responsible for the layout of all openings in concrete, where openings are not left ready under previous contract.
  - .2 All openings shall be core drilled or diamond saw cut.
  - .3 Refer to structural drawings for permissible locations of openings and permissible opening sizes in concrete floors and walls.
  - .4 Refer to structural drawings for locations of steel reinforcing.
  - .5 Be responsible for repairing any damage to steel reinforcing.
- .7 Openings in building surfaces other than concrete:
  - .1 Lay out all openings required.
- .8 Poured concrete for duct encasements, pole bases, transformer pads and housekeeping pads shall be provided by other Divisions, coordinated and supervised by the Electrical Divisions.
- .9 Precast concrete items such as transformer pad bases, pull boxes and light pole bases to be provided and installed by the Electrical Divisions unless otherwise specified.
- .10 Excavation and backfilling will be provided by other Divisions. This Division to supervise the work and provide all layouts and parameters.

### **3.19 PAINTING**

- .1 Clean exposed bare metal surfaces supplied under the Electrical Divisions removing all dirt, dust, grease and millscale. Apply at least one coat of corrosion resistant primer paint to all supports and equipment fabricated from ferrous metal.
- .2 Paint all hangers and exposed sleeves, in exposed areas, with a rust inhibiting primer, as they are installed.
- .3 Repaint all marred factory finished equipment supplied under the Electrical Divisions, to match the original factory finish.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED WORK**

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

**1.2 SCOPE**

- .1 Electrical operations and maintenance manuals (hereinafter referred to as O&M manuals) shall be prepared by a firm specializing in this type of work.
- .2 Specialty firm to be responsible for:
  - .1 The supply and preparation of four sets of O&M manual binders and tabs as specified in the index below.
  - .2 The preparation of all written system descriptions and schematics (neatly drafted) for each tab section identified as article 1.4. Format as directed by the Owner, utilizing proportional typewritten format, with schematics in appendices at the end of each section. System description shall include an overview of basic design philosophy, description of future expansion capability, general construction of components, electrical characteristics not readily deduced from the contract documents, basic system configuration and interfaces with other systems existing or new.
  - .3 Securing and assembling all necessary literature describing operational and maintenance procedures for all equipment into the O&M manual binders, including Preventative Maintenance data as described below. Preventative maintenance data and maintenance suggestions to be compiled in tabular format in applicable section to provide a comprehensive overview of maintenance procedures.
  - .4 Preparing in coordination with Electrical Divisions and equipment manufacturer's technical specialist, scheduled maintenance sheets and check lists. Scheduled maintenance sheets shall include safety in maintenance data plus detailed daily, monthly and yearly scheduled maintenance information. Format as directed by the Owner.
  - .5 Preparation of safety in maintenance suggestions and procedures.
  - .6 Summarized daily, monthly and yearly maintenance charts.
  - .7 Prestonia No. 2047-10 plastic sheet protectors for all drawings larger than 210 mm × 275 mm. Locate drawing title block on lower right hand corner.
- .3 Division 26 shall be responsible for:
  - .1 Supply of four (4) copies of all information as described below:
    - .1 Final shop drawings.
    - .2 All wiring diagrams.
    - .3 List of all major trades, sub-trades and suppliers including names of equipment supplied and by whom, addresses, phone numbers, facsimile numbers and contact persons.

- .4 Obtaining all data necessary to compile a complete comprehensive Preventative Maintenance program. Data gathered shall be neatly handwritten on forms provided by the Owner. Data to be collected for all systems described in the index below.
- .5 Spare/replacement parts lists for all of the above. Copies of the electrical contractor's data collection sheets available during tendering period when requested.
- .6 Test results and verification reports as outlined in other sections of this specification.
- .7 Warranties as outlined in this and other sections of the Specifications.

### **1.3 ELECTRONIC FORMAT**

- .1 In addition to the specified hardcopy, provide an electronic copy in pdf format. Electronic copy to be produced on a CD-ROM in the latest version of Acrobat.
- .2 CD-ROM to be reproducible by owner as required to carry out his duties.
- .3 Electronic copy to consist of a single pdf file divided into chapters to allow a quick and easy access to the different sections of the manual.
- .4 All log sheet, maintenance tables, preventative maintenance sheets, intended to be completed by the Owner are to be completely interactive allowing the Owner to complete all pertinent information and save, print or modify these forms as required.
- .5 Provide a proposed layout to the consultant for approval prior to the construction of the O&M manuals.
- .6 Electrical contractor to submit complete system description and schematics by 50% complete stage of construction. O&M manuals to be submitted to the Owner 90% complete three (3) months prior to substantial completion review.
- .7 Electrical O&M manuals to be assembled in 210 mm × 275 mm capacity, expanding spine catalogue binders complete with plated piano hinges, bound in heavy fabric, hot stamped lettering on front and spine. Electrical contractor to provide sufficient quantity to allow all binders to hold system data while in full closed position (not expanded).
- .8 Electrical contractor to provide sample of art work and fabric cover (before having binders constructed) to the Owner.
- .9 In addition to the specified hardcopy, provide an electronic copy in pdf format. Electronic copy to be produced on a CD-ROM in the latest version of Acrobat.
  - .1 CD-ROM to be reproducible by owner as required to carry out his duties.
  - .2 Electronic copy to consist of a single .pdf file divided into chapters to allow a quick and easy access to the different sections of the manual.
  - .3 All log sheet, maintenance tables preventative maintenance sheets, intended to be completed by the Owner are to be completely interactive allowing the Owner to complete all pertinent information and save, print or modify these forms as required.
  - .4 Provide a proposed layout to the Consultant for approval prior to the construction.

**END OF SECTION**

## **PART 1 GENERAL**

### **1.1 RELATED WORK**

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

### **1.2 REGULATORY REQUIREMENTS**

- .1 Restraints shall meet the requirements of the latest edition of the British Columbia Building Code and amendments.
- .2 The Seismic Consulting Engineer should be able to provide a proof of professional insurance and the related practice credentials if requested by the Electrical Consultant. The Seismic Consulting Engineer should be familiar with SMACNA, ECABC & NFPA guidelines as well as BCBC and VBBL requirements.
- .3 The Contractors' Seismic Consultant shall submit original signed BC Building Code "Letters of Assurance" "Schedules B and C-B" to the Prime Consultant or Electrical Consultant.
- .4 Project shall comply with the local bylaw where applicable.
- .5 The above requirements shall not restrict or supplant the requirements of any local bylaws, codes, or other certified agencies which may have jurisdiction over all or part of the installation.

### **1.3 SCOPE**

- .1 It is the responsibility of equipment manufacturers to design their equipment so that the strength and anchorage of internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.
  - .2 Manufacturer's shop drawings to be submitted with seismic information on equipment structure, bracing and internal components and as required by Division 01.
  - .3 Provide restraint on all equipment and machinery, which is part of the building electrical services and systems, to prevent injury or hazard to persons and equipment in and around the structure. Restrain all such equipment in its normal position in the event of an earthquake.
  - .4 The total electrical seismic restraint design and field review and inspection will be by a B.C. registered professional structural engineer who specializes in the restraint of building elements. Contractor to allow for coordination, provision of seismic restraints, as well as all costs for the services of the Seismic Restraint Engineer. This engineer, herein referred to as the Seismic Consultant, will provide normal engineering functions as they pertain to seismic restraint of electrical installations.
  - .5 The Contractor shall be aware of, and comply with, all current seismic restraining requirements and make provision for those that may come into effect during construction of the project. Make proper allowance for such conditions in the tender.
  - .6 The Seismic Consultant shall provide detailed seismic restraint installation shop drawings to the Contractor. Copies of the shop drawings to be included in the final project manual.
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- .7 Provide seismic restraints on all equipment, and/or installations or assemblies, which are suspended, pendant, shelf mounted, freestanding and/or bolted to the building structure or support slabs.
- .8 The Seismic Consultant shall provide inspections during and after installation. The Contractor shall correct any deficiencies noted without additional cost to the contract.
- .9 Include all costs associated with the Seismic installation and certification in the base tender.

## **PART 2 PRODUCTS**

### **2.1 SLACK CABLE SYSTEMS**

- .1 Slack cable restraint systems shall be as designed and supplied by Vibra-Sonic Control or equal.
- .2 Slack cable restraints shall be provided on suspended and shelf mounted transformers along with associated equipment and assemblies connected to them at the points of vertical support (4 points). The restraint wires shall be oriented at approximately 90 degrees to each other (in plan), and tied back to the ceiling slab or its structure at approximately 45 degrees to the slab or basic structure. The restraints shall be selected for a 1 g earthquake loading, i.e. each wire shall have a working load capacity equal to the weight of the transformer. The anchors in the structure shall be selected for a load equal to the weight of the transformers at a 45 degree pull.
- .3 Slack cable systems to allow normal maintenance of equipment and shall not create additional hazard by their location or configurations. Contractor shall rectify any such installations at no additional cost, all to the satisfaction of the engineer and inspection authority having jurisdiction.
- .4 Coordinate requirements of slack cables with suppliers prior to installation.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

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

### **3.2 CONDUITS**

- .1 Provide restraint installation information and details on conduit and equipment as indicated below:
- .2 Vertical Conduit:
  - .1 Attachment - Secure vertical conduit at sufficiently close intervals to keep the conduit in alignment and carry the weight of the conduits and wiring. Stacks shall be supported at their bases and, if over 2 stories in height, at each floor by approved metal floor clamps.
  - .2 At vertical conduit risers, wherever possible, support the weight of the riser, at a point or points above the center of gravity of the riser. Provide lateral guides at the top and bottom of the riser, and at intermediate points not to exceed 9.2 m.

- .3 Riser joints shall be braced or stabilized between floors.
- .4 Horizontal Conduits:
  - .1 Supports - Horizontal conduit shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.
  - .2 EMT tubing - tubing shall be supported at approximately 1.2 m [4 ft] intervals for tubing.
- .5 Do not brace conduit runs against each other. Use separate support and restraint system.
- .6 Support all conduits in accordance with the capability of the pipe to resist seismic load requirements indicated.
- .7 Trapeze hangers may be used. Provide flexible conduit connections where conduits pass through building seismic or expansion joints, or where rigidly supported conduits connect to equipment with vibration or seismic isolators.
- .8 A conduit system shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an earthquake. Examples: wall and a roof; solid concrete wall and a metal deck with lightweight concrete fill.
- .9 Provide large enough conduit sleeves through walls or floors to allow for anticipated differential movements with firestopping where required.
- .10 It is the responsibility of the contractor to ascertain that an appropriate size restraint device be selected for each individual piece of equipment. Submit details on shop drawings. Review with seismic consultant and submit shop drawings to consultants for their reference.

### **3.3 FLOOR MOUNTED EQUIPMENT**

- .1 Bolt all equipment, e.g. transformers, switchgear, generators, motor control centres, free standing panelboards, control panels, capacitor banks, etc. to the structure. Design anchors and bolts for seismic force applied horizontally through the center of gravity to a seismic force of 0.5g. For equipment which may be subject to resonances, use a nominal 1.0 g seismic force.
- .2 Provide flexible conduit connections between floor mounted equipment to be restrained and its adjacent associated electrical equipment.

### **3.4 LIGHT FIXTURES**

- .1 Fixtures in suspended ceilings shall be hung independently of the ceiling system. Fixtures shall be secured to concrete or structural deck above by at least two taught cables which are connected to the fixture at diagonal points.
  - .2 Surface and recessed style fixtures shall be hung independently of the ceiling system. Fixtures shall be secured to concrete or structural deck above by taut cables.
  - .3 Fixtures which are hung independently of ceiling systems shall have minimum of one seismic cable in addition to the chain or cable used to support the fixture. Seismic restraint cables shall be secured into the concrete or structural deck above.
  - .4 Cables shall be corrosion resistant and approved for the application.
  - .5 Fixtures which are rod hung shall have seismic ball alignment fittings at the ceiling and fixture.
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**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED SECTIONS**

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

**1.2 EXCAVATION AND BACKFILL**

- .1 Check the drawings of other Divisions of the work for the existence of underground services, and report any serious interference before proceeding with the work. The services of Utility Authorities shall be engaged to accurately determine the location of any underground services prior to excavation.
- .2 Carefully coordinate duct bank location below building with the structure.
- .3 In the execution of this work, or any extra work in connection therewith, do not move any structure or services without the consent of the proper parties. In crossing or running parallel with said structures or services, secure same in place until the work is completed. Any damage to structures or services of this kind caused by neglect to attend to same shall be paid for by the Contractor.
- .4 Keep excavations dry at all times by bailing, pumping, or other means as is necessary.
- .5 Prove grades and the route of ductwork and conduits and the location of manholes far enough along the route in advance of forming and concrete pour so that any relocation or re-design necessitated by unforeseen obstacles may be carried out.
- .6 Grade the bottom of trenches for ducts, duct banks and conduit and level with pit-run gravel and sand, graded from coarse to fine with a maximum size of 38mm [1½"]. Where excavation is carried out to a depth greater than that required for the proper elevation for the ducts, duct bank, or conduit, backfill with carefully compacted and power-tamped sand and pit-run gravel as specified to the required grade.
- .7 Backfill trenches under building floor areas with sand placed in layers in an approved manner to achieve 95% modified Proctor compaction. Material from excavation shall not be used for backfilling.
- .8 In locations other than under building floor areas, thoroughly tamp same around and over ducts and conduits to a height of at least 300mm [12"] above. Fill remainder of trench and consolidate on 450mm [18"] layers with approved excavated materials, free from stone and foreign materials.
- .9 Except where beneath the building, supply and install polyethylene HIGH VOLTAGE marking tape over and along the full length of underground services at a depth of 300mm [12"] below grade.
- .10 Backfill the top 150mm [6"] of the excavation with pit-run gravel where the excavation is situated on a paved or travelled road; crushed rock screenings where the excavation is situated on a concrete sidewalk; black loam where the excavation is on a developed grass boulevard; and sand or earth free of clay, extraneous material, or rock no larger than 38mm [1½"] in any dimensions elsewhere. All shall be thoroughly tamped. Where area

was originally grassed, rake loam clear of all stones and debris and leave ready for re-sodding.

- .11 Backfill as soon as possible, so that regular traffic in and around the work will not be inconvenienced.
- .12 Fill depressions to restore the correct grade after a period adequate to reveal settlement has passed. Restore all surfaces (paving, sidewalk, grass) to same quality as the surroundings. Assume responsibility for making good any subsequent settlement of such fill. Pay costs involved in making good pavement, surfacing lawns, curbs and all other surfaces damaged by such settlement and subsequent restoration.
- .13 Store materials excavated during the progress of the work in such locations as directed by the Consultant and in such a manner as to produce a minimum of inconvenience, damage or disfigurement of existing ground.
- .14 Remove and dispose of excess excavated material remaining on completion of the work and leave site clear and unencumbered.

### **1.3 WATERPROOFING/VAPOUR BARRIERS**

- .1 Generally penetrations through waterproofing members and vapour barriers will not be permitted. However, where any work must pierce vapour barriers and waterproofing membranes including waterproofed concrete, the method of installation, colour of caulking material and location of penetration shall be as approved by the Consultant and as coordinated with Division 07 prior to proceeding with the work. Supply and install all necessary sleeves, caulking and flashing and make the penetrations watertight. For penetrations of vapour barrier, maintain integrity of the system. Restore penetrations through existing surfaces to match the surroundings.
- .2 Provide specified caulking around all exterior recessed lighting fixtures in concrete steps, walls, etc.
- .3 Provide clear silicon bead on top and down both sides of all exterior wall mounted devices (e.g. light fixtures and gongs) where devices are exposed to the weather.

### **1.4 EQUIPMENT FINISHES**

- .1 Thoroughly degrease all metalwork and apply one overall coat of zinc chromate primer to all electrical equipment enclosures, supports, switchgear cubicles, bus ducts, gutters, panelboards, low tension and other cabinets. Unless otherwise directed, apply one overall coat of grey enamel and a second coat of gloss enamel. Paint all exposed surfaces Grey ASA #61 unless matching existing equipment in which case colour shall match existing.
- .2 Unless otherwise directed, paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1-1955.
- .3 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint. Ensure that equipment finishes are not defaced during installation. Scratched or otherwise marred surfaces shall be refinished

before the job will be accepted. Other surfaces shall be completely repaired to match original paint. Patching of damaged area will not be accepted.

- .4 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.
- .5 Generally, equipment finishes shall be as outlined under applicable sections of the specifications.

**END OF SECTION**

**PART 1      General**

**1.1            RELATED WORK**

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

**1.2            BRANCH WIRING**

- .1      Adhere to the circuit numbers indicated on the drawings. Provide all branch circuit wiring using materials and methods described herein and in consultation with the Consultant.
- .2      Calculate volt drop of all feeders and branch circuit wiring and increase wire sizes based on actual wire run to meet the minimum requirements of the Canadian Electrical Code.
- .3      Install a green insulated bonding conductor in all conduits; do not rely on metallic conduit for bonding continuity. Size bonding conductor as per the Canadian Electrical Code.
- .4      Phase all panelboard buses throughout the building such that the left, centre, and right hand buses represent phase A, B, and C respectively. Identify all indicating meters to this sequence.
- .5      Provide all conduits and wiring including flexible connections, outlet boxes complete with wiring devices and surface raceways for all casework and millwork as shown on the drawings, unless otherwise noted. Arrange conduit so that it will be completely concealed along the entire run to the outlet.
- .6      Where wiring devices are indicated on free-standing benches or tables, locate conduit so that it will be concealed along the entire run to the outlet. Location of conduit floor penetrations shall be to the approval of the Consultant. Conduits will not be permitted to run in concrete floor or topping or below slab on grade.
- .7      Wire to all electrical appliances indicated on the drawings. The word appliance is intended to include cooking equipment not of 'plug-in' nature, laundry equipment, stills, hot water tanks, and other special equipment throughout the building for which outlets are indicated on the drawings or noted in the equipment schedule. Use flexible conduit or liquid-tight flexible conduit for connection from outlets to appliances.
- .8      Unless otherwise noted, appliances will be supplied and set in place in the rooms by others. Check with the trades involved and with the Owner to determine correct orientation of the appliances, the final and exact location and electrical requirements of each outlet (both control and supply) before proceeding with the installation.
- .9      Prior to rough-in of outlet boxes confirm final furniture layout with the Architect.
- .10     Prior to installation of switch outlets, confirm door swing on Architectural Drawings. Where switch cannot be located on latch side of door, install the outlet box a minimum of three feet from the door swing, do not install switch behind door.
- .11     Wiring circuits for electronic equipment, such as computers, printers and Communications equipment shall have a separate dedicated neutral for each and every circuit.

**END OF SECTION**

**PART 1      General**

**1.1            RELATED SECTIONS**

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

**1.2            REFERENCES**

- .1      Canadian Standards Association (CSA International)
  - .1      CAN/CSA-C22.2No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
  - .2      CSA C22.2No.65, Wire Connectors.
- .2      Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1      EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3      National Electrical Manufacturers Association (NEMA)

**PART 2      PRODUCTS**

**2.1            MATERIALS**

- .1      Pressure type wire connectors to: CSA C22.2No.65, with current carrying parts of copper alloy sized to fit copper conductors as required.
- .2      Fixture type splicing connectors to: CSA C22.2No.65, with current carrying parts of copper alloy sized to fit copper conductors 10 AWG or less.
- .3      Bushing stud connectors: to EEMAC 1Y-2/NEMA to consist of:
  - .1      Connector body and stud clamp for round copper conductors.
  - .2      Clamp for round copper conductors.
  - .3      Clamp for stranded aluminum conductors round aluminum bar.
  - .4      Stud clamp bolts.
  - .5      Bolts for copper conductors and bar.
  - .6      Bolts for aluminum conductors and bar.
  - .7      Sized for conductors or bars as indicated.
- .4      Clamps or connectors for armoured cable, aluminum sheathed cable, flexible conduit as required to: CAN/CSA-C22.2No.18.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

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

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED WORK**

- .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.
- .2 Refer to Division 27 & 28 for particular Communications, Electronic Safety & Security wiring systems and types.

