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Camp Henry Renewal Project

*Parks Canada Agency
Point Pelee National Park*

Contract Documents and Specifications

Prepared For;

Southwestern Ontario Field Unit
Point Pelee National Park

Prepared by;

lemay



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- K1.1 KITCHEN LAYOUT AND EQUIPMENT LIST

END OF SECTION

1 GENERAL

1.1 SECTION INCLUDES

- .1 Title and description of Work.
- .2 Contract Method.
- .3 Work sequence.
- .4 Contractor use of premises.

1.2 PRECEDENCE

- .1 For Federal Government projects, Division 01 Sections take precedence over technical specification sections in other Divisions of the specifications.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises the construction of one (1) new building, the demolition and expansion of one (1) existing building and the relocation of two (2) existing buildings located at Camp Henry of Point Pelee National Park located within the Essex County of southwestern Ontario.
- .2 The new building shall serve as a new 74m² (796ft²) Comfort Station located in the northern portion of Camp Henry. Services, water, power and natural gas conduits are to be extended to the area within close proximity of the building.
- .3 The existing Mess Hall located in the southern portion of Camp Henry is to be selectively demolished and expanded from its current building footprint of 142m² (1,533ft²) to a total of 299m² (3,218ft²). The building is to be fully season, with the exception of the new screened-in-porch located on the eastern side of the building. Services, water, power and natural gas conduits are to be selectively demolished and modified as shown in the contract documents.
- .4 Two (2) existing bunkhouses are to be carefully removed from their existing foundations and transported to the newly assigned positions within Camp Henry to serve as future buildings.
 - .1 Bunk House 1 – with an approximate existing footprint of 73m² (788ft²) and currently residing on the north side of the pathway dividing Camp Henry into north and south is to be carefully removed from its existing foundation and transported to a new foundation located to the south side of the Mess Hall to act as a future dorm facility. The existing foundation is to remain in place for future use by Parks Canada. Power services are to be provided at the new siting and connected to the existing panel.
 - .2 Bunk House 2 – with an approximate existing footprint of 58m² (623ft²) and currently residing on the immediate south side of the pathway dividing Camp Henry is to be carefully removed from its existing foundation, displaced and re-orientated just to the east of its current position to serve as a future Camp Office. The existing foundation is to be demolished and the new location provided with services that include hydro, water and sanitary services.
- .5 Existing tertiary septic systems are to be modified and/or replaced as specified in the contract documents.

- .6 Natural gas and power are to be provided to all twenty four (24) oTentik sites and connected to existing equipment.

1.4 CONTRACT METHOD

- .1 Construct Work under lump sum contract.
- .2 Refer to tender documents provide by the Parks Canada Contracting Officer

1.5 WORK SEQUENCE

- .1 Coordinate Progress Schedule and coordinate with Departmental Representative Occupancy of site during construction to minimize conflict and to facilitate Owner's usage or access
- .2 Other construction projects within the Point Pelee National Park may be ongoing. Coordinate with Departmental Representative.
- .3 Maintain all fire access/control.
- .4 Provide access when required for Parks Canada environmental impact analysis (EIA) in order to fulfill its requirements as a federal land manager under the Canadian Environmental Assessment Act, 2012 and monitor potential impacts of construction process on local flora and fauna.

1.6 CONTRACTOR USE OF PREMISES

- .1 Unrestricted use of defined construction site until project completion.
- .2 During construction, the Contractor will have full use of site within the limits indicated on the documents. Contractor's use of premises is limited only by Owner's right to perform, work or access areas of the site not included in construction boundaries agreed to.
- .3 Contractor's use of premises must follow all restrictions indicated on all building permits obtained by Owner or Contractor and by all by-laws applicable.
- .4 Remove or alter existing work to prevent injury or damage to portions of existing work which are to remain.
- .5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.
- .5 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.7 OWNER FURNISHED ITEMS

- .1 Owner-Furnished Items: The following products will be furnished by the Owner and installed by the Contractor as part of the Work:
 - .1 Soap Dispensers: Model 2L Proline Heavy Duty as manufactured by DEB
 - .2 Toilet Paper Dispensers: Model JRT Junior Dispenser 4212
 - .3 Hand Dryers: Extreme Air Model GXT9 120/240V

- .2 The Contractor is responsible for providing all necessary blocking and power supply for Owner-Furnished Items and Work related to other Sections for installation.

1.8 WORK NOT IN CONTRACT

- .1 Work not in this contract (noted *N.I.C. on drawings) shall be governed by others and is shown for information purposes only.

1.9 EXISTING SERVICES

- .1 Where Work involves breaking into or connecting to existing services impeding main services supplying area outside the designated zone of Camp Henry, 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 vehicular traffic.
- .2 If required, provide alternative routes for vehicular traffic.
- .3 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .4 Record locations of maintained, re-routed and abandoned service lines.
- .5 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.10 ALTERATIONS TO EXISTING SITE

- .1 Remove and recycle material designated for reuse or dispose of items as indicated.
- .2 Do not cut, drill or sleeve load-bearing members without obtaining approval from Departmental Representative for each condition.
- .3 Schedule and coordinate work to minimize cutting and patching. Cut and patch as required to make work fit. Use workers qualified in work being cut and patched to ensure that it is correctly done.

1.11 EXISTING CONDITIONS

- .1 Make good surfaces and finishes damaged or disturbed due to Work of this Contract to match existing. Ensure that material used to repair damage is compatible with existing work and of the same quality.
- .2 Term "make good" shall mean repairing or filling operations performed on existing floors, walls, ceiling or any other exposed surfaces. Perform cutting and patching where applicable as specified herein. It is intended that finished surfaces match and line with existing adjoining surfaces.
- .3 Restore Site to condition equal to or, if specified elsewhere, to condition better than existing conditions.

1.12 CUTTING AND PATCHING

- .1 Do not cut, drill or sleeve load-bearing members without obtaining approval from Departmental Representative for each condition.
- .2 Schedule and coordinate work to minimize cutting and patching. Cut and patch as required to make work fit. Use workers qualified in work being cut and patched to ensure that it is correctly done.
- .3 Make cuts with clean, true, smooth edges to tolerances required and in conformance with industry practice for applicable class of work. Make patches undetectable in finished work.

1.13 DOCUMENTS REQUIRED

- .1 Maintain at job site, one (1) copy each contract documents on site at all times of the following:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 List of Outstanding Shop Drawings.
 - .6 Change Orders.
 - .7 Other Modifications to Contract.
 - .8 Field Test Reports.
 - .9 Copy of Approved Work Schedule.
 - .10 Health and Safety Plan and Other Safety Related Documents.
 - .11 Other documents as specified.

2 PRODUCTS

2.1 NOT USED

- .1 Not used.

3 EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION

1 GENERAL

1.1 ACCESS AND EGRESS

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

1.2 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Where security is reduced by work provide temporary means to maintain security.
- .3 Provide sanitary facilities for use by Contractor's personnel. Keep facilities clean.

1.3 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 forty-eight (48) hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants.
- .3 Provide for personnel for vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.4 SPECIAL REQUIREMENTS

- .1 Submit schedule in accordance with Section 01 32 16 – Construction Progress Schedule.
- .2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including endangered species, safety, fire, traffic and security regulations.
- .3 Parks Canada is to be granted access when required environmental impact analysis (EIA) in order to fulfill its requirements as a federal land manager under the Canadian Environmental Assessment Act, 2012 and monitor potential impacts of construction process on local flora and fauna. Departmental Representative shall a request for access to the Contractor at least one (1) working day in advance. The Contractor is to assign a Health and Safety Coordinator to accompany EIA whenever accessing the construction site.
- .4 Keep within limits of work and avenues of ingress and egress.
- .5 Ingress and egress of Contractor vehicles at site is limited to hours as instructed by Departmental Representative.

1.5 SECURITY

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

1.6 SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions and only in pre-approved areas as directed by the Departmental Representative.

2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Departmental Representative in accordance with materials specified in the following Sections:

- | | | |
|----|-------------|---------------------------------------|
| .1 | 03 30 00 | Cast-in-Place Concrete |
| .2 | 31 23 33.01 | Excavating, Trenching and Backfilling |

1.2 APPOINTMENT AND PAYMENT

- .1 Departmental Representative will appoint and pay for services of testing laboratory except follows:
- .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
 - .4 Mill tests and certificates of compliance.
 - .5 Tests specified to be carried out by Contractor under supervision of Departmental Representative.
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

1.3 CONTRACTOR'S RESPONSIBILITIES

- .1 Provide labour, equipment and facilities to:
- .1 Provide access to Work for inspection and testing.
 - .2 Facilitate inspections and tests.
 - .3 Make good Work disturbed by inspection and test.
 - .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.
- .2 Notify Departmental Representative forty eight (48) hours minimum sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.1 ADMINISTRATIVE

- .1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting four (4) days in advance of meeting date to Departmental Representative.
- .4 Provide physical space and make arrangements for meetings.
- .5 Preside at meetings.
- .6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .7 Reproduce and distribute copies of minutes within three (3) days after meetings and transmit to Departmental Representative, meeting participants and affected parties not in attendance.
- .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.03 PRECONSTRUCTION MEETING

- .1 Within five (5) days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 16 - Construction Progress Schedule
 - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
 - .5 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
 - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .8 Owner provided products.

- .9 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .10 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .12 Monthly progress claims, administrative procedures, photographs, hold backs.
- .13 Appointment of inspection and testing agencies or firms.
- .14 Insurances, transcript of policies.

1.04 PROGRESS MEETINGS

- .1 During course of Work and two (2) weeks prior to project completion, schedule progress meetings bi-weekly.
- .2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.
- .3 Notify parties minimum three (3) days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within three (3) days after meeting.
- .5 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.
 - .8 Progress schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.
 - .11 Review proposed changes for affect on construction schedule and on completion date.
 - .12 Other business.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.1 REFERENCES

.1 Definitions:

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (Gantt chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars.
- .3 Baseline: original approved plan (for Project, work package, or activity), plus or minus approved scope changes.
- .4 Cash Flow: projection of progress payment requests based on cash loaded construction schedule.
- .5 Completion Milestones: they are firstly [Interim Certificate] [Substantial Completion] and secondly Final Certificate.
- .6 Constraint: applicable restriction or limitation, either internal or external to project, that will affect performance of Project. Factors that affect activities can be scheduled.
- .7 Control: process of comparing actual performance with planned performance, analyzing variances, evaluating possible alternatives, and taking appropriate corrective action as needed.
- .8 Critical Activity: any activity on a critical path.
 - .1 Most commonly determined by using critical path method.
- .9 Critical Path: sequence of activities that determines duration of Project. Generally, it is the longest path through Project.
 - .1 Usually defined as those activities with float less than or equal to specified value, often zero.
- .10 Critical Path Method (CPM): network analysis technique used to determine the amount of scheduling flexibility (amount of float) on various logical network paths in Project schedule network, and to determine the minimum total Project duration.
- .11 Data Date: date through which project status and progress were last determined and reported for analyses, such as scheduling and performance measurements.
- .12 Duration: total number of work periods (not including holidays or other non-working periods) required to complete activity or other Project element.
 - .1 Usually expressed as workdays or work weeks.
- .13 Early Finish Date: in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can finish, based on network logic and schedule constraints.
 - .1 Early finish dates can change as Project progresses and changes are made to Project plan.
- .14 Early Start Date: in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can start, based on network logic and schedule constraints.
 - .1 Early start dates can change as Project progresses and changes are made to Project Plan.
- .15 Finish Date: point in time associated with activity's completion.
 - .1 Usually qualified by one of following: actual, planned, estimated, scheduled, early, late, baseline, target, or current.
- .16 Float: amount of time that activity may be delayed from its early start without delaying Project finish date.
 - .1 This resource is available to both PWGSC and Contractor.
- .17 Impact Analysis: schedule analysis technique that adds a modeled delay to an accepted construction

- schedule to determined possible outcome of that delay on project completion.
- .18 Lag: modification of logical relationship that directs delay in successor activity.
 - .19 Late Finish Date (LF): in critical path method, latest possible point in time that activity may be completed without delaying specified milestone (usually Project finish date).
 - .20 Late Start Date (LS): in critical path method, latest possible point in time that activity may begin without delaying specified milestone (usually Project finish date).
 - .21 Lead: modification of logical relationship that allows acceleration of successor task.
 - .22 Logic Diagram: see Project network diagram.
 - .23 Master Schedule: summary-level schedule that identifies major deliverable; work breakdowns structure and key milestones.
 - .24 Milestone: significant point or event in Project, usually completion of major deliverable.
 - .25 Monitoring: capture, analysis, and reporting of Project performance, usually as compared to plan.
 - .26 Non-Critical Activities: activities which when delayed, do not affect specified Contract duration.
 - .27 Project Control System: fully computerized system utilizing commercially available software packages.
 - .28 Project Network Diagram: schematic display of logical relationships of Project activities.
 - .1 Always drawn from left to right to reflect Project chronology.
 - .29 Project Plan: formal, approved document used to guide both Project execution and Project control.
 - .1 Primary uses of Project plan are to document planning assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines.
 - .2 Project plan may be summary or detailed.
 - .30 Project Planning: development and maintenance of Project Plan.
 - .31 Project Planning, Monitoring and Control System: overall system operated to enable monitoring of Project Work in relation to established milestones.
 - .32 Project Schedule: planned dates for performing activities and planned dates for meeting milestones.
 - .33 Quantified days duration: working days based on five (5) day work week, discounting statutory holidays.
 - .34 Risk: uncertain event or condition that, if it occurs, has positive or negative effect on Project's objectives.
 - .35 Start Date: point in time associated with activity's start, usually qualified by one of following: actual, planned, estimated, scheduled, early, late, target, baseline, or current.
 - .36 Work Breakdown Structure (WBS): deliverable-oriented hierarchical decomposition of Work to be executed by contractor to accomplish project objectives and create required deliverables. It organizes and defines total scope of Project. Each descending level represents an increasingly detailed definition of Project Work. WBS is decomposed into Work packages.

- .2 Reference Standards:
 - .1 Project Management Institute (PMI Standards)
 - .1 A Guide to the Project Management Body of Knowledge (PMBOK Guide) - Fourth Edition.
 - .2 Practice Standard for Scheduling - 2011.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Project Meeting:
 - .1 Meet with Departmental Representative within three (3) working days of Award of Contract date, to establish Work requirements and approach to project construction operations.
 - .2 Participate in regular project progress meetings with Departmental Representative specifically

intended to discuss update of detailed schedule and contract changes.

- .2 Scheduling:
 - .1 Planning: ensure that planning process is iterative and results in generally top-down processing with more detail being developed as planning progresses, and decisions concerning options and alternatives are made.
 - .2 Ensure project schedule efficiencies through monitoring of Project in detail to ensure integrity of Critical Path, by comparing actual completions of individual activities with their scheduled completions, and review progress of activities that has started but are not yet completed..
 - .3 Monitor sufficiently often so that causes of delays can immediately be identified and removed.
- .3 Project monitoring and reporting:
 - .1 Keep team aware of changes to schedule, and possible consequences as project progresses.
 - .2 Use narrative reports to provide advice on seriousness of difficulties and measures to overcome them.
 - .3 Begin narrative reporting with statement on general status of Project followed by summarization of delays, potential problems, corrective measures and Project status criticality.
- .4 Critical Path Method (CPM) Requirements:
 - .1 Ensure Master Plan and Detail Schedule are practical and remain within specified Contract duration.
 - .2 Revise Master Schedule and Detail Schedule deemed impractical by Departmental Representative and resubmit for approval.
 - .3 Change to Contract Duration:
 - .1 Acceptance of Master Schedule and Detail Schedule showing scheduled Contract duration shorter than specified Contract duration does not constitute change to Contract.
 - .2 Duration of Contract may only be changed through bilateral Agreement.
 - .4 Consider Master Schedule and Detail Schedule deemed practical by Departmental Representative, showing Work completed in less than specified Contract duration, to have float.
 - .5 First Milestone on Master Schedule and Detail Schedule will identify start Milestone with an "ES" constraint date equal to Award of Contract date.
 - .6 Calculate dates for completion milestones from Plan and Schedule using specified time periods for Contract.
 - .7 Substantial Completion with "LF" constraint equal to calculated date.
 - .8 Calculations on updates to be such that if early finish of Interim Certificate falls later than specified Contract duration then float calculation to reflect negative float.
 - .9 Delays to non-critical activities, those with float may not be basis for time extension.
 - .10 Do not use float suppression techniques such as software constraints, preferential sequencing, special lead/lag logic restraints, extended activity times or imposed dates other than required by Contract.
 - .11 Allow for and show Master Plan and Detail Schedule adverse weather conditions normally anticipated.
 - .1 Specified Contract duration has been predicated assuming normal amount of adverse weather conditions.
 - .12 Provide necessary crews and manpower to meet schedule requirements for performing Work within specified Contract duration.
 - .1 Simultaneous use of multiple crews on multiple fronts on multiple critical paths may be required.
 - .13 Arrange participation on and off site of subcontractors and suppliers, as required by Departmental

- Representative, for purpose of network planning, scheduling, updating and progress monitoring.
- .1 Approvals by Departmental Representative of original networks and revisions do not relieve Contractor from duties and responsibilities required by Contract.
- .14 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative Project Control System for planning, scheduling, monitoring and reporting of project progress.
- .3 Submit Project Control System to Departmental Representative for approval.
 - .1 Failure to comply with each required submission, may result in progress payment being withheld in accordance with Federal Government's GC 5 Terms of Payment.
- .4 Include costs for execution, preparation and reproduction of schedule submittals in bid documents.
- .5 Submit letter ensuring that schedule has been prepared in co-ordination with major sub-contractors.
- .6 Refer to article "PROGRESS MONITORING AND REPORTING" of this specification Section for frequency of Project control system submittals.
- .7 Submit impact analysis of schedule for changes that result in extension of contract duration.
 - .1 Include draft schedule update and report as outlined in article "PROGRESS MONITORING AND REPORTING".
- .8 Submit Project planning, monitoring and control system data as part of initial schedule submission and monthly status reporting as required by Departmental Representative in following form.
 - .1 On USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative, in original scheduling software containing schedule and cash flow information, labeled with data date, specific update, and person responsible for update.
 - .2 Master Schedule Bar Chart.
 - .3 Construction Detail schedule Bar Chart.
 - .4 Listing of project activities including milestones and logical connectors, networks (sub-networks) from Project start to end. Sort activities by activity identification number and accompany with descriptions. List early and late start and finish dates together with durations, codes and float.
 - .5 Criticality report listing activities and milestones with [negative] [zero] [and][up to [5] days] total float used as first sort for ready identification of [critical] [or][near critical] paths through entire project. List early and late starts and finishes dates, together with durations, codes and float for critical activities.
 - .6 Progress report in early start sequence, listing for each trade, activities due to start, underway, or finished within two (2) months from monthly update date. List activity identification number, description and duration. Provide columns for entry of actual start and finish dates, duration remaining and remarks concerning action required.

1.4 QUALITY ASSURANCE

- .1 Use experienced personnel, fully qualified in planning and scheduling to provide services from start of construction to Final Certificate of completion.

1.5 WORK BREAKDOWN STRUCTURE (WBS)

- .1 Prepare construction Work Breakdown Structure (WBS) within five (5) working days of Award of Contract date.
 - .1 Develop WBS through at least five levels: project, stage, element, sub-element and work package.

1.7 PROJECT MILESTONES

- .1 Mandatory and recommended project milestones form targets for both Master Schedule and Detail Schedule of CPM construction network system.
 - .1 Recommended: demolition completed within ten (10) working days of Award of Contract date.
 - .2 Recommended: excavation completed within twenty (20) working days of Award of Contract date.
 - .3 Recommended: substructure completed within thirty five (35) working days of Award of Contract date.
 - .4 Recommended: superstructure completed within forty five (45) working days of Award of Contract.
 - .5 Recommended: building closed-in and weatherproofed within sixty (60) working days of Award of Contract date.
 - .6 Recommended: interior finishing and fitting, mechanical, and electrical work completed within one hundred and five (105) working days of Award of Contract date.
 - .7 Mandatory: final Certificate completion within one hundred and twenty (120) working days of Award of Contract date.

1.8 MASTER SCHEDULE

- .1 Structure and base CPM construction networks system on WBS coding in order to ensure consistency throughout Project.
- .2 Prepare comprehensive construction Master Schedule (CPM logic diagram) and dependent Cash Flow Projection within three (3) working days of finalizing Agreement to confirm validity or alternates of identified milestones.
 - .1 Master Schedule will be used as baseline.
 - .1 Revise baseline as conditions dictate and as required by Departmental Representative.
 - .2 Departmental Representative as Project progresses will review and return revised baseline within three (3) work days.
- .3 Reconcile revisions to Master Schedule and Cash Flow Projections with previous baseline to provide continuous audit trail.
- .4 Initial and subsequent Master Schedule will include:
 - .1 USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative containing schedule and cash flow information, clearly labeled with data date, specific update, and person responsible for

- update.
- .2 Bar chart identifying coding, activity durations, early/late and start/finish dates, total float, completion as percentile, current status and budget amounts.
- .3 Network diagram showing coding, activity sequencing, total float, early/late dates, current status and durations.
- .4 Actual/projected monthly cash flow: expressed monthly and shown in both graphical and numerical form.

1.9 DETAIL SCHEDULE

- .1 Provide detailed project schedule (CPM logic diagram) within five (5) working days of Award of Contract date showing activity sequencing, interdependencies and duration estimates. Include listed activities as follows:
 - .1 Shop drawings.
 - .2 Samples.
 - .3 Approvals.
 - .4 Procurement.
 - .5 Construction.
 - .6 Installation.
 - .7 Site works.
 - .8 Testing.
 - .9 Commissioning and acceptance.
- .2 Detail CPM schedule to cover in detail minimum period of two (2) months beginning from Award of Contract date with each activity duration approximately five (5) days.
 - .1 Show remaining activities for CPM construction network system up to Final Certificate and develop complete detail as project progresses.
 - .2 Detail activities completely and comprehensively throughout duration of project.
- .3 Relate Detail Schedule activities to basic activities and milestones developed and approved in Master Schedule.
- .4 Clearly show sequence and interdependence of construction activities and indicate:
 - .1 Start and completion of all items of Work, their major components, and interim milestone completion dates.
 - .2 Activities for procurement, delivery, installation and completion of each major piece of equipment, materials and other supplies, including:
 - .1 Time for submittals, resubmittals and review.
 - .2 Time for fabrication and delivery of manufactured products for Work.
 - .3 Interdependence of procurement and construction activities.
 - .3 Include sufficient detail to assure adequate planning and execution of Work. Activities should generally range in duration from 3 to 15 workdays each.
- .5 Provide level of detail for project activities such that sequence and interdependency of Contract tasks are demonstrated and allow co-ordination and control of project activities. Show continuous flow from left to right.
- .6 Ensure activities with no float are calculated and clearly indicated on logical CPM construction network system as being, whenever possible, continuous series of activities throughout length of Project to form "Critical Path". Increased number of critical activities is seen as indication of increased risk.

- .7 Insert Change Orders in appropriate and logical location of Detail Schedule. After analysis, clearly state and report to Departmental Representative for review effects created by insertion of new Change Order.

1.10 REVIEW OF THE CONSTRUCTION DETAIL SCHEDULE

- .1 Allow five (5) work days for review by Departmental Representative of proposed construction Detail Schedule.
- .2 Upon receipt of reviewed Detail Schedule make necessary revisions and resubmit to Departmental Representative for review within five (5) work days.
- .3 Promptly provide additional information to validate practicability of Detail Schedule as required by Departmental Representative.
- .4 Submittal of Detail Schedule indicates that it meets Contract requirements and will be executed generally in sequence.

1.11 COMPLIANCE WITH DETAIL SCHEDULE

- .1 Comply with reviewed Detail Schedule.
- .2 Proceed with significant changes and deviations from scheduled sequence of activities that cause delay, only after written receipt of approval by Departmental Representative.
- .3 Identify activities that are behind schedule and causing delay. Provide measures to regain slippage.
 - .1 Corrective measures may include:
 - .1 Increase of personnel on site for effected activities or work package.
 - .2 Increase in materials and equipment.
 - .3 Overtime work and additional work shifts subject to Departmental Representative approval.
- .4 Submit to Departmental Representative, justification, project schedule data and supporting evidence for approval of extension to Contract completion date or interim milestone date when required. Include as part of supporting evidence:
 - .1 Written submission of proof of delay based on revised activity logic, duration and costs, showing time impact analysis illustrating influence of each change or delay relative to approved contract schedule.
 - .2 Prepared schedule indicating how change will be incorporated into the overall logic diagram. Demonstrate perceived impact based on date of occurrence of change and include status of construction at that time.
 - .3 Other supporting evidence requested by Departmental Representative.
 - .4 Do not assume approval of Contract extension prior to receipt of written approval from Departmental Representative.
- .5 In event of Contract extension, display in Detail Schedule that scheduled float time available for work involved has been used in full without jeopardizing earned float.
 - .1 Departmental Representative will determine and advise Contractor number of allowable days for extension of Contract based on project schedule updates for period in question, and other factual information.
 - .2 Construction delays affecting project schedule will not constitute justification for extension of contract completion date.

1.12 PROGRESS MONITORING AND REPORTING

- .1 On ongoing basis, Detail Schedule on job site must show "Progress to Date". Arrange participation on and off site of subcontractors and suppliers, as, and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Inspect Work with Departmental Representative at least once monthly to establish progress on each current activity shown on applicable networks.
- .2 Update and reissue project Work Breakdown Structure and relevant coding structures as project develops and changes.
- .3 Perform Detail Schedule update monthly with status dated (Data Date) on last working day of month. Update to reflect activities completed to date, activities in progress, logic and duration changes.
- .4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.
- .5 Submit to Departmental Representative copies of updated Detail Schedule.
- .6 Requirements for monthly progress monitoring and reporting are basis for progress payment request.
- .7 Submit monthly written report based on Detail Schedule, showing Work to date performed, comparing Work progress to planned, and presenting current forecasts. Report must summarize progress, defining problem areas and anticipated delays with respect to Work schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate any potential delay. Include in report:
 - .1 Description of progress made.
 - .2 Pending items and status of: permits, shop drawings, change orders and possible time extensions.
 - .3 Status of Contract completion date and milestones.
 - .4 Current and anticipated problem areas, potential delays and corrective measures.
 - .5 Review of progress and status of Critical Path activities.