**1.2 TERMS OF REFERENCE**

- .1 Use insulated 98% conductivity copper conductor wiring for the all communication systems unless otherwise indicated. Refer to "Site Services" Section for allowable site conduits as an alternative to steel.
- .2 Aluminium conductors only permitted where indicated on drawings and then typically only for feeder conductors larger than 3/0 AWG. All conductor sizes indicated on drawings are based on copper conductors unless otherwise noted.
- .3 Teck cable may only be used where specifically indicated on the drawings or in the specifications. Where permitted, Teck wiring up to 750 system volts to be PVC jacketed armoured cable, multi-copper conductor type Teck90 1000 volt having a PVC jacket with FT-4 flame spread rating.
- .4 Flexible armoured cabling (BX) and nmd90 is permissible to be used for the general wiring systems.
- .5 Provide all control wiring except mechanical equipment controls as specified in Section 26 24 21 Mechanical Equipment Controls and the Mechanical Divisions.
- .6 Refer to Equipment Schedule(s) for detailed responsibilities.
- .7 Non-metallic sheathed wiring is not to be used on this project.
- .8 Non-metallic sheathed copper cable type: NMD90XLPE size as indicated.

**1.3 PRODUCT DATA**

- .1 Provide product data in accordance with Division 01

**PART 2 PRODUCTS**

**2.1 WIRING & CABLES – GENERAL**

- .1 Conductors: stranded for 10 AWG and larger. Minimum size #12 AWG.
  - .2 Insulation to be 600 volt NMD90 for the general building wiring.
  - .3 Use RWU75XLPE for underground installations.
  - .4 Site services sub-circuits, including site lighting, to be minimum #10 AWG for power and #12 AWG for controls. Increase wiring size for lengthy and/or loaded circuits so that system will not exceed the maximum voltage drop as recommended by the Canadian Electrical Code CSA 22.1.
-

- .5 Main feeders to be conduit and copper insulated wiring unless otherwise noted on drawings. Provide bond wiring for all conduits. Increase conduit size as required.
- .6 Armoured (AC-90) cable may only be utilized for recessed tee bar luminaire drops from ceiling mounted outlet boxes. "Tite Bite" connectors and their counterparts of other manufacturers shall not be used. Use anti-short connectors. Cable from luminaire to luminaire is discouraged. Allow nominally 900mm [3'] extra cable looped and supported in the ceiling space to permit fixture relocations of one tile space.
- .7 TBS75 #14 AWG stranded shall be used in all switchgear assemblies. Current transformer secondary wiring shall be #12 AWG stranded. Current transformer leads shall incorporate ring type tongues for termination purposes
- .8 Conductors to be colour-coded. Conductors #10 AWG and smaller shall have colour impregnated into insulation at time of manufacture. Conductors size #8 AWG and larger may be colour-coded with adhesive colour coding tape, but only black insulated conductors shall be employed in this case, except for neutrals which shall be white wherever possible. Where colour-coding tape is utilized, it shall be applied for a minimum of 50 mm at terminations, junctions and pullboxes and conduit fittings. Conductors shall not be painted.
- .9 Where cabling is required to be protected by a minimum of 1-hour (or greater) fire rating the electrical contractor shall provide 2 hour rated cabling (Vitalink Armored cabling or Vitalink Ethernet for communications). All installation methods shall meet the manufacturers recommendations and UL 2196 and CAN/ULC-S101 requirements. Note: fire rated shafts for conductors is not an acceptable method of fire protection.

## **2.2 TECK CABLE**

- .1 Cable: to CAN/CSA-C22.2 No. 131.
- .2 Conductors: copper and sized as indicated.
- .3 Insulation: Chemically cross-linked thermosetting polyethylene rated type RW75XLPE,600V
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: flat galvanized steel.
- .6 Overall covering: PVC jacket with FT-6 flame spread rating. PVC flame retardant jacket over armour meeting requirements of Vertical Tray Fire Test of CSA C22.2 No. 0.3 with maximum flame travel of 1.2 m.
- .7 Fastenings:
  - .1 One (1) hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
  - .2 Channel type supports for two (2) or more cables.
  - .3 Threaded rods: 6 mm dia. to support suspended channels.
- .8 Connectors: Watertight approved for TECK cable

## **2.3 ARMOURED CABLE (AC-90)**

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90 600 V rated.



- .3 Armour: interlocking type fabricated from galvanized steel.
- .4 Anti-short connectors.
- .5 AC-90 cable is only to be used for extending from ceiling mounted junction box to device boxes mounted on suspended accessible ceiling (3m maximum length), or where expressly permitted by the Consultant.

## **2.4 LOW VOLTAGE CONTROL CABLES**

- .1 Type LVT: soft annealed copper conductors, with thermoplastic insulation, outer covering of thermoplastic jacket. Minimum size #18 AWG. FT-6 Rated.
- .2 Unless otherwise specified wiring to be multicore individually identified and colour coded with grey sheath.

## **2.5 WIRE & BOX CONNECTORS**

- .1 Pressure type wire connector current carrying parts to be copper and sized to fit conductors used.
- .2 Fixture type splicing connector current carrying parts to be copper sized to fit conductors 10 AWG or less.
- .3 Bushing stud connectors to EEMAC 1Y-2 and suitable for stranded copper conductors
- .4 Clamps or connectors for armoured cable, flexible conduit, as required.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Install all cables and wiring.
- .2 Conductor length for parallel feeders to be identical. Provide permanent plastic nametag indicating load fed.
- .3 Group Teck, Armoured, MI & Sheathed cables on channels wherever possible.
- .4 Lace or clip groups of feeder conductors at all distribution centres, pullboxes, and termination points.
- .5 Wiring in walls should typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls should be avoided unless indicated.
- .6 All grounding and bonding conductors and straps to be copper. All bonding conductors to have green insulation jacket.
- .7 Colour coding to be strictly in accordance with Section 26 05 00 – Common Work Results.
- .8 Provide sleeves where cables enter or exit cast concrete or masonry.
- .9 Power wiring up to and including #6 AWG shall be spliced with nylon-insulated expandable spring-type connectors. Large conductors shall be spliced using split-bolt or other compression type connectors wrapped with cambric tape then PVC tape.
- .10 Wires shall be sized for 2% maximum voltage drop to farthest outlet on a loaded circuit. Increase home run cable size to meet these requirements.

- .11 All branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.
- .12 Provide numbered wire collars for all control wiring. Numbers to correspond to control drawing legend. Obtain wiring diagram for control wiring of other Divisions.

### **3.2 VOLTAGE REGULATION**

- .1 The drawings are diagrammatic and indicate the general routing of conduit runs and not exact routing, either horizontally or vertically.
- .2 Branch circuit conductor sizes shall be #12 AWG or larger based on the Canadian Electrical Code CSA 22.1 Section 8, which allows a maximum 3% voltage drop for branch circuits.

### **3.3 WIRE & BOX CONNECTORS**

- .1 Remove insulation carefully from ends of conductors and:
  - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65
  - .2 Install fixture type connectors and tighten. Replace insulating cap.
  - .3 Install bushing stud connectors in accordance with EEMAC 1Y-2

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

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

**1.2 REFERENCES**

- .1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE) – most recent version
  - .1 ANSI/IEEE 837, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.
  - .2 Grounding equipment to: CSA C22.2 No.41.
  - .3 All grounding conductors to be stranded soft annealed copper unless otherwise noted.
  - .4 Install complete grounding and bonding system in accordance with Canadian Electrical Code and local inspection authority requirements.
  - .5 ANSI/TIA 607B Generic Telecommunications Bonding and Grounding for Customer Premises.

**PART 2 PRODUCTS**

**2.1 EQUIPMENT**

- .1 Clamps for grounding of conductor: size [as indicated] as required to electrically conductive underground water pipe.
- .2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, soft annealed, size as indicated.
- .3 Rod electrodes: copper clad steel 19 mm diameter by minimum 3 m long.
- .4 Plate electrodes: to CSA Standard 41.
- .5 Grounding conductors: bare stranded copper, tinned, soft annealed, size as per C.E.C.
- .6 Insulated grounding conductors: green, copper conductors, sized as per C.E.C.
- .7 Ground bus: copper, complete with insulated supports, fastenings, connectors.
- .8 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1 Grounding and bonding bushings.
  - .2 Protective type clamps.
  - .3 Bolted type conductor connectors.
  - .4 Thermit welded type conductor connectors.
  - .5 Bonding jumpers, straps.
  - .6 Pressure wire connectors.

## **2.2 STANDARDS OF ACCEPTANCE**

- .1 Acceptable manufacturers:
  - .1 Burndy Corp.
  - .2 Erico Inc.
  - .3 Cadweld.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

### **3.2 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process, permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Install bonding wire in EMT conduits.
- .7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .9 Install separate ground conductor to outdoor lighting standards.
- .10 Connect building structural steel and metal siding to ground by welding copper to steel.
- .11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .12 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.
- .13 Ground secondary service pedestals.

- .14 Provide a grounding/bonding bus in each electrical room and in the Generator room. Connect a #2/0cu bonding conductor or as shown on the drawings between grounding/bonding buses.
- .15 All bonding and grounding connections to be compression type unless noted otherwise.
- .16 Bond bonding bus of switchboard to the grounding grid with a #3/0 copper conductor.
- .17 Ground the secondary winding of potential and current transformers.
- .18 Supply and install complete grounding and bonding system as indicated and as required by Canadian Electrical Code and the local electrical inspection authorities.
- .19 Provide grounding/bonding bus bars mounted on standoff insulators or as shown on the drawings.
- .20 All components shall be securely and adequately bonded and where required to accomplish this, bonding jumpers, grounding studs and bushings shall be used.
- .21 Ensure that all raceways, terminal panels, etc. for fire alarm, etc. are securely and adequately bonded and provide grounding conductor to main ground bus where called for or when required.
- .22 All interior metallic gas piping which may become energized to be made electrically continuous and to be bonded in accordance with requirements of Canadian Electrical Code.
- .23 Bond all low tension equipment with #6 AWG green insulated bonding conductor.
- .24 Bond all structural steel, all concrete reinforcing steel and all metal systems with a #6 AWG copper bonding conductor. Connect to closest ground bus or bonding point.
- .25 All metallic conduits longer than 1m in length, containing a single grounding or bonding conductor, shall be bonded as per the Canadian Electrical Code.

### **3.3 ELECTRODES**

- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
- .2 Install water meter shunt.
- .3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.
- .4 Install rod electrodes and make grounding connections as indicated.
- .5 Bond separate, multiple electrodes together.
- .6 Use size 2/0 AWG copper conductors for connections to electrodes.
- .7 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

### **3.4 SYSTEM AND CIRCUIT GROUNDING**

- .1 Install system and circuit grounding connections to neutral of primary 25kV system, secondary 240/120V 3 wire system.

### **3.5 EQUIPMENT BONDING**

- .1 Install bonding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, UPS units, elevators and escalators, distribution panels, outdoor lighting and cable trays.
- .2 Provide a bonding conductor from the secondary of every distribution transformer to the grounding system. Bond conductor to be sized and installed in accordance with Canadian Electrical Code.

### **3.6 GROUNDING BUS**

- .1 Provide a ground bus in the main electrical room. Ground bus shall consist of suitable length of 50mm x 6mm [2" x 1/4"] copper bus mounted on a 25mm [1"] insulating standoffs. This bus shall be drilled and tapped to receive all the bonding conductors indicated and an engraved nameplate or tag installed above or below individual conductors indicating their function.
- .2 Bond items of electrical equipment in electrical room and IT equipment in communication equipment room to ground bus with individual bare stranded copper connections size 2/0AWG.

### **3.7 MECHANICAL EQUIPMENT BONDING**

- .1 Bond wires to be installed in all conduit serving motor feeder circuits and to extend to ground screws on junction and outlet boxes for bonding.

### **3.8 COMMUNICATION SYSTEMS**

- .1 Install Bonding connections for telephone, sound, fire alarm, security systems, intercommunication systems as required in ANIS/TIA 607B:
  - .1 Utility Provider grounding system in accordance with telephone company's requirements.
  - .2 Communication, sound, fire alarm, security systems, intercommunication systems as indicated.

### **3.9 SYSTEMS BONDING**

- .1 Install a home run #6 AWG insulated bonding conductor in conduit from the main ground bus to the:
  - .1 Main Security panel.
  - .2 Communication systems head end.

### **3.10 POST MOUNTED LUMINAIRE BONDING**

- .1 Provide #10 AWG bonding conductor with green RW90 X-link insulation to luminaire standards. Connect to luminaire corrosion resistant ground stud or ground clamp.

### **3.11 LABELLING**

- .1 Provide equipment identification labelling nameplates for grounding bus bar, bonding and grounding conductors.

- .2 Apply identification and warning labels to grounding bus bar, bonding and grounding conductors.

**3.12 FIELD QUALITY CONTROL**

- .1 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.
- .2 Perform tests before energizing electrical system.
- .3 Disconnect ground fault indicator during tests.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED SECTIONS**

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

**PART 2 PRODUCTS**

**2.1 SUPPORT CHANNELS**

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

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Secure equipment to hollow and solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 Fasten exposed conduit or cables to building construction or support system using straps.
  - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
  - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
  - .3 Beam clamps to secure conduit to exposed steel work.
- .6 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.
- .7 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .8 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .9 Do not use wire lashing or perforated strap to support or secure raceways or cables.



- .10 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.
- .11 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED WORK**

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

**PART 2 PRODUCTS**

**2.1 SPLITTERS**

- .1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Main and branch lugs, connection bars to match required size and number of incoming and outgoing conductors as indicated.
- .3 At least three spare terminals on each set of lugs in splitters less than 400 A.

**2.2 JUNCTION AND PULL BOXES**

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Covers with 25 mm [1"] minimum extension all around, for flush-mounted pull and junction boxes.

**2.3 CABINETS**

- .1 Type E: sheet steel, hinged door and return flange overlapping sides, handle and catch, for surface mountings.
- .2 Type T: sheet steel cabinet, with full length hinged door, latch, lock, 2 keys, containing 19 mm G1S fir plywood backboard for surface or flush mounting as appropriate.
- .3 Include filtered vents and/or fan-cooling when enclosed equipment is heat producing.

**PART 3 EXECUTION**

**3.1 SPLITTER INSTALLATION**

- .1 Install splitters as indicated and mount plumb, true and square to the building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

**3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION**

- .1 Install pull boxes in inconspicuous but accessible spaces.
  - .2 Only main junction and pull boxes are indicated. Provide pull boxes so as not to exceed 30 m of conduit run between pull boxes.
  - .3 Provide pull boxes and junction boxes in locations shown on the drawings and as required to suit job conditions.
  - .4 Locate pull boxes and junction boxes above removable ceilings, in electrical rooms, utility rooms or storage areas.
-

- .5 Junction boxes, when used, to be installed in areas that are accessible through luminaire openings, and/or access panels.
- .6 Where pull boxes are flush mounted, provide overlapping covers with flush head cover retaining screws, prime coated and painted to match wall or ceiling finish.
- .7 Where cast corrosion resistant boxes are used, covers to be of matching type and gasketed.
- .8 For special (not 100mm [4"] square or octagonal) pull boxes and/or junction boxes, paint identification for the system and provide lamicaid nametags to box covers with a size 2 nameplate 5mm [0.25"] lettering identifying system.
- .9 Interior of all pull boxes and junction boxes for each system to be spray painted with colour as specified in Section 26 05 00
- .10 All pull boxes, junction boxes and cabinets to be supported directly from building structure using one or a combination of galvanized screws, galvanized bolts, galvanized rods, and approved box clip.
- .11 Support of pull boxes, junction boxes by conduit fittings or wire is not acceptable.

### **3.3 CABINETS INSTALLATION**

- .1 Mount cabinets with top not higher than 2 m [6'] above finished floor.
- .2 Cabinets shall be flush mounted in finished areas where depth can be accommodated in the walls. Provide flush trim to suit.
- .3 Provide fit up in Type T cabinets as indicated.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED WORK**

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

**PART 2 PRODUCTS**

**2.1 OUTLET AND CONDUIT BOXES IN GENERAL**

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm [4"] square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped. Do not use sectional boxes.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347V outlet boxes for 347V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped shall be equal to Spyder Technology multi-gang boxes.
- .7 Standard of acceptance is Thomas and Betts - Iberville.

**2.2 SHEET STEEL OR PVC OUTLET BOXES**

- .1 PVC or Electro-galvanized steel single and multi-gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm [3" x 2" x 1.5"] or as indicated. Larger 102 mm square x 54mm deep [4"x 2"] outlet boxes to be used when more than one conduit enters one side. Provide extension and plaster rings as required.
- .2 For larger boxes use GSB solid type as required.
- .3 Boxes for surface mounted switches, receptacles, communications, telephone to be 100mm square PVC with white cover plate.
- .4 Lighting fixture outlets: 102 mm [4"] square outlet boxes or PVC octagonal outlet boxes.
- .5 103 mm [4"] square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster and/or tile walls.
- .6 Standard of acceptance is Thomas and Betts - Iberville.

**2.3 MASONRY BOXES**

- .1 Electro-galvanized steel masonry single and multi-gang type MDB boxes for devices flush mounted in exposed block walls.
- .2 Standard of acceptance is Thomas and Betts - Iberville.

**2.4 CONCRETE BOXES**

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.
  - .2 Standard of acceptance is Thomas and Betts - Iberville.
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## **2.5 SURFACE CONDUIT BOXES**

- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.
- .2 Standard of acceptance is Thomas and Betts - Iberville.

## **2.6 FITTINGS – GENERAL**

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of foreign materials.
- .3 Conduit outlet bodies for conduit up to 35 mm [1.25"] Use pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal or plastic boxes.
- .5 Standard of acceptance is Thomas and Betts - Iberville.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Typical outlet box mounting heights are indicated in Section 26 05 00 or refer to wiring device and communication specification sections and to architectural layouts for particular mounting heights of outlet boxes where indicated.
  - .2 Support boxes independently of connecting conduits.
  - .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm [0.25"] of opening.
  - .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers not to be used.
  - .5 All outlet boxes to be flush mounted in all areas, excluding mechanical rooms, electrical rooms, and above removable ceilings.
  - .6 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.
  - .7 No sectional or handy boxes to be installed.
  - .8 When installed in wood walls, plastic outlet boxes shall only be used with permission of the consultant.
  - .9 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.
  - .10 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.
  - .11 Outlets installed back to back in party stud walls to be off-set by one stud space.
-

- .12 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.
- .13 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.
- .14 Where outlet boxes penetrate through a fire separation, ensure that the boxes are externally tightly fitted with an approved non-combustible material to prevent passage of smoke or flame in the event of a fire.
- .15 Conduit for floor mounted boxes shall terminate with a locknut and bushing in base of the fitting. Seal around conduit and the conduit itself after installation of conductors with heavy density fiberglass.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED WORK**

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

**1.2 SCOPE**

- .1 Conduit is required for the main service feeder.
- .2 Rigid PVC conduit is to be used for all in-ground conduit systems.
- .3 Unless noted, conduit is not required for typical wiring. The specifications within detail conduit requirements only where conduit is mandated.
- .4 Drawings do not show all conduits. Those shown are in diagrammatic form only.
- .5 Where conduits are required, conceal all conduits where possible in finished areas. Conduits may be surface mounted either only where indicated or in service areas accessible only to authorized personnel.
- .6 If a finished area is concrete (existing) or concealment is not practical, obtain ruling from Consultant where exposed wiremold may be substituted.
- .7 Note particular requirements for routing of conduits where detailed.
- .8 Provide polypropylene pull cord in all "empty" conduits.

**PART 2 PRODUCTS**

**2.1 CONDUITS**

- .1 Rigid metal conduit: to CSA C22.2 No.45 Galvanized Steel.
- .2 Electrical Metallic Tubing (EMT): to CSA C22.2 No.83.
- .3 Rigid PVC conduit: to CSA C22.2 No.211.2.
- .4 Flexible metal conduit: to CSA C22.2 No.56 liquid-tight flexible metal conduit.

**2.2 CONDUIT FASTENINGS**

- .1 One hole steel straps to secure surface conduits 41mm [1.5"] and smaller. Use two hole steel straps to conduits larger than 41mm [1.5"].
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits.
- .4 10mm [3/8"] threaded rods to support suspended channels.

**2.3 CONDUIT FITTINGS**

- .1 Fittings manufactured for use with conduits specified. Coating same as conduit.
  - .2 Provide factory "ells" where 90 degree bends are required for 27mm [1"] and larger conduits.
-

- .3 EMT couplings and connectors shall be steel, or Regal Die-cast zinc alloy. Couplings used on conduit containing fire-rated cable shall be steel. Regular die-cast alloy fittings and couplings are not acceptable. Provide plastic bushings (insulated throat) for all connectors for 27mm EMT or larger. Provide water-tight connectors in damp or wet locations and for surface equipment (e.g. Panelboards, MCC's, etc.) in rooms that are fire sprinkler protected.

## **2.4 EXPANSION FITTINGS FOR RIGID CONDUIT**

- .1 Weatherproof expansion fittings with internal bonding assembly suitable linear expansion.
- .2 Water-tight expansion fittings: with integral bonding jumper, suitable for linear expansion and 21mm [3/4"] deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel as required.

## **2.5 RIGID P.V.C. CONDUIT**

- .1 Conduit: rigid non-metallic conduit of unplasticized polyvinyl chloride as manufactured C.G.E. "Sceptre".
- .2 Fittings: threaded male or female solvent weld connectors and solvent weld couplings, as supplied by conduit manufacturer.
- .3 Solvent: as recommended by conduit manufacturer.

# **PART 3 EXECUTION**

## **3.1 INSTALLATION - GENERAL**

- .1 Where noted on drawings, use electrical metallic tubing (EMT) in the building interior and in above grade slabs except where subject to mechanical injury or where otherwise indicated.
- .2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass. Set out the work and coordinate with other services prior to installation. Maintain access to junction and pull boxes.
- .3 Where practical conceal conduits.
- .4 Any exposed conduit in finished areas to be free of unnecessary labels and trademarks.
- .5 All conduit ends to be reamed to ensure a smooth interior finish that will not damage the insulation of the wiring.
- .6 Ensure bonding continuity in all conduit systems.
- .7 Surface conduits are acceptable in mechanical and electrical service rooms and in unfinished areas or where indicated.
- .8 Use rigid galvanized steel (RGS) threaded conduit where the installation is subject to mechanical injury. In any event, use RGS conduit for surface installations up to 1.5m [5'] above the finished floor.
- .9 Field threads on rigid conduit shall be sufficient length to draw conduits ends together.
- .10 Unless otherwise noted and where practical, all conduits to be routed through the ceiling space rather than in, or below, slabs or floor structures to facilitate future changes.



- .11 Conduits in walls should typically drop (or loop) vertically from above to better facilitate future renovations. Generally conduits from below and horizontal conduits in walls and concrete structures should be avoided unless indicated.
  - .12 All communication conduits to be minimum 27 mm [1"] diameter unless otherwise indicated.
  - .13 Generally use Rigid PVC conduits in or below ground level slab unless otherwise noted. Transition to RGS conduit in exposed locations: eg where conduits emerge from ground level slab.
  - .14 Conduits are not permitted in terrazo or concrete toppings.
  - .15 Cap turned up conduits to prevent the entrance of dirt or moisture during construction.
  - .16 Locate conduits more than 75mm [3"] parallel to steam or hot water lines with a minimum of 25mm [1"] at crossovers.
  - .17 Bend conduits cold, so that conduit at any point is not flattened more than 1/10th of its original diameter. Conduits bent more than this or kinked to be replaced.
  - .18 Provide polypropylene pull cord in empty conduits to facilitate pulling wiring in future.
  - .19 Where conduits become blocked, the use of corrosive agents is prohibited. Remove and replace blocked section.
  - .20 Damaged conduits to be repaired or replaced.
  - .21 Dry conduits out thoroughly before installing wiring. Swab out conduit and thoroughly clean internally before wires and cables are pulled.
  - .22 Conduits shall not pass through structural members except as indicated.
  - .23 Conduit sizes indicated on drawings are minimum only. Increase sizes as required to suit alternative wiring types, to comply with Code or for ease of conductor installation.
  - .24 Conduits and ducts crossing building expansion joints shall have approved conduit expansion fittings to suit the type of conduit used.
  - .25 Seal conduits with approved sealant where conduits are run between heated and unheated areas.
  - .26 Seal openings with approved sealant where conduits, cables, or cable trays pierce fire separations.
  - .27 Where conduits pass through walls, they shall be grouped and installed through openings. After all conduits are installed, wall openings shall be closed with material compatible with the wall construction and/or to meet any fire separation integrity.
  - .28 Where drawings show conduit designations, these conduits shall be identified at each point of termination with Thomas & Betts "Ty-Rap" No. TY532M labels.
  - .29 Use "Condulet" fittings for power and telephone type conduit terminations in lieu of standard boxes where box support is not provided.
  - .30 Provide necessary roof jacks or flashing where conduits pass through roof or watertight membranes. Apply approved sealant to maintain membrane integrity.
  - .31 Use flexible metal conduit for connection to recessed luminaires without a prewired outlet box.
-

- .32 Use liquid tight flexible metal conduit for connection to motors sprinkler monitoring devices, and other vibrating equipment and transformers.
- .33 Use explosion proof flexible connection for connection to explosion proof motors.
- .34 Install conduit-sealing fittings in hazardous areas, isolation rooms and clean rooms. Fill with compound.

### **3.2 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with minimum 1.5m [5'] clearance.
- .3 Conduits to be run in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended and/or surface channels.
- .5 Surface conduits will not be accepted in finished areas unless detailed.

### **3.3 EXPANSION JOINT CONDUIT FITTINGS**

- .1 Provide conduit expansion joint fittings at concrete expansion joint.

### **3.4 RIGID P.V.C. CONDUIT**

- .1 Use in accordance with the Canadian Electrical Code and Building Codes and as noted below:
- .2 Use as raceways for following applications
  - .1 In poured slab on grade concrete floors and walls and for underground runs exterior to the buildings unless otherwise noted.
  - .2 Wiring installed in areas subject to intermittent or continuous moisture but not surface mounted.
  - .3 Rigid PVC conduit shall not be surface mounted or exposed within buildings.
- .3 Do not use in return air plenums or for exit light circuits and emergency lighting.
- .4 Provide insulated ground wire in all rigid PVC conduits in accordance with the Canadian Electrical Code.
- .5 Where rigid PVC conduit is set in poured concrete, solvent joints must be completed and allowed to set as per manufacturer's instructions before pour.
- .6 Bend rigid conduit in strict accordance with manufacturer's directions. Distorted bends will not be accepted.

**END OF SECTION**

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## **PART 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

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

### **1.2 REFERENCES**

- .1 CSA International – most recent version
  - .1 CAN/CSA-Z809, Sustainable Forest Management.
- .2 Forest Stewardship Council (FSC) – most recent version
  - .1 FSC-STD-01-001, FSC Principle and Criteria for Forest Stewardship.
- .3 Insulated Cable Engineers Association, Inc. (ICEA)
- .4 Sustainable Forestry Initiative (SFI) – most recent version
  - .1 SFI Standard.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Sustainable Design Submittals:
  - .1 Wood Certification: submit manufacturer's Chain-of-Custody Certificate number for CAN/CSA-Z809 or FSC or SFI certified wood.

## **PART 2 PRODUCTS**

### **2.1 CABLE PROTECTION**

- .1 38 x 140mm planks pressure treated with coloured, copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

### **2.2 MARKERS**

- .1 Concrete type cable markers: 600 x 600 x 100 mm with words: cable, joint or conduit impressed in top surface, with arrows to indicate change in direction of cable and duct runs.
- .2 Cedar post type markers: to CAN/CSA-Z809 or FSC or SFI 89 x 89mm, 1.5m long, pressure treated with coloured copper naphthenate or 5% pentachlorophenol solution, water repellent preservative, with nameplate fastened near post top, on side facing cable or conduit to indicate depth and direction of duct and cable runs.
  - .1 Nameplate: aluminum anodized 89 x 125mm, 1.5mm thick mounted on cedar post with mylar label 0.125 mm thick with words Cable, Joint or Conduit with arrows to indicate change in direction.

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**PART 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for cable installation in accordance with manufacturer's written instructions.
  - .1 Inform Consultant of unacceptable conditions immediately upon discovery.

**3.2 DIRECT BURIAL OF CABLES**

- .1 After sand bed in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling, is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable.
  - .1 Do not pull cable into trench.
- .2 Include offsets for thermal action and minor earth movements.
  - .1 Offset cables 150mm minimum for each 60m run, maintaining minimum cable separation and bending radius requirements.
- .3 Make termination and splice only as indicated leaving 0.6m minimum of surplus cable in each direction.
  - .1 Make splices and terminations in accordance with manufacturer's written recommendations using approved splicing kits.
- .4 Underground cable splices not acceptable.
- .5 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable or in accordance with manufacturer's written recommendations; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
- .6 Cable separation:
  - .1 Maintain 75mm minimum separation between cables of different circuits.
  - .2 Maintain 300mm minimum horizontal separation between low and high voltage cables.
  - .3 When low voltage cables cross high voltage cables maintain 300mm vertical separation with low voltage cables in upper position.
  - .4 At crossover, maintain 75mm minimum vertical separation between low voltage cables and 150mm between high voltage cables.
  - .5 Maintain 300mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position.
  - .6 Install treated planks on lower cables 0.6m minimum in each direction at crossings.
- .7 After sand protective cover specified in Section 31 23 33.01 - Excavating, Trenching and Backfilling, is in place, install continuous row overlapping 38 x 140mm pressure treated planks as indicated to cover length of run.

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### **3.3 CABLE INSTALLATION IN DUCTS**

- .1 Install cables as indicated in ducts.
- .2 Do not pull spliced cables inside ducts.
- .3 Install multiple cables in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multi-conductor control cables reel off in same direction during installation.
- .6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with duct sealing compound.

### **3.4 MARKERS**

- .1 Mark cable every 150m along duct runs and changes in direction.
- .2 Mark underground splices.
- .3 Where markers are removed to permit installation of additional cables, reinstall existing markers.
- .4 Install concrete cable markers within 180m from each side of runway centreline; 45m from each side of taxi way centreline; 50m from edge of taxi ramps or aprons.
- .5 Install cedar post type markers.
- .6 Lay concrete markers flat and centred over cable with top flush with finish grade.

### **3.5 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using qualified personnel.
  - .1 Include necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds.
  - .1 Ensure resistance to ground of circuits is not less than 50megohms.
- .5 Pre-acceptance tests:
  - .1 After installing cable but before splicing and terminating, perform insulation resistance test with megger on each phase conductor.
  - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Acceptance Tests:
  - .1 Ensure that terminations and accessory equipment are disconnected.

- .2 Ground shields, ground wires, metallic armour and conductors not under test.
- .3 High Potential (Hipot) Testing.
  - .1 Conduct hipot testing at original factory test voltage in accordance with manufacturer's recommendations.
- .4 Leakage Current Testing:
  - .1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.
  - .2 Hold maximum voltage for specified time period by manufacturer.
  - .3 Record leakage current at each step.
- .7 Provide Consultant with list of test results showing location at which each test was made, circuit tested and result of each test.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

### **3.6 PROTECTION**

- .1 Repair damage to adjacent materials caused by cables installation.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED SECTIONS**

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

**1.2 REFERENCES**

- .1 ASHRAE 90.1 American Society of Heating, Refrigeration and Air Conditioning Engineers. – most recent version.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Control system: by one manufacturer and assembled from compatible components.
- .2 Line voltage dual technology occupancy wall mounted sensors shall be equal to Sensor Switch WSD-PDT-SA (set to manual on); color to match switches.
- .3 Line voltage dual technology occupancy two pole wall mounted sensors shall be equal to Sensor Switch WSD-PDT-2P and be set to manual on for both loads; color to match switches.
- .4 Line voltage dual technology occupancy wall mounted sensors installed in larger rooms shall be equal to Sensor Switch LWS-PDT (set to manual on); color to match switches.
- .5 Line voltage dual technology occupancy ceiling mounted sensors shall be equal to Sensor Switch CMR-PDT-9 color white.
- .6 Line voltage dual technology occupancy ceiling mounted sensors for larger rooms shall be equal to Sensor Switch CMR-PDT-10 color white.
- .7 Line voltage dual technology occupancy ceiling mounted two pole sensors shall be equal to Sensor Switch CMR-PDT-9-2P color white.
- .8 Line voltage dual technology occupancy and daylight sensing ceiling mounted sensors shall be equal to Sensor Switch CMR-PC-ADT color white.
- .9 Line voltage dual technology occupancy ceiling mounted wide view sensors shall be equal to Sensor Switch WVR-PDT color white.
- .10 Line voltage dual technology occupancy ceiling mounted hallway sensors shall be equal to Sensor Switch HWR-13 color white.
- .11 Photocell equal to Sensor Switch SBOR series.
- .12 Line voltage dimmers shall be equal to Leviton TPI10-1LW series.

- .13 Line voltage switches as per Section 26 27 26.
- .14 The lighting control system shall be tested and certified by the manufacturer's representative as per ASHRAE 90.1-10 requirements. Provide documentation of certification in maintenance manual and submit copy to the Engineer.
- .15 Preapproved equal manufactures shall be Lutron, Leviton and Hubbell.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- .1 Install system and components in accordance with manufacturer's recommendations and as shown on the drawings to provide a fully functional system as shown on the drawings and contained herein. Not all system components for a fully functional system may be detailed in this specification; provide all necessary components for a fully functional system.
- .2 Install cabling and connect to each component in accordance with the manufacturer's recommendations.
- .3 Adjust each component in the system to function as shown on the drawings and in conjunction with the Owners' directions.
- .4 Connect to other systems such as DDC and Security as shown on the drawings; verify operation of lighting system of connections to the other systems.
- .5 Measure and adjust all occupancy sensors, vacancy sensors, daylight sensors and photocells. Unless otherwise noted, wall mounted occupancy sensors shall be set to manual on and auto off.
- .6 Where daylighting controls are installed, the lighting levels during full day light and at night shall be measured and light levels adjusted to provide even illumination in both scenarios. Retest after adjustments and re-adjust as necessary.
- .7 Ensure all switching and controls requirements of ASHRAE 90.1 have been met; bring any variances to the Engineer.

#### **3.2 FIELD QUALITY CONTROL**

- .1 On completion of installation the manufacturer representative shall carry out site inspection and verification. Verification to comply with the ASHRAE 90.1 requirements, the design as shown on the drawings in addition to the Manufacturer's own requirements. Provide copy of verification report to the Engineer. Corrections are to be implemented to comply with manufacturer's report.

**END OF SECTION**



**PART 1 GENERAL**

**1.1 RELATED WORK**

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

**1.2 PLANT ASSEMBLY**

- .1 Install circuit breakers in panelboards before shipment from plant.
- .2 Install and prewire low voltage relays assemblies where indicated.
- .3 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .4 All panelboards to be of a common manufacturer.

**1.3 FINISH**

- .1 Apply finishes in accordance with Section 26 05 00.
- .2 Panel finish in electrical and equipment rooms and closets to be standard ASA Grey baked enamel for normal power service. Confirm with Consultant prior to shop finishing panels.
- .3 Panels in finished and/or public areas to be either as clause .2 above or prepared to accept painting to closely match surroundings as directed by the Architect. 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 Consultant prior to paint finishing panels.

**PART 2 PRODUCTS**

**2.1 PANELBOARDS, DOORS AND TRIMS**

- .1 Bus and breakers rated for 10 KA symmetrical, minimum, interrupting capacity.
  - .2 Copper bus with full size neutral.
  - .3 Minimum 20% spare capacity.
  - .4 Mains, number of circuits and number and size of branch circuit breakers as indicated.
  - .5 Provide all necessary connectors and mounting hardware in every space to facilitate installation of future breakers. Provide blank fillers for all spaces.
  - .6 Concealed hinges and concealed trim mounting screws, hinged locking door with flush catch.
  - .7 Panelboards to have flush doors. (Gasketed where required).
  - .8 Provide two keys for each panelboard and key similar voltage panelboards alike.
  - .9 Panel tubs to be typically 600mm [20"] wide.
  - .10 Provide "sprinkler-proof" design in areas where sprinkler fire protection is installed. In any event, all surface mounted enclosures to be complete with sprinkler drip cover.
-

- .11 Provide door within door trims where indicated to facilitate ease of service maintenance. Each tub trim cover to be hinged and self-supporting and to swing out to expose breaker cable terminations and wireways. Hinged trim shall be secured with cover screws on opening side by concealed machine screws. Hinged breaker cover shall be recessed into the hinged overall tub cover. Breaker cover shall have latch type closures. Submit details on shop drawings prior to manufacturing.
- .12 Feed through lugs as indicated.
- .13 Integral Surge Protection Devices as indicated; refer to section 26 24 17.

## **2.2 BREAKERS**

- .1 All breakers to be bolt on type, moulded case, non-adjustable and non-interchangeable trip, single, two and three pole, 120/240V and with trip free position separate from "On" or "Off" positions.
- .2 Two and three pole breakers to have common simultaneous trip and able to be located in any circuit position within the panelboard. Minimum interrupting rating of breakers to be as follows:
  - .1 120/240V panelboards - 10,000 Amps at 250 volts.
- .3 Main breaker to be separately mounted at top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .4 Provide circuit breakers with indicated trip ratings as shown in the panelboard schedules.
- .5 Provide at least 10% spare 15 Amp single pole breakers whether indicated or not.
- .6 Provide GFI type breakers as indicated.
- .7 Provide Lock-on devices as indicated and in any event for Fire Alarm circuits, Security equipment circuits, EXIT sign circuits and Emergency Battery equipment circuits.

## **2.3 PANELBOARD IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00.
- .2 Nameplate for each panelboard size 5 (2 line) engraved as indicated and include panel designation and voltage/phase.
- .3 Complete circuit directory with typewritten card(s) located in slide-in plastic pocket(s) fixed to the back of the related door. Directory card to indicate the panel designation, mains size, voltage/phase and the location and load controlled of each circuit. Include a "letter sized" paper copy of each directory in the project maintenance manual.
- .4 Provide a plasticized typewritten information card fixed to the back of the each panel door. Information card to indicate the panel designation and location, feeder type and size and locations of any controlling contactors and feeder pullboxes. Include a "letter sized" paper copy of each information card in the project maintenance manual.

## **2.4 STANDARD OF ACCEPTANCE**

- .1 Cutler Hammer Type Pow-R Line 1a
  - .2 Schneider Type NQOD
  - .3 Siemens Canada.
-

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Locate panelboards as indicated and mount securely, plumb true and square, to adjoining surfaces.
- .2 Panelboards located in service rooms, mechanical rooms, and electrical rooms to be mounted on unistrut supports.
- .3 Connect loads to circuits as indicated.
- .4 Connect neutral conductors to common neutral bus with respective neutral identified.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED WORK**

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

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International) – most recent version
  - .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 (Bi-national standard, with UL 514D).
  - .3 CSA-C22.2 No.55, Special Use Switches.
  - .4 CSA-C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

**PART 2 PRODUCTS**

**2.1 SWITCHES**

- .1 20 A, 120 V or 347 V, single pole, double pole, three-way, four-way switches as indicated, white commercial grade. Equal to Leviton 1243 series
- .2 Switches shall be “Decora” style.
- .3 Switches of one manufacturer throughout project.
- .4 Provide 3 way switches/dimmers as required and as shown.
- .5 Alternate Manufactures: Pass & Seymour, Hubbell

**2.2 RECEPTACLES – GENERAL**

- .1 Duplex receptacles, CSA type 5-15R, 125 V, 15 A, U ground, white commercial grade.
  - .2 T-Slot duplex receptacles, CSA type 5-20R, 125 V, 20 A, U ground, white commercial grade.
  - .3 Use tamper resistant receptacles where required by Code and as indicated.
  - .4 Receptacles shall be ‘Decora’ style.
  - .5 Receptacles of one manufacturer throughout project.
  - .6 Standard of acceptance:
    - .1 Leviton 5340 series
  - .7 Alternate Manufactures: Pass & Seymour, Hubbell
-

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### 2.3 RECEPTACLES – PARTICULAR APPLICATION

- .1 Ground Fault Interrupter type to be 15 Amp, 125 volt duplex receptacles to be 2 pole, 3 wire, U ground, impact resistant nylon face, complete with breaker and reset button. white commercial grade.
- .2 Ground Fault Interrupter located outside shall come with wet location cover plates.
- .3 Use tamper resistant receptacles where required by Code and as indicated.
- .4 Receptacles of one manufacture throughout project.
- .5 Standard of Acceptance:
  - .1 Leviton 7899 series indoors (Tamper Resistant as required)
  - .2 Leviton W7899 series outdoors
- .6 Alternate Manufactures: Pass & Seymour, Hubbell
- .7 Surge Protective type to be T slot 5-20R, 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 indicator.
- .8 Standard of Acceptance:
  - .1 Leviton 7380-IGG (type 3)
- .9 Alternate Manufacture: Pass & Seymour, Hubbell.
- .10 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.