2 PRODUCTS

2.1 NOT USED

- .1 Not used.

3 EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION

1 GENERAL

1.1 DEFINITIONS

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately ten (10) working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Submit to Departmental Representative within three (3) working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within five (5) working days of receipt of acceptance of Master Plan.

1.4 PROJECT MILESTONES

- .1 Project milestones form interim targets for Project Schedule.
 - .1 Demolition completed within ten (10) working days of Award of Contract date.
 - .2 Excavation completed within twenty (20) working days of Award of Contract date.
 - .2 Substructure completed within thirty five (35) working days of Award of Contract date.
 - .3 Superstructure completed within forty five (45) working days of Award of Contract date.
 - .4 Building closed-in and weatherproofed within sixty (60) working days of Award of Contract date.
 - .5 Interior finishing and fitting, mechanical, and electrical work completed within one hundred and five (105) working days of Award of Contract date.
 - .6 Interim Certificate (Substantial Completion) within one hundred and ten (110) working days of Award of Contract date.

1.5 MASTER PLAN

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative will review and return revised schedules within five (5) working days.
- .3 Revise impractical schedule and resubmit within three (3) working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.6 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Excavation.
 - .6 Cast-in-place concrete footings and subgrade walls.
 - .7 Backfill and grading.
 - .8 Slab on grade.
 - .9 Wood framed structures.
 - .10 Siding and Roofing.
 - .11 Interior Architecture (Walls, Floors and Ceiling).
 - .12 Plumbing.
 - .13 Lighting.
 - .14 Electrical.
 - .15 Piping.

- .16 Controls.
- .17 Heating, Ventilating, and Air Conditioning.
- .18 Millwork.
- .19 Testing and Commissioning.
- .20 Supplied equipment long delivery items.

1.7 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.8 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site meetings specified in Section 01 31 19 Project Meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

2 PRODUCTS

2.01 NOT USED

- .1 Not used.

3 EXECUTION

3.01 NOT USED

- .1 Not used.

END OF SECTION

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.
- .11 Submit number of hard copies specified for each type and format of submittal and also submit in electronic format as pdf files. Forward pdf, NMSEdit Professional spp, MS Word, MS Excel, and Autocad dwg files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

1.2 PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment

- attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow five (5) working days for Departmental Representative's review of each submission.
 - .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
 - .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
 - .7 Accompany submissions with transmittal letter, in [duplicate], containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
 - .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
 - .9 After Departmental Representative's review, distribute copies.
 - .10 Submit three (3) hard copies and one (1) electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

- .11 Submit three (3) hard copies and one (1) electronic copy 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 done within three (3) years of date of contract award for project.
- .12 Submit three (3) hard copies and one (1) electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .13 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .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

1.3 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 to Departmental Representative's business address.
- .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.

1.4 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic [and hard] copy of colour 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 Viewpoints and their location as determined by Departmental Representative.
- .4 Frequency of photographic documentation: weekly as directed by Departmental Representative.
 - .1 Upon completion of: demolition, excavation, concrete, framing and services before concealment and as directed by Departmental Representative.

1.5 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Safety and Insurance Board Experience Report.
- .2 Submit transcription of insurance immediately after award of Contract.

1.6 RECORD DRAWINGS

- .1 Maintain, as the work progresses, until project duration, one (1) set of project Record Drawings. The full size drawings shall be in white prints. Refer to mechanical and electrical for their requirements.
- .2 Record accurately on the Record Drawings, all changes to the Contract Documents as constructed, such as Department Representative/ Engineer originated changes, Contractor / Subcontractor originated changes, Site Instructions, Supplementary Instructions, Addenda, instructions by correspondence and Jurisdictional Authority approvals. Carefully record location of concealed elements as required for future maintenance, alteration work, and building additions. Delete information made obsolete by changes, and accurately draw or duplicate instructions and indicate all changes listed herein. Refer to Mechanical and Electrical Specification Divisions for additional requirements.
- .3 Clearly mark each of the project Record Drawings "Project Record Copy". Maintain in good condition. Make the File Copy available at all times for inspection or use by the Departmental Representative.
- .4 Keep the File Record Drawings current and do not record irrelevant information. Do not permanently conceal any work until the required information has been recorded.
- .5 Submit to the Departmental Representative, the record drawings and one (1) bound photocopy of the Drawing Detail Sheets with the application for Substantial Performance of the project. Refer to Section 01 78 00 Closeout Submittals.

2 PRODUCTS

2.1 NOT USED

.1 Not Used.

3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA): Canada
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .2 National Building Code of Canada 2010 (NBC):
 - .1 NBCC 2010, Division B, Part 8 Safety Measures at Construction and Demolition Sites.
- .3 National Fire Code of Canada 2010 (NFC):
 - .1 NFC 2010, Division B, Part 5 Hazardous Processes and Operations, subsection 5.6.1.3 Fire Safety Plan.
- .4 Province of Ontario:
 - .1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, and Regulations for Construction Projects, O. Reg. 213/91 as amended.
 - .2 O. Reg. 490/09, Designated Substances.
 - .3 Workplace Safety and Insurance Act, 1997.
 - .4 Municipal statutes and authorities.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within seven (7) days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
 - .3 Measures and controls to be implemented to address identified safety hazards and risks.
- .3 Provide a Fire Safety Plan, specific to the work location, in accordance with NBC, Division B, Article 8.1.1.3 prior to commencement of work.
- .4 Contractor's and Sub-contractors' Safety Communication Plan.
- .5 Contingency and Emergency Response Plan addressing standard operating procedures specific to the project site to be implemented during emergency situations.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within three (3) days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within three (3) days after receipt of comments from Departmental Representative.

- .7 Submit copies of incident and accident reports.
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Submit names of personnel and alternates responsible for site safety and health.
- .10 Submit records of Contractor's Health and Safety meetings when requested.
- .11 Submit two (2) copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and authority having jurisdiction, weekly.
- .12 Submit two(2) copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative, weekly.
- .13 Submit copies of orders, directions or reports issued by health and safety inspectors of the authorities having jurisdiction.
- .14 Submit Material Safety Data Sheets (MSDS).
- .15 Submit Workplace Safety and Insurance Board (WSIB)- Experience Rating Report.

1.3 FILING OF NOTICE

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

1.4 WORK PERMIT

- .1 Obtain all permits related to the project prior to the commencement of Work.

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

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

1.7 REGULATORY REQUIREMENTS

- .1 Comply with the acts and regulations of the Province of Ontario and all other authorities having jurisdiction.
- .2 Comply with specified standards and regulations to ensure safe operations at the site.
- .3 Do Work in accordance with Section 01 41 00 Regulatory Requirements.

1.8 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.9 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .4 Contractor will be responsible for permitting access of Parks Canada personnel when required as part of the environmental impact analysis (EIA). Assign Health and Safety Coordinator for guidance of personnel required on site to perform EIA. All Parks Canada personnel are to comply all Health and Safety regulations required on the construction site during analysis period.

1.10 COMPLIANCE REQUIREMENTS

- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 and Ontario Regulations for Construction Projects, O. Reg. 213/91.

1.11 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, immediately stop work and advise Departmental Representative verbally and in writing.
- .2 Follow procedures in place for Employee's Right to Refuse Work as specified in the Occupational Health and Safety Act for the Province of Ontario.

1.12 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. Health and Safety Coordinator must:
 - .1 Have working knowledge of occupational safety and health regulations.
 - .2 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

- .4 Be on site during execution of Work.

1.13 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of the Province of Ontario, and in consultation with Departmental Representative.
 - .1 Contractor's Safety Policy.
 - .2 Constructor's Name.
 - .3 Notice of Project.
 - .4 Name, trade, and employer of Health and Safety Representative or Joint Health and Safety Committee members (if applicable).
 - .5 Ministry of Labour Orders and reports.
 - .6 Occupational Health and Safety Act and Regulations for Construction Projects for Province of Ontario.
 - .7 Address and phone number of nearest Ministry of Labour office.
 - .8 Material Safety Data Sheets.
 - .9 Written Emergency Response Plan.
 - .10 Site Specific Safety Plan.
 - .11 Valid certificate of first aider on duty.
 - .12 WSIB "In Case of Injury At Work" poster.
 - .13 Location of toilet and cleanup facilities.

1.14 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.15 BLASTING

- .1 Blasting or other use of explosives s not permitted

1.16 POWDER ACTUATED DEVICES

- .1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

1.17 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

2 PRODUCTS

2.1 NOT USED

.1 Not used.

3 EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

1 GENERAL

1.1 REFERENCES

.1 Definitions:

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

1.2 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 SILT CURTAIN and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit two (2) copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements

.3 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.

.4 Environmental Protection 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 Environmental Protection Plan:

- .1 Names of persons responsible for ensuring adherence to Environmental Protection 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 identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations [and EPA 832/R-92-005, Chapter 3].
- .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 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] [or] 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.
- .14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.
- .15 Pesticide treatment plan to be included and updated, as required.

1.3 FIRES

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

1.4 DRAINAGE

- .1 Develop and submit erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
- .2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.
- .3 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .4 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.5 SITE CLEARING AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties as indicated.
- .2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2m minimum.

- .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.
- .5 Restrict tree removal to areas indicated or designated by Departmental Representative.

1.6 WORK ADJACENT TO WATERWAYS

- .1 Construction equipment to be operated on land only.
- .2 Use waterway beds for borrow material only after written receipt of approval from Departmental Representative.
- .3 Waterways to be kept free of excavated fill, waste material and debris.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.

1.7 POLLUTION CONTROL

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

1.8 HISTORICAL/ ARCHAEOLOGICAL CONTROL

- .1 Provide historical, archaeological, cultural resources, biological resources, and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.
- .2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

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 Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform [Departmental Representative] [DCC Representative] [Consultant] of proposed corrective action and take such action for approval by Departmental Representative.
 - .1 Take action only after receipt of written approval by Departmental Representative.
 - .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
 - .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 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 reuse and recycling] in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with National Building Code of Canada (NBC) 2010, National Fire Code of Canada (NFC) 2010, 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 Where reference is made to barrier-free design, such references shall be considered to refer to:
 - .1 National Building Code of Canada 2010
 - .2 CAN/CSA B651-12 Accessible Design for the Built Environment
 - .1 In case of conflict or discrepancy between NBC and the CAN/CSA B651-12, the requirements of CAN/CSA B651-12 shall apply.
- .3 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

- .1 Stop Work immediately and notify Departmental Representative if materials which may contain hazardous materials are discovered during the course of Work.

1.3 SITE SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions as directed by Departmental Representative.

1.4 NATIONAL PARKS ACT

- .1 Perform Work in accordance with National Parks Act as the project is located within the boundaries of a National Park.
- .1 Relics and antiquities, and items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tables, and similar objects found on site shall remain the property of Parks Canada. Protect such articles and request directives from Departmental Representative.
- .2 Should historic objects be uncovered during excavating, stop work immediately and notify the Departmental Representative. Do not resume work until directed to by the Departmental Representative.
- .3 Archaeology staff from Parks Canada will monitor the project work and may require temporary stop of work to carry out site investigations.

1.5 EXAMINATION

- .1 Examine existing conditions and determine conditions affecting Work.

2 PRODUCTS

2.1 NOT USED

.1 Not Used.

3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

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.
- .3 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .4 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.
- .5 Departmental Representative may order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such Work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.

1.3 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

- .1 Notify appropriate agency Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with

reasonable promptness and in orderly sequence to not cause delays in Work.

- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 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.
- .3 Make good other Contractor's work damaged by such removals or replacements promptly.
- .4 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Department Representative may deduct from Contract Amount the difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.6 REPORTS

- .1 Submit four (4) copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of Work being inspected or tested and the manufacturer or fabricator of material being inspected or tested.

1.7 EQUIPMENT AND SYSTEMS

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

2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 52 00 Construction Facilities
- .2 Section 01 56 00 Temporary Barriers and Enclosures

1.2 REFERENCES

- .1 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 SUBMITTALS

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

1.4 INSTALLATION AND REMOVAL

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

1.5 DEWATERING

- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.6 WATER SUPPLY

- .1 Maintain continuous supply of potable water for construction use.

1.7 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 non-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°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 Pay costs for maintaining temporary heat, when using permanent heating system
- .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.

1.8 TEMPORARY POWER AND LIGHT

- .1 Provide and pay for temporary power during constructing for temporary lighting, heating, site construction trailers and operating of power tools in accordance with governing regulations and the Canadian Electrical Code, latest edition.
- .2 Arrange for connection with Utility company. Pay all costs for installation, maintenance and removal.
- .3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.
- .4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all temporary exit facilities and stairs is not less than 162 lx.
- .5 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than three (3) months
- .6 General contractor responsible for payment of all electrical energy charges associated with temporary power up to date of substantial completion.

1.9 TEMPORARY COMMUNICATION FACILITIES

- .1 Provide and pay for temporary telephone, fax, lines and equipment necessary for own use and use of Departmental Representative.

1.10 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Maintain integrity and safety of egress/ exit facilities in and around the building and site at all times.
- .3 Burning rubbish and construction waste materials is not permitted on site.

2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

3 EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to the requirements of authorities having jurisdiction 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.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 51 00 Temporary Utilities
- .2 Section 01 56 00 Temporary Barriers and Enclosures

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
 - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-0121-M1978(R2003), Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.
 - .4 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.
- .3 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as of: May 14, 2004.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 INSTALLATION AND REMOVAL

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas which have to be graveled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.

1.5 SCAFFOLDING

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ramps, ladders, swing staging and platforms as required.

1.6 HOISTING

- .1 Provide, operate and maintain hoists / cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2 Hoists / cranes to be operated by qualified operator.

1.7 SITE STORAGE/LOADING

- .1 Confine work and operations of employees by 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.

1.8 CONSTRUCTION PARKING

- .1 Parking will be permitted on site provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site.
- .3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads..

1.9 SECURITY

- .1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

1.10 OFFICES

- .1 Provide marked and fully stocked first-aid case in a readily available location.
- .2 Subcontractors to provide their own offices as necessary. Direct location of these offices.

1.11 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.

1.12 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.

1.13 CONSTRUCTION SIGNAGE

- .1 No other signs or advertisements, other than warning signs, are permitted on site.
- .8 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .9 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative

1.14 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Construct access and haul roads necessary.
- .8 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .10 Dust control: adequate to ensure safe operation at all times.
- .11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .13 Provide snow removal during period of Work.
- .14 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.15 CLEAN-UP

- .1 Remove construction debris, waste materials, packaging material from work site daily.

- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

3 EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to [requirements of authorities having jurisdiction] [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.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 51 00 Temporary Utilities
- .2 Section 01 52 00 Construction Facilities
- .3 Section 01 61 00 Common Product Requirements

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
 - .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-O121-M1978(R2003), Douglas Fir Plywood.

1.3 INSTALLATION AND REMOVAL

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

1.4 HOARDING

- .1 Erect temporary site enclosure using new 1.2 m high snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 m o.c. Provide at least one lockable truck gate. Maintain fence in good repair.
- .2 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.5 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around deep excavations.
- .2 Provide as required by governing authorities.

1.6 WEATHER ENCLOSURES

- .1 Provide weather tight closures to unfinished door and window openings, tops of chimneys and other openings in floors and roofs.
- .2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
- .3 Design enclosures to withstand wind pressure and snow loading.

1.7 DUST TIGHT SCREENS

- .1 Provide dust tight screens or temporary partitions to localize dust generating activities, and for protection of workers and finished areas of Work.
- .2 Maintain and relocate protection until such work is complete.

1.8 ACCESS TO SITE

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

1.9 PUBLIC TRAFFIC FLOW

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

1.10 FIRE ROUTES

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

1.11 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

1.12 PROTECTION OF BUILDING FINISHES

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm with Departmental Representative locations and installation schedule three (3) days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

1.13 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

1.14 COLD WEATHER CONSTRUCTION

- .1 Work of this Contract shall be carried forward to completion with all possible speed for the full twelve (12) months of every year and shall commence when the Contract is awarded.

- .1 The Contractor shall be deemed to have included in his Tender Sum ample funds for the provision of all necessary temporary heating, temporary enclosures and all other cold weather measures during cold weather construction period from September 15th of each year to May 31st of the following year.
- .2 Provide all labour, plant, equipment and services to provide and maintain adequate heat for work of all trades within the building. The method of providing temporary heat shall be to approval and satisfaction of the Departmental Representative, but use of open fires or salamanders will not be permitted. Temperatures attained shall not be injurious to materials or finishes of any trade
- .3 During all cold weather periods, maintain the ambient air temperature at working areas at or above 5° Celsius for all trades requiring above freezing temperatures to ensure specified quality of work and workmanship. Erect and maintain temporary enclosures as required.
- .4 The use of the permanent heating plant for temporary heat in areas of the building not occupied by the public will not be permitted unless authorized by the Departmental Representative in writing and then only under conditions set out in the mechanical sections of these Specifications and in a manner which guarantees and warrants on equipment will not be affected.
- .5 Maintain adequate venting, ventilation and humidity to ensure proper curing of materials, safeguard finishes and to prevent buildup of combustion gases within enclosures.
- .6 In cold weather, the General Contractor shall provide ambient minimum protection as follows:

Outdoor Air Temperature		Type of Heat	Enclosure
5°C to 2°C	(41°F to 36°F)	none	none
2°C to -4°C	(36°F to 25°F)	vented heater	windbreak tarpaulin or plastic / canvas enclosure
-4°C to -8°C	(25°F to 18°F)	vented heater	windbreak tarpaulin or plastic / canvas enclosure
-8°C to -18°C	(18°F to 0°F)	temporary heating	full enclosure of approved type
below -18°C	(below 0°F)	temporary heating	full enclosure of approved type

1.15 REMOVAL OF TEMPORARY FACILITIES

- 1.4.1 Remove temporary facilities from site when directed by Departmental Representative.
- 1.4.2 When project is closed down at end of construction season keep temporary facilities operational until close down or removal is approved by Departmental Representative.

2 PRODUCTS

2.1 NOT USED

.1 Not Used.

3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 45 00 Quality Control

1.2 REFERENCES

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.3 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 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.
- .3 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 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.
- .8 Use only materials, components and equipment which are in production.

1.4 AVAILABILITY

- .1 Obtain specified construction materials and equipment from suppliers in the same locality as the project as much as possible.
- .2 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply

delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

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

1.5 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, such as lumber and fibre cement siding 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.

1.6 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Owner will be paid for by Departmental. Unload, handle and store such products.
- .3 Schedule early deliveries of materials to enable work to be executed without delay. Before delivery, arrange for receiving at site.
- .4 Deliver packaged materials and equipment and store until use, with manufacturer's seals and labels intact.
- .5 Label packaged goods to describe contents, quantities, and other information as specified.

1.7 MANUFACTURER'S INSTRUCTIONS

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

1.8 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.9 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.

1.10 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.

1.11 REMEDIAL WORK

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.12 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate unless specifically located with dimensioning on the drawings.
- .2 Reflected ceiling plans must be read in conjunction with Mechanical and Electrical drawings. Architectural plans shall govern the positioning of mechanical and electrical fixtures and the latter shall govern all quantities and acceptable make or model.
- .3 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .4 Inform Departmental Representative of conflicting installation. Install as directed.
- .5 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.13 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.

1.14 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.

1.15 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.

1.16 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.
- .3 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active services or facility. Adhere to approved schedule and provide notice to affected parties.
- .4 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .5 Remove abandoned services lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

1.17 EXISTING UTILITIES

- .1 Material and equipment specified in the tender documents, and selected by Contractor, by one or more of the following methods:
 - .1 Specification by reference to a relevant Standard, such as CSA, ASTM, ULC, etc., select any material or equipment that meets or exceeds the specified.
 - .2 Specification by reference to an accepted product evaluation publication, such as the CGSB "Qualified Products List", or CCMC Registry of Product Evaluations", - select any manufacturer's product so listed.
 - .3 Specification by Prescriptive or Performance specification – select any material or equipment meeting or exceeding specification.
 - .4 Specification by identification of one or more Manufacturer's specific product(s) as an "Acceptable Product", along with a listing of other manufacturers who may offer equivalent products – select any product so named, or select from equivalent product(s) of other listed manufacturers.
- .2 "Acceptable Product" is deemed to be a complete and working commodity as described by a manufacturer's name, catalogue number, trade name, or any combination thereof, and will constitute the minimum standard of acceptance.
- .3 Departmental Representative will determine acceptability of Contractor's selection of material and equipment at time of Shop Drawing review.
- .4 When material or equipment is specified by a Standard, Prescriptive or Performance specification, upon request of the Owner's Representative, obtain from manufacturer an independent laboratory reporting, showing that material or equipment meets or exceeds the specified requirements.

1.18 SUBSTITUTION OF MATERIAL AND EQUIPMENT

- .1 Prior to Tender: closing bidders may propose addition of other manufacturer's names to those listed in the tender documents providing requests are made in writing at least seven (7) days prior to tender closing date or

- bid depository where bid depository is used. Departmental Representative will inform all prospective bidders of decision by addendum, issued at least five (5) days prior to the tender closing date.
- .2 Where no manufacturer's names are listed, the onus is on contractor to provide material and equipment to meet performance specification.
 - .3 After Contract award: substitutions of material or equipment, other than as selected by Contractor from those specified, will be considered Departmental Representative only if:
 - .1 material or equipment selected from those specified are not available.
 - .2 delivery date of material or equipment selected from those specified would unduly delay completion of the Contract; or
 - .3 alternative material or equipment to those specified, provided they are determined by the Departmental Representative to be equivalent to or better than those specified, will result in a credit to the Contract amount.
 - .4 Requests for substitutions after Contract award must be accompanied by sufficient information in the form of shop drawings, manufacturer's literature, samples or other data to permit proper investigation of the substitutes used. Requests must also include statements of respective costs of material or equipment originally specified and the proposed substitution.
 - .5 Should a proposed substitution be accepted after Contract award either in part or in whole, assume full responsibility and costs when substitution affects other work on Project. Contractor to pay for design or drawing changes required as a result of the substitution.
 - .6 Amounts of all credits arising from approval of substitutions after Contract award will be determined by Departmental Representative and the Contract amount will be reduced accordingly.

2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.1 REFERENCES

- .1 Owner's identification of existing survey control points and property limits.

1.2 QUALIFICATIONS OF SURVEYOR

- .1 Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to Departmental Representative.

1.3 SURVEY REFERENCE POINTS

- .1 Existing base horizontal and vertical control points are designated on drawings.
- .2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
- .3 Make no changes or relocations without prior written notice to Departmental Representative.
- .4 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5 Require surveyor to replace control points in accordance with original survey control.

1.4 SURVEY REQUIREMENTS

- .1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
- .2 Establish lines and levels, locate and lay out, by instrumentation.
- .3 Stake for grading and fill.
- .4 Stake slopes and berms.
- .5 Establish pipe invert elevations.
- .6 Stake batter boards for foundations.
- .7 Establish foundation footing and floor elevations.
- .8 Establish lines and levels for mechanical and electrical work.

1.5 EXISTING SERVICES

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

- .2 Remove abandoned service lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

1.6 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Departmental Representative of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.7 RECORDS

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.
- .3 Record locations of maintained, re-routed and abandoned service lines.

1.8 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit name and address of Surveyor to Departmental Representative.
- .2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.9 SUBSURFACE CONDITIONS

- .1 Promptly notify Departmental Representative in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- .2 After prompt investigation, should Departmental Representative determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 61 00 Common Product Requirements
- .3 Section 01 74 21 Construction/Demolition Waste Management And Disposal
- .4 Section 07 84 00 Firestopping

1.2 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of elements of project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of operational elements.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Owner or separate contractor.
- .3 Include in request:
 - .1 Identification of project.
 - .2 Location and description of affected Work.
 - .3 Statement on necessity for cutting or alteration.
 - .4 Description of proposed Work, and products to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on Work of Owner or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.3 MATERIALS

- .1 Required for original installation.
- .2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures and Section 01 61 00 – Common Product Requirements.

1.4 PREPARATION

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

- .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.5 EXECUTION

- .1 Execute cutting, fitting, and patching [including excavation and fill,] to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with fire stopping material in accordance with Section 07 84 00 – Fire Stopping, full thickness of the construction element.
- .12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse, recycling and composting in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PARKS CANADA
Point Pelee National Park
Camp Henry Renewal
Leamington, ON

EXECUTION

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3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 74 21 Construction Waste / Demolition Waste Management And Disposal

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.

- .4 Remove waste products and debris including that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .14 Remove dirt and other disfiguration from exterior surfaces.
- .15 Clean and sweep roofs and gutters.
- .16 Sweep and wash clean exterior surfaces such as concrete pads or patios.
- .17 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .18 Clean roofs, downspouts, and drainage systems.
- .19 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .20 Remove snow and ice from access to building.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 – GENERAL

1.1 CONSTRUCTION & DEMOLITION WASTE

- .1 Carefully deconstruct and source separate materials/equipment and divert, from D&C waste destined for landfill to maximum extent possible. Target for this project is [60] [75] [95]% diversion from landfill. Reuse, recycle, compost, anaerobic digest or sell material for reuse except where indicated otherwise. On site sales are not permitted.
- .2 Source separate waste and maintain waste audits in accordance with the Environmental Protection Act, Ontario Regulation 102/94 and Ontario Regulation 103/94.
 - .1 Provide facilities for collection, handling and storage of source separated wastes.
 - .2 Source separate the following waste:
 - .1 Brick and portland cement concrete.
 - .2 Corrugated cardboard.
 - .3 Wood, not including painted or treated wood or laminated wood.
 - .4 Gypsum board, unpainted.
 - .5 Steel.
- .3 Submit a waste reduction workplan indicating the materials and quantities of material that will be recycled and diverted from landfill.
 - .1 Indicate how material being removed from the site will be reused, recycled, composted or anaerobically digested using Deconstruction and Waste Products Workplan Summary.
 - .4 Submit proof that all waste is being disposed of at a licensed land fill site or waste transfer site. A copy of the disposal/waste transfer site's license and a letter verifying that said landfill site will accept the waste must be supplied to Departmental Representative prior to removal of waste from the demolition site.