### 2.4 INTERVAL TIMERS

- .1 Range: 0-30 minutes.
- .2 Digital without hold feature.
- .3 Single pole 120 volt, 20 Amp contacts to open at end of timing cycle.
- .4 Finished to match switches in colour.
- .5 Standard of acceptance:
  - .1 Leviton 6230M series
- .6 Alternate Manufacture:
  - .1 Wattstopper
  - .2 Intermatic

### 2.5 COVER PLATES

- .1 Cover plates for devices shall match device in color (white in color). In service rooms, shops and other like applications, provide stamped steel cover plates.
  - .2 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.
  - .3 All plates to be bevelled type with smooth rolled outer edge and smooth face. Exposed sharp edges are not acceptable.
-

- .4 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.
- .3 Install on latch side of door; coordinate with Architectural drawings prior to install.
- .2 Receptacles:
- .1 Install all receptacles in the vertical plane unless otherwise noted.
- .2 Generally install the 5-15/20R 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 Install receptacles near mechanical equipment mounted on the roof as per the CEC. Provide wet location rated cover plates.
- .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 whenever within 1.5 meters of all sinks or water sources.
- .7 Utilize tamper resistant receptacles in public areas and in all areas dedicated for children.
- .3 Cover plates:
- .1 Install suitable common cover plates where wiring devices are grouped.
- .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.
- .3 Provide wet location cover plates which provide a seal whether or not a plug is inserted into the receptacle.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

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

**1.2 REFERENCES**

- .1 CSA International – most recent version
- .1 CSA C22.2 No. 5, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

**PART 2 PRODUCTS**

**2.1 BREAKERS GENERAL**

- .1 Moulded-case circuit breakers, Circuit breakers, ground-fault circuit-interrupters,; to CSA C22.2 No. 5
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation. Breakers to be arc fault type in residential locations as per the requirements of the Canadian Electrical Code.
- .3 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation.
- .4 Common-trip breakers: with single handle for multi-pole applications.
- .5 Circuit breakers with interchangeable trips.
- .6 Circuit breakers to have minimum 10kAIR symmetrical RMS interrupting capacity rating at 240V.
- .7 Moulded case circuit breakers shall be of one manufacturer and match distribution equipment manufacturer.

**2.2 THERMAL MAGNETIC BREAKERS [DESIGN A]**

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection. To be arc fault type in residential applications where required by code.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.

**3.2           INSTALLATION**

- .1       Install circuit breakers as indicated.

**END OF SECTION**



**PART 1 GENERAL**

**1.1 RELATED SECTIONS**

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

**PART 2 PRODUCTS**

**2.1 GROUND FAULT CIRCUIT INTERRUPTER RECEPTACLE**

- .1 Self-contained with 15A, 120V circuit interrupter and receptacle complete with
  - .1 Solid state ground-sensing device
  - .2 Facility for testing and reset
    - .1 Cover plate as specified in Section 26 27 26 - Wiring Devices
    - .2 CSA Class A certified
    - .3 Equal to Hubbell No. GF-5252I – check

**2.2 CIRCUIT BREAKER-TYPE GROUND FAULT INTERRUPTER**

- .1 Single- or Two- pole ground fault circuit interrupter for 15/20/30/40A, 120/ 208V, 1-phase operation as indicated on drawings and/or panelboard schedules and complete with test and reset facilities.
- .2 Sensitivity 10 mA.
- .3 2-pole units to have indication and provision for remote indication.
- .4 Circuit breakers to have thermal and magnetic trip units and to be integral to the panelboard.
- .5 Circuit breakers to be of similar construction and of same manufacturer as the non-ground fault units in the same panelboard.

**2.3 GROUND FAULT PROTECTION PANEL**

- .1 120, 1 -pole circuit breaker to supply power to 2 circuits And complete with
  - .1 Standard circuit breaker with overload and short circuit protection
  - .2 Ground current sensing device to detect to 5mA ground leakage and trip the breaker
  - .3 Power pack with control transformer to provide tripping power
  - .4 Facilities for testing and reset
  - .5 CSA Enclosure 3 surface mounted
  - .6 Ground fault trip indicator light
  - .7 CSA Class A approved, FPL Series 2PDT or approved equal

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**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Do not ground neutral on load side of ground fault relay.
- .2 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.
- .3 All exterior-mounted receptacles, pool pumps, and pool lighting circuits shall be protected by ground fault circuit interrupters.
- .4 Provide self-contained GFCI type receptacles where indicated.
- .5 For the protection of persons using, pools containing electrical devices, etc., supply and install Ground Fault Circuit Interrupter (GFCI) breakers in the branch wiring to all electrical equipment associated with these "wet" areas.
- .6 If the manufacturer of the panelboard being used throughout this project has available a Type A GFCI, designed to replace normal circuit breakers in the panel boards, such a device may be used. Alternately, a separate approved GFCI shall be used.

**3.2 FIELD QUALITY CONTROL**

- .1 Arrange and pay for field testing of ground fault equipment by contractor before commissioning service.
- .2 Submit report of tests to Consultant and a certificate that system as installed meets criteria specified herein.
- .3 Demonstrate simulated ground fault tests.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED WORK**

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

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International):
  - .1 CAN/CSA C22.2 No.4, Enclosed Switches.
  - .2 CSA C22.2 No.39, Fuseholder Assemblies.

**PART 2 PRODUCTS**

**2.1 DISCONNECT EQUIPMENT**

- .1 "Heavy Duty" class, enclosed manual air break switches in non-hazardous locations: to CSA C22.2 No.4
- .2 Fuseholder assemblies to CSA C22.2 No.39.
- .3 Fusible and non-fusible disconnect switch in CSA enclosure.
- .4 Provision for padlocking in off switch position.
- .5 Fuses as indicated. Allow for Class J or L for general circuits, Class RK5 for transformer, motor or other high inrush current circuits
- .6 Fuseholders in each switch suitable without adaptors, for type of fuse as indicated.
- .7 Quick-make, quick-break action.
- .8 ON-OFF switch position indication on switch enclosure cover.
- .9 Weatherproof as required.
- .10 NEMA-3 rated disconnect for roof top.

**2.2 EQUIPMENT IDENTIFICATION**

- .1 Indicate name of load controlled on size 4 name plate to Section 26 05 00.

**2.3 STANDARD OF ACCEPTANCE**

- .1 Cutler Hammer – Heavy Duty
  - .2 Schneider - Heavy Duty
  - .3 Siemens - Heavy Duty
-

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Provide and locate safety disconnect switches to isolate individual items of equipment in accordance with Canadian Electrical Code CSA 22.1 whether indicated on not on the contract drawings.
- .2 Install disconnect switches complete with fuses where indicated or required.
- .3 All disconnect switches for elevator machine rooms shall be fused in accordance with the equipment supplier's requirements.
- .4 Provide and locate safety disconnect switches to isolate individual items of equipment in accordance with Canadian Electrical Code CSA 22.1 whether indicated on not on the contract drawings.

**3.2 MOTOR PLUG/RECEPTACLE AND QUICK DISCONNECTS**

- .1 Motor quick disconnects do not negate the requirement for a switched safety disconnect as specified in this Division. A separate disconnect is still required unless the Consultant has given a special pre-approved circumstance.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED WORK**

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

**1.2 REFERENCES**

- .1 CAN/CSA C22.1, Canadian Electrical Code, Part I - most recent version
- .2 CAN/CSA C22.2 No.9.0, General Requirements for Luminaires.
- .3 IESNA Illuminating Engineering Society of North America - Lighting Handbook – most recent version
- .4 IES RP-33 Lighting for the Exterior Environment

**1.3 ADDITION OF ACCEPTABLE MANUFACTURERS**

- .1 Excepting luminaires listed as ‘Cash Allowance Fixture’ each luminaire in the Luminaire Schedule has 3-4 listed alternates already listed in the Luminaire Schedule; no other alternates will be allowed.
- .2 Where listed luminaire is out of date; the manufacturer shall indicate alternate to Engineer during Tender period. No extra will be provided for out of date luminaires not identified during the Tender process; Engineer has final say on alternate fixture in this case.

**1.4 INTENT**

- .1 Provide lighting fixtures and accessories for all outlets as listed in the Fixture Schedule and as shown on drawings.
  - .2 Lighting fixtures shall be structurally well designed and constructed, using new parts and materials of the highest commercial grade available.
  - .3 Bond all lighting equipment to grounding system.
  - .4 Verify all ceiling types and finishes before ordering fixtures and provide fixtures suitable for mounting in or on ceilings being installed in each area, as specified. Where fixture types specified are not suitable for ceiling being installed, obtain written instructions from the Consultant before ordering fixtures.
  - .5 Fixtures of the same or similar type shall be supplied by the same manufacturer.
  - .6 Electrical contractor shall supply and install all luminaries complete with lamps, mounting brackets, lenses, ballasts (dimming or otherwise), drivers and all necessary accessories in accordance with luminaire types shown on drawings and listed in luminaries schedule unless otherwise noted.
  - .7 Supply and install complete and proper support and hangers for all luminaires in ceiling space where required for proper support of outlet boxes and luminaire hanger assemblies.
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## **PART 2 PRODUCTS**

### **2.1 LED DRIVERS**

- .1 LED drivers shall be fully dimmable, Energy Star compliant, maximum THD of 20%, power factor to be greater than .95, have high voltage regulation and have internal surge protection.
- .2 LED lit luminaires shall meet the LM-79 and LM-80 test protocols (70% output at 50,000 hours), a minimum efficacy of 90 watts per lumen and shall meet or exceed ENERGY STAR SSL standards to ensure lumen and color consistency between luminaires.
- .3 Drives shall have 0-10V dimming standard.

### **2.2 LEDS**

- .1 LEDs in fixtures shall be 4 step Binning or better.
- .2 LEDs shall be CRI 90 or higher.
- .3 Fixtures shall be designed to allow for replacement of LED boards.

### **2.3 FIXTURES**

- .1 Provide fixtures as indicated on the fixture schedule.
- .2 All fixtures shall comply with CSA Standard C22.2 No.9. Accessories and components shall comply with relevant CSA Standards applicable to accessory or components.
- .3 Recessed down light luminaires shall be of the approved pre-wired type with junction box forming an integral part of luminaires assembly with access facility to the satisfaction of the electrical inspection authority. Supply and install all necessary plaster rings, supports, etc. required for complete and proper installation.
- .4 Except where otherwise noted in the Fixture Schedule, depth of recessed fixtures shall not exceed 150 mm, including mounting yokes, or bridges and the distance from the back face of the diffuser or lens to the centre of the lamp shall be not less than 75 mm. Design of reflector and lamp position shall be to provide high efficiency, even brightness and lack of lamp lines.
- .5 Fixtures shall be constructed of not less than code gauge steel. All metal parts shall be thoroughly cleaned and finished in high reflectance baked white enamel over corrosion-resistant primer. Reflecting surfaces and exposed surface shall have not less than two coats of baked white enamel with reflectance of not less than 85%.
- .6 All fixture diffusers, lens panels, lens frames, etc., shall be securely and adequately supported and shall be removable without the use of tools for cleaning.
- .7 Where recessed LED luminaires are to be mounted in drywall ceilings or type of ceilings requiring frames, supply drywall frames for the recessed luminaires and turn frames over to the general contractor for installation.

## **PART 3 EXECUTION**

### **3.1 VERIFICATION OF CONDITIONS**

- .1 Confirm all ceiling depths against the final architectural ceiling plans and sections to ensure that recessed fixtures can be installed in all ceiling conditions and advise the
-

Consultant immediately of any discrepancies prior to ordering of the fixtures or proceeding with the work.

### **3.2 INSTALLATION - GENERAL**

- .1 Lighting fixtures shall be installed as indicated on architectural reflected ceiling plans, Electrical Drawings, and per approved shop drawings.
- .2 Verify locations and spacing of lighting fixtures with reflected ceiling plans and notify Consultant of any variance or conflict between the plans and field conditions. Do not proceed until conflict has been resolved.
- .3 Work shall be coordinated with other trades. Lighting fixture locations shall have priority over locations of ducts, diffusers, sprinklers, smoke detectors, and other non-structural obstructions.
- .4 All fixtures shall be supported directly from the building structural members or from bridging attached to the structural members by rod hangers and inserts. Provide all necessary hardware and blocking to ensure that fixtures hang true.
- .5 Lighting fixtures shall be adequately supported and braced to satisfy seismic codes. Refer to Section 26 05 05 Seismic Restraints.
- .6 Mount wall fixtures at elevations specified or as shown on Architectural or Electrical Drawings. Where no elevation is shown, confirm mounting height with the Consultant prior to rough-in.

### **3.3 INSTALLATION AND SUPPORTS**

- .1 Provide complete and proper support for all fixtures, fixture hangers, etc., including headers in ceiling space, where required, for proper support of outlet boxes and fixture hanger assemblies.
  - .2 Support fixtures as shown on the drawings, level, plumb and true with the structure and other equipment in a horizontal or vertical position as intended. Wall or side bracket mounted fixture housings shall be rigidly installed and adjusted to give a neat flush fit to the surface on which it is mounted.
  - .3 All hangers, supports, fastenings or accessory fittings shall be protected against corrosion. Care shall be taken during the installation to assure that insulation and corrosion protection is not damaged.
  - .4 Self-aligning seismically rated ball joint hangers shall be used for rod suspended fixtures. Ceiling canopies or hood assemblies intended to cover the suspension attachments shall be installed to fit tightly to the ceiling without restricting the alignment of the hanger. Support fixtures by hangers and mounting arrangements which will not cause the fixture frame, housing, sides or lens frame to be distorted; or prevent complete alignment of several fixtures in a row.
  - .5 The suspension length of all ceiling mounted suspended types of lighting fixtures as listed in the Fixture Schedule shall be the overall length from the ceiling to the lowest point of the fixture body, reflector or glassware in its hanging position.
  - .6 Metal inserts, expansion bolts or toggle bolts in concrete slabs for stems which do not carry wiring must be accurately located in relation to the outlet boxes, to allow perfect alignment and spacing of suspension stems.
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- .7 Where fixtures are surface mounted on the underside of an inverted tee bar ceiling, the fixture shall be supported either directly from the building structure by means of rod hangers and inserts or by means of metal angle headers, supported from the tee bar framing structure above the tile. Fixtures shall be supported from the quarter points.
- .8 All recessed fixtures to be installed so that they are removable from below to gain access to outlet box or prewired fixture box. Connect all recessed fixtures to boxes with flexible conduit and approved fixture wire. Provide approved drywall enclosures in insulated ceilings. Volume of enclosure to comply with Electrical Code.
- .9 Install fixture lenses as late as possible to protect from dirt and dust. Remove and clean or replace lenses to the satisfaction of the Consultant.
- .10 Provide and install all conduit, boxes, wire and make emergency power connection to all units and to unit controllers. Refer to architectural reflected ceiling plans for locations prior to conduit installation. Obtain all specialty backboxes, switches, controllers, etc. from contractor and coordinate installation as required.
- .11 Where drivers are to be remotely located, they shall be racked together and labelled with size 3 lamicaid. Label shall bear the driver number which has a corresponding location on an adjacent floor plan reference drawing. Labels and floor plans shall be provided by electrical contractor. Floor plans shall measure 280mm x 430mm (11"x17") and shall be framed and laminated.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED WORK**

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

**1.2 REFERENCES**

- .1 Canadian Electrical Code (CEC)
- .2 BICSI Telecommunications Distribution Methods Manual (TDMM), latest edition
- .3 ANSI/TIA-568-C.0 Generic Telecommunications Cabling for Customer Premises
- .4 ANSI/TIA-568-C.1 Commercial Building Telecommunications Cabling Standard
- .5 ANSI/TIA -568-C.2 Balanced Twisted Pair Telecommunications Cabling & Components Standard
- .6 ANSI/TIA-568-C.3 Optical Fibre Cabling Components Standard
- .7 ANSI/TIA-569-D Telecommunications Pathways and Spaces Standard
- .8 ANSI/TIA -606-B Administration Standard for Commercial Telecommunications Infrastructure.
- .9 ANSI/TIA-607-B Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

**1.3 PRODUCT DATA**

- .1 Submit product data in accordance with Section 26 05 00.

**1.4 LABOUR**

- .1 The communications contractor must comply with all job-site requirements for the duration of the project.
- .2 The communications contractor agrees to use only trade person who are fully trained, qualified and experienced on the installation, termination and testing of the structured cabling solution. The communications contractor must be an approved installer of the specific structured cabling solution.

**PART 2 PRODUCTS**

**2.1 UNIFORMITY OF MANUFACTURE**

- .1 Unless otherwise specifically called for in the specifications, uniformity of manufacture shall be maintained for similar products throughout the work.
-

### **PART 3 EXECUTION**

#### **3.1 COORDINATION WITH OTHER DIVISIONS**

- .1 Examine the specifications and drawings of all divisions and become fully familiar with their work. Coordinate work with all trades and make changes to facilitate a satisfactory installation.
- .2 Lay out the work and equipment with due regard to architectural, structural, mechanical, electrical and A/V features. Architectural and structural drawings take precedence over the telecommunications drawings regarding locations of walls, doors, equipment and the location and heights of outlets.
- .3 Coordinate with all Divisions installing and services, and ensure that there are no conflicts.
- .4 Install anchors, bolts, pipe sleeves, hanger inserts, etc. in ample time to prevent delays.

#### **3.2 LOCATION OF OUTLETS**

- .1 Telecommunications drawings are, unless otherwise indicated, drawn to scale and approximate distances and dimensions may be obtained by scaling. Figured dimensions shall govern over scaled dimensions. Where exact dimensions and details are required, refer to Architectural and Structural drawings.
- .2 Unless otherwise specified or shown, install products in accordance with recommendations and ratings of manufacturers.

#### **3.3 SEPARATION OF SERVICES**

- .1 Maintain separation between electrical wiring system and building piping, ductwork, etc. so that wiring system is isolated (except at approved connections to such systems) to prevent galvanic corrosion.
- .2 In particular, contact between dissimilar metals, such as copper and aluminum, in damp or wet locations is not permitted.
- .3 Do not support wiring from pipes, ductwork, etc. Hangers for suspended ceilings may be used for the support of wiring only when approval is obtained from the Owner and the ceiling installer, and approved clips or hangers are used.

#### **3.4 EQUIPMENT IDENTIFICATION**

- .1 Colour code exposed conduits, junction and pull boxes and metallic sheathed cables with paint or plastic tape (27mm wide band) at 15 metre intervals. Refer to Section 26 05 00.

#### **3.5 MOUNTING HEIGHTS**

- .1 Refer to section 26 05 00 Common Work Results for general mounting heights specification.

#### **3.6 SERVICE PENETRATIONS IN NON-RATED SEPARATIONS**

- .1 All cabling, wiring, conduits, cable trays, etc. passing through non-rated fire separations and non-rated walls and floors shall be tightly fitted and sealed on both sides of the separation with caulking or silicon sealant to prevent the passage of smoke and/or transmission of sound.
-

**3.7 CONDUIT SLEEVES**

- .1 Vertical floor penetration sleeves shall extend 102mm above finished floor level.
- .2 The space between the sleeve and the conduit shall be filled with approved permanently resilient, non-flammable and weatherproof silicone base compound and ensure that the seal is compatible with the floor and ceiling finishes.
- .3 Located and position sleeves exactly prior to construction of walls and floors.
- .4 Failure to comply with the above requirements shall be remedied at this Division's expense.

**END OF SECTION**

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**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-B Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
- .2      ANSI/TIA-606-B Administration Standard for the Commercial Telecommunications Infrastructure.

**1.3      SYSTEM DESCRIPTION**

- .1      The facility shall be equipped with a Telecommunications Bond as per utility standards. Bond to be used to ground all telecommunications equipment and other associated hardware.

**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-B.
- .2      Dimensions 6mm thick, 100 mm wide, 300 mm long to: ANSI/TIA 607-B.

**2.2      BONDING CONDUCTOR FOR TELECOMMUNICATIONS**

- .1      #6 AWG copper conductor, green insulated to: ANSI/TIA 607-B.

**2.3      WARNING LABELS**

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

**PART 3      EXECUTION**

**3.1      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.

**3.2 BONDING TO TMGB**

- .1 Bond metallic raceways in telecommunications entrance room to TMGB using #6 AWG green insulated copper conductor.

**3.3 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-606B.

**END OF SECTION**

## **PART 1 GENERAL**

### **1.1 RELATED WORK**

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

### **1.2 REFERENCES**

- .1 Canadian Electrical Code (CEC)
- .2 BICSI Telecommunications Distribution Methods Manual (TDMM), most recent edition

### **1.3 GENERAL REQUIREMENTS**

- .1 AllThe system, when complete, must be free of all interference from cross-talk, hum, switch and relay noise, etc.
- .2 Personnel installing communications cabling shall be trained and conversant with communications cabling practices required for this project. Proof of certification with the Manufacturer must be provided prior to commencement of work.
- .3 The system shall be certified, by a contractor designated and trained by the manufacturer of being capable to do so and shall provide written confirmation of this fact.