1.2 WASTE PROCESSING SITES

- .1 Province of: Ontario.
 - .1 Ministry of Environment and Energy, 135 St. Clair Avenue West, Toronto, ON, M4V 1P5.
 - .2 Telephone: 800-565-4923 or 416-323-4321.
 - .3 Fax: 416-323-4682.
- .2 Recycling Council of Ontario: 215 Spadina Avenue, #225, Toronto, ON, M5T 2C7.
 - .1 Telephone: 416-657-2797

- .2 Fax: 416-960-8053
- .3 Email: rco@rco.on.ca.
- .4 Internet: <http://www.rco.on.ca/>.

PART 2 – PRODUCTS

2.1 NOT USED

- .1 Not Used

PART 3 – EXECUTION

3.1 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

- .1 Government Chief Responsibility for the Environment. Province Address
General Fax Inquiries

Ontario Ministry of (416) (416)
Environment 323-4321 323-4682
and Energy (800)
135 St Clair 565-4923
Avenue West
Toronto, ON
M4V 1P5
Environment (416)
Canada 734-4494
Toronto, ON

END OF SECTION

PARKS CANADA
Point Pelee National Park
Camp Henry Renewal
Leamington, ON

CONSTRUCTION / DEMOLITION
WASTE MANAGEMENT AND
DISPOSAL

Section 01 74 20
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2017-01-31

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 78 00 Closeout Submittals
- .2 Section 01 74 11 Cleaning
- .3 Section 01 74 21 Construction/Demolition Waste Management And Disposal

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request Departmental Representative inspection.
 - .2 Departmental Representative Inspection:
 - .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Equipment and systems: tested, adjusted and fully operational.
 - .4 Certificates required by Boiler Inspection Branch, Fire Marshall, Utility companies: submitted.
 - .5 Operation of systems: demonstrated to Owner's personnel.
 - .6 Work: complete and ready for final inspection.
 - .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Departmental Representative and Contractor.
 - .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.

1.3 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Remove waste surplus materials, rubbish and construction facilities from the site in accordance with Section 01 74 20 - Construction/Demolition Waste Management and Disposal.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 31 19 Project Meetings
- .2 Section 01 33 00 Submittal Procedures
- .3 Section 01 45 00 Quality Control
- .4 Section 01 71 00 Examination and Preparation
- .5 Section 01 77 00 Closeout Procedures

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
 - .1 Convene meeting one (1) week prior to contract completion with Contractor's representative and Departmental Representative, in accordance with Section 01 31 19 - Project Meetings And Coordination to:
 - .1 Verify Project requirements.
 - .2 Review manufacturer's installation instructions and warranty requirements.
 - .2 Departmental Representative to establish communication procedures for:
 - .1 Notifying construction warranty defects.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two (2) weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four (4) final copies of operating and maintenance manuals in English and French.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

1.4 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
 - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Text: manufacturer's printed data, or typewritten data.
- .7 Drawings: provide with reinforced punched binder tab.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .8 Provide CAD files in dwg format. Forward pdf, MS Word, MS Excel, and Autocad dwg files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

1.5 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and [Contractor] [Design-Builder] with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
 - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section [01 45 00 - Quality Control].

1.6 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.

- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.
- .6 Turn one set, paper copy and electronic copy, of AS-BUILT drawings and specifications over to Departmental Representative on completion of work. Submit files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.
- .7 If project is completed without significant deviations from Contract drawings and specifications submit to Departmental Representative one set of drawings and specifications marked "AS-BUILT".

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 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: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain [manufacturer's certifications,] [inspection certifications,] [field test records,] required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.8 FINAL SURVEY

- .1 Submit final site survey certificate in accordance with Section 01 71 00 - Examination and Preparation, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.9 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics and limiting conditions.
 - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
 - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
 - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing schedule..
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.
- .15 Additional requirements: as specified in individual specification sections.

1.10 MATERIALS AND FINISHES

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size,

- composition, and colour and texture designations.
- .1 Provide information for re-ordering custom manufactured products.
 - .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .4 Additional requirements: as specified in individual specifications sections.

1.11 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location approved by Departmental Representative; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
 - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to approved by Departmental Representative; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
 - .1 Provide special tools, in quantities specified in individual specification section.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to location approved by Departmental Representative; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative
 - .2 Include approved listings in Maintenance Manual.

1.12 DELIVERY, STORAGE AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.

- .5 Remove and replace damaged products at own expense and for review by Departmental Representative

1.13 WARRANTIES AND BONDS

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittal.

1.14 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Departmental Representative.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Contract number.
 - .5 Warranty period.
 - .6 Inspector's signature.
 - .7 Construction Contractor.

2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

3 EXECUTION

3.1 NOT USED

- .1 Not Used.

PARKS CANADA
Point Pelee National Park
Camp Henry Renewal
Leamington, ON

CLOSEOUT SUBMITTALS

SECTION 01 78 00
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END OF SECTION

Approved: 2012-12-31

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 45 00 Quality Control
- .2 Section 01 56 00 temporary Barriers and Enclosures
- .3 Section 01 74 21 Construction/Demolition Waste Management Disposal
- .4 Section 02 49 92 Deconstruction of Structure

1.2 MEASUREMENT AND PAYMENT

- .1 Measurement Procedures.
 - .1 Removal of 1450 square metres of base and sub-base pavement materials at a depth of 400mm.
 - .2 Removal of 242 square metres of concrete pads with a thickness of 150mm.

1.3 REFERENCES

- .1 Definitions:
 - .1 Demolition: rapid destruction of building following removal of hazardous materials.
 - .2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.
 - .3 Waste Audit (WA): detailed inventory of materials in building. Indicates quantities of reuse, recycling and landfill.
 - .1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.
 - .2 Indicates quantities of reuse, recycling and landfill.
 - .4 Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
 - .5 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.
- .2 Reference Standards:
 - .1 Canadian Council of Ministers of the Environment (CCME)

- .1 PN1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).
 - .2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
 - .3 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.
 - .4 LEED Canada for Existing Buildings, Operations and Maintenance-2009, LEED Canada 2009 Leadership In Energy and Environmental Design Green Building Rating System Reference Guide.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Site Meetings.
 - .1 Convene pre-demolition meeting one week prior to beginning work of this Section in accordance with Section [01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM)] Section [01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart] to:
 - .1 Verify project requirements.
 - .2 Review installation conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
 - .2 Arrange for site visit with Parks Canada Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.
 - .3 Hold project meetings every two (2) weeks.
 - .4 Ensure a representative from Parks Canada, the Consultant, and the Contractor attend.
 - .5 Reporting Requirements: WMC to complete.
 - .6 The Consultant, Parks Canada or Contractor will provide notification of change of meeting schedule established upon contract award 24 hours prior to scheduled meeting.

.2 Scheduling: meet project time lines without compromising specified minimum rates of material diversion.

.1 Notify the Consultant and Parks Canada when unforeseen delay[s] occur.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Canada.

.2 Submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning, where required by authorities having jurisdiction.

.3 Hazardous Materials:

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

.4 Waste Reduction Workplan:

.1 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal and indicate:

.1 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.

.2 Schedule of selective demolition.

.3 Number and location of dumpsters.

.4 Anticipated frequency of tippage.

.5 Certificates:

.1 Submit copies of certified weigh bills, bills of lading, and receipts from authorized disposal sites and reuse and recycling facilities for material removed from site a bi-weekly basis or upon request by Parks Canada or the Consultant.

.2 Written authorization from Parks Canada or the Consultant is required to deviate from haulers, facilities, and or receiving organizations listed in Waste Reduction Workplan.

.6 Sustainable Design Submittals:

.1 LEED Canada submittals: in accordance with Section 01 35 21 - LEED Requirements.

.2 Construction Waste Management:

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

.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50 - 75% of construction wastes were recycled or salvaged.

- .3 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with Parks Canada according to Section 01 35 21 - LEED Requirements.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable acts and regulations of the Province of Ontario.

1.7 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 Parks Canada and/or the Consultant and at no cost to Parks Canada and/or the Consultant.
 - .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.
- .3 Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.

1.8 SITE CONDITIONS

- .1 Site Environmental Requirements.
 - .1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.
 - .2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .3 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
 - .1 Ensure proper disposal procedures are maintained throughout the project.
 - .4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
 - .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities and as Parks Canada and/or the Consultant see fit.
 - .6 Protect trees, plants and foliage on site and adjacent properties where indicated.

- .2 Existing Conditions.
 - .1 Remove contaminated or hazardous materials as directed by Parks Canada and/or the Consultant from site, prior to start of demolition Work, and dispose of at designated disposal facilities in a safe manner in accordance with TDGA and other applicable regulatory requirements as per Section 02 81 01 - Hazardous Materials.

Part 2 Products

2.1 EQUIPMENT

- .1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

Part 3 Execution

3.1 PREPARATION

- .1 Inspect site with Parks Canada and the Consultant 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.
- .4 Disconnect and Cap Mechanical Services.
 - .1 Sewer and Water Lines: remove in accordance with Civil Drawings or as directed by the Consultant and/or Parks Canada authority having jurisdiction and securely plug to form watertight seal.
 - .2 Other Underground Services: remove and dispose of as indicated on the Civil Drawings or as directed by the Consultant and/or Parks Canada in accordance with Section 33 71 73.02 - Underground Electrical Service.

3.2 REMOVAL OF HAZARDOUS WASTES

- .1 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.

3.3 REMOVAL OPERATIONS

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Removal of pavements, curbs and gutters:
 - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Parks Canada and/or the Consultant.

- .2 Protect adjacent joints and load transfer devices.
- .3 Protect underlying and adjacent granular materials.
- .4 Excavate at least 300mm below pipe invert, when removing pipes under existing or future pavement area.
- .5 Remove designated trees during demolition.
 - .1 Obtain written approval of Parks Canada prior to removal of trees not designated.
- .6 Stockpile topsoil for final grading and landscaping:
 - .1 Provide erosion control and seeding if not immediately used.
- .7 Salvage:
 - .1 Dismantle items containing materials for salvage and stockpile salvaged materials at locations specified on Civil Drawings.
- .8 Disposal of Material:
 - .1 Dispose of materials not designated for salvage or reuse on site at authorized facilities approved in Waste Reduction Workplan as instructed by Parks Canada and/or the Consultant.
- .9 Backfill:
 - .1 Backfill in areas as indicated and in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.4 STOCKPILING

- .1 Label stockpiles, indicating material type and quantity.
- .2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.
- .3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.
- .4 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.

3.5 REMOVAL FROM SITE

- .1 Remove stockpiled material as directed by Parks Canada or the Consultant, when it interferes with operations of project.
- .2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.
- .3 Transport material designated for alternate disposal using approved haulers, facilities, or receiving organizations listed in Waste Reduction Workplan and in accordance with applicable regulations.

- .1 Written authorization from Parks Canada or Consultant is required to deviate from haulers, facilities, or receiving organizations listed in Waste Reduction Workplan.
- .4 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.
 - .1 Disposal Facilities: approved and listed in Waste Reduction Workplan.
 - .2 Written authorization from Parks Canada or the Consultant is required to deviate from disposal facilities listed in Waste Reduction Workplan.

3.6 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to conditions that existed prior to beginning of Work.
- .2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.7 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Wood.
 - .8 Low-emitting materials.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work
 - .3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.
- .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 and/or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal 01 35 21 - LEED Requirements.

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

3.9 PROTECTION

- .1 Repair damage to adjacent materials or property caused by selective site demolition.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 45 00 Quality Control
- .2 Section 01 56 00 Temporary Barriers And Enclosures
- .3 Section 01 74 21 Construction / Demolition Waste Management Disposal
- .4 Section 02 49 92 Deconstruction of Structure

1.2 REFERENCES

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures and 01 74 21 - Construction/Demolition Waste Management Disposal.
- .2 Submit demolition drawings:
 - .1 Submit for review and approval by Departmental Representative demolition plan of impacted areas relating to site services and existing environmental conditions.
- .3 Where required by authorities having jurisdiction, submit for approval, drawings, diagrams or details showing sequence of disassembly work, shoring, supporting structures and underpinning.

1.4 SITE CONDITIONS

- .1 Review "Designated Substance Report" and take precautions to protect environment.
- .2 If material resembling spray or trowel-applied asbestos or other suspicious hazardous materials are encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
 - .1 Proceed only after receipt of written instructions have been received from Departmental Representative.
- 3 Notify Departmental Representative before disrupting access or services affecting other areas of the Park.
 - .1 Proceed Submissions to bear the stamp of qualified professional engineer registered in the Province of Ontario.

1.5 DEFINITIONS

- .1 Execute all demolition, removals and alterations to the existing Mess Hall and its accompanying structure as required to construct the new Mess Hall expansion as shown in drawings and to carry out alterations within the existing building.

- .2 Provide materials, scaffolding, tools and manpower necessary to complete all the Work of this Section and the areas identified on the Contract Documents.
- .3 Make good all existing structure, materials and finishes affected by demolitions, removals and alterations.
- .4 Consult all Structural, Mechanical, Electrical and Sub-Consultant's Drawings to determine the extent of work required.
- .5 Existing drawings of Mess Hall building and Bunk Houses to be relocated are available for inspection via request to the Parks Canada Contract Officer. It shall be understood that such examination shall be for reference only and the Departmental Representative does not guarantee their accuracy.
- .6 Remove all surplus materials from the site.

1.6 STRUCTURAL COORDINATION

- .1 Cooperate with Contractor to facilitate the removal of existing walls, temporary shoring, reinforcement and bracing for new and modified openings.
- .2 Refer to Section 02 49 92 – Deconstruction of Structure

1.7 MECHANICAL COORDINATION

- .1 Cooperate with Contractor to facilitate removal of existing equipment and cutting of new openings. Disconnect, remove, cap off and relocate existing lines interfering with such work. Remove and/or relocate all equipment as required.
- .2 Do all cutting, patching and making good of existing structure required to complete mechanical work.

1.7 ELECTRICAL COORDINATION

- .1 Cooperate with Contractor to facilitate demolition, removals, and alteration, in existing building, disconnecting, removing and/or relocating existing wiring, fixtures, and devices interfering with such work.
- .2 Carry out all alterations to existing electrical, signal, and fire alarm systems as shown on Drawings and as required to interconnect new and existing systems where applicable.

1.8 COORDINATION WITH OWNER

- .1 Parks Canada will remove, handle, store and/or temporarily relocate all items from the existing buildings (Bunkhouses and Mess Hall).
- .2 Schedule of items to be removed and turned over to owner:
 - .1 Stainless steel countertops

1.9 QUALITY ASSURANCE

- .1 Comply with all applicable municipal regulations, the Occupational Health and Safety Act 1991 and Regulations for Construction Projects and the National Building Code.

- .2 Provide all shoring, bracing, or other measures necessary to prevent accidental collapse of any part of existing buildings, and take all necessary measures to prevent damage to any existing adjacent buildings or structures.
- .3 Complete all measures required by the authority having jurisdiction for the enclosure of the site and protection of the public before the work of demolition is commenced.
- .4 Post danger signs around the property where risks are present. Close off with barricades all doorways and thoroughfares giving access to the areas of demolition.
- .5 The requirements specified herein are considered the minimum requirements. The Contractor is to be responsible for providing and performing things required and necessary to complete the work, in a safe, proper and workmanlike manner.
- .6 A competent foreman shall be in charge of the work at all times while work is in progress.

1.10 ACCESS

- .1 Maintain and preserve access to existing buildings on site in areas where demolition and removal work is being carried out.
- .2 Do not close, obstruct, place or store materials or debris so as to block egress paths, fire fighting routes or maintenance access. Conduct operations with minimal interference with roads, streets and passageways.

1.11 PROTECTION

- .1 Protect work to remain against damage of any kind. Repair or replace damaged work at the discretion of the Departmental Representative, at no additional cost.
- .2 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, trees, landscaping, adjacent grades and sections of existing building to remain. Provide bracing, shoring and underpinning as required. Make good damage caused by demolition.
- .3 Take necessary precautions to support affected structures and, if safety of building being demolished or adjacent structures or services appears to be endangered, cease operations and notify the Departmental Representative.
- .4 Pay particular attention to prevention of fire and elimination of fire hazards which would endanger the work or adjacent buildings or premises.
- .5 Provide and maintain necessary fire extinguishers throughout the work at all times to the approval of the Fire Marshal, and located at convenient and accessible points.

2 PRODUCTS

2.01 NOT USED

- .1 Not used.

3 EXECUTION

3.1 EXAMINATION

- .1 Inspect existing buildings and 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.
- .4 Disconnect, cap, plug or divert, as required, existing public 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 Immediately notify Departmental Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.
 - .2 Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

3.2 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 the 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..
- .2 Protection of In-Place Conditions:
 - .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features to remain in place. Provide bracing and shoring required.
 - .2 Keep noise and dust to minimum.
 - .3 Protect building systems, services and equipment to remain.
 - .4 Provide temporary dust screens, covers, railings, supports and other protection as required.
 - .5 Do Work in accordance with Section 01 35 29.06 - Health and Safety Requirements .
- .3 Demolition/Removal:
 - .1 Remove items as indicated.
 - .2 Remove parts of existing building to permit new construction.
 - .3 Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative to suit future use.

3.3 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 Refer to demolition drawings and specifications for items to be salvaged for reuse.
- .4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

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PART 1 – GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA S350-[M1980(R2003)], Code of Practice for Safety in Demolition of Structures.
- .2 National Fire Code of Canada (2010).
- .3 Comply with National Building Code of Canada NBC 2010, Division B, Part 8, "Safety Measures at Construction and Demolition Sites", and Provincial requirements.
- .4 Federal Legislation
 - .1 Canadian Environmental Assessment Act (CEAA) [1992].
 - .2 Canadian Environmental Protection Act (CEPA) [1999].
 - .3 Transportation of Dangerous Goods Act (TDGA) [1992].
 - .4 Occupational Health and Safety Act.

1.2 DEFINITIONS

- .1 Deconstruction: the systematic dismantling of a structure to salvage materials for reuse. What cannot be reused is considered subsequently for recycling. The ultimate objective is to recover potentially valuable resources while diverting from landfill what has traditionally been a significant portion of the waste system.
- .2 Demolition: rapid destruction of a building with or without prior removal of designated / hazardous substances. Recyclable materials may be pulled out from the resulting demolition debris.
- .3 Salvage: removal of structural and non- structural components from a building during a deconstruction project for the purpose of reuse.
- .4 Reuse: the use of a building material in its original form and function (i.e. without drastic alteration by melting, shredding, pulverizing, etc.).

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- .5 Recycling: the use of a building material which has been processed in some way for use in a form and function which is different from its original form and function.
- 6 Waste Management Coordinator (WMC): a person or organization appointed to be responsible for supervising all waste management activities as well as coordinating all related, required submittal and reporting requirements.
- .7 Designated and Regulated Substances: designated substances are substances that are known for their adverse effect on human health and the environment. These include but are not limited to asbestos, lead, mercury, arsenic, silicate, coke oven emissions, acrylonitrile, benzene, ethylene oxide, isocyanates, and vinyl chloride. Regulated substances include fuels, refrigeration and fire suppression fluids, and PCBs.
- .8 Hazardous Materials: dangerous substances, chemicals and goods such as biological contaminants, poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or any other material that, if handled improperly, can endanger human health or well being or the environment.
- .9 Alternate Disposal: disposal at other than a landfill or an incineration plant. Alternate disposal includes salvage and delivery for reuse or delivery to an authorized facility for recycling.
- .10 Departmental Representative: throughout this section, the term "Departmental Representative" shall refer to the on-site representative of the Project Management body.

1.3 QUALIFICATIONS

- .1 Contractor shall be specialized in performing the work of this section with documented experience in similar types of deconstruction projects.
- .2 Contractor shall provide a qualified and competent supervisor with previous experience in deconstruction work who shall be present at all times during the deconstruction activities and who shall direct all work. Designate a person on site who would be responsible for worker and general public safety and who will maintain project site safety procedures and requirements.

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- .3 Ensure workers and subcontractors employed on the project are trained [periodically briefed on the job] to carry out work in accordance with the appropriate deconstruction techniques.

1.4 REGULATORY REQUIREMENTS

- .1 Conform to applicable codes and regulations for deconstruction of buildings, safety of adjacent structures, noise and dust control, removal of common and hazardous waste and disposal. Refer also to Clause 1.7 of this Section.
- .2 Complete all deconstruction work according to the requirements of the Canadian Construction Safety Code, Provincial Labour and Workers' Compensation Board Regulations and Waste Management regulations.
- .3 Obtain required authorization, certificates and permits from authorities having jurisdiction. Acquire adequate insurance for potential liabilities related to material pickup from the project site, as applicable.
- .4 Notify Departmental Representative and affected utility companies before starting work, and comply with their requirements.
- .5 Do not close or obstruct hydrants, parking or storage areas without prior approval of Departmental Representative.
- .6 Conform to applicable regulatory procedures when discovering hazardous or contaminated materials that were not previously documented.
- .7 Only those resale/brokerage, storage, recycling, transfer and/or disposal facilities which comply with the provincial and municipal regulations and by-laws shall be used by the Contractor for the disposal of materials generated at the deconstruction project.

1.5 PERFORMANCE REQUIREMENTS

- .1 Complete the waste reduction workplan to indicate the proposed deconstruction product types, percent salvageable, recyclable and/or waste components, proposed action for waste reduction and diversion from landfill. A similar table will be used for performance monitoring during progress of the deconstruction and demolition activities.

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- .2 Salvage materials from the structures and segregate unsalvageables for recycling to achieve to achieve maximum diversion of waste that otherwise would be destined for landfill disposal.

1.6 SUBMITTALS

- .1 Where required by authorities having jurisdiction, submit for approval drawings, diagrams or details showing sequence of deconstruction work and supporting structures and underpinning.
- .2 Submit plans stamped and signed by qualified professional engineer registered or licensed in the Province of Ontario, Canada.

SPEC NOTE: Contact the Used Building Materials Association for further information on material marketability and available end users.

- .3 Submit a verified list of certified/ authorized equipment dismantlers, material haulers, receivers and/or end users of salvaged materials, recycling facilities, and waste disposal facilities.
- .4 Submit copies of certified weigh bills, bills of lading, used building material receipts, from authorized disposal sites and reuse and recycling facilities for all material removed from site to Departmental Representative on a bi-weekly basis. Written authorization from Departmental Representative is required to deviate from the haulers, facilities and receiving organizations, listed above submission Clause 1.5.1.
- .5 With regards to documentation of materials removal, include but not limited to the five items listed below. This information must be submitted to Departmental Representative in a tabulated format on a [weekly] [bi-weekly] [monthly] basis or on specific time periods specified by Departmental Representative.
 - .1 Description of materials.
 - .2 Time and date of removal.
 - .3 Weight, volume, or quantity of material.
 - .4 Breakdown of reuse, recycling and landfill percentages or quantities.
 - .5 End destination of materials.

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- .6 Workers, haulers and subcontractors shall possess applicable, current licenses, Certificates of Approval, and/or permits to remove, handle, transport and dispose of materials provincially, municipally, and/ or federally categorized as designated, hazardous or otherwise regulated substances. Upon written request, submit proof of compliance to Departmental Representative within 24 hours.

1.7 QUALITY ASSURANCE

- .1 Ensure work is performed in compliance with all applicable federal legislation including CEPA, CEAA, TDGA, MVSA, and all applicable provincial regulations and municipal bylaws.
- .2 Document work activities and produce evidence of compliance immediately upon request by Departmental Representative or respective regulatory body.

1.8 SITE CONDITIONS

- .1 Contractor shall visit the site at his own expense prior to the submission of bids to ascertain existing site conditions and surrounding features related to the proposed deconstruction, and satisfy himself that conditions are suitable for execution of the work.
- .2 Contractor shall accept the site as it exists and will be responsible for all deconstruction work as required.
- .3 Prior to start of work, arrange for a site visit together with Departmental Representative to examine existing exterior and interior site conditions and adjacent structures. Where applicable, the Contractor at his expense shall be responsible for taking pictures of any existing damage to adjacent structures and record same in writing to avoid any disputes at a later date.
- .4 Where materials or conditions revealed appear to be other than those normally expected or indicated in the Contract documents, the Contractor shall immediately inform the Departmental Representative, should such variance of conditions or materials result in a contemplated change to the cost of the work. Should an alternate method of deconstruction or change of materials be appropriate, the Departmental Representative shall immediately give his decision before the work proceeds.
 - .1 If material resembling spray or trowel applied asbestos or any other [designated,] or [listed as hazardous] substance be encountered in course

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of deconstruction, stop work, take preventative measures, and notify Departmental Representative immediately. Do not proceed until written instructions have been received.

- .2 Ensure compliance with the handling, transportation and disposal requirements of fuels, PCBs, halocarbons and other regulated substances that are likely to be encountered during removal, disassembly or dismantling of mechanical and electrical equipment.
- .3 Prior to dismantling and removal of equipment specified for salvage, clearly label all parts/components of mechanical to facilitate re-assembly, as applicable.
- .4 Appropriately label and package all components and parts of mechanical and electrical materials specified for salvage to prevent damage or loss.
- .5 Protection:

SPEC NOTE: The configuration and nature of the site may require the design and specification of temporary structural safety procedures.