### **1.4 SCOPE OF WORK**

- .1 The scope of work includes new horizontal Cat6 cable, connectors, communications outlets, patch panels, cover plates, patch cords, and supporting cross-connect and terminating hardware, testing the entire system.
- .2 The following is a list of components required for supply and installation:
  - .1 Copper horizontal cabling system
  - .2 Patch panels and rack in garage room.
  - .3 Labeling and testing of all copper cabling systems installed.
- .3 All structured cabling components shall be of the same manufacturer and will be supplied by one of the recognized industry leader. The cable may be supplied by a manufacturer other than the component manufacturer as long as the complete system is warranted by the manufacturer.

### **1.5 SYSTEM DESCRIPTION**

- .1 A complete telecommunications wiring system with conduits for telecommunication utility service entrance to a main and central telecom box.
    - .1 Provision of horizontal cabling, copper, terminations, connectors, racks, patch panels, communication bonding system, and CATV cables.
  - .2 This Contract includes provision of a complete structured wiring system, including but not necessarily limited to:
    - .1 CATV Cabling
    - .2 Telephone Cabling
    - .3 Horizontal wiring to communications outlets.
    - .4 Rack-mounted patch panels inside telecom smart box. Refer to drawing details.
-

- .3 This Contract includes all necessary hardware, connections and testing for a complete functional standards-compliant system. The test results shall be to the satisfaction of the Owner, the Consultant, and the Manufacturer responsible for the System Warranty.
- .4 The communication system shall comprise all components specified, implied or otherwise necessary to constitute a fully operational system.

## **1.6 WARRANTY/SERVICE**

- .1 A system warranty shall be provided covering the installed cabling system against defects in workmanship, components, and performance, and follow-on support after project completion.

## **PART 2 PRODUCTS**

### **2.1 GENERAL**

- .1 All products must be from the same manufacturer and capable of being certified as a complete system under full warranty by the manufacturer. The selection of material types, fixing, and workmanship shall be to provide a robust installation with an operational life equal to or in excess of 25 years. This warranty shall be direct from the system / cabling manufacturer and supported by the local cabling Contractor.
- .2 Coordinate with the local telecom utility for typical CATV splitters and other required components.

### **2.2 STANDARD OF ACCEPTANCE**

- .1 Panduit
- .2 Belden
- .3 Leviton (Network Solutions)
- .4 TE Connectivity

### **2.3 PATCH PANELS**

- .1 As per the drawing details.

### **2.4 WORK AREA MODULAR JACK & FACEPLATE**

- .1 General - Eight-position modular jack ("RJ-45"), type T568A Category 6 to: ANSI/TIA-568-C.2:
  - .1 Mounted in compatible single gang faceplate, angle entry, 4 port positions per faceplate.
  - .2 Blank inserts for unused port positions within the faceplate.
  - .3 Each wall outlet shall be capable of accommodating a minimum of four RJ-45 connectors.
  - .4 Provide surface box mounted to modular furniture base track or install in mid-span.

## **PART 3 EXECUTION**

**3.1 GENERAL**

- .1 Do not install Communication room equipment until room is clean and painted. All walls to have fire resistant 19mm (3/4") plywood installed up to eight feet high.
- .2 Utilize cabling to manufacturer's recommended requirements; do not bend or strain cables beyond recommended limits. Cables installed outside of manufacturer's recommended limits will be replaced at no cost to the Owner.
- .3 Cable raceway and management systems shall not be filled greater than the CEC maximum fill for the particular raceway type. Paint all junction box covers blue.

**3.2 INSTALLATION OF HORIZONTAL DISTRIBUTION CABLES AND OUTLETS**

- .1 Install horizontal cables in free air or cable trays from telecommunication box to individual work-area jacks.
- .2 Terminate horizontal cabling in patch panels in the telecommunication box.
- .3 Cables shall be installed in continuous lengths from origin to destination (no splices) unless specifically addressed in this document and shall not be longer than 90m.
- .4 Harness slack cable in cabinets, racks, and wall-mounted termination and cross-connection hardware.
- .5 The cable's minimum bend radius and maximum pulling tension shall not be exceeded.
- .6 The cabling system and support hardware shall be installed so that it does not obscure any valves, boxes, or other systems or equipment.
- .7 Cables shall not be attached to ceiling grid or lighting support wires.
- .8 Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor prior to final acceptance at no cost to the Contractor.
- .9 Cables shall be identified by a self-adhesive label in accordance with the System Documentation Section of this specification.
- .10 The cable label shall be applied to the cable behind the patch panel termination no more than 150mm from the end of cable.
- .11 The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.
- .12 There shall be no use of tie wraps on any network cabling. All cables shall be wrapped with Velcro-type strapping where such restraint is necessary.

**END OF SECTION**



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**PART 1 GENERAL**

**1.1 GENERAL REQUIREMENTS**

- .1 Provide a complete Security System. The system shall include, but not be limited to: main security panel, door position switches, motion (PIR) sensors, glass break sensors, key pads, conduit, wire and accessories required to provide a complete operational system.
- .2 All work shall be completed to manufacturer's recommendations and requirements. The contractor shall be certified to install the security system by the manufacturer.
- .3 Install all security wiring in EMT conduit and junction boxes. Paint junction box covers yellow.
- .4 Verify operation of all devices including security codes and train Owner's forces on use of system. Provide test certification letter to Consultant and include in Maintenance Manual.

**1.2 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.

**1.3 REFERENCE DOCUMENTS**

- .1 National Fire Protection Association (NFPA)
  - .1 NFPA 70, Article 517, National Electric Code.
  - .2 NFPA 101, Life Safety Code.
- .2 Electronic Industries Association (EIA)
  - .1 REC 12749, Power Supplies.
  - .2 RS 16051, Sound Systems.

**1.4 REFERENCE STANDARDS**

- .1 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S302, Installation and Classification of Burglar Alarm Systems for Financial and Commercial Premises, Safes and Vaults.
  - .2 CAN/ULC-S303, Local Burglar Alarm Units and Systems.
  - .3 CAN/ULC-S304, Intrusion Detection.
  - .4 CAN/ULC-S306, Intrusion Detection Units.
  - .5 ULC-S318, Power Supplies for Burglar Alarm Systems.
  - .6 ORD-C634, Connectors and Switches for Use with Burglar Alarm Systems.
- .2 Underwriters' Laboratories (UL)
  - .1 UL 603, Standard for Power Supplies For Use With Burglar-Alarm Systems.
  - .2 UL 639, The Standard for Intrusion-Detection Units.

## **1.5 DEFINITIONS**

- .1 EAC: Electronic Access Control System.
- .2 PIR: Passive Infrared Detectors.

## **1.6 DESIGN PERFORMANCE REQUIREMENTS**

- .1 Design intrusion detection system using only ULC Listed products.
- .2 Design intrusion detection system using ULC/UL Listed Alarm Service Company specializing in intrusion detection systems.
- .3 Design intrusion detection system as a ULC/UL Certified Alarm System.
- .4 Design system as a modular access control, alarm monitoring system expandable, and easily modified for inputs, outputs and remote control stations.
  - .1 Design components in accordance with CAN/ULC-S306 and be capable of:
    - .1 Annunciating undesirable, abnormal or dangerous condition.
    - .2 Prioritizing alarms by alarm type; i.e. panic/duress, intrusion and tamper.
    - .3 Determining zone where alarm occurred.
    - .4 Annunciating power failure and power restoration.
    - .5 Annunciating low battery condition.
    - .6 Operate continuously for minimum period of 4 hours in the event of a power failure.
- .5 Equip control panels with continuous tamper detection on door and wall.
  - .1 Tamper detection to trigger alarm.
- .6 Design system with:
  - .1 Alarm masking.
  - .2 Remote maintenance or diagnostics with password activation and callback modem.
  - .3 Unique identifier for each authorized person.
  - .4 Arming and disarming capabilities: manual and automatic by time of day, day of week, or by operator command.
  - .5 Support both manual and automatic responses to alarms entering system.
  - .6 Each alarm capable of initiating different functions of camera, homing, and activation of remote devices, audio switching, door control and card or pin validation.
  - .7 Zone or alarm location annunciated at monitoring station.
- .7 Alarm condition: Design system to provide maximum time for an alarm to be communicated of 120 seconds from alarm initiation to annunciation at remote monitoring location.
- .8 Junction boxes: tamper proof with continuous tamper-detection capability.

- .9 Design system power supplies rated to provide cumulative load of all systems components plus safety factor of 25% or greater.

## 1.7 WARRANTY

- .1 Provide a 12 month warranty period for materials.
- .2 Manufacturer's Warranty: Submit, for Consultant's acceptance, manufacturer's standard warranty document executed by authorized company official.

## 1.8 SUPPORT SERVICES

- .1 Provide manufacturer/dealer advice, information and support services for 2 years.

## PART 2 PRODUCTS

### 2.1 Intrusion Detection System (Open to approved alternates, but alternates are required to be reviewed by the RCMP security team)

- .1 Control Panel: Honeywell Vista-20P complete with 4208U Zone expander
- .2 Keypad: Honeywell 616
- .3 Detection Accessories:
  - .1 Passive Infrared Detectors (PIR's):
    - .1 FX-360 Motion Sensor Ceiling Mount 360°
    - .2 FX-40 Motion Sensor Wall mount
      - .1 FA-3 Corner Mount Bracket
  - .2 Contacts : GE Sentrol; 2200 (OH door) & 1078 (door)
    - .1 Mounting: concealed.
    - .2 Mounting locations: doors and windows.
    - .3 Operating gap: 25.4 mm.
    - .4 Type: magnetic balanced.
  - .3 Notification Devices:
    - .1 Siren: 15 watt.
- .4 Connectors and switches: to ORD-C634.
- .5 Power supplies: to ULC-S318 or UL 603. Approved model Altronix SMP3.
- .6 Batteries: Panasonic LC-R12R2 Sealed Lead Acid Type.
- .7 End of line resistors: GRI 6644
- .8 Detection Accessories:
  - .1 Passive Infrared Detectors (PIR's):
    - .1 FX-360 Motion Sensor Ceiling Mount 360°
    - .2 FX-40 Motion Sensor Wall mount

- .1 FA-3 Corner Mount Bracket
- .2 Contacts : GE Sentrol; 2200 (OH door) & 1078 (door)
  - .1 Mounting: concealed.
  - .2 Mounting locations: doors and windows.
  - .3 Operating gap: 25.4 mm.
  - .4 Type: magnetic balanced.
- .9 Communications:
  - .1 Communications: telephone line complete with cellular communicator equal to Numerex 4640G CN. Provide dedicated transformer, 12V PSU, backup battery, and externally mounted Uplink 100ANT high gain antenna.

### **PART 3 EXECUTION**

#### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, and datasheet.

#### **3.2 INSTALLATION**

- .1 Install panels, intrusion detection system and components in accordance with manufacturer's written installation instructions to locations, heights and surfaces shown on reviewed shop drawings.
- .2 Install panels, intrusion detection system and components secure to walls, ceilings or other substrates.
- .3 Install motion sensors and door contacts on all exterior doors and windows.
- .4 Install required boxes in inconspicuous accessible locations.
- .5 Conceal conduit and wiring.

#### **3.3 FIELD QUALITY CONTROL**

- .1 Manufacturer's Services:
  - .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its product[s] and submit written reports, in acceptable format, to verify compliance of Work with Contract.
  - .2 Manufacturer's Field Services: Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, at stages listed:

- .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
- .2 Twice during progress of Work at 25% and 60% complete.
- .3 Upon completion of the Work, after cleaning is carried out.
- .4 Obtain reports, within 3 days of review, and submit, immediately, to Consultant.

### **3.4 VERIFICATION**

- .1 Perform verification inspections and test in the presence of Consultant.
  - .1 Provide all necessary tools, ladders and equipment.
  - .2 Ensure appropriate subcontractors, manufacturer's representatives and security specialists are present for verification.
- .2 Visual verification: Objective is to assess quality of installation and assembly and overall appearance to ensure compliance with Contract Documents. Visual inspection to include:
  - .1 Sturdiness of equipment fastening.
  - .2 Non-existence of installation related damages.
  - .3 Compliance of device locations with reviewed shop drawings.
  - .4 Compatibility of equipment installation with physical environment.
  - .5 Inclusion of all accessories.
  - .6 Device and cabling identification.
  - .7 Application and location of ULC approval decals.
- .3 Technical verification: Purpose to ensure that all systems and devices are properly install and free of defects and damage. Technical verification includes:
  - .1 Measurements of coverage patterns
  - .2 Connecting joints and equipment fastening.
  - .3 Compliance with manufacturer's specification, product literature and installation instructions.
- .4 Operational verification: Purpose to ensure that devices and systems' performance meet or exceed established functional requirements. Operational verification includes:
  - .1 Operation of each device individually and within its environment.
  - .2 Operation of each device in relation with programmable schedule and or/specific functions.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 45 00 Quality Control
- .2 Section 02 41 99 Demolition of Civil Works
- .3 Section 31 22 13 Rough Grading
- .4 Section 31 23 33.01 Excavating, Trenching and Backfilling
- .5 Section 32 11 23 Aggregate Base Courses
- .6 Section 33 11 16 Site Water Utility Distribution Piping

**1.2 SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit name of professional engineer retained by the Contractor for geotechnical testing review and approval by Departmental Representative.
  - .2 Submit name of testing laboratory retained by Contractor for materials testing for review and approval by Departmental Representative.
  - .3 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
  - .4 Submit geotechnical quality assurance information and test results within 1 week of undertaking.

**1.3 GEOTECHNICAL QUALITY ASSURANCE**

- .1 Retain and pay for the services of a qualified independent geotechnical testing agency under the supervision of a registered professional engineer, and pay the cost of testing services for quality control including, but not limited to, the following:
  - .1 Sieve analysis of sands and aggregates to be supplied
  - .2 Standard proctor density curves for backfill materials
  - .3 Standard proctor density curves for approved borrow materials
  - .4 Compaction control tests for backfill and embankment material including the following:
    - .1 Trench bedding (service) - once per road crossing
    - .2 Trench backfill (service) - once per road crossing
    - .3 Trench bedding (mainline) - once per every 75m of trench at 1.0m vertical lifts with min. one between manholes.
    - .4 Trench backfill (mainline) - once per every 75m of trench at 1.0m vertical lifts with min. one between manholes.
    - .5 Granular base (curbs) - once per 50 lineal metres
    - .6 Granular base (sidewalks) - once per 50 lineal metres
  - .5 Concrete mix design and testing
  - .6 Concrete strength tests (minimum three specimen cylinders in accordance with CSA a23.1) for the following:
    - .1 Curb and gutter - once per 150 lineal metres (minimum one per day during concrete placing)
    - .2 Sidewalk - once per 150 lineal metres (minimum one per day during concrete placing)

- .7 Asphalt mix design and testing
- .8 Asphalt tests for the following:
  - .1 Aggregate gradation tests - one per each 300 tonnes of production (minimum once per day during asphalt placement)
  - .2 Marshall test - three briquettes for every 300 tonnes of production (minimum once per day during asphalt placement)
  - .3 Compaction - one core for each 500m<sup>2</sup>.
- .2 When site excavated material granular backfill is proposed for use as backfill the contractor shall employ a professional geotechnical engineer with experience in geotechnical engineering for performance of in-place density and sieve testing. The site material shall fall within one of the granular backfill material specifications as per Section 31 23 33.01.

#### **1.4 SURVEY**

- .1 The Contractor is to retain a qualified surveyor to complete:
  - .1 A pre-construction survey of any site features not already surveyed
  - .2 All site layout, both vertical and horizontal, for pipes, manholes, underground features, curbs, sidewalks, roads, ditches, and surface features.
  - .3 All as-constructed locations of utilities and surface features.
- .2 A copy of the as-constructed survey and drawing markups are to be compiled and provided to the Departmental Representative within 10 days of construction completion.

#### **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 RELATED REQUIREMENTS**

- .1 Section 02 41 99 Demolition of Civil Works
- .2 Section 31 05 00 Common Works Results – Earthworks, Exterior Improvements and Utilities
- .3 Section 31 23 33.01 Excavating, Trenching and Backfilling

**1.2 REFERENCES**

- .1 ASTM International
  - .1 ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m<sup>3</sup>).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Not used.

**1.4 EXISTING CONDITIONS**

- .1 Known underground and surface utility lines and buried objects are as indicated on site plan.
- .2 Refer to dewatering in Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Fill material in accordance to Section 31 23 33.01.
- .2 Excavated or graded material existing on site suitable to use as fill for grading work if approved by Departmental Representative and a qualified geotechnical engineer retained by the contractor.

**Part 3 Execution**

**3.1 EXAMINATION**

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

**3.2 STRIPPING OF TOPSOIL**

- .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Departmental Representative.
- .2 Commence topsoil stripping of areas as indicated after area has been cleared of surface features and removed from site.
- .3 Strip topsoil to depths as directed by Departmental Representative. Avoid mixing topsoil with subsoil.
- .4 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 m.
- .5 Dispose of unused topsoil to location as directed by Departmental Representative.



### **3.3 GRADING**

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 Rough grade to depths below finish grades as shown in Contract Drawings C-002
- .3 Slope rough grade away from building at minimum 2%.
- .4 Grade ditches to depth as indicated in Contract Drawings.
- .5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum before placing fill over existing ground. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .6 Compact filled and disturbed areas to modified maximum dry density to ASTM D698, as follows:
  - .1 90% under landscaped areas.
  - .2 95% under paved and walk areas.
- .7 Do not disturb soil within branch spread of trees or shrubs to remain.

### **3.4 TESTING**

- .1 Refer to Section 01 45 00 – Quality Control and Section 31 05 00 Common Works Results – Earthworks, Exterior Improvements, and Utilities for geotechnical testing requirements.

### **3.5 CLEANING**

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

### **3.6 PROTECTION**

- .1 Protect existing site features including fencing, trees, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain. If damaged, restore to original or better condition unless directed otherwise.
- .2 Maintain access roads to prevent accumulation of construction related debris on roads.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 02 41 99 Demolition of Civil Works.
- .2 Section 31 05 00 Common Works Results – Earthworks, Exterior Improvements, and Utilities
- .3 Section 32 11 23 Aggregate Base Courses.

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C117-04, Standard Test Method for 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 D422-63/2002, 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<sup>3</sup>) (2,700 kN- m/m<sup>3</sup>).
  - .6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 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.
- .4 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**1.3 DEFINITIONS**

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
  - .1 Rock: solid material in excess of 1.00m<sup>3</sup>, and which cannot be removed by means of heavy duty mechanical excavating equipment available on site. Frozen material not classified as rock
  - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.

- .3 Topsoil:
  - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
  - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
  - .1 Weak, chemically unstable, and compressible materials.
  - .2 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136 : Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
    - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45
    - .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

#### 1.4 EXCAVATION AND DISPOSAL

- .1 Contractor to submit to Departmental Representative for review and approval, location of proposed disposal facility prior to disposal of any material.

#### 1.5 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control:
  - .1 Submit name of professional engineer retained by the Contractor for design and review of temporary works related to underpinning and bracing of existing structure and excavations for review and approval by Departmental Representative.
  - .2 Submit to Departmental Representative testing inspection results report as described in PART 3 of this Section.
- .3 Inform Departmental Representative at least 3 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

## 1.6 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability for professionals retained by Contractor.
- .2 Submit design and supporting data for excavations at least 2 weeks prior to beginning Work. Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of British Columbia, Canada.
- .3 Keep design and supporting data on site.
- .4 Do not use soil material until written report of soil test results are reviewed and approved by Departmental Representative.
- .5 Health and Safety Requirements:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

## 1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .2 Divert materials from landfill to local facility for reuse.

## 1.8 EXISTING CONDITIONS

- .1 Carefully examine existing mapping of site utilities prior to excavation.
- .2 Buried services:
  - .1 Before commencing work verify location of buried services on and adjacent to site by either soil hydrovactor excavation or hand-digging methods.
  - .2 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
  - .3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .4 Prior to beginning excavation Work, notify applicable Departmental Representative establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during Work.
  - .5 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
  - .6 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing.
  - .7 Record location of maintained, re-routed and abandoned underground lines.
  - .8 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
  - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
  - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

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**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 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 be in conformance to the AMEC Geotechnical Site Assessment. 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 SURVEY**

- .1 Refer to Section 31 05 00 - Common Works Results – Earthworks, Exterior Improvements, and Utilities for survey requirements.