- .1 Prevent movement, settlement or damage of adjacent [structures,] services, walkways, paving, trees, landscaping, and/or adjacent ground grades. Provide [bracing,] [shoring,] and/or [underpinning] as required. Repair damage caused by deconstruction as directed by Departmental Representative.
- .2 Support affected structures and, if safety of structure being deconstructed or adjacent structures or services appears to be endangered, take preventative measures, cease operations and immediately notify Departmental Representative.
- .3 Prevent debris from blocking emergency exit routes, surface drainage system, elevators, mechanical and electrical systems which must remain in operation.

1.9 ENVIRONMENTAL PROTECTION

- .1 Do work in accordance with Section 01 356 43.

1.10 SCHEDULING

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- .1 Ensure project time lines are met without compromising specified minimum rates of material salvage, recovery or diversion. Notify Departmental Representative in writing of delays.

PART 2 – PRODUCTS

2.1 EQUIPMENT

SPEC NOTE: ENVIRONMENTAL: The use of specific machinery, equipment or attachments which help to salvage materials in reusable and recyclable condition should be specified. For example, portable pulverizer/crusher/mulcher are available which process asphalt pavement and shingles, concrete, masonry, and wood for recycling. Be sure to verify manufacturer specifications prior to specifying any particular machinery or equipment.

- .1 Employ equipment and techniques to maximize material salvage potential and segregate all recyclable materials.
- .2 Equipment and heavy machinery used during course of demolition shall meet or exceed all applicable emission requirements, operate in compliance with EPA CFR 86.098-10, Emission Standards for 1998 and Later Model Year Otto-Cycle Heavy Duty Engines and Vehicles and EPA CFR 86.098-11, Emission Standards for 1998 and Later Model Year Diesel Heavy Duty Engines and Vehicles and MVSA.
- .3 Leave equipment and machinery running only while in use, except where extreme cold temperatures prohibit shutting down.
- .4 Use water misting or water efficient wetting equipment/trucks/attachments for dust suppression.
- .5 Demonstrate that all equipment and tools are being used in a manner which allows for the salvage of materials in best condition possible.

PART 3 – EXECUTION

3.1 PREPARATION

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SPEC NOTE: Delete, edit or add to following paragraphs in accordance with project-specific drawings and scope of work.

- .1 Disconnect and re-route electrical, telephone and communication service lines entering buildings to be deconstructed. Post warning signs on electrical lines and equipment which must remain energized to serve other installations during period of deconstruction.
- .2 Locate and protect utility lines. Do not disrupt active or energized utilities [traversing premises] [designated to remain undisturbed].
- .3 Disconnect and cap [designated] mechanical services.
 - .1 Natural gas supply lines: [remove in accordance with utility company requirements] [as directed by Departmental Representative].
 - .2 Sewer and water lines: [remove in accordance with requirements of authority having jurisdiction] [as directed by [Departmental Representative Engineer.
 - .3 Other underground services: remove and dispose of [as indicated] [as directed by Departmental Representative] in accordance with Section [33 71 75 – Underground Electrical Services].
 - .4 Underground storage tanks: remove and dispose of in accordance with CCME Code of Practice and directions of [Departmental Representative] and Section [02 65 00 – Underground Storage Tank Removal].
- .4 Remove trees and shrubs only when necessary and with Departmental Representative's written approval. Where practically possible, remove trees and shrubs and temporarily store in a manner and condition for re-planting on-site or elsewhere.
- .5 Post signs in visible locations and appropriate languages to alert workers, subcontractors, haulers, and public to the job site hazards, travel routes, location of [on-site sale] processing and stockpiling of each material, material storage bin location and use, e.g. "CLEAN WOOD ONLY".

3.2 PROTECTION

- .1 Carry out work with minimum or no interference to public or private accesses. Maintain protected egress and access at all times.

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- .2 Ensure that deconstruction work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .3 Do not dispose of waste or volatile materials such as: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout project.
- .4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties. Control runoff or disposal of water containing suspended materials or other harmful substances in accordance with local authorities.
- .5 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .6 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during deconstruction activities.
- .7 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust and mud tracking on all temporary roads.
- .8 Stop work immediately if adjacent installations or structures appear to be in danger. Notify Departmental Representative. Do not resume work until directed by Departmental Representative.
- .9 Provide, install and maintain all necessary and/or legally required railings, guards and warning signs during execution of the work to fully protect all persons from loss, damage, death or injury.
- .10 It is the Contractor's responsibility to ensure that the methods, equipment and/or techniques used during the deconstruction activities do not overload or undermine any structural members or jeopardize the overall safety of the operation.
- .11 It is the responsibility of the Contractor to design, provide, install and maintain an adequate temporary shoring and/or bracing that may be required during the deconstruction activities.
- .12 Protect existing structures, equipment and machinery which are not to be dismantled or salvaged. Protect from damage all property and site improvements in the immediate surroundings of the project area. Make good all damages to

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property and improvements including sidewalks, curbs, landscaped or paved areas and other finishes that may be damaged during execution of the deconstruction work.

- .13 Prevent debris from blocking surface drainage systems, exits, travel routes, mechanical and electrical systems that are to remain in operation.
- .14 It is the Contractor's responsibility to design, provide, install and maintain all necessary lighting and temporary fire protection requirements.

3.3 REMOVAL OF DESIGNATED/ HAZARDOUS WASTES

- .1 Prior to start of deconstruction work identify and remove all designated and hazardous substances [listed] [as defined by authorities having jurisdiction] and other materials contaminated by such substances [as directed by Departmental Representative]. Handle in a safe manner and transport in accordance with TDGA and provincial/regional regulations/by-laws and dispose of [at facilities authorized to receive the respective materials in accordance with the applicable regulatory requirements]. Remove asbestos – containing materials in accordance with Section [02 82 13 – Asbestos Abatement].

3.4 DISASSEMBLY

- .1 Materials removed from structures are property of Contractor.
- .2 Throughout the course of deconstruction, pay close attention to connections and material assemblies. Employ workmanship procedures which minimize damage to salvageable materials and equipment.
- .3 Deconstruct in accordance with CSA S350 and all other applicable safety regulations, codes, guidelines and standards.
- .4 Workers must utilize adequate fall protection and certified harness and belay system where necessary.
- .5 Maintain structural integrity of structure at all times.

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- .6 Systematically remove all finishes, furnishings, mechanical and electrical equipment.
- .7 Carefully remove all windows and doors from structure.
- .8 Disassemble all non-loadbearing interior partitions and remove materials from structure.
- .9 Disassemble in sequence: roof, interior loadbearing partitions, exterior walls, floors, and foundations.
- .10 Wherever possible, transfer material assemblies from heights to ground level for easier disassembly. Take all appropriate measures to ensure safety.
- .11 Carefully and methodically separate and segregate materials into reusable, recycleable and waste streams.
- .12 At end of each day's work, leave work in safe and stable condition.
- .13 Do not backfill excavations or below grade cavities until inspected by Departmental Representative.
- .14 Where required remove all foundation walls, footings and concrete floor slab and backfill the remaining cavity with imported soils that are free of chemical and aesthetic contamination and are readily compactable to at least 98% Standard Proctor Density.
- .15 Remove only the upper 1000 mm of foundation walls [and columns]; break adequate holes on floor slab for drainage and backfill the remaining cavity with imported soils that are free of chemical and aesthetic contamination and are readily compactable to at least 98% Standard Proctor Density.
- .16 Apply a layer of about 300 mm to 600 mm of screened topsoil across the backfilled area and grade to match surrounding ground contours. The topsoil must be certified as free of chemical and aesthetic contamination and must not inhibit seed germination and growth of landscaping vegetation.
- .17 Apply grass seed [hydroseed] at time period[s] and with varieties and densities as directed by Departmental Representative.

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3.5 PROCESSING

SPEC NOTE: Processing is an important step in material salvage. Wherever possible designate adequate and readily accessible space on site to allow Contractor to properly process materials. The following paragraphs specify general processing procedures; edit as necessary.

- .1 Designate location for processing of materials which eliminates double handling and provides adequate space to maintain efficient material flow.
- .2 De-nail, strip, separate, stock materials in manner which ensures best possible condition of salvaged materials.
- .3 Keep processing area clean, organized and free of debris.
- .4 Supply separate, clearly marked disposal bins [containers] for all categories of materials. Do not remove waste bins from site until inspected and approved by Departmental Representative. Notify Departmental Representative prior to removal of any material bins from site.
- .5 Separate and prepare processed materials into organized piles for proper handling and storage or transportation. Provide collection area for materials [processed] [listed] [designated for alternate disposal].

3.6 STORAGE AND STOCKPILING

SPEC NOTE: Proper storage and stockpiling will help maintain the value of salvaged materials.

- .1 Store salvaged materials in designated secure areas and protect from the elements. Clearly label all stockpiles, indicating material type and quantity.
- .2 Employ reasonable means necessary to protect salvaged materials from vandalism, theft, adverse weather or inadvertent damage by heavy machinery. Designate a worker, hire security, erect temporary fencing acquire insurance as necessary.
- .3 Stockpile materials designated for off-site destinations in locations which facilitate removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

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- .4 Maximum permitted duration of material storage on site is between commencement and completion dates stipulated in the project contract documents.

3.7 TRANSPORATATION AND DISPOSAL

- .1 Load, transport salvaged material and unload at destination so that material is delivered in condition that is acceptable to the end user.
- .2 Transport recyclable materials in appropriate containers and in accordance with applicable provincial/territorial and municipal requirements.
- .3 Transport solid waste, contaminated materials and/or hazardous materials/waste in in accordance with TDGA and related provincial/territorial and municipal regulations and by-laws. Contaminated materials and waste must be transported by appropriately licensed/authorized haulers.
- .4 Salvaged reusable materials, recyclables, waste, and contaminated or hazardous materials removed from the project site shall be transported by and delivered to appropriately licensed or authorized [haulers], [facilities] and [receiving organizations] listed in [waste reduction workplan]. Do not deviate from [haulers], [facilities] and [receiving organizations listed in [waste reduction workplan] without prior written authorization from Departmental Representative.
- .5 Recyclable materials, solid waste, contaminated or hazardous materials removed from the site shall be disposed of at appropriately licensed or authorized facilities only. Contractor shall provide legal evidence of appropriate disposal to the Departmental Representative.

SPEC NOTE: Organizations receiving salvaged materials must issue an appropriately notarized indemnification document on their own letterhead. Individuals picking up salvaged materials at the site must sign a release form before material is loaded onto vehicles. Prepare a suggested release form and a one-page suggested wording of an indemnification document for Contractor's reference.

- .6 Individuals or organizations receiving salvaged reusable materials must for ever indemnify the owner and the project team against all claims arising from handling, transportation, and use of the materials. The Contractor is responsible to

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obtain such legal indemnification to the Departmental Representative's satisfaction.

3.8 CLEANING AND RESTORATION

- .1 Keep site clean and organized throughout deconstruction activities.
- .2 Upon completion of project, remove debris, trim surfaces and leave work site clean.
- .3 Fires and burning of waste or materials is not permitted on-site and is strongly discouraged off-site.
- .4 Do not bury material on-site unless the activity is authorized by the Departmental Representative in writing and the material is processed for use as fill and meets all applicable regulations and codes.
- .5 Upon completion of project, reinstate [all areas,] [parking surfaces,] [walkways,] [light standards,] and other adjacent areas or structures affected by Work to match condition of adjacent, undisturbed areas.

END OF SECTION

PART 1 – GENERAL

1.1 ACTION AND INFORMATION SUBMITTALS

- .1 Provide testing and inspection results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.

1.2 ENVIRONMENTAL CHOICE PROGRAM

- .1 Provide sealant and polyethylene products bearing the ‘Ecologo’ of the Environmental Choice Program, Department of the Environment, Canadian Environmental Protection Act, Certification Criteria document CCD-045-95 Sealants and Caulking Compounds, and CCD-126-95 Plastic Film Products.
- .2 Submit two copies of the licensing criteria statements and the verification of compliance with Section 3(a) and 3(b) of CCD to the Departmental Representative in accordance with Sections 01 33 00 and 01 45 00. Alternatively, material in original containers bearing the ‘Ecologo’ or products bearing the ‘Ecologo’ will satisfy this requirement. For primers and sealants, indicate VOC in g/l during application and curing.

1.3 ACRONYMS AND TYPES

- .1 Cement: hydraulic cement or blended hydraulic cement (XXb - b denotes blended).
 - .1 Type GU or GUb - General use cement.
 - .2 Type MS or MSb - Moderate sulphate-resistant cement.
 - .3 Type MH or MHb - Moderate heat of hydration cement.
 - .4 Type HE or HEb - High early-strength cement.
 - .5 Type LH or LHb - Low heat of hydration cement.
 - .6 Type HS or HSb - High sulphate-resistant cement.
- .2 Fly ash:
 - .1 Type F - with CaO content less than 8%.
 - .2 Type CI - with CaO content ranging from 8 to 20%.
 - .3 Type CH - with CaO greater than 20%.
- .3 GGBFS - Ground, granulated blast-furnace slag.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Concrete: mix proportion method Alternative 1 to CSA A23.1-14/A23.2-14, Concrete materials and methods of concrete construction.
 - .1 Cement: to CAN/CSA-A3000-13, type GU.
SPEC NOTE: Use new names instead of old types from the previous edition of the standard, old type 10 now type GU, old Type 50 now type H5 with

exposure class S1,S2 or S3. See preface pages xiii and xiv as well as Annex C page 25 of new standard. A5 no longer exists.

- .2 Compressive strength: [25] [30] [32] [35] [_____] MPa at 28 days.
.3 Exposure class: [F-1] [F-2] [C-1] [C-2] [C-XL] [_____] to CSA A23.1-14/A23.2-14.

SPEC NOTE: See A23.1/A23.2 Tables 1 Definitions, 2 Requirements and 5 Alternative Methods for Specifying Concrete. F-1 (30 MPa) exposed to freeze/thaw, water saturated, no chlorides, strengths in MPa are values at 28 days for C-1 to F-2 (table 2) and 56 days for S-1 to S-3 (tables 2 and 3). F-2 (25 MPa) exposed to freeze/thaw, unsaturated, note exposed to chlorides. C-1 (35 MPa) structurally reinforced, where protection against reinforcement corrosion is critical, with or without freezing and thawing, exposed to chlorides. C-2 (32 MPa) non-structurally reinforced, exposed to freeze/thaw, exposed to chlorides. C-3 (30 MPa) continually submerged, not exposed to freeze/thaw, saturated, exposed to chlorides. C-4 (25 MPa) non-structurally reinforced, not exposed to freeze/thaw, exposed to chlorides. See also C-XL. S-1 (35 MPa) very severe sulphate exposure. S-2 (32 MPa) severe sulphate exposure. S-1 to S-3 deleted in the 2000 edition. N – not exposed to chlorides or freeze/thaw. See also A-1 to A-4 exposed to manure, agricultural exposures.

- .4 Aggregate size: [20]mm maximum size to CSA A23.1-14/A23.2-14.

- .5 Slump: [70mm+/-20mm] [80mm+/-30mm] at time of deposit.

SPEC NOTE: Use 04 edition 4.4.3. Check old CAN/CSA-A23.1-00 (clause 17.3)/A23.2-09 (test method A23.2-5C) for selection of proper slump. 40 for topping concrete to A23.1/A23.2. 80+/-30mm held over from A23.1-94.

- .6 Air content: Table 4, Category [1] [2], 6%.

SPEC NOTE: Category for air content is dependent on maximum size of course aggregate. Ex. 20mm is Cat2.

- .7 Admixtures: air entraining to ASTM C233/C233M-14 Standard Test Method for Air-Entraining Admixtures for Concrete. Calcium chloride or compounds containing calcium chloride not permitted.

- .8 Water: potable, to Table 9.

- .2 Reinforcing bars and dowels: to CSA G30.18-09, Grade 400[R] [W], deformed at reinforcing, plain at dowels, minimum 30% recycled content.

SPEC NOTE: For reinforcing bars and dowels, R – denotes regular and W – denotes weldable.

- .3 Welded steel wire fabric: flat sheets to ASTM A1060/A1060M-14, 152 x 152MM, MW18.7 x MW18.7, minimum 30% recycled content.

SPEC NOTE: Use when specifying fibre reinforcement in lieu of steel rebar or welded wire mesh.

- .4 Fibre reinforcing: polyethylene terephthalate, to ASTM C1116/C1116M-10a, engineered and designed for use in concrete, with the following properties:
 - .1 Specific Gravity: 1.34
 - .2 Tensile Strength: 130-160 kSI
 - .3 Fibre Length: 19-38mm
 - .4 Fibre Denier: 16-60
 - .5 Type of Filament: monofilament
 - .6 Acceptable material: 'Nurlon Fiber' distributed by NU-Tech Fiber-Con Inc., 416-663-5123; and 'Lo Mod Fibre' manufactured by Gemite Products Inc. 905-672-2020.

- .5 Fibre reinforcing: polypropylene fibre, designed and engineered for use in concrete with the following properties:
 - .1 Tensile Strength: 55 to 300 kN/mmy
 - .2 Young's Modulus: 0.44 to 3.5 kN/mmy
 - .3 Fibre Length: 12 to 51 mm.
 - .4 Type of Filament: [monofilament] [fibrillated].
 - .5 Specific Gravity: 0.90
 - .6 Melting Point: 160°C to 170°C
 - .7 Ignition Point: 590°C to 593°C
 - .8 Acceptable material: 'Conloc SE Fibres' manufactured and distributed by Pro Tech., 519-453-9905; and 'Plycon Polypropylene Fibre Reinforcement' manufactured and distributed by Novocon International Inc., 416-296-1739.
SPEC NOTE: 'Conloc SE Fibres' are fibrillated, with Tensile Strength of 300 and Young's Modulus 0.44; 'Plycon' fibres are either monofilament or fibrillated, with Tensile Strength of 55 to 75 and Young's Modulus 3.5.
SPEC NOTE: See CSA A23.1-14/A23.2-14.

- .6 Anchor bolts: to CSA G40.20-13/G40.21-13, Grade 300W, minimum 30% recycled content.

- .7 Mastic cement: plastic, cutback asphalt to CAN/CGSB-37.5-95.

- .8 Joint filler:
 - .1 Preformed, asphalt saturated fibre to ASTM D1751-04(2013)e1, or.
 - .2 Premoulded, synthetic foam to ASTM D1752-04a(2013), Type 1 with compression requirement modified to 69 kPa minimum and 172 kPa maximum, CFC free.
 - .1 Compression to ASTM D545-08: 91.7 kPa
 - .2 Thickness: [6.4] [9.5] [12.7] [19] [25.4]mm.
 - .3 Sheet size: [1219mm] [3.05m]
 - .4 Acceptable material: 'Sealtight Ceramar Expansion Joint Filler' distributed by W.R. Meadows of Canada Limited.

- .9 Grout: non-shrink, premixed, 20 MPa compressive strength at 24 hours.
- .10 Sealant: multi-component, chemical curing to CAN/CGSB-19.24-M90, Type 1, Class B, Ecologo certified, compatible with joint filler.
- .11 Curing and sealing compound: acrylic curing and sealing compound to ASTM C309-11, Type 1, Class B.
 - .1 Maximum VOC content: 90 g/l
- .12 Sealer: water based, one component, 20% active ingredient silane, VOC <350 G/L

PART 3 – EXECUTION

3.1 PLACING AND INSTALLATION

- .1 Do concrete work in accordance with CSA A23.1-14/A23.2-14.
- .2 Provide 25mm chamfer on exposed corners.
- .3 Build-in items supplied by other Sections.
- .4 Grout structural steel base plates in place.
- .5 Place colour/texture finish in accordance with CSA B651-12, assembly type 1 in pairs, spaced approximately 33mm apart, to overall width as indicated.

3.2 FINISHING

- .1 Finish concrete in accordance with CSA A23.1-14/A23.2-14.
- .2 Formed surfaces exposed to view: sack rubbed finish in accordance with CSA A23.1-14/A23.2-14.
- .3 Equipment pads: smooth troweled surface; in accordance with CSA A23.1-14/A23.2-14 Table 21, finish classification Class D.
- .4 Pavements, walks, curbs and exposed site concrete: screed to plane surfaces and float using aluminum, magnesium, or wood floats in accordance with CSA A23.1-14/A23.2-14, Table 21, finish classification Class A. Round edges and provide joint spacings using standard tools. Trowel smooth followed by lightly brushed non-slip finish to CSA B651-12.
SPEC NOTE: For other finishes check requirements of CSA A23.1-14/A23.2-14, Clause 7.6.

3.3 CURING

.1 Cure concrete in accordance with CSA A23.1-14/A23.2-14, Clause 7.7 Table 19, Type [1-Basic] [2-Additional] [3-Extended] and [Appendix D].

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 45 00 Quality Control
- .3 Section 01 61 00 Common Product Requirements
- .4 Section 01 78 00 Closeout Submittals

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20-95, Surface Sealer for Floors
- .2 CSA International
 - .1 CAN/CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction//Methods of Test for Concrete
- .3 American Society for Testing Materials (ASTM)
 - .1 ASTM C 666 – Concrete Durability Test
 - .2 ASTM C 672 – Scaling Resistance
 - .3 ASTM C 642 – Absorption,
 - .4 ASTM C 779 – Abrasion Resistance
 - .5 ASTM E 274 – Skid Resistance

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Provide two (2) copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content in g/L.
 - .2 Include application instructions for concrete floor treatment.

1.4 ENVIRONMENTAL REQUIREMENTS

- .1 Temporary lighting:
 - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .2 Electrical power:
 - .1 Provide sufficient electrical power to operate equipment normally used during construction.

- .3 Work area:
 - .1 Make work area water tight protected against rain and detrimental weather conditions.
- .4 Temperature:
 - .1 Maintain ambient temperature of not less than 10° C from seven (7) days before installation to at least forty-eight (48) hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Moisture:
 - .1 Ensure concrete substrate is within moisture limits prescribed by sealant manufacturer.
- .6 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
 - .1 Contractor is responsible for ventilation system to be operated during installation of concrete floor treatment materials. Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.
 - .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
 - .3 Provide continuous ventilation during and after coating application.

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:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- .1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.

2.2 SEALING COMPOUNDS

- .1 Surface sealer: to CAN/CGSB-25.20, Type 2 - water based, clear non-yellowing acrylic emulsion cure and seal.
 - .1 Acceptable product: Florseal WB 18 by Sika Canada or equivalent approved by the Departmental Representative.
- .2 Sealants: maximum VOC limit 250 g/L

3 EXECUTION

3.1 EXAMINATION

- .1 Verify that slab surfaces are ready to receive work.

3.2 PREPARATION OF EXISTING SLAB

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges [unless otherwise indicated].
- .2 Saw cut control joints to CAN/CSA-A23.1, 24 hours maximum after placing of concrete.

3.3 APPLICATION

- .1 Apply concrete sealer hardener in accordance with manufacturer's written instructions.
- .2 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.
- .3 Apply floor treatment in accordance with Sealer manufacturer's written instructions.
- .4 Clean over spray. Clean sealant from adjacent surfaces.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 20 - Construction/Demolition Waste Management And Disposal.

3.5 PROTECTION

- .1 Protect finished installation in accordance with manufacturer's instructions.

3.6 SCHEDULE

- .1 Table:

<u>Surface Sealer</u>	<u>Location</u>
CS	Service Rooms 107 and 203

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 45 00 Quality Control
- .3 Section 04 22 00 Concrete Unit Masonry
- .4 Section 04 05 12 Masonry Mortar and Grout
- .5 Section 04 43 13 Stone Veneer Cladding
- .6 Section 07 92 00 Joint Sealants

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A 123/A 123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A 775/A 775M-07b, Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
 - .3 ASTM D 412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
 - .4 ASTM D 2240-05(2010), Standard Test Method for Rubber Property - Durometer Hardness.
 - .5 ASTM C 494/C 494M-11, Standard Specification for Chemical Admixtures for Concrete.
- .2 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-A23.3-04(R2010), Design of Concrete Structures.
 - .3 CSA A23.4-09, Precast Concrete-Materials and Construction.
 - .4 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .5 CSA G30.18-09, Carbon and Steel Bars for Concrete Reinforcement.
 - .6 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .7 CSA G279-M1982(R1998), Steel for Prestressed Concrete Tendons (Metric Version).
 - .8 CAN/CSA-S6-06 + S6S1-10, Consists of CAN/CSA-S6, Canadian Highway Bridge Design Code and S6S1, Supplement #1 to CAN/CSA-S6.
 - .9 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
 - .10 CSA W48-06(R2011), Filler Metals and Allied Materials for Metal Arc Welding.
 - .11 CSA W59-03(R2008), Welded Steel Construction (Metal Arc Welding).
 - .12 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .3 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - [current edition].
 - .1 MPI #18 Primer, Zinc Rich Organic.
 - .2 MPI #79 Primer, Alkyd, Anti-Corrosive for Metal.

- .4 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .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] and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Submit shop drawings to CSA A23.4 and CAN/CSA-A23.3.
 - .3 Indicate on drawings:
 - .1 Design calculations for items designated by manufacturer.
 - .2 Tables and bending diagrams of reinforcing steel.
 - .3 Camber.
 - .4 Finishing schedules.
 - .5 Methods of handling and erection.
- .4 Samples:
 - .1 Produce, deliver and erect where directed by Departmental Representative on project site, one (1) full size sample of each type of precast concrete unit showing details, colour, finish and quality for approval of Departmental Representative.
 - .1 Begin production of precast units after receipt of Departmental Representative written approval.
- .5 Submit evidence of welding certification including welding procedures before commencing work.

1.4 QUALITY ASSURANCE

- .1 Fabricate and erect precast concrete elements using manufacturing plant certified by CSA International in appropriate categories to CSA A23.4.
- .2 Precast concrete manufacturer to be certified to CSA's certification procedures for precast concrete plants prior to submitting bid and to specifically verify as part of bid that plant is currently certified in appropriate categories Architectural.
- .3 Only precast elements fabricated in such certified plants to be acceptable to owner, and plant certification to be maintained for duration of fabrication, erection until warranty expires.
- .4 Welder Qualification: certified to CSA W47.1 and for weld type required.