**3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Refer to Section 01 35 43 – Environmental Procedures for additional information.
- .2 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.
- .3 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .4 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.3 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

### **3.4 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 to 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, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

### **3.5 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 3m and should be protected from erosion.
- .4 Dispose of unused topsoil as directed by Departmental Representative.

### **3.6 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.

### **3.7 SHORING, BRACING AND UNDERPINNING**

- .1 Contractor is responsible for the protection and temporary support of all project excavations.
- .2 Contractor to retain and pay for services of professional geotechnical engineer registered in the Province of British Columbia for design and review of temporary works related to underpinning and bracing of existing structure and excavations.
- .3 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
- .4 Construct temporary Works to depths, heights and locations as indicated by Contractor's geotechnical engineer.

- .5 During backfill operation:
  - .1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
  - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
  - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
- .6 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .7 Upon completion of substructure construction:
  - .1 Remove cofferdams, shoring and bracing.

### **3.8 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.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

### **3.9 EXCAVATION**

- .1 All or any existing underground utilities are not necessarily shown on the Contract Drawings. Existing Underground utilities shall be located and all utility companies contacted, prior to installing any new underground services.
- .2 Test holes may be required to be excavated to determine exact depths of existing utilities. Any discrepancy in elevation or location shall be referred to the Departmental Representative prior to construction.
- .3 Advise Departmental Representative at least 7 days in advance of excavation operations. Excavate to lines, grades, elevations and dimensions as indicated.
- .4 All trenches to conform to WorkSafeBC Guidelines and Regulations.
  - .1 Any costs associated with trench certification and shoring are to be paid by the Contractor.
- .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 Do not disturb soil within branch spread of trees or shrubs that are to remain.
  - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw, as directed by the project Arborist.
  - .2 Provide 24 hours' notice to Departmental Representative of need for Arborist on site.
- .8 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations. No more than 5 m of trench may be exposed at end of day's operation and must be securely covered. Road plates are to be used to cover exposed excavations in areas of vehicular travel.
- .9 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .10 Restrict vehicle operations directly adjacent to open trenches.
- .11 Do not obstruct flow of surface drainage or natural watercourses.
- .12 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
  - .1 Subgrade for paved areas to be reviewed and approved by the Contractor's 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 95% Modified Proctor Maximum Dry Density, or as directed by Geotechnical Engineer.
- .13 Correct unauthorized over-excavation as follows:
  - .1 Fill with granular base material to not less than 95% Modified Proctor Density.
- .14 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.
- .15 Hand trim, make firm and remove loose material and debris from excavations.
  - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
  - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

### **3.10 ROADWAY EXCAVATION, EMBANKMENT AND COMPACTION**

- .1 Not Applicable

### **3.11 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services as indicated.
- .2 Place bedding and surround material in unfrozen condition.

### **3.12 BACKFILLING**

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



- .3 Inspection, testing, approval, and recording location of underground utilities.
- .4 Removal of concrete formwork.
- .5 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 except as shown otherwise on Contract Drawings. Compact to 90% modified proctor density.
  - .2 Roads, foundations, buildings, driveways, concrete walks: backfill with imported granular material. Place backfill material in uniform layers not exceeding 150 mm compacted to 95% Modified Proctor Maximum Dry Density thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
  - .1 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .2 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 150mm.
  - .3 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
    - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative.
- .6 All structural fill should extend beyond footing and hard surfaced areas so that compact/dense native soils, or approved structural fill are present within an area extending one metre laterally from the edge of the foundation and then at a 1H:1V (Horizontal:Vertical) downward projection.
- .7 Place unshrinkable fill in areas as indicated.
- .8 Consolidate and level unshrinkable fill with internal vibrators.
- .9 Install drainage system in backfill as indicated.

### **3.13 TESTING**

- .10 Refer to Section 01 45 00 – Quality Control for geotechnical testing requirements and Section 31 05 00 - Common Works Results – Earthworks, Exterior Improvements, and Utilities.

### **3.14 RESTORATION**

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

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- .5 Reinststate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
  - .6 Restore surface to match existing.
    - .1 Minimum topsoil depth: 100mm
    - .2 Minimum asphalt thickness: 75mm
  - .7 Clean and reinststate areas affected by Work as directed by Departmental Representative.
  - .8 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
  - .9 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

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**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1        Section 31 05 00 Common Works Results – Earthworks, Exterior Improvements, and Utilities
- .2        Section 31 23 33.01 Excavating, Trenching and Backfilling

**1.2            REFERENCES**

- .1        ASTM International
  - .1        ASTM C117-04, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2        ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3        ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4        ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN- m/m<sup>3</sup>).
  - .5        ASTM D1557-09, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft<sup>3</sup>) (2,700kN-m/m<sup>3</sup>).
  - .6        ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .7        ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2        Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2        CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3        U.S. Environmental Protection Agency (EPA) / Office of Water
  - .1        EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**1.3            DELIVERY, STORAGE AND HANDLING**

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

**1.4            ACTION AND INFORMATION SUBMITTALS**

- .1        Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2        Product Data:
  - .1        Submit proposed source and sieve analysis of all aggregate materials 2 weeks prior to commencing work.

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**Part 2 Products**

**2.1 MATERIALS**

- .1 Granular base and sub-base to Section 31 23 33.01.

**Part 3 Execution**

**3.1 PREPARATION**

- .1 Temporary Erosion and Sedimentation Control:
- .1 Refer to Section 01 35 43 – Environmental Procedures for additional information.
  - .2 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction, sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
  - .3 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .4 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2 PLACEMENT AND INSTALLATION**

- .1 Place granular base after sub-base and subgrade surface is inspected and approved in writing by Departmental Representative.
- .2 Placing:
- .1 Construct granular base to depth and grade in areas indicated.
  - .2 Ensure no frozen material is placed.
  - .3 Place material only on clean unfrozen surface, free from snow and ice.
  - .4 Begin spreading base material on crown line or on high side of one-way slope.
  - .5 Place material using methods which do not lead to segregation or degradation of aggregate.
  - .6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
    - .1 Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
  - .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
  - .8 Remove and replace that portion of layer in which material becomes segregated during spreading.

- .3     **Compaction Equipment:**
  - .1     Ensure compaction equipment is capable of obtaining required material densities.
  - .2     **Compacting:**
    - .1     Compact to density not less than 95% Modified Proctor Density.
    - .2     Shape and roll alternately to obtain smooth, even and uniformly compacted base.
    - .3     Apply water as necessary during compacting to obtain specified density.
    - .4     In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Departmental Representative.
    - .5     Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .4     **Proof rolling:**
  - .1     For proof rolling use standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.
  - .2     Obtain written approval from Departmental Representative to use non-standard proof rolling equipment.
  - .3     Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
  - .4     Where proof rolling reveals areas of defective subgrade:
    - .1     Remove base, sub-base and subgrade material to depth and extent as directed by Departmental Representative.
    - .2     Backfill excavated subgrade with common material and compact.
    - .3     Replace sub-base material and compact.
    - .4     Replace base material and compact in accordance with this Section.
  - .5     Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by Departmental Representative and replace with new materials in accordance with this section at no extra cost.
  - .6     At the discretion of the Departmental Representative, nuclear densometer testing may be utilized for compaction testing rather than proof rolling. Location and frequency of densometer tests to be approved by the Departmental Representative.

### **3.3     TESTING**

- .1     Refer to Section 31 05 00 - Common Works Results – Earthworks, Exterior Improvements, and Utilities for geotechnical testing requirements.
- .2     Contractor shall notify Departmental Representative in advance of planned testing.
- .3     Contractor to pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Departmental Representative.

- .4 Provide Departmental Representative with 2 copies of testing and commissioning reports as soon as they are available.

**3.4 SITE TOLERANCES**

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

**3.5 PROTECTION**

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 31 05 00 Common Works Results – Earthworks, Exterior Improvements, and Utilities
- .2 Section 32 11 23 Aggregate Base Courses

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.5 – M91 (March 1999), Low Flash Petroleum Spirits Thinner.
  - .2 CAN/CSGB-1.74 – 2001, Alkyd Traffic Paint.
- .3 Master Municipal Contract Documents (MMCD), Platinum Edition Volume II - 2009, British Columbia. Contractor to maintain a copy on-site at all times.

**1.3 SAMPLES AND SUBMITTALS**

- .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit asphalt mix design to Departmental Representative for review at least 1 week prior to commencing work.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Divert unused aggregate materials from landfill to facility for reuse as approved by Department Representative.
- .4 Dispose of unused paint and paint thinner materials at official hazardous material collections site as approved by Department Representative.
- .5 Do not dispose of unused paint thinner material into sewer system, into streams, lakes, onto ground or in other location where it will pose health environmental hazard.
- .6 Divert unused asphalt from landfill to facility capable of recycling materials.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Prime coat: N/A
- .2 Tack coat: CAN/CGCB – 16.2, Grade SS-1
- .3 Asphalt cement: CGSB – 16.3-M 90, Grade 80-100
- .4 Asphalt concrete: MMCD Upper Course #1 and 2
- .5 Traffic paint: yellow and white to CAN/CGSB-1.74.
- .6 Paint thinner: to CAN/CGSB-1.5.

**Part 3 Execution**

**3.1 FOUNDATIONS**

- .1 Foundations for roadways and parking lots comprise:
  - .1 compacted granular subbase, thickness as shown in Contract Drawings.
  - .2 compacted granular base, thickness as shown in Contract Drawings.
- .2 Compaction: compact each lift of granular material to 95% modified Proctor density. Maximum lift thickness: 150 mm.

**3.2 PAVEMENT THICKNESS**

- .1 Pavement thickness for roadways and parking lots is to be as specified in the Contract Drawings with the following gradation (MMCD 32 12 16):
  - .1 Patching and in-fill adjacent to curbs and sidewalks: MMCD Upper Course #2
  - .2 Temporary ATB access: MMCD Upper Course #1.
  - .3 Fire lane south of the ATB: MMCD Upper Course #1 in two lifts.

**3.3 PAVEMENT CONSTRUCTION**

- .1 Construction of asphalt concrete to MMCD 32 12 16 – Hot-Mix Asphalt Concrete Paving.
- .2 Surface preparation to MMCD 32 12 16 – Hot-Mix Asphalt Concrete Paving

**3.4 TESTING**

- .1 Refer to Section 01 45 00 – Quality Control and Section 31 05 00 - Common Works Results – Earthworks, Exterior Improvements, and Utilities for geotechnical testing requirements.

END OF SECTION



**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 03 30 00 Cast-In-Place Concrete.

**1.2 REFERENCES**

- .1 ASTM International
  - .1 ASTM A53/A53M-10, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A90/A90M-09, Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
  - .3 ASTM A121-07, Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
  - .4 A653/A653M-10, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .5 ASTM C618-08a, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
  - .6 ASTM F1664-08, Standard Specification for Poly(Vinyl Chloride) (PVC)-Coated Steel Tension Wire Used with Chain-Link Fence.
  - .7 ASTM A123/A123M-09, Standard Specification for Zinc (Hot Dip Galvanized) coatings on Iron and Steel Products.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-138.1-96, Fabric for Chain Link Fence.
  - .2 CAN/CGSB-138.2-96, Steel Framework for Chain Link Fence.
  - .3 CAN/CGSB-138.3-96, Installation of Chain Link Fence.
  - .4 CAN/CGSB-138.4-96, Gates for Chain Link Fence.
  - .5 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
  - .6 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles
  - .7 CAN/CSA-G40.20-13/G40.21-13, General requirements for rolled or welded structural quality steel / Structural quality steel
  - .8 CAN/CSA-W59-13 - Welded steel construction (metal arc welding)
- .3 CSA International
  - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CAN/CSA-A3000-08, Cementitious Materials Compendium.
- .4 Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual - current edition.
- .5 U.S. Environmental Protection Agency (EPA) / Office of Water
  - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for concrete mixes, fences, posts and gates and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 For powered gates:
    - .1 indicate electric power requirements, installation details, wiring diagrams.
    - .2 Submit manufacturer's written installation instructions.
    - .3 Drive unit shall bear a label indicating that the gate controller/operator mechanism has been tested certified to UL 325 and CSA C22.2 No. 247 standards for all electrical components.
    - .4 Provide operation and maintenance data for gate for incorporation into manual specified in Section 01 78 10 - Closeout Submittals.
    - .5 Provide concrete foundation designs sealed by an Engineer registered to practice in BC.

### **1.4 QUALITY ASSURANCE**

- .1 Manufacturer: A company specializing in the manufacture of automated gate systems.
- .2 Installer: A minimum of three years' experience installing similar equipment and approved by manufacturer.

### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations.
  - .2 Store and protect fence and gate materials from damage.
  - .3 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: remove for reuse of pallets, crates, padding, packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 19 – Construction/Demolition Waste and Disposal.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Concrete mixes and materials: in accordance with CSA A23.1 and Section 03 30 00 - Cast-in-Place Concrete.
  - .1 Nominal coarse aggregate size: 20-5.
  - .2 Compressive strength: 20 MPa minimum at 28 days.
  - .3 Additives: fly ash to CSA A3000 ASTM C618.
- .2 Chain-link fence fabric: to CAN/CGSB-138.1.
  - .1 Type 1, Class A, medium style, Grade 2.

- .2 Height of fabric: as indicated.
- .3 Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe. Dimensions as indicated.
- .4 Top, bottom tension wire: to CAN/CGSB-138.2, single strand, galvanized steel wire.
- .5 Tie wire fasteners: aluminum wire.
- .6 Tension bar: to ASTM A653/A653M, 5 x 20 mm minimum galvanized steel.
- .7 Gates: to CAN/CGSB-138.4.
- .8 Gate frames: to ASTM A53/A53M, galvanized steel pipe, standard weight 45 mm outside diameter pipe for outside frame, 35 mm outside diameter pipe for interior bracing.
  - .1 Fabricate gates as indicated with electrically welded joints, and hot-dip galvanized after welding.
  - .2 Fasten fence fabric to gate with twisted selvage at top.
  - .3 Furnish gates with galvanized malleable iron hinges, latch and latch catch with provision for padlock which can be attached and operated from either side of installed gate.
  - .4 Furnish pilots access gates with galvanized malleable iron hinges and knob with five button access code on the ground side of the gate. Knob hardware to allow free exit from the air side and protected from operation through the gate/fence. Gates to be fitted with automatic closing hardware. Refer to architectural specifications for further details.
  - .5 Furnish double gates with chain hook to hold gates open and centre rest with drop bolt for closed position.
  - .6 Refer to electrical specifications for gate power and control details.
- .9 Fittings and hardware: to CAN/CGSB-138.2, galvanized steel.
  - .1 Tension bar bands: 3 x 20 mm minimum galvanized steel or 5 x 20 mm minimum aluminum.
  - .2 Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail.
  - .3 Overhang tops to provide waterproof fit, to hold top rails and an outward inward projection to hold barbed wire overhang.
  - .4 Include projection with clips or recesses to hold 3 strands of barbed wire spaced 100 mm apart.
  - .5 Projection of approximately 300 mm long to project from fence at 45 degrees above horizontal.
  - .6 Turnbuckles to be drop forged.
  - .7 Organic zinc rich coating: to CAN/CGSB-1.181 MPI #18.
- .10 Barbed wire: to ASTM A121 2 mm diameter galvanized steel wire aluminum coated steel wire 4 point barbs 125 mm spacing.
- .11 Barbed wire: to CAN/CGSB-138.2, 2.5 mm diameter.
- .12 Grounding rod per Canadian Electrical Code.

## 2.2

### FINISHES

- .1 Galvanizing:

- .1 For chain link fabric: to CAN/CGSB-138.1 Grade 2.
- .2 For pipe: 550 g/m<sup>2</sup> minimum to ASTM A90.
- .3 For barbed wire: to CAN/CGSB-138.2 ASTM A121, Class 2.
- .4 For other fittings: to ASTM A123/A123M.
- .5 For powered gates: Hot dip galvanized finish 0.5 kg/m<sup>2</sup> zinc coating to CAN/CSA-G164.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

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

#### **3.2 PREPARATION**

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction sediment and erosion control drawings sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Grading:
  - .1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.
    - .1 Provide clearance between bottom of fence and ground surface of 30 mm to 50 mm.
- .3 Layout
  - .1 Contractor to provide full layout of the fences, gates, powered gates and adjacent features and report any potential conflicts to the Departmental Representative prior to construction.

#### **3.3 RESTORATION OF FENCE**

- .1 Restore and damaged or temporarily removed sections of fence as shown in the Contract Drawings in accordance with this specification and to match existing.

### 3.4 ERECTION OF FENCE

- .1 Erect fence along lines as directed by Departmental Representative and to CAN/CGSB-138.3.
- .2 Excavate post holes to dimensions indicated 600 mm depth x 300 mm diameter as directed by Departmental Representative.
- .3 Space line posts 3 m apart, measured parallel to ground surface.
- .4 Space straining posts at equal intervals not to exceed 150 m if distance between end or corner posts on straight continuous lengths of fence over reasonably smooth grade, is greater than 150 m.
- .5 Install additional straining posts at sharp changes in grade and where directed by Departmental Representative.
- .6 Install corner post where change in alignment exceeds 10 degrees.
- .7 Install end posts at end of fence and at buildings.
  - .1 Install gate posts on both sides of gate openings.
- .8 Place concrete in post holes then embed posts into concrete to minimum 450 mm depth.
  - .1 Extend concrete 50 mm above ground level and slope to drain away from posts.
  - .2 Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.
- .9 Install fence fabric after concrete has cured, minimum of 5 days.
- .10 Install brace between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface.
  - .1 Install braces on both sides of corner and straining posts in similar manner.
- .11 Install overhang tops and caps.
- .12 Install top rail between posts and fasten securely to posts and secure waterproof caps and overhang tops.
- .13 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.
- .14 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals.
  - .1 Knuckled selvedge at bottom.
  - .2 Twisted selvedge at top.
- .15 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals.
  - .1 Give tie wires minimum two twists.
- .16 Install barbed wire strands and clip securely to lugs of each projection.
- .17 Install grounding rods as required.

### 3.5 INSTALLATION OF GATES

- .1 Install gates in locations as indicated.
- .2 Install powered gates to manufacturer's written instructions.

- .3 Level ground between gate posts and set gate bottom approximately 40 mm above ground surface.
- .4 Determine position of centre gate rest for double gate.
  - .1 Cast gate rest in concrete as directed.
  - .2 Dome concrete above ground level to shed water.
- .5 Install gate stops where indicated.

### **3.6 TOUCH UP**

- .1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas as indicated.
  - .1 Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

### **3.7 CLEANING**

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

**END OF SECTION**

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**PART 1      General**

**1.1            RELATED SECTIONS**

- .1      Section 32 93 10 - Trees, Shrubs and Ground Cover Planting.
- .2      Section 32 92 20 - Seeding.

**1.2            TESTING**

- .1      Obtain Departmental Representative initial approval of topsoil at source.
- .2      Test growing medium from source for the following as outlined in section 6.2.6 Growing Medium Properties and Table T-6.3.5.4 Properties of Growing Medium for Level 4 “Open Space / Play” (3L) Lawn and Trees & (3P) Planting Areas in the British Columbia Landscape Standard – 2012. Edition:
  - .1      Fertility (N,P,K)
  - .2      Salinity
  - .3      Boron
  - .4      Sodium
  - .5      Total Nitrogen
  - .6      Available Phosphorus
  - .7      Available Potassium
  - .8      Carbon to Nitrogen Ratio
  - .9      Acidity (Ph)
  - .10     Texture -% dry weight of sand, silt and clay.
  - .11     Organic Matter
- .3      Submit 0.5 kg sample of each growing medium type (planting beds and grass areas) to testing laboratory and indicate intended use, type of mulches to be applied, type of subsoil and quality of drainage. Prepare and ship sample according to provincial regulations.
- .4      Growing medium shall be tested and recommendations for corrections provided to bring properties to levels indicated in Section 6.2.6 and Table T-6.3.5.4 of the British Columbia Landscape Standard – 2012 Edition, for Level 4 “Open Space / Play” (3L) Lawn and Trees & (3P) Planting Areas
- .5      Submit one copy of growing medium analysis and recommendations for corrections to Departmental Representative.
- .6      Inspection and testing of topsoil will be carried out by a reputable testing laboratory at the Contractors expense.

**1.3            DELIVERY AND STORAGE**

- .1      Deliver and store fertilizer, lime, sulphur, in waterproof bags showing bulk accompanied in writing by weight, analysis and name of manufacturer.