- .5 Submit evidence of welding certification including welding procedures before commencing work.

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 [off ground] [indoors] [in dry location] and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect [precast panels] from [damage].
 - .3 Replace defective or damaged materials with new.

1.6 WARRANTY

- .1 For spalling and cracking of precast elements twelve (12) months warranty period prescribed is extended to sixty (60) months.

2 PRODUCTS

2.1 MATERIALS

- .1 Cement, colouring material, aggregates, water, admixtures: to [CSA A23.4] and [CSA A23.1/A23.2].
- .2 Exposed aggregate to match selected finish sample.
- .3 Use same brands and source of cement and aggregate for entire project to ensure uniformity of colouration and other mix characteristics.
- .4 Reinforcing steel: epoxy coated.
- .5 Prestressing steel: to CAN/CSA-S6 and CSA G279.
- .6 Welded wire fabric.
- .7 Forms: to CSA A23.4.
- .8 Hardware and miscellaneous materials: to CSA A23.1/A23.2.
- .9 Anchors and supports: to CSA G40.20/G40.21, Type 350 W, epoxy coated.
- .10 Welding materials: to CSA W48.
- .11 Galvanizing: hot dipped galvanizing with Coating Grade 85
- .12 Steel primer: to MPI #79.

- .13 Epoxy coating: to ASTM A 775/A 775M.
- .14 Shims: plastic.
- .15 Zinc-rich primer: to MPI #18.
- .16 Weep hole tubes: purpose made plastic.
- .17 Curing compound: not permitted without prior approval of Departmental Representative.
- .18 Sealers:
 - .2 Field applied: Sealer: VOC limit 100 g/L.
- .19 Sealant:
 - .1 Sealant: VOC limit 250 g/L maximum to SCAQMD Rule 1168.

2.2 CONCRETE MIXTURES

- .1 Proportion normal density concrete in accordance with CSA A23.1/A23.2.
 - .1 Cement: mix of Type Portland cement and supplementary cementing materials to CAN/CSA-A3001.
 - .2 Minimum compressive strength at 28 days: 18 MPa.
 - .3 Chemical admixtures to CAN/CSA-A3000.

2.3 DESIGN REQUIREMENTS

- .1 Design precast elements to CAN/CSA-A23.3, CSA A23.4, CAN/CSA-S6 and to resist handling, stockpiling, shipping and erection stresses.
- .2 Design precast elements to carry loads as indicated, and in accordance with NBC.
 - .1 Design to include resistance to creep, shrinkage and temperature effects, and, wind and earthquake loads.
- .3 Design connections and attachments of precast elements to load and forces as indicated, and in accordance with NBC.
 - .1 Connections to be designed to withstand long-term corrosion for exposed elements.

2.4 PERFORMANCE REQUIREMENTS

- .1 Tolerance of precast elements: to CSA A23.4.
- .2 Length of precast elements not to vary from design length by more than plus or minus 8 mm.
- .3 Cross sectional dimensions of precast elements not to vary from design dimensions by more than plus or minus 5 mm.
- .4 Deviations from straight lines not to exceed 5 mm in 3m.
- .5 Precast elements not to vary by more than plus or minus 3mm from true overall cross sectional shape as measured by difference in diagonal dimensions.

2.5 FABRICATION

- .1 Manufacture units to CSA A23.4.
- .2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit which will not be exposed.
- .3 Design and attach anchors and inserts to precast concrete elements to carry design loads.
- .4 Shop prime anchors after fabrication and touch up primer on anchors after welding. Do not apply primer to embedded portion of anchors or inserts.
- .5 Galvanize steel embedments after fabrication and touch up with zinc-rich primer after welding.

2.6 FINISHES

- .1 Finish and colour of precast units to match sample approved by Departmental Representative.
- .2 Smooth finish: as cast using smooth form liners.
- .3 Smooth back surface of precast units exposed on both sides.

2.7 SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative with certified copies of quality control tests related to this project as specified in CSA A23.4.
- .2 Provide records from in-house quality control program based upon plant certification requirements to Departmental Representative for inspection and review.
- .4 Upon request provide Departmental Representative with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.

3 EXECUTION

3.1 GENERAL

- .1 Do precast concrete work to CSA A23.4 and CAN/CSA-A23.3 and CAN/CSA-S6.

3.2 EXAMINATION

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

3.3 ERECTION

- .1 Erect precast elements within allowable tolerances indicated.
- .2 Non-cumulative erection tolerances in accordance with CSA A23.4.
- .3 Set elevations and alignment between units to within allowable tolerances before connecting units.
- .4 Bed units in mortar in accordance with Section 04 05 12 - Masonry Mortar and Grout.
- .5 Grout underside of unit bearing plates with shrinkage compensating grout.
- .6 Fasten precast panels in place as indicated on reviewed shop drawings.
- .7 Secure bolts with lockwashers.
- .8 Uniformly tighten bolted connections with torque indicated.
- .9 Do not weld or secure bearing plates at sliding joints.
- .10 Set units dry, without mortar, attaining specified joint dimension with [plastic] shims.
- .11 Clean field welds with wire brush and touch-up galvanized finish with zinc-rich primer.
- .12 Remove shims and spacers from joints of non-load bearing panels after fastening but before sealant is applied.
- .13 Apply sealant to precast panels to manufacturer's recommendations unless specified otherwise.

3.4 WELDING

- .1 Weld to CSA W186 for welding of reinforcement.

3.5 CLEANING

- .1 Obtain approval of cleaning methods from Departmental Representative before cleaning soiled precast concrete surfaces.
- .2 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .4 Waste Management:
 - .1 Remove disposal bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

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

- .2 Repair damage to adjacent materials caused by precast concrete installation.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 61 00 Common Product Requirements
- .3 Section 06 40 00 Architectural Woodwork
- .4 Section 07 72 00 Joint Sealants
- .5 Section 09 91 23 Interior Painting

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A 53/A 53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A 269-08, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A 307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA International
 - .1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA G164-M92R2003, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA S16-09, Design of Steel Structures.
 - .4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-M03(R2008), Welded Steel Construction (Metal Arc Welding) Metric.
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.

1.3 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 that include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two (2) copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.
 - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.

- .3 Shop Drawings:
 - .1 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 [off ground] [indoors] [in dry location] and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.
- .5 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

2 PRODUCTS

2.1 MATERIALS

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W].
- .2 Steel pipe: to ASTM A 53/A 53M standard weight, black or galvanized finish.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A 307.
- .6 Stainless Steel Sheet Metal: to ASTM A 269, Type 304, 18 gauge, commercial quality, welded, without longitudinal joints, with AISI No. 4 Finish, except where indicated otherwise.
- .7 Stainless steel tubing: to ASTM A 269, Type [302] [commercial grade] [seamless welded with AISI No. [4]

finish].

- .8 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof [flat] [round] [oval] headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.
- .5 Shear and punch metals cleanly and accurately. Remove burrs and ease exposed edges. Form bent-metal corners to smallest radius possible without impairing work
- .6 Welding: Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. At exposed connections, finish welds and surfaces smooth with contour of welded surface matching those adjacent.

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CAN/CSA-G164.
- .2 Chromium plating: chrome on steel with plating sequence of 0.009 mm thickness of copper 0.010 mm thickness of nickel and 0.0025 mm thickness of chromium.
- .3 Shop coat primer: to CAN/CGSB-1.40
- .4 Zinc primer: zinc rich, ready mix in accordance with chemical component limits and restrictions requirements and VOC limits of GS-11.

2.4 ISOLATION COATING

- .1 Isolate aluminum from following components, by means of bituminous paint:
- .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
 - .2 Concrete, mortar and masonry.
 - .3 Wood.

2.5 SHOP PAINTING

- .1 All metal components, except for those that are galvanized or encased within concrete are to be coated with a layer of shop applied primer.
- .2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7° C.

- .3 Metal surfaces to be welded on site must be cleaned and free of any paint coatings.
- .4 All shop applied primers should follow the recommendations contained within SSPC - PA-1, Shop, Field and Maintenance Painting of Steel.
- .5 Prepare all surfaces to receive paint in accordance with the minimum requirements of SSPC. For interior work refer to SSPC-SP3 (power tool cleaning).

2.6 CORNER GUARDS (CG)

- .1 Stainless steel corner guards, type 304, 18 gauge:
 - .1 L profile (CG-1) : 75mm x 75mm x 800mm high, with the top installed at a height of 915mm from finished floor.
 - .2 U profile (CG-2): 75mm x partition thickness x 75 x 800mm high, with the top installed at a height of 915mm from finished floor.

2.7 SPLASH GUARD (SG)

- .1 Stainless steel sheet metal with continuous adherence to adjacent stainless steel countertops, type 304, 16 gauge :
 - .1 Dimensions: 610mm x 840mm (sides), mop-sink width x 810mm
 - .2 Seams: Install in largest lengths possible to avoid unnecessary seams. Seams must be lapped in a water shedding fashion with continuous seal.

2.8 COUNTERTOP SUPPORTS

- .1 Fabricate countertop supports using galvanized steel angles 38mmx38mmx6mm as detailed on the drawings.
 - .1 Supports should be spaced according to necessary loading.
 - .2 Supports are to be field painted, refer to Division 09 91 13 – Interior Painting.

3 EXECUTION

3.1 EXAMINATION

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

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.

- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CSA S16 or weld.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
- .10 Touch-up high build epoxy coated finishes.

3.4 CORNER GUARDS

- .1 Install corner guards in locations as indicated.

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.

3.6 PROTECTION

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

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 06 40 00 Architectural Woodwork
- .2 Section 07 92 00 Joint Sealants
- .3 Section 08 11 13 Metal Doors and Frames
- .4 Section 09 21 16 Gypsum Board Assemblies
- .5 Section 09 22 16 Non-Structural Metal Framing
- .6 Section 10 28 13.13 Metal Toilet Compartments
- .7 Section 10 28 13 Washroom Accessories

1.2 REFERENCES

- .1 American National Standards Institute/National Particleboard Association (ANSI/NPA)
 - .1 ANSI/NPA A208.1-2009, Particleboard.
- .2 ASTM International
 - .1 ASTM A 123/A 123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A 653/A 653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
 - .3 ASTM C 578-11a, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - .4 ASTM C 1289-11, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - .5 ASTM C 1396/C 1396M-11, Standard Specification for Gypsum Board.
 - .6 ASTM D 1761-06, Standard Test Methods for Mechanical Fasteners in Wood.
 - .7 ASTM D 5055-11, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
 - .8 ASTM D 5456-11, Standard Specification for Evaluation of Structural Composite Lumber Products.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-M87, Hardboard.
 - .2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
 - .3 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction and amendment.
 - .4 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.
- .5 CSA International
 - .1 CAN/CSA-A123.2-03 (R2008), Asphalt Coated Roofing Sheets.
 - .2 CAN/CSA-A247-M86 (R1996), Insulating Fiberboard.
 - .3 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
 - .4 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).
 - .5 CSA O121-08, Douglas Fir Plywood.
 - .6 CAN/CSA O122-06 (R2011), Structural Glued-Laminated Timber.
 - .7 CSA O141-05 (R2009), Softwood Lumber.

- .8 CSA O151-09, Canadian Softwood Plywood.
 - .9 CSA O153-M1980(R2008), Poplar Plywood.
 - .10 CSA O325-07, Construction Sheathing.
 - .11 CSA O437 Series-93(R2011), Standards on OSB and Waferboard.
 - .12 CAN/CSA-Z809-08, Sustainable Forest Management.
- .6 National Lumber Grades Authority (NLGA)
- .1 Standard Grading Rules for Canadian Lumber 2010.
- .7 The Truss Plate Institute of Canada
- .1 Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses 2007.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

1.4 QUALITY ASSURANCE

- .1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

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 off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wood from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 When it is required that wood maintain dimensional stability and tolerances, to ensure accurate installation of later work, store and install it only in dry areas and when no further installation of moist materials is

- contemplated.
- .5 Accept delivery of pressed steel door frames. Be responsible for any damage to frames from time of delivery until accepted by the Consultant after installation.
 - .6 Install temporary wood protection strips at door jambs and similar locations vulnerable to damage.
 - .7 Cover materials stored on site with tarpaulins or polyethylene sheets to prevent moisture, absorption and impairment of structural and aesthetic-properties

2 PRODUCTS

2.1 FRAMING STRUCTURAL AND PANEL MATERIALS

- .1 Lumber: unless specified otherwise, softwood, No. 1 or No. 2 grade, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
 - .1 CAN/CSA-O141
 - .2 NLGA Standard Grading Rules for Canadian Lumber
- .2 Wood Studs: spruce, pine or fir (SPF), 121c. "STUD"
- .3 Glulam in accordance with Structural Glued-Laminated Timber CAN/CSA-O122.
- .4 Light-frame trusses in accordance with "Truss Design and Procedures for Light Metal Connected Wood Trusses", The Truss Plate Institute of Canada.
- .5 Structural Composite Lumber (SCL) in accordance with ASTM D 5456.
- .6 Framing and board lumber: in accordance with NBC.
- .7 Furring, blocking, nailing strips, grounds, rough bucks, [cants,] curbs, fascia backing and sleepers:
 - .1 Board sizes: "Standard" or better grade.
 - .2 Dimension sizes: "Standard" light framing or better grade.
 - .3 Post and timbers sizes: "Standard" or better grade.
- .8 Plywood, OSB and wood based composite panels: to CSA O325.
- .9 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .10 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .11 Poplar plywood (PP): to CSA O153, standard construction.
- .12 Gypsum sheathing: to ASTM C 1396/C 1396M.

2.2 ACCESSORIES

- .1 Polyethylene film: to CAN/CGSB-51.34, Type 1 , 0.15 mm thick.

- .2 General purpose adhesive: to CSA O112.9.
 - .1 VOC limit 200 g/L.
- .3 Nails, spikes and staples: to CSA B111.
- .4 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .5 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.
- .6 Joist hangers: minimum 1 mm thick sheet steel, galvanized ZF001 coating designation.
- .7 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, [sheet metal], [fibre], formed to prevent dishing. Bell or cup shapes not acceptable.
- .8 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, extruded 6063-T6 aluminum alloy type approved by Departmental Representative.
- .9 Fastener Finishes:
 - .1 Galvanizing: to [ASTM A 123/A 123M] [ASTM A 653], use galvanized fasteners for [exterior work] [interior highly humid areas] [pressure-preservative] [fire-retardant] [treated lumber].
 - .2 Stainless steel: use stainless steel [] alloy for [].
- .10 Wood Preservative:
 - .1 Preservative Coating: in accordance with manufacturer's recommendations for surface conditions:

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate 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 surfaces of material with wood preservative, before installation.
- .2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.
- .3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.
- .4 Treat material as indicated as follows:

- .1 Wood fascia backing, curbs and nailers.
- .2 Wood furring for siding on outside surfaces.
- .3 Wood sleepers supporting wood subflooring over concrete slabs in contact with ground or fill.

3.3 MATERIAL USAGE

- .1 Roof sheathing:
 - .1 Plywood, DFP or CSP sheathing grade or PP standard sheathing T&G 13 mm thick.
- .2 Exterior wall sheathing:
 - .1 OSB, 11mm thick.
- .3 Electrical equipment mounting boards:
 - .1 Plywood, DFP or CSP grade, square edge 13 mm thick.

3.4 INSTALLATION

- .1 Install members true to line, levels and elevations, square and plumb.
- .2 Construct continuous members from pieces of longest practical length.
- .3 Install spanning members with "crown-edge" up.
- .4 Select exposed framing for appearance. Install lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.
- .5 Install wall sheathing in accordance with manufacturer's printed instructions.
- .6 Install roof sheathing in accordance with requirements of NBC.
- .7 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding [electrical equipment mounting boards], and other work as required.
- .8 Install furring to support siding applied vertically [where there is no blocking and] where sheathing is not suitable for direct nailing.
 - .1 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .9 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .10 Install fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.
- .11 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.
- .12 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .13 Countersink bolts where necessary to provide clearance for other work.
- .14 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

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.

3.6 PROTECTION

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

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 CSA International
 - .1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA O80 Series-15, Wood Preservation.
 - .3 CSA O86-14, Engineering Design in Wood.
 - .4 CAN/CSA-Z809-16, Sustainable Forest Management.
 - .5 CAN/CSA-080.20-1.1-15, Fire-retardant treatment of lumber
 - .6 CAN/CSA-080.27-1.1-15, Fire-retardant treatment of Douglas Fir, hardwood, softwood, and poplar plywood by pressure processes.
 - .7 CAN/CSA-080.201-15, Hydrocarbon solvents for preparing solutions of preservatives.
 - .8 CSA-0322015, Procedure for certification of pressure-treater wood materials for use in preserved wood foundations.
- .3 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2012, FSC Principle and Criteria for Forest Stewardship.
 - .2 FSC-STD-20-002-2012, Structure and Content of Forest Stewardship Standards V2-1.
 - .3 FSC Accredited Certified Bodies.
- .5 Green Seal Environmental Standards (GS)
 - .1 GS-36-2.1, Commercial Adhesives.
- .6 American Wood-Preservers' Association (GS)
 - .1 AWPA M2-15, Standard for Inspection of Treated Wood Products.
 - .2 AWPA M4-15, Standard for the Care of Preservative-Treated Wood Products.
- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Materials Safety Data Sheets (MSDS).
- .8 National Lumber Grades Authority (NLGA)
 - .1 NLGA Standard Grading Rules for Canadian Lumber 2014.

- .8 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
 - .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.2 ACTIONS AND INFORMATIONAL SUBMITTALS

- 1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wood decking and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS.
- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit 2 150 x 300 mm samples of each type.

1.3 QUALITY ASSURANCE

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plant inspection of products treated with preservative and fire-retardant by pressure impregnation will be carried out by designated testing laboratory to AWPA M2, and revisions specified in CAN/CSA-080 Series, supplementary requirements to AWPA M2.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wood decking from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Wood decking: to NLGA standard Grading Rules for Canadian Lumber commercial grade Western Red Cedar 19mm x 150mm. CAN/CSA-Z809, SFI or Forestry Stewardship Council (FSC) certified.
- .2 Decking lengths: 1.8 to 6 m or longer with a minimum of 90% planks exceeding 3 m. Square end trimmed. For single spans, shorter than 3 m use decking of same length as span.
- .3 wood framing: to NLGA standard Grading Rules for Canadian Lumber commercial grade S-P-F pressure-treated 38mm x 140mm, 38mm x 189mm, 38mm x 235mm, 38mm x 286mm, 89mm x 89mm, 140mm x 140mm. Kiln dry decking to 15% maximum moisture content. CSA-z809, SFI or Forestry Stewardshop Council (FSC) Certified.
- .4 Nails: to CSA B111, hot dipped galvanized finish; sizes to CSA O86. Supply 200 mm spiral spikes for lateral nailing.
- .5 Splines: galvanized metal, as recommended by decking manufacturer.
- .6 Wood preservative: odourless type to CSA O80 for natural finish.
- .7 Adhesive and Sealants: in accordance with Section 07 92 00.

PART 3 – EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Do wood deck work to CSA O86 except where specified otherwise.
- .2 Install decking to CSA O86, simple span pattern.
- .3 Supply minimum of 1 bearing support for each plank except extend cantilevers over two supports. Install sloping deck with tongues up.
- .4 Stagger end joints in adjacent planks minimum of 0.5 m.
 - .1 Separate joints in same area by at least 2 intervening courses.
 - .2 Avoid joints in first fifth of end spans.
 - .3 Minimize joints in middle third of span.
- .5 Apply preservative to end cuts of pressure treated lumber.

3.3 APPLICATION: FIELD TREATMENT

- .1 For field treatment of end cuts, comply with AWPAs M4 and revisions specified in CAN / CSA 080 Series, Supplementary Requirements to AWPAs M2.
- .2 Departmental Representative will pay for costs of testing.

3.4 FIELD QUALITY CONTROL

- .1 Testing:
 - .1 Testing moisture content of delivered material will be performed by testing laboratory designated by Departmental Representative.
- .2 Departmental Representative will pay for costs of testing.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .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.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

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

3.6 PROTECTION

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

END OF SECTION

PART 1 – GENERAL

1.1 SCOPE OF WORK

- .1 Work furnished and Installed:
 - .1 Glue Laminated Structural Units
 - .2 Cross-laminated Timber (CLT) structural units
 - .3 Holes for other trades
 - .4 Composite connectors to timber
- .2 Related work specified elsewhere
 - .1 Cast in place concrete 03 30 11
 - .2 Painting and finishing

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A123/A123M-12, 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 Strength.
 - .3 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 CSA and International Standards
 - .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA-O80 Series-08, Wood Preservation.
 - .3 CSA O86.14, Engineering Design in Wood.
 - .4 CSA O112 Series-M1977 (R2006), CSA Standards for Wood Adhesives.
 - .5 CAN/CSA-O122-06, Structural Glued-Laminated Timber, with Update No. 1 (07) and Update No. 2 (09).
 - .6 CSA O177-06 (R2015), Qualification Code for Manufacturers of Structural Glued-Laminated Timber.
 - .7 ANSI/ APA PRG 320 Standard for Performance- Rated Cross Laminated Timber
 - .8 American Wood-Preservers Association (AWPA) standard c28.
 - .9 ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
 - .10 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel.
 - .11 CAN/CSA G164-M92 (R2003) Hot Dip Galvanized of Irregularly Shaped

Articles

- .12 CSA S16-14, Design of Steel Structures.
- .13 CSA W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel Structures
- .14 CSA-Z809-16, Sustainable Forest Management.

- .4 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

 - .2 FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1.

- .5 Green Seal Environmental Standards (GS)
 - .1 GS-11-2008, 2nd Edition, Paints and Coatings.

- .6 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

- .7 The Master Painters Institute (MPI) / Architectural Painting Specification Manual - February 2004.
 - .1 MPI# 79 - Primer, Alkyd, Anti-Corrosive for Metal.

1.3 QUALITY OF MANUFACTURERS

- .1 Manufacture structural glued-laminated members in plant certified by Administrative Board Structural Glue Laminated Timber Division, to CSA-0177 to manufacture Class 1 (interior) members and Class X (exterior) members

- .2 Manufacture structural cross laminated timber panel members in a plant qualified in accordance with ANSI/ APA PRG 320 or equivalent certification

- .3 Fabricator for welded steel connections to be certified in accordance to CSA W47.1. 1-09 (R2014)

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for glued-laminated construction and CLT construction and

include product characteristics, performance criteria, physical size, finish and limitations.

- .2 Submit two copies of WHMIS MSDS.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Submit erection drawings in accordance with CSA S16 and CSA O86.
 - .3 Shop drawings for members: indicate stress grade, service grade and appearance grades, shop applied finishes, camber, cuts, ledgers, holes and connection details.
 - .4 Submit Sketches and calculations bearing the stamp and signature of a Professional Engineer licensed in the Province of Ontario as may be necessary to show design and loading assumption but not limited to, all connection design and details including hardware, appearance and member net section design.
- .4 Manufacturer's Instructions: submit manufacturer's installation instructions.
- .5 Low-Emitting Materials:
 - .1 Submit listing of adhesives and sealants and paints and coatings used in building, showing compliance with VOC and chemical component limits or restrictions requirements similar to that of LEEDS requirements.
 - .2 Submit listing of glue-laminated products used in building, stating that they contain no added urea-formaldehyde resins, and laminate adhesives used in building, stating that they contain no urea-formaldehyde.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Manufacture structural glued-laminated members: Submit certificate in accordance with CSA O177.
 - .2 Fabricator for welded steel connections to be certified to CSA W47.1.
 - .4 Place authorization labels on glued-laminated members indicating manufactured in CSA certified plant.
 - .5 Certification of material protective sealer.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .2 Apply protective sealer to glued-laminated units before shipping unless specified otherwise.
 - .3 Wrap quality commercial grade members prior to leaving plant with a moisture resistant wrapping.
 - .4 Make adequate provision for delivery and handling stresses.
- .3 Storage and Handling Requirements:
- .1 Store materials [off ground] [indoors] [in dry location] and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store glued-laminated units and protect from weather, block off ground and separate with stripping, so air may circulate around faces of members.
 - .3 Cover glued-laminated units with opaque moisture resistant membrane if stored outside.
 - .4 Replace defective or damaged materials with new.

1.7 DESIGN

- .1 Products – Glulam, CLT panels and wood deck products shall be custom designed to fit the dimensions and loads indicated on the plans.
- .2 Retain a Professional Engineer registered in the Province of Ontario to design Glulam and CLT Framing System; to prepare, seal and sign all shop drawings. Shop drawings shall show both design and installation requirements.
- .3 All wood connections are to be designed by a Professional Engineer registered in the Province of Ontario in accordance with CSA-086 and CSA S16. This includes panel to panel connection, glulam connections and associated steel connection brackets and plates

PART 2 - PRODUCTS

2.1 SUPPLY/ FABRICATION

- .1 The glue-laminated timber, cross laminated timber supplier/ fabricator carried by the Contractor shall be named in the bid submission.

2.2 MATERIALS

- .1 Laminating stock: Douglas Fir-Larch (unless otherwise noted on structural drawings) SFI or Forest Stewardship Council (FSC) certified, to CAN/CSA-

O122.