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**PART 2      Products**

**2.1            MATERIALS**

- .1 Growing medium for grass and planting areas to consist of imported topsoil and shall meet requirements identified outlined in Section 6.2.6 and Table T-6.3.5.4 of the British Columbia Landscape Standard – 2012 Edition, for Level 4 “Open Space / Play” (3L) Lawn Areas and Trees & (3P) Planting Areas. Growing medium shall be free from subsoil, roots, grass, weeds, toxic materials, stones, and foreign objects. Growing medium containing crabgrass, couch grass, equisetum, noxious weeds or seeds or parts thereof is unacceptable.
  
- .3 Peatmoss:
  - .1 Decomposed plant material, fairly elastic and homogenous, free of decomposed colloidal residue, wood, sulphur and iron containing minimum 60% organic matter by weight and moisture content not exceeding 15%. Shredded particles may not exceed 6 mm in size. Minimum pH value of peat 5.0, maximum 7.0.
  
- .4 Fertilizer
  - .1 Complete commercial synthetic slow release fertilizer with maximum 35% water soluble nitrogen.
  - .2 Formulation ratio: 1:4:4 Seeding and 1:4:2 Trees & Shrubs
  
- .5 Lime:
  - .1 Ground agricultural limestone containing minimum 85% of total carbonates.
  - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 125 micrometre sieve.
  - .3 Use lime as indicated by acidity analysis of topsoil to bring pH to required level.
  
- .6 Bonemeal:
  - .1 Raw steamed bonemeal, finely ground with a minimum analysis of 4% nitrogen and 20% phosphoric acid.
  
- .7 Sand:
  - .1 Hard, granular sharp sand to CSA A82.56-M1976, well washed and free of impurities, chemical or organic matter.
  
- .8 Sulphur:
  - .1 Finely crushed agricultural elemental sulphur, free of impurities.



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## **2.2 SOIL MIXTURES FOR PLANTING**

- .1 Planting soil: For planting of trees, shrubs and groundcover, incorporate organic matter into the growing medium at a rate as recommended by the soil analysis.
- .2 Incorporate bonemeal into the growing medium as recommended by the soil analysis.
- .3 Incorporate fertilizer as recommended by the soil analysis.

## **PART 3 Execution**

### **3.1 PREPARATION**

- .1 Grade subgrade, eliminating uneven areas and low spots, ensuring positive drainage. Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials. Remove subsoil that has been contaminated with oil, gasoline or calcium chloride. Dispose of removed materials as directed.
- .2 Cultivate entire area which is to receive topsoil to depth of one hundred (100) mm. Repeat cultivation in those areas where equipment used for hauling and spreading has compacted subgrade.

### **3.2 SPREADING OF TOPSOIL**

- .1 Spread topsoil with adequate moisture in uniform layers during dry weather over approved, dry, unfrozen subgrade, where seeding and planting is indicated. No topsoil or fill shall be placed over debris, organic matter, snow, ice or frozen ground.
- .2 Install topsoil in areas as indicated on Planting Plan, drawing L1.
- .3 Apply topsoil to the following minimum depths:
  - .1 450 mm for shrub beds.
  - .2 100 mm for grass areas.
  - .3 See Section 32 93 10 Trees, Shrubs and Groundcover Planting, 3.1 for tree planting pit requirements.
- .4 Remove stones, roots, grass, weeds, construction materials, debris and foreign non-organic objects from topsoil.
- .5 Manually spread topsoil around trees and plants.

### **3.3 SOIL AMENDMENTS**

- .1 Apply lime, sulphur or other soil amendment at rate determined from soil analysis.
- .2 Mix soil amendments as required by the topsoil analysis into the topsoil by cultivating or roto-tilling prior to application of fertilizer.

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**3.4 APPLICATION OF FERTILIZER**

- .1 Apply fertilizer at least one week after lime application and at least 6 days before seeding.
- .2 Spread fertilizer with mechanical spreaders over entire area of topsoil at manufacturer's recommended rate of application rate and as determined by the soil analysis.
- .3 Mix fertilizer thoroughly into upper 50 mm of topsoil.

**3.5 FINISH GRADING**

- .1 Fine grade subgrade, eliminating uneven areas and low spots. Remove debris and stones in excess of 5.0 cm. Remove subsoil that has been contaminated with oil, gasoline or building materials.
- .2 Fine grade topsoil in planting areas indicated on the Landscape Plan, eliminating rough and low areas to ensure positive drainage.
- .3 Fine grade and loosen topsoil prior to seeding. Eliminate rough spots and low areas to ensure positive drainage. Prepare loose friable sod bed by means of disking and subsequent raking. Roll lightly and rake wherever topsoil is too loose.
- .4 Roll topsoil with 50 kg roller, minimum 900 mm wide, to compact and retain surface.
- .5 Leave surface smooth, uniform, firm against deep foot printing, with a fine loose texture.
- .6 Be responsible for maintaining finish grades in all planting areas and for executing any grading as designed or necessary to achieve surface drainage.

**END OF SECTION**

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**PART 1      General**

**1.1            RELATED SECTIONS**

- .1      Section 32 91 21 - Topsoil Placement and Grading.
- .2      Section 32 93 10 - Trees, Shrubs and Groundcover Planting.

**1.2            INSPECTION**

- .1      The Contractor shall give timely notice, in writing, that all work has been completed.
- .2      Inspection for acceptance will be conducted within fifteen (15) days after completion.
- .3      At the time of inspection for acceptance, grass shall be well established and in a vigorous growing condition.

**1.3            GUARANTEE**

- .1      All seeded areas shall be guaranteed for a period of one (1) year from date of substantial completion. All areas which show deterioration, bare spots, or are thin due to faulty materials and/or workmanship, shall be reseeded at the Contractor's expense.

**1.4            ESTABLISHMENT MAINTENANCE OF GRASS AREAS**

- .1      The Contractor is responsible for providing a temporary irrigation system and/or hand watering for establishment of the seeded grass areas.
- .2      The maintenance of seeded areas shall continue until 30 days after substantial completion.
- .3      Such maintenance shall include all measures necessary to establish and maintain grass in a vigorous growing condition, including, but not limited to:
  - .1      Mowing: At regular intervals as required to maintain grass at a maximum height of fifty (50) mm. No more than one-third (1/3) of blade shall be cut at any one mowing. Edges of grass areas shall be neatly trimmed and hand clipped where necessary. Heavy clipping shall be removed immediately after mowing and trimming.
  - .2      Hand Watering: When required, and with sufficient amounts to ensure germination and prevent grass and underlying soil from drying out.

- .3 Fertilizing: Including all required supplementary fertilizer applications as necessary to establish a vigorous growing stand of grass.
- .4 Weed Control: Shall be carried out when required to keep seeded areas reasonably free of weeds. When herbicides are used, they shall be applied in accordance with manufacturer's recommendations and local regulations. Any damage resulting from Contractor's use of herbicides shall be remedied at their own expense.
- .5 Erosion: Eroded areas resulting from Contractor's faulty workmanship and/or materials, heavy rainfall or overwatering shall be repaired and reseeded at the Contractor's expense.
- .6 Reseeding: Repair areas which show root growth failure, deterioration, bare or thin spots, or which have been damaged by any means, including replacement operations.
- .7 Immediately after seeding, erect barricades and warning signs to protect seeded areas from traffic until grass is established.

## **1.5 HANDLING / STORAGE**

- .1 Grass Seed: All grass seed, where specified, shall be stored in a dry, weatherproof storage place and shall be protected from damage by heat, moisture, rodents or other causes until time of seeding. Care shall be taken that labels or other identification are not removed or defaced.
- .2 Fertilizers:
  - .1 Fertilizer shall be packed in standard containers, clearly marked with the name of the manufacturer, weight and analysis.
  - .2 All fertilizer shall be stored in a weatherproof storage place and in such a manner that it will stay dry and its effectiveness is not impaired.
  - .3 The Contractor shall supply all necessary fertilizers to eliminate any chemical deficiencies of topsoil.
- .3 Topsoil:
  - .1 See Section 32 91 21 Topsoil Placement and Grading, for topsoil requirements.
  - .2 Topsoil shall not be fine graded, or otherwise handled while in a frozen or muddy condition.

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**1.6 TESTING**

- .1 See specification section 32 91 21 Topsoil Placement and Grading for topsoil testing requirements.

**PART 2 Products**

**2.1 FERTILIZER**

- .1 The Contractor shall provide all necessary fertilizers to eliminate any chemical deficiencies of the topsoil as determined by the topsoil analysis.

**2.2 TOPSOIL**

- .1 See Section 32 91 21 Topsoil Placement and Grading, for topsoil requirements.

**2.3 WATER**

- .1 Water used in this work shall be furnished by the Departmental Representative and will be suitable for irrigation and free from ingredients harmful to plant life. Watering equipment required for the work shall be furnished by the Contractor.

**2.4 GRASS SEED**

- .1 Grass seed shall be certified seed, meeting the requirements of the Seeds Act for Canada No. 1 Seed, and mixed as specified hereinafter.
- .2 Seed Mixture for grass areas to consist of a drought resistant / low maintenance blend of grass species.
- .1 Seed mix: Canada No. 1 Lawn Mixture
    - 20% Hard Fescue
    - 15% Quatro Sheep's Fescue
    - 15% Chewings Fescue
    - 15% Chantilly Creeping Red Fescue
    - 15% Creeping Red Fescue
    - 20% Aspire Perennial Ryegrass
- .2 Seeding rate: 22.76 kg. (50 lb.) per 930 square metres (10,000 sq. ft.).

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**PART 3 Execution**

**3.1 SUBGRADE PREPARATION**

- .1 Subgrades for seeded grass areas to be established to a depth of one hundred (100) mm below finished grades.

**3.2 FINISH GRADING**

- .1 Sub-grade shall be scarified to a minimum depth of one hundred (100) mm to provide an even, loose textured surface.
- .2 Fine grade subgrade to minus 100 mm below finished grade eliminating uneven areas. Remove debris and stones in excess of fifty (50) mm. Remove subsoil that has been contaminated with oil, gasoline or building materials.
- .3 Fine grade topsoil to finish grades eliminating rough and low areas to ensure positive drainage.
- .4 No fill shall be placed over debris, organic matter, snow, ice, or frozen ground.
- .5 Roll topsoil with 50 kg roller to compact and retain finish surface grades flush with adjacent curbs and walks.
- .6 The Contractor shall be responsible for maintaining finish grades in all planting areas and for executing any grading as designed or necessary to achieve surface drainage.
- .7 Fine grading of each area shall be executed with care. All reasonable precautions, such as wetting down, covering, or other effective measures must be taken to prevent dust from becoming airborne.
- .8 The topsoil under all seeded areas shall be spread evenly over the approved subgrade to the specified depth, and compacted to 80-85% Standard Proctor Density. The minimum depth of topsoil under seeded areas shall be one hundred (100) mm.

**3.3 INSPECTION**

- .1 Finish grades shall be inspected and approved prior to any seeding.

**3.4 WORKMANSHIP**

- .1 Keep site well drained.
- .2 Clean up soil or debris spilled onto pavement or concrete and dispose of deleterious materials.
- .3 Leave site in a neat and acceptable condition. Remove all excess materials from the site.

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**3.5 SEEDING OPERATION**

- .1 The specified fertilizer shall be applied to and well worked into the topsoil by disking, raking or harrowing at the rate required to eliminate chemical deficiencies of the topsoil. This shall be done within 48 hours prior to seeding.
- .2 The fertilizers shall be well worked into the upper one hundred (100) mm of soil prior to seeding.
- .3 Immediately before any seed is to be sown, the ground shall be scarified as necessary and shall be raked until the surface is smooth, friable and of uniformly fine texture. Grass areas shall be seeded evenly with a mechanical spreader at the rate of 22.76 kg. (50 lb.) per 930 square metres (10,000 sq. ft.), lightly raked, rolled with a 9 to 12 kg per linear metre roller, and watered with a fine spray. The method of seeding may be varied at the discretion of the Contractor on his own responsibility to establish a smooth, uniformly grassed area. All the grass areas showing germination failure shall be reseeded at intervals of 10 days, until a good growth of grass is established over the entire seeded area.

**3.6 GENERAL REQUIREMENTS**

- .1 All seeding shall be done on ground which is free of frost, snow or standing water.
- .2 The Contractor is responsible for providing hand watering to ensure germination of the seeded areas. Hand watering to continue for 30 days after substantial completion.
- .3 The Contractor shall be responsible for providing and maintaining warning signs for all seeded areas until the acceptance unless specified otherwise. Remove protection after grass areas are accepted.
- .4 Seeding grass areas shall be carried out during periods which are most favourable for the establishment of a healthy stand of grass.

**END OF SECTION**

**PART 1      General**

**1.1            RELATED SECTIONS**

- .1      Section 32 91 21 - Topsoil Placement and Grading.
- .2      Section 32 92 20 - Seeding.

**1.2            QUALIFICATIONS AND SUPERVISION**

- .1      All planting work described in this section shall be executed by experienced personnel under the direction of a skilled foreman.
- .2      The Contractor shall be responsible for insuring that all plants to be supplied conform with all Provincial and Federal laws, rules, regulations and inspections.

**1.3            SUBSTITUTIONS**

- .1      All plants shall be supplied as specified on the plant list. Substitution will be permitted only upon submission of proof that any plant as specified is not obtainable. All proposed substitutions must be approved in writing by the Departmental Representative, prior to commencement of work, and must be made at no additional cost to the Departmental Representative. Unauthorized substitutions will be corrected at the Contractor's expense using the specified plants or other substitute plants authorized by the Departmental Representative.

**1.4            INSPECTION**

- .1      Within ten (10) days following acceptance of the bid, the Departmental Representative shall be notified of the source of the materials required.
- .2      All materials may be subject to inspection and approval before they are installed. Inspection and approval by the Departmental Representative of plants at the place of growth shall be for quality, size and varieties only, and shall not in any way impair the right of rejection for failure to meet other requirements during progress of the work.
- .3      The Contractor shall give timely notice to the Departmental Representative when such materials are available for inspection.

**1.5            ACCEPTANCE DATE**

- .1      Inspection for acceptance shall be completed by the Departmental Representative within 15 days of receipt of written notification from the Contractor that the work is complete.
- .2      Any work not satisfactory as specified shall be rectified by the Contractor. This process of inspection and correction shall continue until the Departmental Representative is satisfied that the work is 100% complete.



- .3 The date of the written acceptance report by the Departmental Representative shall be the acceptance date.

## **1.6 GUARANTEE**

- .1 All plant materials shall be guaranteed for a period of one (1) year after the date of substantial completion.

## **1.7 REPLACEMENTS**

- .1 During the guarantee period and during the normal planting season, any plant required under this contract that is dead or not in satisfactory growth, as determined by the Departmental Representative, shall be removed from the site and replaced immediately; these and any plants missing due to the Contractor's negligence, and any plant materials which do not meet the requirements of the specifications, shall be replaced as soon as conditions permit, but during the normal planting season. At the end of the guarantee period, inspection will be made by the Departmental Representative together with the Contractor. All costs of replacements shall be borne by the Contractor.
- .2 All replacements shall be plants of the same kind as specified in the plant list and planted in accordance with the drawings and specifications.
- .3 Any damage to plant materials from any source whatsoever shall be reported in writing to the Departmental Representative.
- .4 The cost of replacements resulting from theft, vandalism, carelessness or neglect on the part of others, or any causes due to circumstances beyond the control of the Contractor, shall be borne by the Departmental Representative.

## **1.8 ESTABLISHMENT MAINTENANCE OF PLANT MATERIAL**

- .1 The Contractor is responsible for maintenance to immediately follow, and coincide with, and be continuous with the planting operations, and shall continue until 30 days after substantial completion.
- .2 Such maintenance shall include all measures necessary to establish and maintain all plants in an acceptable, vigorous and healthy growing condition, including, but not limited to:
- .1 Hand cultivating and weeding of planting beds and tree pits.
  - .2 Hand Watering: Hand watering trees and shrubs to supplement the irrigation system when required and in sufficient quantities to saturate the root systems.

- .3 Pruning: Including the removal of dead, or broken branches and treatment of pruning wounds.
- .4 Disease and insect control when required: When chemicals are used for such control, they shall be used in accordance with manufacturer's recommendations and government regulations.
- .5 Maintain in good condition all tree stakes and tree ties and replace all accessories when required.

## **1.9 DELIVERY OF MATERIALS**

- .1 All manufactured materials, such as fertilizers, bonemeal, mulches, etc., shall be delivered to and stored on the site in standard containers clearly indicating contents, weight, analysis and the name of the manufacturer.
- .2 All plant material shall be delivered in an enclosed truck or truck covered with a heavy duty plastic tarp securely enveloping all plants. Failure to do so may result in rejection of some or all delivered plants due to wind stress and damage.

## **1.10 STORAGE OF MATERIALS**

- .1 All materials which are subject to deterioration resulting from weather or any other causes, shall be stored on the site in a dry, weatherproof place in such a manner that their effectiveness will not be impaired.
- .2 All plant materials which cannot be planted immediately upon arrival on site, shall be well protected with soil or similar material to prevent drying out and shall be kept moist until commencement of planting.

## **1.11 DIGGING OF PLANTS**

- .1 All plants shall be dug and delivered to the site as specified on the Plant List.
- .2 Immediately after digging, the root system shall be kept moist to prevent drying out until planted on the site.
- .3 All plants specified 'B&B' shall be moved with solid balls firmly wrapped in burlap or any other acceptable material, and bound with twine, cord, or wire mesh.
- .4 The sizes of root balls for deciduous and coniferous trees shall be as per British Columbia Landscape Standard – 2012 Edition, table T-9.1 and T-9.2.
- .5 All root balls less than 450 mm in diameter shall be burlapped with 140 g Hessian burlap or approved equal. Balls from 450 to 750 mm in diameter shall be double burlapped and drum laced with 6.0 mm rope at 200 mm spacing.
- .6 Plants moved with frozen root balls shall be moved only when balls are complete, and root systems intact. Such plants shall be planted as soon as possible after digging.

- .7 No plants shall be used when the root ball of earth surrounding the roots has been cracked or broken preparatory to or during the process of planting, or when the steel mesh and ropes required in connection with their transplanting, have been removed.

## **1.12 HANDLING OF PLANTS**

- .1 All plants shall be well protected against damage and drying out from the time of digging until they are planted on the site.
- .2 All plant material which cannot be planted immediately upon arrival on the site shall be well protected with soil or similar materials to prevent drying out and shall be kept moist until commencement of planting.
- .3 Plants with broken or abraded trunks or branches are not acceptable.
- .4 Root balls, trunks, branches and leaves shall be protected from sun and wind desiccation.

## **PART 2 Products**

### **2.1 TOPSOIL FOR PLANTING SOIL**

- .1 See specification section 32 91 21 Topsoil Placement and Grading for topsoil requirements.
- .2 Topsoil Depths
- .1 450 mm. in shrub planting areas.
- .2 100 mm. in grass areas.
- .3 See section 3.1 for tree planting pit requirements.

### **2.2 PEAT MOSS**

- .1 See specification section 32 91 21 Topsoil Placement and Grading.

### **2.3 FERTILIZER**

- .1 See specification section 32 91 21 Topsoil Placement and Grading for fertilizer requirements. The Contractor shall provide all necessary fertilizers to eliminate any chemical deficiencies of the topsoil as specified in the soil analysis report.

### **2.4 BONEMEAL**

- .1 See specification section 32 91 21 Topsoil Placement and Grading.

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## 2.5 BARK MULCH

- .1 Mulch to consist of partially composted fine textured Douglas Fir / Hemlock bark and shall be free from small branches, leaves, stones, dirt, vegetative material.
- .2 Mulch to be installed to standards indicated in the British Columbia Landscape Standard – 2012 Edition, section 10.

## 2.6 WATER

- .1 Water used in this work shall be furnished by the Departmental Representative and will be suitable for irrigation and free from ingredients harmful to plant life. Hose and other watering equipment required for the work shall be furnished by the Contractor.