- .2 Adhesive: to CSA O112 Series, to grade of service required in accordance with CAN/CSA-O122.
 - .1 Urea-formaldehyde free.
- .3 Sealer for glued-laminated members: penetrating type, clear, non-yellowing liquid.
 - .1 Coatings: VOC limit 550g/L maximum to SCAQMD Rule 1113.
- .4 CLT Adhesive: to CSA 00125.10, and Sections 2.1.3 and 3.3 (ASTM D7247 heat durability) of AITC 405. In addition, adhesives shall be evaluated for heat performance in the accordance with Section 6.1.3.4 of DOC PS1.
- .5 Fastenings:
 - .1 Split ring connections: hot rolled carbon steel, SAE 1010, in accordance with SAE handbook.
 - .2 Shear plate connections:
 - .1 Pressed steel type: hot rolled carbon steel, SAE 1010, in accordance with SAE handbook.
 - .2 Malleable iron type: to ASTM A47/A47M, grade 350W.
 - .3 Lag screws: to ASTM A307.
 - .4 Bolts: to ASTM A307.
 - .5 Side plates: to CSA-G40.20/G40.21.
 - .6 Drift pins: to ASTM A307.
 - .7 Glued-laminated rivets: hot dip galvanized to ASTM A36.
 - .8 Nails and spikes: to CSA B111.
 - .9 Truss plates: light gauge galvanized sheet steel to ASTM A653/A653M, grade A, yield point 230 MPa.
- .6 Galvanizing: to ASTM A123/A123M, hot dipped, Coating Grade 85, minimum zinc coating of 600 g/ Square Meter
- .7 Sealer for untreated glue-laminated members and cut ends of glue laminated and CLT members: Penetrating type, clear, non-yellowing liquid which will protect wood against moisture entry.
- .8 Wood Preservatives:
 - .1 Alkaline Copper Quaternary (ACQ) or Copper Azole (CA), based preservatives in accordance with CAN/ CSA-080 SERIES.
 - .2 All wood in direct contact with concrete, masonry, or soil are to be protected with preservatives as listed in item 2.1.6.

- .3 For Glulam members where edges are exposed to the weather, treat members in accordance with the American Wood – Preservers Association (AWPA standard C28 with pentachlorophenol in light solvent to avoid preservative, or sealer staining of panels or members exposed to view.
- .4 Coordinate with Painting section to avoid preservative or sealer staining or panels or members exposed to view.

2.2 FABRICATION

- .1 Fabricate members to following classifications:
 - .1 Glulam Stress grade: to CSA O86 24f-E bending grade 20f-E bending grade unless otherwise noted on the drawings
 - .2 CLT members to SPF 1 or SPF 2 material
 - .3 For CLT exposed in the finished structure Face layer to be SPF J Grade
 - .4 Appearance grade for Glulam: Quality
 - .5 Stress grade: V2
- .2 Mark laminated members for identification during erection. Marks not to be visible in final assembly. Clearly mark top surface of all roof panels.
- .3 Do not apply sealer to areas which are to receive stained finish or preservative treatment.
- .4 Design connections to CSA O86, and CSA S16 unless specifically detailed, to resist shears, moments and forces indicated.
 - .1 Fabricate in accordance with CSA S16.
- .5 Galvanize connections after fabrication.
- .6 Cut holes as required for pipes, ducts, and the like in accordance with the following:
 - .1 Indicate openings on the fabrication and erection drawings.
 - .2 Holes in glulam beams:
 - .1 Provide holes as required up to a maximum diameter of 10% of the beam depth.
 - .2 Locate holes within the middle third of the span and within the middle third of the beam depth.
 - .3 Space adjacent holes at five times the largest diameter.
 - .3 Holes in CLT panels:
 - .1 A single hole up to 200mm round or square is allowable in a standard panel.
 - .2 Do not locate holes below concentrated loads or near panel edges or corners.
 - .4 Do not overcut corners on square openings.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glue-laminated material 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 PRESERVATIVE TREATMENT

- .1 Pressure treat indicated members with preservative in accordance with CAN/CSA-O80 Series after fabrication.
- .2 Coordinate with painting section to avoid preservative, or sealer staining of CLT panels, or other members that would affect the final uniform colour/ clear finish exposed to view.

3.3 ERECTION

- .1 Protect protective sealer from damage before erection.
 - .1 Touch up damaged areas on site with specified sealer.
- .2 Erect glued-laminated members in accordance with reviewed erection drawings.
- .3 Brace and anchor members until permanently secured by structure.
- .4 Make adequate provisions for erection stresses.
- .5 Splice and join only at locations as indicated on reviewed erection drawings.
- .6 Do not field cut or alter members without Departmental Representative's approval. If approved, preservative treat cut ends.
- .7 Make splicing and jointing only at locations shown.

- .8 Fit members closely and accurately to other members and other assemblies
- .9 Field cutting and alteration of members not permitted without Departmental Representatives approval.
- .10 Confirm to erection tolerances specified in CSA-s16 Clause 29.3. If the interfacing tolerances are not compatible review and coordinate interfacing tolerances so that various elements come together properly.
- .11 Re-tightening Connections:
 - .1 Connection steel assemblies of glue laminated members shall be inspected at 6 to 12 months after completion of the building and tightened sufficiently to bring the faces of the connected materials into close contact without deformation.
 - .2 Any paint or other finishes damaged by these operations shall be made good.
 - .3 The cost of this work shall be included in the contract price.

3.4 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, protecting and cleaning of product.
 - .2 Submit 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 Ensure manufacturer's representative is present before and during [critical periods of installation] [construction of field joints] [and] [testing].
 - .4 Schedule site visits:
 - .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 Three times during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.

3.5 CLEANING

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

- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20 [and 01 35 21].
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

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

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 61 00 Product Requirements
- .3 Section 06 40 00 Millwork
- .4 Section 07 92 00 Joint Sealants
- .5 Section 09 91 23 Interior Painting

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-09, Particleboard.
 - .2 ANSI A208.2-09, Medium Density Fibreboard (MDF) for Interior Applications.
 - .3 ANSI/HPVA HP-1-10, American National Standard for Hardwood and Decorative Plywood.
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
 - .1 Architectural Woodwork Quality Standards, 1st edition, 2009.
- .3 ASTM International
 - .1 ASTM A 123/A 123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-M87, Hardboard.
- .5 CSA International
 - .1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
 - .2 CSA O121-08, Douglas Fir Plywood.
 - .3 CSA O141-05(R2009), Softwood Lumber.
 - .4 CSA O151-09, Canadian Softwood Plywood.
 - .5 CSA O153-M1980(R2008), Poplar Plywood.
 - .6 CAN/CSA-Z809-08, Sustainable Forest Management.
- .6 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2010.

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 and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two (2) copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety

Requirements and 01 35 43 - Environmental Procedures.

- .3 Shop Drawings:
 - .1 Indicate details of construction, profiles, jointing, fastening and other related details.
 - .3 Indicate materials, thicknesses, finishes and hardware.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit duplicate 300 x 300 mm samples of wood soffits, window casements and wall base.
- .5 Certifications: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.

1.4 QUALITY ASSURANCE

- .1 Lumber by grade stamp of agency certified by Canadian Lumber Standards Accreditation Board (CLSAB).
- .2 Plywood, particleboard, OSB and wood based composite panels to CSA and ANSI 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wood products from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 MATERIALS

- .1 Softwood lumber: S4S, moisture content 19% or less in accordance with following standards:
 - .1 CSA O141.
 - .2 CAN/CSA-Z809 or FSC or SFI certified.
 - .3 NLGA Standard Grading Rules for Canadian Lumber.
 - .4 AWMAC custom premium as specified.
 - .5 Hardwood lumber: moisture content 10% or less in accordance:
 - .1 National Hardwood Lumber Association (NHLA).
 - .2 AWMAC custom grade, moisture content as specified.
 - .3 CAN/CSA-Z809 or FSC or SFI certified.

- .2 Western Red Cedar (WRC): kiln dried, Grade A clear allowing for 10-15% moisture content.
- .3 Pacific Coast Yellow Cedar (PCYC): no 2 or better, one face clear

2.2 ACCESSORIES

- .1 Nails and staples: to CSA B111; galvanized to ASTM A 123/A 123M for exterior work, interior humid areas and for treated lumber.
- .2 Wood screws: stainless steel, type and size to suit application.
- .3 Splines: wood.
- .4 Adhesive and Sealants: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 VOC limit 250 g/L maximum.

3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Do finish carpentry to Quality Standards of (AWMAC).
- .2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.
- .3 Form joints to conceal shrinkage.

3.3 CONSTRUCTION

- .1 Fastening:
 - .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
 - .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
 - .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.
 - .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

- .2 Standing and running trim:
 - .1 Butt and cope internal joints of baseboards to make snug, tight, joint. Cut right angle joints of casing and base with mitred joints.
 - .2 Fit backs of baseboards and casing snugly to wall surfaces to eliminate cracks at junction of base and casing with walls.
 - .3 Make joints in baseboard, where necessary using a 45 degrees scarf type joint.
 - .4 Install door and window trim in single lengths without splicing.

- .3 Paneling:
 - .1 Secure paneling and perimeter trim using adhesive recommended for purpose by manufacturer. Fill nail holes caused by temporary fixing with filler matching wood in colour.
 - .2 Secure paneling and perimeter trim using concealed fasteners.
 - .3 Secure paneling and perimeter trim using counter sunk screws plugged with matching wood plugs.

3.4 INSTALLATION OF TRIM

- .1 Interior Window Trim (Window W1-1)
 - .1 Species: Pacific Coast Yellow Cedar
 - .2 Grade: no 2 or better, once face clear
 - .3 Thickness 19mm

- .2 Interior Wall Cladding (Dining Area – West Wall)
 - .1 Species: Pacific Coast Yellow Cedar
 - .2 Grade: no 2 or better, once face clear
 - .3 Dimensions: 19x140mm
 - .4 Profile: v-joint (refer to detail)

- .3 Exterior Trim (Screened-in-Porch)
 - .1 Species: Western Red Cedar
 - .2 Grade: no 2 or better, once face clear
 - .3 Thickness: refer to drawings

3.5 INSTALLATION OF SOFFIT (SF-1 AND SF-2)

- .1 Soffit S-1:
 - .1 Species: Pacific Coast Yellow Cedar
 - .2 Grade: no 2 or better, once face clear

- .2 Soffit S-2:
 - .1 Species: Western Red Cedar
 - .2 Grade: no 2 or better, once face clear
 - .3 Finish: Waterborne Solid Colour Stain, to match exterior cladding

- .3 Coordinate the installation of soffit vents, refer to Section 07 72 26 – Ridge And Soffit Vents

3.6 INSTALLATION OF WOOD WALL BASE (WB)

- .1 WB:
 - .1 Species: Pacific Coast Yellow Cedar
 - .2 Grade: no 2 or better, once face clear

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.

3.8 PROTECTION

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

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 61 00 Common Product Requirements
- .3 Section 05 50 00 Metal Fabrications
- .4 Section 06 40 00 Finish Carpentry
- .5 Section 07 92 00 Joint Sealants

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-09, Particleboard.
 - .2 ANSI A208.2-09, Medium Density Fiberboard (MDF) for Interior Applications.
 - .3 ANSI/HPVA HP-1-10, Standard for Hardwood and Decorative Plywood.
- .2 ASTM International
 - .1 ASTM E 1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.
 - .2 ASTM D 2832-92(R2011), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
 - .3 ASTM D 5116-10, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.
- .3 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
 - .1 Architectural Woodwork Quality Standards Illustrated, 8th edition, Version 1.0 (2009).
- .4 CSA International
 - .1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
 - .2 CSA O112.10-08, Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure).
 - .3 CSA O121-08, Douglas Fir Plywood.
 - .4 CSA O141-05(R2009), Softwood Lumber.
 - .5 CSA O151-09, Canadian Softwood Plywood.
 - .6 CSA O153-M1980(R2008), Poplar Plywood.
- .5 Canadian Standards Association (CSA):
 - .1 CAN/CSA-B45 SERIES-02(R2013), Plumbing Fixtures (Consists of B45.0, B45.1, B45.2, B45.3, B45.4, B45.5, B45.6, B45.7, B45.8 and B45.9), Includes Updates No. 1, No. 2, No. 3, and No. 4 (2007).
 - .2 CSA B651-12, Accessible Design for the Built Environment.
 - .3 CSA O121-08(R2013), Douglas Fir Plywood.
 - .4 CSA Z204-94(R1999), Guideline for Managing Indoor Air Quality in Office Buildings.

- .6 National Hardwood Lumber Association (NHLA)
 - .1 Rules for the Measurement and Inspection of Hardwood and Cypress [2011].
- .7 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber [2010].

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 architectural woodwork and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two (2) copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Indicate details of construction, profiles, jointing, fastening and other related details.
 - .1 Scales: profiles full size, details half size.
 - .3 Indicate materials, thicknesses, finishes and hardware.
 - .4 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Submit duplicate samples of veneer plywood: sample size 300 mm square.
 - .3 Submit duplicate samples of stainless steel countertop surfaces: sample size 300mm square

1.4 QUALITY ASSURANCE

- .1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Sustainable Standards Certification:
 - .1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.
- .3 Plywood, particleboard, OSB and wood based composite panels to CSA and ANSI 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.
 - .1 Protect millwork against dampness and damage during and after delivery.
 - .2 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.

- .3 Deliver, handle, store and protect materials of this section in accordance with Section 01 61 00 – Common Product Requirements
- .4 Protect millwork against dampness and damage during and after delivery.
- .5 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.
- .6 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .7 Store and protect architectural woodwork from nicks, scratches, and blemishes.
- .8 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.
- .9 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.
- .10 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 MATERIALS

- .1 Softwood lumber: unless specified otherwise, S4S, moisture content 19 % or less in accordance with following standards:
 - .1 CSA O141.
 - .2 CAN/CSA-Z809 or FSC or SFI certified.
 - .3 NLGA Standard Grading Rules for Canadian Lumber.
 - .4 AWMAC custom premium grade, moisture content as specified.
- .2 Machine stress-rated lumber is acceptable for all purposes.
- .3 Hardwood lumber: moisture content 10 % or less in accordance with following standards:
 - .1 National Hardwood Lumber Association (NHLA).
 - .2 CAN/CSA-Z809 or FSC or SFI certified.
 - .3 AWMAC custom grade, moisture content as specified.
- .5 Douglas fir plywood (DFP): to CSA O121, standard construction, CAN/CSA-Z809 or FSC or SFI certified.
 - .1 Plywood resin to contain no added urea-formaldehyde.
- .6 Canadian softwood plywood (CSP): to CSA O151, standard construction, CAN/CSA-Z809 or FSC or SFI certified.
 - .1 Plywood resin to contain no added urea-formaldehyde.
- .7 Hardwood plywood: to ANSI/HPVA HP-1, CAN/CSA-Z809 or FSC or SFI certified.
 - .1 Plywood resin to contain no added urea-formaldehyde.
- .8 Poplar plywood (PP): to CSA O153, standard construction, CAN/CSA-Z809 or FSC or SFI certified.
 - .1 Plywood resin to contain no added urea-formaldehyde.
- .9 Interior mat-formed wood particleboard: to ANSI/NPA A208.1, CAN/CSA-Z809 or FSC or SFI certified.
 - .1 Particleboard resin to contain no added urea-formaldehyde.
- .10 Birch plywood: to AWMAC [Paint Grade] [Natural] [Select White] [Select Red], CAN/CSA-Z809 or FSC or SFI

- certified.
- .1 Plywood resin to contain no added urea-formaldehyde.
 - .11 Fibreboard must contain less than 10% roundwood by weight, using weighted average over three month period at manufacturing locations.
 - .1 Fibreboard resin to contain no added urea-formaldehyde.
 - .2 CAN/CSA-Z809 or FSC or SFI certified.
 - .12 Hardboard:
 - .1 To CAN/CGSB-11.3, CAN/CSA-Z809 or FSC or SFI certified.
 - .2 Hardboard resin to contain no added urea-formaldehyde.
 - .13 MDF medium density fibreboard core: to ANSI A208.2, density 769 kg/m³, CAN/CSA-Z809 or FSC or SFI certified.
 - .1 Medium density fibreboard performance requirements to: [ANSI A208.2].
 - .2 MDF resin to contain no added urea-formaldehyde.
 - .14 Nails and staples: to CSA B111.
 - .15 Wood screws: steel plain, type and size to suit application.
 - .16 Sealant: in accordance with Section 07 92 00 - Joint Sealants

2.2 MANUFACTURED UNITS

- .1 Built-In Countertops:
 - .1 Fabricate caseworks to AWMAC custom quality grade.
 - .2 Furring, blocking, nailing strips, grounds and rough bucks and sleepers.
 - .1 Board sizes: "standard" or better grade.
 - .3 Dimension sizes: "standard" light framing or better grade.
 - .4 Urea-formaldehyde free.
 - .3 Finished surface: stainless steel, type 304, 18 gauge conforming to Section 05 50 00
 - .4 Panels: Plywood conforming to CSA 0121, G2S or particleboard to CAN3-0188.1-M78, Grade R, or 48 lb pcf
- .2 Shelving and Lower Bench:
 - .1 Material for interior millwork shall be hardwood plywood or particleboard core with birch veneer, as shown, and specified herein, for gables, shelves, backs, divisions tops and wherever plywood veneer material is shown, unless indicated otherwise.
 - .2 To prevent warping use a backing veneer of same thickness as face. Apply backing veneer using the same application techniques such as application rate, method of application, drying techniques and finish. Provide backing sheet of sufficient thickness to compensate stresses caused by facing sheet. Apply uniform coating of sealer on exposed veneered edges.
 - .3 Shelving Rod & Sockets: provide heavy duty adjustable closet rod in lengths to suit equivalent to Knape & Vogt Closet Pro HD RP0020 w/ chrome finish and matching pole

sockets.

2.3 FABRICATION

- .1 Set nails and countersink screws apply plain wood filler to indentations, sand smooth and leave ready to receive finish.
- .2 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.
- .5 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.
- .6 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.
- .7 Ensure adjacent parts of continuous laminate work match in colour and pattern.
- .8 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.
- .10 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.
- .11 Apply laminate backing sheet to reverse side of core of plastic laminate work.
- .12 Apply laminated plastic liner sheet [to interior of cabinetry] [where indicated].

2.4 FACTORY APPLIED MILLWORK FINISH

- .1 All veneer millwork, wood veneer panels and solid oak fitments shall have factory applied finish installed in accordance with Part 5 of the AWMAC Quality Standards.
- .2 Finish shall be semi-transparent water based stain in natural colour and consisting of: one (1) coat oil stain, one (1) coat sanding sealer, sanded lightly. Apply two (2) finish coats of clear standard or catalysed lacquer, at architectural woodwork manufacturer's option, satin finish.
- .3 Submit to the Departmental Representative two (2) – 300 mm x 600 mm representative sample panels illustrating finish for approval. Shop finished surfaces shall closely match the approved samples in all respects.
- .4 Apply finishes evenly, and consistently throughout with no lighter or darker areas or blotches.
- .5 Sheen shall be consistent throughout.
- .6 Fill nail holes and blemishes to closely match and blend with finish so as to be as inconspicuous as possible.
- .7 Surfaces shall be consistently smooth and even with no "orange peel", runs, sags, skips, drips, or rough areas.

- .8 To prevent warping of veneer panels apply finish to all surfaces including backs and edges.
- .9 Prior to shipment to the site suitably protect millwork and fitments from possible damage prior to installation. Maintain protection of millwork on site after installation.

3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Do architectural woodwork to Quality Standards of AWMAC.
- .2 Install prefinished millwork at locations shown on drawings.
 - .1 Position accurately, level, plumb straight.
- .3 Fasten and anchor millwork securely.
 - .1 Supply and install heavy duty fixture attachments for wall mounted cabinets.
- .4 Use draw bolts in countertop joints.
- .5 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
- .6 At junction of countertop and adjacent walls or partitions, apply small bead of sealant in accordance with Section 07 92 00 - Joint Sealants.
- .7 Apply water resistant building paper or bituminous coating over wood framing members in contact with masonry or cementitious construction.
- .8 Fit hardware accurately and securely in accordance with manufacturer's written instructions.

3.3 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.
 - .1 Clean millwork on all exposed surfaces.

- .2 Remove excess glue from surfaces.

3.4 PROTECTION

- .1 Protect millwork from damage until final inspection.
- .2 Protect installed products and components from damage during construction.
- .3 Repair damage to adjacent materials caused by architectural woodwork installation.

3.05 SCHEDULES

- .1 Stainless Steel Countertops
 - .1 Public Washrooms 101, 102, 200 and 201
 - .2 Dishwashing Areas 113 and 204
- .2 Shelf with Closet Rod and Lower Bench
 - .1 Mud Room 109

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 61 00 Common Product Requirements
- .3 Section 03 30 00 Cast-In-Place Concrete
- .4 Section 07 26 00 Vapour Retarders

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM C 208-12, Standard Specification for Cellulosic Fiber Insulating Board.
 - .2 ASTM C 591-13, Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 - .3 ASTM C 612-14, Standard Specification for Mineral Fibre Block and Board Thermal Insulation.
 - .4 ASTM C 726-12, Standard Specification for Mineral Fiber Roof Insulation Board.
 - .5 ASTM C 728-13, Standard Specification for Perlite Thermal Insulation Board.
 - .6 ASTM C 1126-14, Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
 - .7 ASTM C 1289-14, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - .8 ASTM E 96/E 96M-13, Standard Test Methods for Water Vapour Transmission of Materials.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 71-GP-24M-AMEND-77(R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.
- .3 CSA Group
 - .1 CSA B149 PACKAGE-10, Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S604-2012, Standard for Factory-Built Type A Chimneys.
 - .2 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
 - .3 CAN/ULC-S702-2012, Standard for Mineral Fibre Insulation for Buildings.
 - .4 CAN/ULC-S704-11, Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.

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 board insulation and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit two (2) copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures. Indicate VOC's during application and curing.
- .3 Samples:
 - .1 Submit 300 mm square sample of board insulation.
- .4 Certificates:
 - .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .5 Test Reports:
 - .1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

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.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled 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 board insulation from nicks, scratches, and blemishes.
 - .3 Avoid prolonged UV exposure.
 - .4 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 INSULATION

- .1 Extruded polystyrene (XPS): to CAN/ULC-S701 for use below grade:
 - .1 Type: 4
 - .2 Compressive strength: to ASTM D 1621: 207 kPA
 - .3 Thickness: 51mm
 - .4 Size: 1219x2438mm
 - .5 Edges: shiplapped

2.2 ADHESIVE

- .1 Adhesive for polystyrene: to CGSB 71-GP-24M.
 - .1 Type: water based adhesive suitable for bonding polystyrene to substrate as indicated.
 - .2 Follow manufacturer's recommendation for adhesive.

2.3 ACCESSORIES

- .1 Joint sealing tape: air resistant pressure sensitive adhesive tape as recommended by insulation manufacturer.
- .2 Insulation fasteners: impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type
- .3 Insulation baffles: Preformed, rigid fiberboard or plastic sheets designed to fit between roof framing members and to provide cross-ventilation between attic spaces and vented eaves.

3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures.
- .5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .6 Offset both vertical and horizontal joints in multiple layer applications.
- .7 Do not enclose insulation until it has been inspected and approved by Departmental Representative.
- .8 Coordinate installation with vapour retarder.

3.3 PERIMETER FOUNDATION INSULATION

- .1 Interior application: extend boards vertically below bottom of finish floor slab to depths indicated on the drawings, installed on inside face of perimeter foundation walls.
- .2 Exterior application: extend boards below finish grade to top of existing footing. Install on exterior face of perimeter foundation wall with adhesive to the limits shown on the drawings for localized thermal protection of existing footings.
- .3 Under slab application: extend boards 51mm in from perimeter foundation wall as indicated. Lay boards on level compacted fill.

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

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 61 00 Common Product Requirements
- .3 Section 06 10 00 Rough Carpentry
- .4 Section 07 26 00 Vapour Retarders

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM C 553-13, Standard Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .2 ASTM C 665-12, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .3 ASTM C 1320-10, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- .3 CSA Group
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
 - .2 CSA B149 PACKAGE-10, Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.
- .4 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S604-2012, Standard for Factory-Built Type A Chimneys.
 - .2 CAN/ULC-S702-2012, Standard for Mineral Fibre Insulation for Buildings.

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 blanket insulation and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates:
 - .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Test Reports:
 - .1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.

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.

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect blanket insulation from damage.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 INSULATION

- .1 Batt and blanket mineral fibre: to ASTM C 665.
 - .1 Type: 1
 - .2 Thickness: as indicated on the drawings
- .2 Preformed, friction fit glass or mineral fibre batt insulation conforming to the requirements of CSA/ULC-S702, with a minimum thermal resistance value of R3.8 per inch (RSI 0.58 per 25.4 mm).
- .3 Acoustic glass fibre insulation to ASTM C665.
 - .1 Type: 1
 - .2 Thickness: as indicated on the drawings

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for blanket insulation application 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 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and attain sound attenuation as noted on the drawings.
- .2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .3 Do not compress insulation to fit into spaces.

- .5 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures.
- .6 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.3 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

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 61 00 Common Product Requirements
- .3 Section 07 26 00 Vapour Retarder
- .4 Section 07 27 00 Air And Moisture Barriers

1.2 REFERENCES

- .1 Canadian Urethane Foam Contractors Association Inc. (CUFCA)
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101-07, Standard Methods of Fire Tests of Building Construction and Materials.
 - .2 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .3 CAN/ULC-S705.1-01, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification. Includes Amendment 1.2.
 - .4 CAN/ULC-S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.

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 polyurethane foam sprayed insulation and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two (2) copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.
- .3 Test Reports:
 - .1 Submit certified test reports for insulation from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .2 Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.
- .4 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions and special handling criteria and installation sequence.

1.4 QUALITY ASSURANCE

- .1 Applicators to conform to CUFCA Quality Assurance Program.

- .2 Qualifications:
 - .1 Installer: person specializing in sprayed insulation installations
 - .2 Manufacturer: company with experience in producing of material used for work required for this project, with sufficient production capacity to produce and deliver required units without causing delay in work.
- .3 Health and Safety Requirements: worker protection:
 - .1 Protect workers as recommended by CAN/ULC-S705.2 and manufacturer's recommendations:
 - .2 Workers must wear protective clothing, respirators, eye protection and all necessary precautionary measures when applying foam insulation.
 - .3 Workers must not eat, drink or smoke while applying foam insulation.
- .4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.
- .5 Dispose of waste foam sealant daily in location designated by Departmental Representative and decontaminate empty drums in accordance with foam sealant manufacturer's instructions.

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, labeled 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 materials from damage.
 - .3 Replace defective or damaged materials with new.

1.6 SITE CONDITIONS

- .1 Ventilate area in accordance with Section 01 51 00 - Temporary Utilities.
- .2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24 hour after application to maintain non-toxic, unpolluted, safe working conditions.
- .3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.
- .4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.
- .5 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

2 PRODUCTS

2.1 MATERIALS

- .1 Insulation: low expanding, one-component spray polyurethane foam sealant, curing to a semi-rigid, closed cell urethane foam providing a RSI of 0.9 per 25.4 mm.
 - .1 Maximum VOC limit 100 g/L
 - .2 Density: 25.7 kg/m³
 - .3 Compressive Strength Parallel @ 10%: 69-96 psi
 - .4 Tensile Strength: 103 psi
 - .5 Water Vapour Transmission: 5.97 perms
 - .6 Flame Spread: 20
 - .7 Smoke Development: 70
- .2 Primers: in accordance with manufacturer's recommendations for surface conditions.
 - .1 Maximum VOC limit 100g/L

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sprayed insulation application 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 APPLICATION

- .1 Apply insulation to clean surfaces in accordance with CAN/ULC-S705.2 and manufacturer's printed instructions.
- .2 Use primer where recommended by manufacturer.

3.3 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.
 - .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 09 28 13 Cementitious Backer Board

1.2 REFERENCES

.1 Definitions:

- .1 Aesthetic joint: joint for appearance or installation ease. Also known as reveals grooves and reglets used to provide starting and stopping points during application of finish coat.
- .2 Base coat adhesive: adhesive used in base coat. Polymer modified, polymer based or cementitious material, typically mixed with Portland cement.
- .3 Base coat: base coat consists of 2 components; base coat adhesive and reinforcing mesh.
- .4 Direct-Applied: direct-applied systems use EIFS-like coatings applied directly to rigid sheathing boards. Insulation is not used in these systems, thus, they are not EIFS.
- .5 Lamina: base coat reinforcing mesh and finish.
- .6 Reinforcing mesh: woven glass fibre reinforcement to base coat providing impact resistance.

.2 Reference Standards:

.1 ASTM International

- .1 ASTM B 117-11, Standard Practice for Operating Salt Spray (Fog) Apparatus.
- .2 ASTM C 67-13a, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- .3 ASTM C 144-11, Standard Specification for Aggregate for Masonry Mortar.
- .4 ASTM D 968-05(2010), Standard Test Methods for Abrasion Resistance of Organic Coatings by the Falling Abrasive.
- .5 ASTM D 2247-11, Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
- .6 ASTM E 72-13a, Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
- .7 ASTM E 695-03(2009), Standard Method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.
- .8 ASTM G 154-12a, Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-1.162-2004, Emulsion Coating for Stucco and Masonry.
- .2 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.

.4 CSA Group

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

.5 Underwriters Laboratories of Canada (ULC)

- .1 CAN/ULC-S101-07, Standard Methods of Fire Tests of Building Construction and Materials.
- .2 CAN/ULC-S102.2-10, Standard Methods for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.

- .3 CAN/ULC-S134-13, Standard Method of Fire Test of Exterior Wall Assemblies.

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 direct applied exterior finishes and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two (2) copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Indicate wall layout, details, connections, expansion joints, finish system, installation sequence, including interface with fascias, walls, air barriers, vapour retarders and other components.
- .4 Samples:
 - .1 Submit one (1) 300 x 300 mm sample of each colour of finished finish.

1.4 QUALITY ASSURANCE

- .1 Quality Assurance:
 - .1 Installer: company or person specializing in application of exterior finish system direct applied with documented experience.
 - .2 Installation of exterior finish system by applicators certified by manufacturers of system used.
 - .3 Submit certification to Departmental Representative prior to commencement of work.

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, labeled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect from damage.
 - .3 Replace defective or damaged materials with new.

1.6 AMBIENT CONDITIONS

- .1 Temperature, relative humidity, moisture content.
 - .1 Apply exterior finish system components at temperatures, relative humidity, and substrate moisture content and substrate temperature in accordance with manufacturer's written instructions.

- .2 Maintain ambient temperature above 4 degrees C during base coat application and until cured minimum 24 hours.
- .3 Maintain ambient temperature above 4 degrees C during finish coat application and until cured minimum 24 hours.

1.7 WARRANTY

- .1 For work of this Section 07 24 10.03 - Exterior Finish - Direct Applied 12 months warranty period is extended to 24 months.
- .2 Contractor warrants that exterior finish system will not leak or delaminate in twenty four (24) months.

2 PRODUCTS

2.1 SYSTEM DESCRIPTION

- .1 Performance requirements: ensure installed modified polymer (soft) coat wall system has following performance properties:
 - .1 Comply with CAN/ULC-S134.
 - .2 Finish abrasion resistance: falling sand method to ASTM D 968, no deleterious effects.
 - .3 Finish salt spray resistance: to ASTM B 117, after 300 hours exposure to 5% salt spray solution - no effects.
 - .4 Finish moisture resistance: to [ASTM D 2247], after 14 days exposure - no deleterious effects.
 - .5 Accelerated weathering: to [CAN/CGSB-1.162] [ASTM G 154, 2000 hours - no effect].

2.2 SURFACE PREPARATION

- .1 Conditioner: water based, acrylic, clear conditioner/sealer compatible with system materials, recommended by system manufacturer.
- .2 Leveller: polymer-modified, cement-based, reinforced levelling compound.

2.3 BASECOAT

- .1 Liquid polymer based material, which is field mixed in a 1: ration by weight with Portland cement, colour to match exterior cladding.

2.4 REINFORCING MESH

- .1 Balanced, open weave glass fibre fabric made from twisted multi-end strands, treated, alkali resistant, compatible with chemical bonding system base coat and finish coat, weight standard – 163 g/m².
- .2 Speciality mesh:
 - .1 Detail mesh: flexible, symmetrical, woven glass fibre fabric made from twisted multi-end strands, treated, alkali resistant, compatible with chemical bonding system base coat and finish coat, weight 153 g/m².
 - .2 Corner mesh: pre-creased, non-woven glass fibre fabric made from twisted multi-end strands, treated, alkali resistant, compatible with chemical bonding system base coat and finish coat, weight

212 g/m².

2.5 FINISH COAT

- .1 Modified polymer finish coat system: acrylic resins in dispersion, silica aggregate, integral mineral pigmentation and additives, colour to match exterior cladding. Colour to be approved by Departmental Representative.

2.6 PRIMER

- .1 Acrylic based primer.

2.7 ACCESSORIES

- .1 Accessories: galvanized corner beads, casing beads, stop beads, and accessories, as recommended by exterior finish system manufacturer to suit system components.

2.8 EXPANSION JOINTS

- .1 Expansion joints: galvanized
- .2 Ensure expansion joints are back wrapped.
- .3 Joint Cleaner: non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
- .4 Sealant primer: as recommended by sealant manufacturer.
- .5 Joint filler: extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 - 200 kPa, outsized 30 to 50%.
- .6 Sealant: [in accordance with Section 07 92 00 - Joint Sealants asbestos-free sealant, compatible with systems materials, recommended by system manufacturer.
 - .1 Weather seals: [multi-component, chemical curing to CAN/CGSB-19.24, Type 2, Class B].
 - .2 Panel joints: [multi-component, chemical curing to CAN/CGSB-19.24, Type 2, Class B].

2.9 MATERIALS: SITE MIX

- .1 Cement: to CSA A3000, Type GU.
- .2 Sand: dry bag.
 - .1 For white cement: silica sand, 30-50 mesh.
 - .2 For grey cement: mortar sand to ASTM C 144.
- .3 Water: potable.

2.10 MIXES

- .1 General:
 - .1 Mixer: high speed, clean and rust free.

- .2 Mixing pail: clean and rust free.
- .3 Mixes: additive free.

- .2 Conditioner: mix in accordance with manufacturer's written instructions.
- .3 Leveller: mixed to uniform consistency in accordance with manufacturer's written instructions.
- .4 Basecoat: mixed to uniform consistency in accordance with manufacturer's written instructions.
- .5 Finish coat: mixed to uniform consistency in accordance with manufacturer's written instructions.

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 EXAMINATION

- .1 Inspect and verify condition of existing substrate surfaces for contamination, surface absorption, chalkiness, cracks, damage, deterioration, moisture content, moisture damage, and tolerances.
 - .1 Substrate tolerance not greater than 6 mm in 2500 mm design deflection no greater than 1/240 in accordance with manufacturer's written instructions.
- .2 Report deviations from specified requirements or other conditions that might adversely affect exterior finish system installation in writing to Departmental Representative.
- .3 Proceed with Work only after receipt of written approval from Departmental Representative.

3.3 PREPARATION

- .1 Protection:
 - .1 Protect adjacent surfaces from damage resulting from Work of this section.
 - .2 Protect finished Work from water penetration at end of each day or on completion of each section of Work.
 - .3 Protect installation from moisture for 48 hours minimum after completion of each portion of Work.
- .2 Surface preparation:
 - .1 Ensure environmental and site conditions are suitable for installation of system.
 - .2 Prepare new surfaces in accordance with manufacturer's written instructions.
 - .3 Conditioner: water based or acrylic, clear conditioner/sealer compatible with system materials, substrate and as recommended by system manufacturer.
 - .1 Add water and mix.
 - .2 Apply to clean, dry substrate surfaces ensuring complete even coverage in accordance with manufacturer' written instructions.
 - .4 Leveller: polymer-modified, cement based, reinforced levelling compound.
 - .1 Add water and mix.

- .2 Allow set time.
- .3 Apply to existing substrate, [6] mm thick maximum.
- .4 Allow time to fully cure.

3.4 INSTALLATION

- .1 Install system in accordance with CAN/ULC-S134.
- .2 Accessories:
 - .1 Install required accessories as detailed and as required by exterior finish system manufacturer, and in accordance with CAN/ULC-S134.
- .3 Joints:
 - .1 Reveals and Aesthetic Grooves:
 - .1 Cut reveals and aesthetic grooves with appropriate tool in locations indicated in accordance with details.
 - .2 Expansion joints:
 - .1 Install expansion joints in locations indicated and to manufacturers written instructions.
 - .2 Install expansion joints at isolation joints in substrate where new construction abuts existing construction at locations where movement is expected to be greater than 6 mm.
- .4 Mesh and Base Coat Application:
 - .1 Apply 225 x 300 mm diagonal strips of detail mesh at corners, lights, grilles and penetrations through system.
 - .1 Embed strips in wet base coat and trowel from centre to mesh edge to avoid wrinkles.
 - .2 Apply detail mesh at reveals.
 - .1 Embed mesh in wet base coat and trowel from base of reveal to mesh edges.
 - .3 Apply corner mesh at inside and outside corners.
 - .1 Embed mesh in wet base coat and trowel from corner of mesh edges.
 - .4 High impact mesh application: apply base coat over substrate to uniform thickness of approximately [3] mm.
 - .1 Work horizontally or vertically in 1000 mm strips, and immediately embed mesh into wet base coat by trowelling from centre to mesh edge.
 - .2 Butt mesh at seams.
 - .3 Mechanically fasten mesh.
 - .4 Allow basecoat to dry.
 - .5 Standard mesh application:
 - .1 Apply base coat over substrate, including areas with high impact mesh to uniform thickness of approximately 3mm.
 - .2 Work horizontally or vertically in 1000 mm strips, and immediately embed mesh into wet base coat by trowelling from centre to mesh edge.
 - .1 Mechanically fasten mesh.
 - .3 Overlap mesh 64 mm minimum at mesh seams and overlaps of detail mesh.
 - .4 Feather seams and edges.
 - .5 Double wrap inside and outside corners with minimum 64 mm overlap in each direction.
 - .1 Embed corner mat in wet base coat, allow to dry, then overlap up to corner with standard reinforcing mesh embedded in base coat.
 - .6 Avoid wrinkles in mesh.

- .7 Fully embed mesh so that no mesh colour shows through basecoat when dry.
- .8 Ensure minimum base coat thickness of 1.6 mm when dry.
 - .1 Re-skim base coat if 1.6 mm thickness not achieved during initial application.
 - .2 Allow base coat to thoroughly dry before applying primer or finish coat.
- .5 Finish Coat Application:
 - .1 Apply finish coat in accordance with manufacturer's written installation instructions.
 - .2 Prime dry base coat and allow to dry thoroughly before applying finish coat.
 - .3 Apply finish coat directly over base coat, or primed basecoat, only after base coat or primer has thoroughly dried.
 - .4 Apply finish by spray or trowel as recommended by manufacturer.
 - .5 Apply finish in continuous application, and work towards wet edge.
 - .6 Do not install separate batches of finish coat side by side.
 - .7 Do not apply finish into or over sealant joints.
 - .1 Apply finish to outside of wall only.
 - .8 Do not apply finish over irregular or unprepared surfaces.
 - .9 Apply textured or aggregate finishes to wall areas as indicated and in accordance with manufacturer's written instructions.

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.
 - .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 03 30 00 Cast-In-Place Concrete
- .3 Section 06 10 00 Rough Carpentry
- .4 Section 07 92 00 Joint Sealants

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.33-[M89], Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
 - .2 CAN/CGSB-51.34-[M86], Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

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 vapour retarders and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two (2) copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.
- .3 Certificates:
 - .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

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.
- .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 from nicks and scratches.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 SHEET VAPOUR BARRIER

- .1 Above Grade Applications:
 - .1 Polyethylene film: to CAN/CGSB-51.34.
 - .1 Thickness: 0.15mm
 - .2 Vapour permeance: not greater than 45 ng/(P·s·m²)
 - .3 Flame spread rating: less than 150 to CAN/ULC S102
 - .2 Below Grade / Concrete Slab Applications:
 - .1 Polyolefin resin membrane: to ASTM E-1745
 - .1 Thickness: 0.10mm
 - .2 Vapour permeance: not greater than 1 ng/(P·s·m²)
 - .3 Puncture resistance: ASTM D1709, >3,500 grams

2.2 ACCESSORIES

- .1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.
- .2 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer. Refer to Section 07 92 00 - Joint Sealants.
- .3 Staples: minimum 6 mm leg.
- .4 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Ensure services are installed and inspected prior to installation of retarder.
- .2 Install sheet vapour retarder on warm side of exterior wall, and ceiling assemblies prior to installation of

gypsum board to form continuous retarder.

- .3 Use sheets of largest practical size to minimize joints.
- .4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

3.3 EXTERIOR SURFACE OPENINGS

- .1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

3.4 PERIMETER SEALS

- .1 Seal perimeter of sheet vapour barrier as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.
 - .3 Install staples through lapped sheets at sealant bead into wood substrate.
 - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.5 LAP JOINT SEALS

- .1 Seal lap joints of sheet vapour barrier as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
 - .4 Install staples through lapped sheets at sealant bead into wood substrate.
 - .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.6 ELECTRICAL BOXES

- .1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
 - .1 Install moulded box vapour barrier. Wrap boxes with film sheet providing minimum 300 mm perimeter lap flange.
 - .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

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.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 07 31 16 Metal Shingles
- .3 Section 01 78 00 Closeout Submittals
- .4 Section 07 62 00 Sheet Metal Flashing And Trim

1.2 REFERENCES

- .1 American Society for Testing Materials (ASTM)
 - .1 ASTM D5034 Standard Test Method for Breaking Load and Elongation of Textile Fabrics
 - .2 ASTM E398 – Standard Test Method for Water Vapor Transmission Rate of Sheet Materials Using Dynamic Relative Humidity Measurement
 - .3 ASTM E2178 - Standard Test Method for Air Permeance of Building Materials. Meets Air Barrier Association of America (ABAA) requirements for “Adhesive Backed Commercial Building Wraps”
 - .4 AC48 Acceptance Criteria for Roof Underlayments for use in severe climate areas
 - .5 AC207 Acceptance Criteria for Polypropylene Roof Underlayments
 - .6 ASTM D4869 – Test for Liquid Water Transmission to ASTM D4869
 - .7 ASTM D3462 – Standard Test Method for Fastener Pull-through Resistance

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit duplicate samples of roofing underlayment: sample size 300mm square.

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.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.
 - .2 Protect roofing underlayment from damage.
 - .3 Replace defective or damaged materials with new.
- .3 Roofing underlayment is not to be exposed to temperatures beyond those specified by the manufacturer.

1.5 WARRANTY

- 1 Provide manufacturer's standard warranty of underlayment system for a period of twenty (20) years from the date of purchase. Refer to Section 01 78 00 – Closeout Submittals.

2 PRODUCTS

2.1 MATERIALS

- 1 Self-adhered water resistant vapour permeable roof underlayment membrane:
 - .1 Materials: UV stabilized spun-bonded polypropylene
 - .2 Dimensions: 0.022 inches (0.56 mm) thick and inches (1.5 m) wide and 97.06 oz/ft² (257 g/m²).
 - .3 Adhesive: 100% coverage on back side of membrane (not spot applied), vapor permeable, with zero VOC's.
 - .4 Air Leakage: <0.00002 cfm/ft² @ 1.57 psf (<0.0001 L/s·m² @ 75 Pa) when tested in accordance with ASTM E2178
 - .5 Water vapour permeance: to ASTM E398: minimum of 51 perms (359 g/m² • 24hrs)
 - .6 Acceptable Products: Slopeshield SA as manufactured by *VaproShield* or equivalent approved by Departmental Representative.

2.2 ACCESSORIES:

- .1 Transition and flashing membrane: type recommended by the manufacturer.
- .2 Penetration Sealants: type recommended by the manufacturer.

3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 All surfaces must be dry, sound, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the fully self-adhered roof underlayment membrane. Fill voids and gaps greater than 7/8 inch (22 mm) in width, in substrate to provide an even surface.

- .2 All surfaces must be dry, sound, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the fully self-adhered roof underlayment membrane. Fill voids and gaps greater than 7/8 inch (22 mm) in width, in substrate to provide an even surface.
- .3 Ensure all preparatory work, including installation of mechanical and electrical penetrations and fixtures are complete and secured in-place prior to applying fully self-adhered roof underlayment membrane.

3.3 PROTECTION

- .1 All surfaces must be dry, sound, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the fully self-adhered roof underlayment membrane. Fill voids and gaps greater than 7/8 inch (22 mm) in width, in substrate to provide an even surface.
- .2 Protect and Cover membrane as soon as practical.
- .3 Repair damaged water-resistive roof underlayment membrane. Measure and pre-cut roof underlayment membrane to cover damaged area with minimum 305mm overlap to the sides and bottom. Roll membrane to ensure positive contact.
- .4 Remove and replace roof underlayment membrane affected by chemical spills or surfactants

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

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 61 00 Common Product Requirements
- .3 Section 01 78 00 Closeout Submittals
- .4 Section 07 30 05.01 Roofing Underlayment
- .5 Section 07 62 00 Sheet Metal Flashing And Trim
- .6 Section 07 72 26 Ridge and Soffit Vents
- .7 Section 07 92 00 Joint Sealants

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-S136-2007 – North American Specification for the Design of Cold-Formed Steel Structural Members
- .2 CSA International
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .3 American Society for Testing Materials (ASTM)
 - .1 ASTM A792/A792-09M-09a – Standard Specification for Sheet Steel, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process

1.3 SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit duplicate samples of roofing underlayment: sample size 300mm square

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.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.
 - .2 Protect metal shingles from damage.
 - .3 Replace defective or damaged materials with new.
- .3 Submit test reports showing compliance with specified performance characteristics and physical properties.

- .2 Material should be ordered in enough advance to ensure a consistent batch to avoid colour mismatch.

1.5 WARRANTY

- 1 Provide manufacturer's standard warranty of metal shingles for a period of fifty (50) years from the date of purchase. Refer to Section 01 78 00 – Closeout Submittals.

2 PRODUCTS

2.1 MATERIALS

- .1 Aluminium-zinc alloy coated sheet steel shingles with PVDF paint coating prefinished system to ASTM A792/A792M;
 - .1 Dimensions: 304mm x 987mm
 - .2 Thickness: 29 gauge
 - .3 Finish: pre-finished with resin paint system
 - .4 Base metal: to ASTM A792M, Grade 33
 - .5 Fasteners: concealed
 - .6 Acceptable Products: Wakefield Bridge Steel Shingles as manufactured by *Ideal Roofing* or equivalent approved by the Departmental Representative.
 - .7 Colour: Black Mica

2.2 ACCESSORIES

- .1 Fascia trim, valley flashing and all other components required to for complete installation per the manufacturer's installation instructions
- .2 Underlayment: refer to Section 07 27 27
- .3 Plastic cement: to CAN/CGSB-37.5
- .4 Washers: of same material as sheet metal, 1 mm thick with rubber packings
- .5 Touch-up Paint: As recommended by the manufacturer

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal shingle 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.
- .2 Confirm that all roof penetrations have been completed and coordinate with the necessary parties to ensure

proper impermeability.

3.2 INSTALLATION

- .1 All insulation is to be installed in compliance with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions and data sheets.
- .2 Use concealed fastenings except where approved by Departmental Representative.
- .3 Provide underlayment and eave protection under metal shingles. Secure in place and lap joints a minimum of 100mm.

3.3 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.

3.4 PROTECTION

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

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 61 00 Common Product Requirements
- .3 Section 01 78 00 Closeout Submittals
- .4 Section 06 10 00 Rough Carpentry
- .5 Section 07 62 00 Sheet Metal Flashing And Trim
- .6 Section 07 92 00 Joint Sealants

1.2 REFERENCES

- .1 American Society for Testing Materials (ASTM)
 - .1 ASTM C 1185 - Standard Test Methods for Sampling and Testing Non Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards; 1999.
 - .2 ASTM-E119, Standard Methods of Fire Tests of Building Construction and Materials.
 - .3 ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
 - .4 ASTM C1186 - Standard Specification for Flat, Non-Asbestos, Fiber-Cement Sheets
- .2 Underwriters Laboratory of Canada (ULC)
 - .1 CAN/ULC-S101, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
- .3 National Fire Protection Agency (NFPA)
 - .1 NFPA-251, Fire Tests of Building Construction and Materials.

1.3 SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit duplicate samples of fibre cement siding; sample size 300mm square
 - .2 Submit duplicate samples of fibre cement trim 75mm long for each material specified
 - .3 Submit colour sample for review by Departmental Representative.

1.4 QUALITY ASSURANCE

- .1 Submit test reports showing compliance with specified performance characteristics and physical properties.

1.5 WARRANTY

- 1 Provide manufacturer's standard warranty of fibre cement siding and trim for a period of thirty (30) years from the date of purchase. Refer to Section 01 78 00 – Closeout Submittals.

- .2 Provide manufacturer's non-pro-rated 30 year warranty providing coverage against hail and termite damage and defects in materials and workmanship.
- .3 Provide manufacturer's 15 year warranty providing coverage against peeling, cracking, and chipping of panel finish.

1.6 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:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
 - .2 Protect fibre cement siding from damage.
 - .3 Replace defective or damaged materials with new.
- .3 Submit test reports showing compliance with specified performance characteristics and physical properties.

2 PRODUCTS

2.1 MATERIALS

- .1 Fibre Cement Vertical Panel System to ASTM C1186, Grade A, Type II
 - .1 Composition: formulated from Portland cement, ground sand, cellulose fibres, additives and water formed under pressure.
 - .2 Thickness: 8mm
 - .3 Panel dimensions: 1219x2438mm
 - .4 Flame spread: developed rating of 0/5, tested to ASTM E84
 - .5 Acceptable Products: HardiePanel Vertical Siding as manufactured by *James Hardie*, or equivalent approved by Departmental Representative.
 - .6 Texture: Select Cedarmill (simulated wood grain)
 - .7 Colour: Iron Gray
- .2 Fibre Cement Architectural Trim
 - .1 19x184mm, colour Iron Gray
 - .2 30x89mm, colour Iron Gray
- .3 Fasteners: type recommended by the manufacturer.
- .4 Sealants: refer to Section 07 92 00 Joint Sealants.
- .5 Edge Sealer: type recommended by the manufacturer.
- .6 Touch-up Paint: colour matched by the siding manufacturer for on site applications.

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for fibre cement siding installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate/furring 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.
- .2 Confirm that all wall penetrations have been completed and coordinate with the necessary parties to ensure proper air tightness.

3.2 INSTALLATION

- .1 Provide minimum 200mm clearance from finish grade with exception to entrance and patio areas.
- .2 Seal all cladding penetrations in accordance with manufacturer's instructions.

3.3 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.

3.4 PROTECTION

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

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 04 43 13 Stone Masonry Veneer
- .3 Section 06 10 00 Rough Carpentry
- .4 Section 07 31 16 Metal Shingles
- .5 Section 07 46 46 Fibre Cement Siding
- .6 Section 07 72 26 Ridge and Soffit Vents
- .7 Section 07 92 00 Joint Sealants

1.2 REFERENCES

- .1 The Aluminum Association Inc. (AAI)
 - .1 AAI-Aluminum Sheet Metal Work in Building Construction-2002.
 - .2 AAI DAF45-03, Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 167-99(2004), Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM A 240/A 240M-07e1, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - .3 ASTM A 606-04, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
 - .4 ASTM A 653/A 653M-07, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 ASTM A 792/A 792M-06a, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .6 ASTM B 32-04, Standard Specification for Solder Metal.
 - .7 ASTM B 370-03, Standard Specification for Copper Sheet and Strip for Building Construction.
 - .8 ASTM D 523-89(1999), Standard Test Method for Specular Gloss.
 - .9 ASTM D 822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual [1997].
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
 - .2 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA A123.3-05, Asphalt Saturated Organic Roofing Felt.
 - .2 AAMA/WDMA/CSA 101/I.S.2/A440-2008, Standard/Specification for Windows, Doors, and Unit Skylights.