## 2.7 PLANT MATERIALS

- .1 All plant materials shall meet the horticultural standards of the Canadian Nursery Trades Association with respect to grading and quality.
- .2 They shall be nursery grown under proper cultural practices as recommended by the Canadian Nursery Trades Association.
- .3 Nomenclature of specified plants shall conform to the International Code of Nomenclature of Cultivated Plants and shall be in accordance with the approved scientific names given in the latest edition of Standardized Plant Names. The names of varieties not named therein are generally in conformity with the names accepted in the nursery trade.
- .4 Plants shall be true to type and have a growth habit which is normal for the species. They shall be structurally sound; well-branched, healthy, vigorous, and free of disease, insect infestations, rodent damage, sun scald, frost cracks, and other abrasions or scars to the bark. Standard trees shall have straight trunks and full, symmetrical well branched heads. Plants shall be densely foliated when in leaf and have a healthy, well developed root system. Pruning wounds shall show vigorous bark on all edges and all parts shall be moist and show live, green cambium tissue when cut. Where more than one plant of the same species or cultivar is specified, they shall be uniform in appearance.
- .5 All plant materials shall conform to the measurements specified in the plant list except that plants larger than specified may be used only upon approval from the Departmental Representative. The use of such plants shall not increase the contract price. If larger plants are used, the ball of earth shall be increased in proportion to the size of the plant.
- .6 All plants shall be measured when the branches are in their normal position. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to root base or from branch tip to branch tip. Where trees are measured by caliper (cal.) reference is made to the diameter of the trunk measured 150 mm above ground as tree stands in the nursery.

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## **2.8 ACCESSORIES**

- .1 Hardware such as tree ties for supporting trees shall be required as per drawing details.

## **PART 3 Execution**

### **3.1 PLANTING PITS**

- .1 Planting pits for large and medium size trees shall be excavated to a minimum of 3.6 m. diameter and 600 mm. depth minimum. When a 3.6 m. diameter cannot be achieved, tree pits to be extended laterally to provide a 10 sq. meter area. Tree pit locations to be staked out on site and approval obtained from the General Contractor prior to excavation to avoid conflicts with underground services.
- .2 Planting of small trees in planting bed areas do not require additional tree pit excavation or topsoil.
- .3 Pits shall be deep enough to allow a minimum depth of one hundred and fifty (150) mm of compacted topsoil mixture under the root ball.
- .4 The transition of the tree planting area to shallower growing medium of the surrounding planting bed or grass areas shall have a shallow angle.
- .5 All tree pits to drain freely.

### **3.2 PLANT INSTALLATION**

- .1 Planting shall be done during periods suitable with respect to weather conditions and locally accepted practice. Plants shall be set plumb in the centre of the pits and at the same relation to grade as originally grown, after settlement has taken place.
- .2 Trees and other plant materials shall be faced to give the best appearance.
- .3 Soil shall be firmly tamped in place in such a manner that the plant retains its vertical position. Particular care shall be taken to ensure that no air pockets remain under or around the roots. The planting soil shall be thoroughly watered immediately after tamping. All non-porous or non-biodegradable containers shall be removed.

### **3.3 PLANT SUPPORT**

- .1 Trees shall be braced upright in position by stakes and tree ties as noted on the drawings.

### **3.4 PRUNING**

- .1 Plants shall be pruned after planting. The amount of pruning shall be limited to the minimum necessary to remove dead or injured branches. Pruning shall be done in such a manner as to preserve the natural character of the plants. Leaders shall not be removed. Only clean, sharp tools shall be used. All cuts shall be clean and flush, leaving no stubs. Cuts, bruises or scars on the bark shall be traced back to living tissue and removed. The affected areas shall be shaped so as not to retain water.

**3.5 BARK MULCH**

- .1 Partially composted, fine textured Douglas Fir / Hemlock bark mulch shall be installed in all shrub beds to a depth of fifty (50) mm.
- .2 Provide a 600 mm diameter mulch tree ring around trees planted in grass.
- .3 Keep bark mulch 50 mm away from the base of all tree and shrub stems.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 31 05 00 Common Works Results – Earthworks, Exterior Improvements, and Utilities
- .2 Section 32 11 23 – Aggregate Base Courses.
- .3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

**1.2 REFERENCES**

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
  - .1 ANSI/AWWA B300-10, Standard for Hypochlorites.
  - .2 ANSI/AWWA B303-10, Standard for Sodium Chlorite.
  - .3 ANSI/AWWA C207-07, Standard for Steel Pipe Flanges for Waterworks Service, 4 Inch through 144 Inch (100 mm through 3,600 mm).
  - .4 ANSI/AWWA C208-07, Standard for Dimensions for Fabricated Steel Water Pipe Fittings.
  - .5 ANSI/AWWA C500-09, Standard for Metal-Seated Gate Valves for Water Supply Service.
  - .6 ANSI/AWWA C651-05, Standard for Disinfecting Water Mains.
  - .7 ANSI/AWWA C800-05, Standard for Underground Service Line Valves and Fittings.
  - .8 ANSI/AWWA C900-07, Standard for Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 Inch through 12 Inch (100 mm - 300 mm), for Water Transmission and Distribution.
  - .9 AWWA C901, Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) through 3 In. (76 mm), for Water Service
- .2 ASTM International
  - .1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
  - .3 ASTM B88M-05(2011), Standard Specification for Seamless Copper Water Tube Metric.
  - .4 ASTM C117-04, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .5 ASTM C136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .6 ASTM D698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
- .3 American Water Works Association (AWWA)/Manual of Practice
  - .1 AWWA M17-2006, Installation, Field Testing, and Maintenance of Fire Hydrants.
- .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 CSA International
  - .1 CAN/CSA-B137 Series-09, Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12).
    - .1 CAN/CSA-B137.1-09, Polyethylene Pipe, Tubing, and Fittings for Cold-Water Pressure Services.
    - .2 CAN/CSA-B137.3-09, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.
  - .2 CSA G30.18-09, Carbon and Steel Bars for Concrete Reinforcement.
- .6 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S520-07, Standard for Fire Hydrants.
  - .2 CAN/ULC-S543-09, Standard for Internal-Lug, Quick Connect Couplings for Fire Hose.

### **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 and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Pipe certification to be on pipe.

### **1.4 CLOSEOUT SUBMITTALS**

- .1 Not used.

### **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 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations.
  - .2 Store and protect water distribution piping from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

### **1.6 SCHEDULING OF WORK**

- .1 Schedule Work to minimize interruptions to existing services.
- .2 Submit schedule of expected interruptions for approval and adhere to interruption schedule as approved by Departmental Representative.
- .3 Notify Departmental Representative and occupants minimum of 24 hours in advance of interruption in service.
- .4 Notify fire department of planned or accidental interruption of water supply to hydrants.
- .5 Provide and post "Out of Service" sign on hydrant not in use.
- .6 Advise local police department of anticipated interference with movement of traffic.

### **1.7 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Not used



**Part 2 Products**

**2.1 PIPE, JOINTS AND FITTINGS**

- .1 Polyvinyl chloride pressure pipe: to AWWA C900, DR 18 (pressure class 235 psi), gasket bell end, cast iron outside diameter.
  - .1 Joints: push-on integrally thickened bell and spigot type to ASTM D3139 with single elastomeric gasket to ASTM F477.
- .2 PVC injection-moulded fittings shall be DR18, conforming to AWWA C907 and certified to CSA B137.2. PVC compound is 12454B according to ASTM D1784.
- .3 Bolts to be carbon steel, Grade B to ASTM A307, heavy hex style, zinc plated to ASTM B633. Bolt sizes to AWWA C110
- .4 Nuts and washers: to be carbon steel, Grade A, to ASTM A563. Washers to be flat hardened steel to ASTM F436. Nuts and washers to be zinc plated to ASTM B633.
- .5 Tie rods to be continuous threaded, quenched and tempered alloyed steel to ASTM A354, Grade BC. To be zinc plated to ASTM B633. Tie rods to be minimum 19mm diameter or greater.
- .6 Couplings:
  - .1 Minimum pressure class: 225 psi
  - .2 To AWWA C219, with compression gaskets.
  - .3 Epoxy coated to AWWA C213
  - .4 Stainless steel bolts and nuts to ASTM F593.

**2.2 VALVES AND VALVE BOXES**

- .1 Valves to open counter clockwise.
- .2 Gate valves: to AWWA C500 with working pressure of 250 psi, standard iron body, bronze mounted wedge valves with non-rising stems, stem seal to be O-ring type, joints as shown in the Contract Drawings.
- .3 Cast iron valve boxes:
  - .1 Base to be large round type.
  - .2 Top of box to be marked "WATER".

**2.3 SERVICE CONNECTIONS**

- .1 Underground services line valves and fittings 19 to 50mm to AWWA C800 suitable for 1035 kPa working pressure
- .2 HDPE pressure pipe: to CSA-B137.1 and AWWA C901, minimum pressure rating 200 psi.
- .3 Corporation stops to be bronze to ASTM B62, AWWA thread inlet, compression type outlet
- .4 Curb stops to be bronze to ASTM B62, compression type, inverted key, ball or cylinder type construction utilizing rubber O-ring seals.
  - .1 All fitting and valve connections on polyethylene to have solid fluted stiffening liners manufactured from stainless steel to ANSI T304 designed for the appropriate type and ID of pipe.

- .5 Service valve boxes:
  - .1 Curb stop valve boxes on 25mm diameter and smaller services to be telescoping assembly comprised of threaded cast iron top with bronze pentagon centre plug, 25 NPS iron pipe, cast iron base allowing threaded insertion of 25 NPS pipe and accommodation for curb stop valve and 14mm diameter steel operating rod attached to curb stop valve with bronze cotter pin.
- .6 Service connections for PVC pipe:
  - .1 Service connections less than 100 mm: corporation stop, tapped to main using AWWA threads, complete with stainless service saddle. Service saddle to consist of circumferential band type complete with side bars and fingers, keeper bar, stud bolts, nuts, washers and gaskets.
  - .2 Service connections 100 mm and over: use tee fitting or tapping valve and sleeve.
- .7 Tee connections: for services above 100mm. Tee connections to be fabricated of same material and to same standards as specified pipe fittings and to have ends matching pipe to which they are joined.

## **2.4 PIPE BEDDING AND SURROUND MATERIAL**

- .1 Granular material to: Section 31 23 33.01 – Excavating, Trenching and Backfilling
- .2 Concrete mixes and materials required for bedding cradles, encasement, supports, thrust blocks: to Section 03 30 00 - Cast-in-Place Concrete.

## **2.5 BACKFILL MATERIAL**

- .1 As per Section 31 23 33.01 - Excavating, Trenching and Backfilling.

## **2.6 PIPE DISINFECTION**

- .1 Sodium hypochlorite, Calcium hypochlorite to AWWA B300 to disinfect water mains.
- .2 Disinfect water mains in accordance with AWWA C651.
- .3 Dechlorinate flushed water with ascorbic acid dechlorination product.

## **Part 3 Execution**

### **3.1 EXAMINATION**

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

### **3.2 PREPARATION**

- .1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.
  - .1 Inspect materials for defects.
  - .2 Remove defective materials from site.

### 3.3 TRENCHING

- .1 Do trenching work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Ensure trench depth allows coverage over pipe of 2.75 m minimum from finished grade.

### 3.4 GRANULAR BEDDING

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated below bottom of pipe.
- .2 Do not place material in frozen condition.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to 95% minimum of corrected maximum dry density.
- .6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling with compacted bedding material.

### 3.5 PIPE INSTALLATION

- .1 Terminate and cap building water service 1m outside building wall opposite point of connection to main with allowances made for testing and disinfection.
  - .1 Install coupling necessary for connection to building plumbing.
  - .2 If plumbing is already installed, make connection; otherwise cap or seal end of pipe and place temporary marker to locate pipe end.
- .2 Lay pipes to AWWA C600 manufacturer's standard instructions and specifications.
  - .1 Do not use blocks except as specified.
- .3 Join pipes in accordance with manufacturer's recommendations.
- .4 Bevel or taper ends of PVC pipe to match fittings.
- .5 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
- .6 Lay pipes on prepared bed, true to line and grade.
  - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
  - .2 Take up and replace defective pipe.
  - .3 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.
- .7 Face socket ends of pipe in direction of laying. For mains on grade of 2% or greater, face socket ends up-grade.
- .8 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.
- .9 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.
  - .1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

- .10 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .11 Align pipes before jointing.
- .12 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .13 Avoid displacing gasket or contaminating with dirt or other foreign material.
  - .1 Remove disturbed or contaminated gaskets.
  - .2 Clean, lubricate and replace before jointing is attempted again.
- .14 Complete each joint before laying next length of pipe.
- .15 Minimize deflection after joint has been made.
- .16 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- .17 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- .18 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.
- .19 Do not lay pipe on frozen bedding.
- .20 Do hydrostatic and leakage test and have results approved by Departmental Representative before completing surface works.
- .21 Backfill remainder of trench.

### **3.6 VALVE INSTALLATION**

- .1 Install valves to manufacturer's recommendations at locations as indicated.
- .2 Support valves located in valve boxes or valve chambers by means of bedding same as adjacent pipe. Valves not to be supported by pipe.

### **3.7 SERVICE CONNECTIONS**

- .1 Terminate building water service 1m outside building wall.
  - .1 Install coupling necessary for connection to building plumbing.
  - .2 If plumbing is already installed, make connection, otherwise cap or seal end of pipe and place temporary marker to locate pipe end.
- .2 Do not install service connections until satisfactory completion of hydrostatic, leakage tests, and disinfection of water main.
- .3 Employ only competent workmen equipped with suitable tools to carry out tapping of mains, cutting and flaring of pipes.
- .4 Place temporary location marker at ends of plugged or capped unconnected water lines.
  - .1 Each marker to consist of a stake extending from pipe end at pipe level to 60 mm above grade.
  - .2 Paint exposed portion of stake blue with designation "WATER SERVICE LINE".

### **3.8 THRUST BLOCKS AND RESTRAINED JOINTS**

- .1 For thrust blocks: do concrete Work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

- .2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated or as directed by Departmental Representative.
- .3 Keep joints and couplings free of concrete.
- .4 Do not backfill over concrete within 48 hours after placing.
- .5 For restrained joints: use restrained joints as shown in Contract Documents.

### **3.9 HYDROSTATIC AND LEAKAGE TESTING**

- .1 Do tests in accordance with AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
- .2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.
- .3 Notify Departmental Representative at least 48 hours in advance of proposed tests.
  - .1 Perform tests in presence of Departmental Representative.
- .4 Where section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete.
- .5 When testing is done during freezing weather, protect hydrants, valves, joints and fittings from freezing.
- .6 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.
- .7 Open valves.
- .8 Expel air from main by slowly filling main with potable water.
  - .1 Install corporation stops at high points in main where no air-vacuum release valves are installed.
  - .2 Remove stops after satisfactory completion of test and seal holes with plugs.
- .9 Fill asbestos cement pipe and concrete pipe at least 24 hours before testing to allow water absorption by pipe material.
- .10 Apply leakage test pressure of 1380 kPa minimum after complete backfilling of trench, based on elevation of lowest point in main and corrected to elevation of gauge, for period of 2 hours.
- .11 Define leakage as amount of water supplied in order to maintain test pressure for 2 hours.
- .12 Do not exceed allowable leakage, including lateral connections.
- .13 Locate and repair defects if leakage is greater than amount specified.
- .14 Repeat test until leakage is within specified allowance for full length of water main.

### **3.10 PIPE SURROUND AND BACKFILL**

- .1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround, cover, and backfill pipes as per Section 31 23 33.01 – Excavating, Trenching, and Backfilling

### **3.11 PAINTING OF HYDRANTS**

- .1 After hydrant flow tests, paint caps and ports to meet colour selections approved by authority having jurisdiction.

### **3.12 FLUSHING AND DISINFECTING**

- .1 Complete all flushing and disinfection to AWWA C651

- .2 Flushing and disinfecting operations: witnessed by Departmental Representative.
  - .1 Notify Departmental Representative at least 5 days in advance of proposed date when disinfecting operations will begin.
  - .2 Complete disinfection works concurrent with pressure test.
- .3 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of 0.8 m/s, within pipe until foreign materials have been removed and flushed water is clear and a minimum of one pipe volume has been flushed.
- .4 Provide connections and pumps for flushing as required with approved and certified backflow prevention device.
- .5 Open and close valves, hydrants and service connections to ensure thorough flushing.
- .6 When flushing has been completed introduce strong solution of chlorine of minimum 25 mg/L free chlorine into water main and ensure that it is distributed throughout entire system.
- .7 Rate of chlorine application to be proportional to rate of water entering pipe.
- .8 Chlorine application to be close to point of filling water main and to occur at same time.
- .9 Operate valves, hydrants and appurtenances while main contains chlorine solution.
- .10 Flush line to remove chlorine solution after 24 hours.
- .11 Measure chlorine residuals at extreme end of pipe-line being tested.
  - .1 After 24 hours, take further samples to ensure that there is still not less than 10 ppm of chlorine residual remaining throughout system.
- .12 Perform bacteriological tests on water main, after chlorine solution has been flushed out.
  - .1 Take samples in accordance with AWWA C651.
  - .2 Should contamination remain or recur during this period, repeat disinfecting procedure.
  - .3 Contractor to coordinate, deliver and pay for all testing
- .13 Take water samples at service connections, in suitable sequence, to test for chlorine residual.

### **3.13 TIE-INS**

- .1 Provide a shutdown and tie-in plan to the Departmental Representative for review 5 days prior to any planned shutdowns.
- .2 All water service tie-ins to be completed after-hours. Timing to be confirmed with Departmental Representative
- .3 Provide a temporary sump and pump for trench de-watering, including any water discharged from watermains. Dirty water shall not enter watermains or services during the tie-in.
- .4 Provide clean, square cuts on any watermains or services free of burrs.
- .5 Clean, swab and disinfect any materials used for the tie-in per AWWA C651.
- .6 Install all couplers, valves, and fittings per manufacturer's recommendation.
- .7 When tie-in is complete, slowly fill the watermain and purge air. Flush the line until water runs clear and is free of additional disinfectant. Visually observe all exposed joints for leaks and rectify in a timely manner.

**3.14 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 in accordance with Section 01 74 19 - Construction Waste and Disposal.

END OF SECTION

## **PART 1 GENERAL**

### **1.1 RELATED SECTIONS**

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

### **1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No. 211.1, Rigid Types EBI and DB2/ES2 PVC Conduit.
  - .2 CSA C22.2 No. 211.3, Reinforced Thermosetting Resin Conduit (RTRC) and Fittings (Bi-national standard, with UL 1684).

## **PART 2 PRODUCTS**

### **2.1 PVC DUCTS AND FITTINGS**

- .1 Rigid PVC duct: to CSA C22.2 No. 211.1, Type DB2/ES2, with fabricated fittings, for direct burial, Trade size 5 or 6. Nominal length: 3 m plus or minus 12 mm.
- .2 Rigid PVC split ducts.
- .3 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make complete installation.
- .4 Rigid PVC 90 degrees and 45 degrees bends.
- .5 Rigid PVC 5 degrees angle couplings.
- .6 Expansion joints as required.

### **2.2 SOLVENT WELD COMPOUND**

- .1 Solvent cement for PVC duct joints.

### **2.3 FIBREGLASS DUCTS**

- .1 Fibreglass reinforced thermoset duct: to CSA C22.2 No. 211.3, Trade size 5 or 6, watertight type.
- .2 Couplings, reducers, plugs, caps, adaptors, and supports to make complete installation.
- .3 Expansion joints as required.

### **2.4 PLASTIC POLYETHYLENE PIPE**

- .1 Rigid plastic polyethylene pipe with approved couplings and fittings required to make complete installation.



## **2.5 CABLE PULLING EQUIPMENT**

- .1 6 mm stranded nylon pull rope tensile strength 5 kN.

## **2.6 MARKERS**

- .1 Concrete type cable markers: as indicated, with words: "Cable", "Joint" or "Conduit" impressed in top surface, with arrows to indicate change in direction of duct runs.
- .2 Cedar post type markers: 89 x 89mm square, 1.5 m long, pressure treated with clear, copper naphthenate or 5% pentachlorophenol solution, water repellent preservative, with nameplate fastened near post top, on side facing duct.
  - .1 Nameplate: aluminum anodized 89 x 125 mm, 1.5mm thick mounted on cedar post with mylar label 0.125 mm thick with words "Cable" "Joint" or "Conduit" with arrows to indicate change in direction.

## **PART 3 EXECUTION**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

### **3.2 INSTALLATION**

- .1 Install duct in accordance with manufacturer's instructions.
- .2 Clean inside of ducts before laying.
- .3 Ensure full, even support every 1.5 m throughout duct length.
- .4 Slope ducts with 1 to 400 minimum slope.
- .5 During construction, cap ends of ducts to prevent entrance of foreign materials.
- .6 Pull through each duct steel mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter.
- .7 Pull stiff bristle brush through each duct immediately before pulling-in cables.
- .8 In each duct install pull rope continuous throughout each duct run with 3m spare rope at each end.
- .9 Install markers as required.

**END OF SECTION**