- .3 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .6 Green Seal Environmental Standards
 - .1 Standard GS-03-93, Anti-Corrosive Paints.
 - .2 Standard GS-11-97, Architectural Paints.
 - .3 Standard GS-36-00, Commercial Adhesives.
- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two (2) copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .4 Samples:
 - .1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes and colours.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meetings: convene pre-installation meeting one (1) week prior to beginning work of this Section and on-site installation, with contractor's representative and Departmental Representative in accordance with Section 01 32 16 - Construction Progress to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

2 PRODUCTS

2.1 SHEET METAL MATERIALS

- .1 Zinc coated steel sheet: 0.455 mm thickness, commercial quality to ASTM A 653/A 653M, with Z275 designation zinc coating.
- .2 Stainless steel sheet: to ASTM A 167 and ASTM A 240/A 240M], Type 304 with satin finish.
- .3 Aluminum sheet: proprietary utility, 0.213 mm minimum thickness.

2.2 PREFINISHED STEEL SHEET

- .1 Prefinished steel with factory applied polyvinylidene fluoride.
 - .1 Class F1S.
 - .2 Colour selected by Departmental Representative from manufacturer's standard range.
 - .3 Specular gloss: 30 units +/- in accordance with ASTM D 523.
 - .4 Coating thickness: not less than 22 micrometres.
 - .5 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20 % to ASTM D 822 as follows:
 - .1 Outdoor exposure period 2500 hours.
 - .2 Humidity resistance exposure period 5000 hours.

2.3 PREFINISHED ALUMINUM SHEET

- .1 Finish: factory applied coating to CAN/CGSB-93.1 supplemented and amended as follows:
 - .1 Type 1.
 - .2 Class F1S.
 - .3 Colour selected by Departmental Representative from manufacturer's standard range.
 - .4 Specular gloss: 30 units.
 - .5 Coating thickness: not less than 22 micrometres.
 - .6 Outdoor exposure period: 3 years.
 - .7 Exposure period for humidity resistance: 2500 hours.
 - .8 Exposure period for salt spray resistance: 5000 hours.
- .2 Thickness specified for prefinished aluminum sheet applies to base metal.

2.4 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CAN/CGSB 37.5.
- .3 Underlay for metal flashing: asphalt laminated 3.6 to 4.5 kg kraft paper.
- .4 Sealants: refer to Section 07 92 00
- .5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.

- .6 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for [metal flashing] application.
- .7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .8 Touch-up paint: as recommended by prefinished material manufacturer.

2.5 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work as indicated.
- .2 Fabricate aluminum flashings and other sheet aluminum work in accordance with AAI-Aluminum Sheet Metal Work in Building Construction.
- .3 Form pieces in 2400 mm maximum lengths.
 - .1 Make allowance for expansion at joints.
- .4 Hem exposed edges on underside 12 mm.
 - .1 Mitre and seal corners with sealant.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.6 METAL FLASHINGS

- .1 Form flashings, copings and fascias to profiles indicated of 0.455mm thick galvanized prefinished.

2.7 REGLETS AND CAP FLASHINGS

- .1 Form metal cap flashing of 0.213 mm thick sheet metal work for base flashings as detailed.
 - .1 Provide slotted fixing holes and steel/plastic washer fasteners.
 - .2 Cover face and ends with plastic tape.

2.8 ALUMINUM FINISHES

- .1 Finish exposed surfaces of aluminum components in accordance with AA DAF45.
 - .1 As fabricated or colour to match Department Representative's sample

3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install sheet metal work in accordance with CRCA FL series details and AAI-Aluminum Sheet Metal Work in Building Construction.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal.
 - .1 Secure in place and lap joints 100 mm.
- .4 Lock end joints and caulk with sealant.
- .5 Install surface mounted reglets true and level, and caulk top of reglet with sealant.
- .6 Insert metal flashing into reglets or under cap flashing to form weather tight junction.
- .7 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.
- .8 Caulk flashing at reglet and cap flashing with sealant.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 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.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 06 10 00 Rough Carpentry
- .3 Section 07 31 16 Metal Shingles
- .4 Section 07 62 00 Sheet Metal Flashing And Trim
- .5 Section 07 92 00 Joint Sealants

1.2 REFERENCES

- .1 The Aluminum Association Inc. (AAI)
 - .1 Aluminum Sheet Metal Work in Building Construction.
 - .2 AAI DAF45-03, Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A792/A792M, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .3 ASTM D523, Standard Test Method for Specular Gloss.
 - .4 ASTM D822, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .3 Canadian General Standards Board (CGBS)
 - .1 CAN/CGSB-37.5, Cutback Asphalt Plastic Cement.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA B111, Wire Nails, Spikes and Staples.

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.
- .2 Samples:
 - .1 Submit duplicate 50 x 50mm samples of each type of sheet metal material, colour and finish.
- .3 Clearly indicate bending, folding, jointing, fastening installation details.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Store products off ground and cover in a dry, well ventilated enclosure.
- .3 Provide protection for galvanized and pre-coated surfaces.
- .4 Prevent contact of dissimilar metal during storage. Protect from acid, flux and other corrosive materials and elements.

2 PRODUCTS

2.1 MATERIALS

- .1 Sheet aluminium 0.64mm thick. Colour as selected by Departmental Representative.
- .2 Trough size: 125 mm wide
- .3 Trough Supports: continuous aluminum with a perforated aluminum cover that covers the complete trough to prevent debris from getting stuck in the trough and downpipe.
- .4 Downpipes: 0.64 mm thick aluminum.
- .5 Downpipe straps: 0.72 mm thick aluminum.
- .6 Sealant: As per Section 07 92 00 – Joint Sealants.
- .7 Elbows and tees: aluminum same as trough.

2.2 FABRICATION

- .1 Fabricate sheet aluminum work in accordance with Aluminum Association Aluminum Sheet Metal Work in Building Construction.
- .2 Fabricate eavestrough in continuous length up to a maximum length of 12 metres.
- .3 Form eavestrough to an Ogee profile, 125 mm wide and a 305 mm girth.

3 EXECUTION

3.1 INSTALLATION

- .1 Install trough supports/debris catchers to provide a continuous slope to drain all water from the trough.
- .2 Cut opening in the trough to receive the downpipes.
- .3 Install the trough and snap in to the supports (no exposed screws or nails permitted). Install elbows and tees as required. Provide for expansion joints to prevent warping where required.

- .4 Install aluminum downpipes to a distance of 1.5 metres from the grade. Install aluminum straps 1200 mm o.c designed to match the pipe profile and fasten to building with aluminum or stainless steel screws.
- .5 Install sewer type downpiping from the aluminum downpiping to a point 300 mm above the grade. Install aluminum straps designed to suit the pipe profile and fasten to the wall with aluminum or stainless steel screws.
- .6 Install sealant as required to ensure all joints are watertight.
- .7 When work is completed, provide a water test to ensure there are no leaks and that all the water runs from the trough.

3.2 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Leave works areas clean, free from grease, finger marks and stains.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 06 20 00 Finish Carpentry
- .3 Section 07 31 16 Metal Shingles
- .4 Section 07 62 00 Sheet Metal Flashing And Trim

1.2 REFERENCES

Standards Council of Canada (SCC):

- .1 CAN3-A93-M, "Natural Airflow Ventilators for Buildings"

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 including datasheets and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials in sufficient quantities to allow continuity of work.
- .3 Follow manufacturer's instructions and precautions for storage of materials.
- .4 Protect materials from physical damage in a clean, dry, well ventilated and protected location.

2 PRODUCTS

2.1 MATERIALS

- .1 Continuous Soffit Vents: refer to drawings for locations and limits
 - .1 Under eave installation
 - .2 Perforated aluminium sheet
 - .3 Dimensions: 51mm x 2438mm
 - .4 Profile: Leg Style
 - .5 Finish: Mill
 - .6 Acceptable products: Soffit vent model LSV8L by Masterflow or equivalent approved by Departmental Representative.

- .2 Continuous Ridge Vents: refer to drawings for locations and limits
 - .1 Shingle over ridge vent
 - .2 Aluminum construction
 - .3 Dimensions: 3048mm length
 - .4 Finish: Colour black
 - .5 Acceptable products: Ridgevent by *Masterflow*, equivalent by Ideal Roofing or other equivalent approved by Departmental Representative.

3 EXECUTION

3.1 INSTALLATION

- .1 Unless otherwise indicated, install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual."
- .2 Install ridge and soffit vents in compliance with manufacturer's written data, including product technical bulletins, product catalogue instructions, product carton installation instructions and data sheets.
- .2 Coordinate installation of ridge vents with metal roof shingles, underlayment and sheet metal flashing.
- .3 Coordinate installation of soffit vents with wood soffit and fascia flashing.

3.2 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

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 45 00 Quality Control
- .3 Section 09 21 16 Gypsum Board Assemblies

1.2 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-1995, Fire Tests of Fire stop Systems.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two (2) copies of WHMIS MSDS - Material Safety Data Sheets.
- .3 Shop Drawings:
 - .1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
 - .2 Construction details should accurately reflect actual job conditions.

- .4 Samples:
 - .1 Submit duplicate 300 x 300 mm samples showing actual fire stop material proposed for project.
- .5 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company specializing in fire stopping installations with five (5) years experience and approved by manufacturer.
- .2 Pre-Installation Meetings: convene pre-installation meeting one (1) week prior to beginning work of this Section, with contractor's representative and Departmental Representative in accordance with Section 01 32 16 - Construction Progress to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer and ULC markings.
- .2 Storage and Protection:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for recycling] in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

2 PRODUCTS

2.1 MATERIALS

- .1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended [and conforming to specified special requirements described in PART 3.
 - .2 Fire stop system rating: one (1) hour.
- .2 Service penetration assemblies: systems tested to CAN-ULC-S115.
- .3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.
- .4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .10 Sealants for vertical joints: non-sagging.

3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

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

3.3 INSTALLATION

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

3.4 SEQUENCES OF OPERATION

- .1 Proceed with installation only when submittals have been reviewed by Departmental Representative
- .2 Mechanical pipe insulation: certified fire stop system component.
 - .1 Ensure pipe insulation installation precedes fire stopping.

3.5 FIELD QUALITY CONTROL

- .1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.6 CLEANING

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

3.7 SCHEDULE

- .1 Fire stop and smoke seal at:
 - .1 Penetrations through fire-resistance rated gypsum board partitions and walls.
 - .2 Top of fire-resistance rated gypsum board partitions.

- .3 Control and sway joints in fire-resistance rated and gypsum board partitions and walls.
- .4 Around mechanical and electrical assemblies penetrating fire separations
- .5 Fire blocks in horizontal concealed spaces.
- .6 Openings and sleeves installed for future use through fire separations.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 45 00 Common Product Requirements
- .3 Section 06 40 00 Architectural Woodwork
- .4 Section 07 26 00 Vapour Retarders
- .5 Section 07 27 00 Air And Moisture Barriers
- .6 Section 07 46 46 Fibre Cement Siding
- .7 Section 07 62 00 Sheet Metal Flashing and Trim
- .8 Section 07 71 23 Manufactured Gutters and Downspouts

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM C 919-08, 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 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
 - .4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
 - .5 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).

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 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 Submit two (2) copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety

Requirements and 01 35 43 - Environmental Procedures.

- .3 Samples:
 - .1 Submit two (2) 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 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

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, labeled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect joint sealants from damage.
 - .3 Replace defective or damaged materials with new.

1.6 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Proceed with installation of joint sealants only when:
 - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
 - .2 Joint substrates are dry.
 - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .2 Joint-Width Conditions:
 - .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
 - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and provision of Material Safety Data Sheets (MSDS) acceptable to Health Canada.
- .2 Departmental Representative will arrange for ventilation system to be operated on maximum outdoor air and exhaust during installation of caulking and sealants. Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

2 PRODUCTS

2.1 SEALANT MATERIALS

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.
- .3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Selant Type A – Exterior non-traffic bearing, weather side of construction.
 - .1 Multi-component modified urethane base chemical curing conforming to CAN/CGSB-19.24, Type 1, Class B matched to adjacent materials or as selected by Departmental Representative.
- .2 Selant Type B – Interior non-traffic bearing
 - .1 Latex sealant, single-component, nonsag, mildew-resistant, paintable, acrylic-emulsion sealant complying with ASTM C 834.
- .3 Selant Type C – Sanitary
 - .1 Single component, chemical curing, mildew resistant, silicone conforming to CAN/CGSB-19.22M, containing non-toxic fungicidal agents .
- .4 Acoustical Sealant for Concealed Joints:
 - .1 Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound to ASTM C 919.
- .5 Preformed compressible and non-compressible back-up materials:
 - .1 Polyethylene, urethane, neoprene or vinyl foam:
 - .1 Extruded closed cell foam backer rod.

- .2 Size and shape to suit various conditions and manufactured specifically for caulking purposes
- .3 Bond breaker tape:
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 SEALANT SELECTION

- .1 Perimeters of exterior openings where frames meet exterior facade of building (i.e. brick, block, precast masonry): sealant type: A.
- .2 Expansion and control joints in exterior surfaces of poured-in-place concrete walls: sealant type: A
- .3 Joints between interior hollow metal doors and adjacent wall / partition: type B
- .4 Penetrations through roofs, floors or exterior wall other than firestopping: type A
- .5 Exterior joints in horizontal wearing surfaces (as itemized): sealant type: A.
- .6 Seal interior perimeters of exterior openings as detailed on drawings: sealant type: B.
- .7 Interior control and expansion joints in floor surfaces: Refer to 09 67 23.
- .8 Perimeters of interior frames, as detailed and itemized: sealant type: B.
- .9 Perimeter of bath fixtures (e.g. sinks, tubs, urinals, stools, water closets, basins, vanities): sealant type: C.
- .10 Exposed interior control joints in drywall: sealant type: B.

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.

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for joint sealants 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 SURFACE PREPARATION

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup

materials and sealants.

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

3.3 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.

3.4 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.

3.5 MIXING

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

3.6 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.

3.7 CLEANING

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

- .2 Clean adjacent surfaces immediately.
- .3 Remove excess and droppings, using recommended cleaners as work progresses.
- .4 Remove masking tape after initial set of sealant.

.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 21 - Construction/Demolition Waste Management and Disposal.

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

3.8 PROTECTION

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

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 06 10 00 Rough Carpentry
- .3 Section 07 24 29.03 Sprayed Insulation – Polyurethane Foam
- .4 Section 07 27 00 Air And Moisture Barriers
- .6 Section 07 62 00 Sheet Metal Flashing and Trim
- .7 Section 07 92 00 Joint Sealants
- .8 Section 08 80 50 Glazing
- .9 Section 09 21 16 Gypsum Board Assemblies
- .10 Section 09 91 13 Exterior Painting
- .11 Section 09 91 23 Interior Painting

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM A653/A653M, Specification for Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot Dip Process)
 - .2 ASTM B29-03, Standard Specification for Refined Lead.
 - .3 ASTM B749-03, Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
- .2 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating
 - .2 CGSB 41-GP-19Ma, Rigid Vinyl Extrusions for Windows and Doors
- .3 Canadian Standards Association (CSA)
 - .1 G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
 - .2 CSA W59, Welded Steel Construction (Metal Arc Welding)
- .4 Canadian Steel Door Manufacturers' Association, (CSDMA):
 - .1 CSDMA, Specifications for Commercial Steel Doors and Frames
 - .2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 80-99, Standard for Fire Doors and Fire Windows
 - .2 NFPA 252-03, Standard Methods of Fire Tests of Door Assemblies
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .2 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .3 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.
 - .4 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.3 DESIGN REQUIREMENTS

- .1 Design door assembly to withstand minimum 1,000,000 swing cycles in accordance with ANSI A151.1, with no failure of any design features of the door.
- .2 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C.
- .3 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.
- .4 Steel fire rated doors and frames: labeled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 and NFPA 252 for ratings specified or indicated.
- .5 Provide fire labeled frames for openings requiring fire protection ratings. Test products in conformance with CAN4-S104 and NFPA 252 and listed by nationally recognized agency having factory inspection services and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

1.4 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide shop drawings: in accordance with Section 01 33 00- Submittal Procedures.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, louvred, glazed, arrangement of hardware, fire rating and finishes.
 - .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings, reinforcing, fire rating and finishes.
 - .4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
- .3 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, louvred, arrangement of hardware and fire rating and finishes.
- .4 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing firerating and finishes.
- .5 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

- .6 Provide samples in accordance with Section 01 33 00- Submittal Procedures.
 - .1 Submit one 300 x 300 mm top corner sample of each type door
 - .1 Show glazing stops, snap-on trim with clips, butt cutout, 300 mm long removable mullion connection.

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 Deliver, handle and store doors and frames at the job site in such a manner as to prevent damage.
- .3 Store doors and frames under cover with doors stored in a vertical position on blocking, clear of floor and with blocking between doors to permit air circulation.

2 PRODUCTS

2.1 MATERIALS

- .1 Steel: commercial grade steel to ASTM A568/A568M-09a, Class 1, wiped coat galvanized to ASTM A527, coating designation ASTM A525, ZF75 typical.
- .2 Hot dipped galvanized steel sheet: to ASTM A653/A653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.
- .3 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653/A653M, ZF75.

2.2 DOOR CORE MATERIALS

- .1 Honeycomb construction:
 - .1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m³ minimum sanded to required thickness.
 - .2 Stiffened: face sheets welded insulated core.
 - .1 Fibreglass: to CAN/ULC-S702, semi-rigid
 - .2 Expanded polystyrene: CAN/ULC-S701, density 16 to 32 kg/m³
 - .3 Polyurethane: to CAN/ULC-S704 rigid, modified polyisocyanurate, closed cell board. Density 32 kg/m³
 - .3 Thermal Insulation material must:
 - .1 Not require being labelled as poisonous, corrosive, flammable or explosive under the Consumer Chemical and Container Regulations of the Hazardous Products Act.

.2 Be manufactured using a process that uses chemical compounds with the minimum zone depletion potential (ODP) available.

.3 Temperature rise rated (TRR): core composition to limit temperature rise on unexposed side of door to 250°C at 60 minutes. Core to be tested as part of a complete door assembly, in accordance with CAN4-S104, ASTM E152 or NFPA 252, covering Standard Method of Tests of Door Assemblies and listed by nationally recognized testing agency having factory inspection service.

2.3 ADHESIVES

.1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.

.2 Polystyrene and polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.

.3 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.4 PRIMER

.1 Touch-up prime CAN/CGSB-1.181.

2.5 PAINT

.1 Field paint steel doors and frames in accordance with Section[s] [09 91 23- Interior Painting], [09 91 13- Exterior Painting]. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

2.6 ACCESSORIES

.1 Door silencers: single stud rubber/neoprene type.

.2 Exterior top and bottom caps: steel

.3 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.4 Door bottom seal: Refer to Section 08 71 00 – Door Hardware

.5 Metallic paste filler: to manufacturer's standard.

.6 Fire labels: metal riveted.

.7 Sealant: Refer to Section 07 92 00 – Joint Sealants

.8 Provide low expanding, single component polyurethane foam sealant installed at head and jamb perimeter of door frame for sealing to building air barrier, vapour retarder and door frame. Foam sealant width to be adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder foam interior. Refer to Section 07 24 29.03 – Strayed Insulation – Polyurethane Foam.

.9 Glazing: Refer to Section 08 80 50 - Glazing

.10 Make provisions for [glazing]as indicated and provide necessary glazing stops.

.1 Provide removable stainless steel glazing beads for dry glazing of snap-on type.

- .2 Design exterior glazing stops to be tamperproof.

2.7 FRAMES FABRICATION GENERAL

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Exterior frames: 1.6 mm welded, thermally broken type construction.
- .4 Interior frames: 1.6mm welded type construction.
- .5 Blank, reinforce, drill and tap frames for mortised, templated hardware, [electronic hardware]using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .6 Protect mortised cutouts with steel guard boxes.
- .7 Prepare frame for door silencers, 3 for single door, 2 at head for double door.
- .8 Manufacturer's nameplates on frames and screens are not permitted.
- .9 Conceal fastenings except where exposed fastenings are indicated.
- .10 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .11 Insulate exterior frame components with low expansion polyurethane insulation.

2.8 FRAME ANCHORAGE

- .1 Shim and anchor new doors in accordance with CAN/CSA A440.4.
- .2 Provide appropriate anchorage to floor and wall construction.
- .3 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .4 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
- .5 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm o.c. maximum.

2.9 FRAMES: WELDED TYPE

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.10 FRAMES: KNOCKED-DOWN TYPE

- .1 Ship knocked-down type frames unassembled.

- .2 Provide frames with mechanical joints which inter-lock securely and provide functionally satisfactory performance when assembled and installed in accordance with CSDMA Recommended Installation Guide for Steel Doors and Frames.
- .3 Securely attach floor anchors to inside of each jamb profile.

2.11 FRAMES: SLIP-ON TYPE

- .1 Ship slip-on type frames unassembled.
- .2 Provide frames with mechanical joints which inter-lock securely and provide functionally satisfactory performance when installed in accordance with CSDMA Recommended Installation Guide for Steel Doors and Frames and manufacturers' instructions.
- .3 Provide slip-on frames with manufacturers' proprietary design of wall anchorage comprising single, adjustable tension type per jamb and provision for secure attachment of each jamb base to stud runners.

2.12 DOOR FABRICATION GENERAL

- .1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.
- .2 Exterior doors: insulated, hollow steel construction. Interior doors: hollow steel honeycomb construction.
- .3 Fabricate doors with longitudinal edges locked seam. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.
- .4 Doors: manufacturers' proprietary construction, tested and/or engineered as part of a fully operable assembly, including door, frame, gasketing and hardware in accordance with ASTM E330.
- .5 Blank, reinforce, drill doors and tap for mortised, templated hardware electronic hardware.
- .6 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .7 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .9 Provide fire labeled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with NFPA 252, CAN4-S104, ASTM E152 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .10 Manufacturer's nameplates on doors are not permitted.

2.13 HOLLOW STEEL CONSTRUCTION

- .1 Form face sheets for exterior doors from 1.6 mm sheet steel.
- .2 Form face sheets for interior doors from 1.6 sheet steel.
- .3 Reinforce doors with vertical stiffeners, securely welded to face sheets at 150 mm on centre maximum.
- .4 Fill voids between stiffeners of exterior doors with insulation as specified.
- .5 Fill voids between stiffeners of interior doors with honeycomb core.

2.14 THERMALLY BROKEN DOORS AND FRAMES

- .1 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.
- .2 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.
- .3 Fabricate thermally broken frames separating exterior parts from interior parts with continuous interlocking thermal break.
- .4 Apply insulation.

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of frames previously installed under other Sections or Contracts are acceptable for door installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect framing and frames 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 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION GENERAL

- .1 Install labeled steel fire rated doors and frames to NFPA 80 except where specified otherwise.
- .2 Install doors and frames to CSDMA Installation Guide.

3.4 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Caulk perimeter of frames between frame and adjacent material.
- .6 Maintain continuity of air barrier and vapour retarder.

3.5 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latch side and head: 1.5 mm.
 - .3 Finished floor: 13 mm.
- .3 Adjust operable parts for correct function.
- .4 Install louvres.

3.6 FINISH REPAIRS

- .1 Touch up with primer finishes damaged during installation.
- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.7 GLAZING

- .1 Install glazing for doors and frames in accordance with Section 08 80 50 – Glazing.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 06 10 00 Rough Carpentry
- .3 Section 08 71 00 Door Hardware
- .4 Section 09 91 13 Exterior Painting

1.2 REFERENCES

- .1 Window and Door Manufacturer's Association (WDMA):
 - .1 WDMA I.S.6, "Industry Standard for Wood Stile and Rail Doors and AWI's "Architectural Woodwork Quality Standards."

1.3 SUBMITTALS

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Submit product data, including details of construction and factory finishing specifications, including installation instructions and recommendations for painting and maintenance requirements.
- .3 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.
 - .2 Protect wood screen doors from damage.
 - .3 Replace defective or damaged materials with new.
- .4 Submit test reports showing compliance with specified performance characteristics and physical properties.

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.
- .2 Deliver, handle and store doors and frames at the job sit in such a manner as to prevent damage.
- .3 Store doors and frames under cover with doors stored in a vertical position on blocking, clear of floor and with blocking between doors to permit air circulation.

2 PRODUCTS

2.1 MATERIALS

- .1 Exterior Porch Entrance Doors:
 - .1 Panels: solid, 35mm thick stiles and rails wood openings for insect screening

- .2 Insect screening mesh: count 18x14
- .3 Hardware: Refer to Section 08 71 00 – Door Hardware
- .4 Acceptable products: Elmwood Wood Screen Door by *Amherst Moulding Inc.* or equivalent approved by Departmental Representative.

2.2 DOOR FABRICATION AND FINISHING

- .1 Factory fit doors to suit frame-opening sizes and to comply with referenced quality standard
 - .1 Provide 3mm clearance at jambs, heads, and meeting stiles and 13mm at bottom. At thresholds, provide 9mm clearance.
 - .2 Factory machine doors for hardware that is not surface applied
 - .3 Factory treat exterior doors after fabrication with water repellent to comply with WDMA I.S.4
 - .4 Factory finish wood doors with manufacturer's standard stain and two-coat conversion varnish finish in color selected by Departmental representative

3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Install wood door frames level, plumb, true, and aligned with adjacent materials. Countersink fasteners, fill surface flush, and sand smooth.
- .2 Align and fit doors in frames with uniform clearances and bevels indicated below. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 - .1 Provide 3mm clearance at jambs, heads, and meeting stiles and 3mm at bottom. At thresholds, provide 6mm clearance from bottom of door.
- .3 Align factory-fitted doors in frames for uniform clearances.
- .4 Repair, refinish, or replace factory-finished doors damaged during installation as directed by Departmental Representative.

END OF SECTION

PARKS CANADA
Point Pelee National Park
Camp Henry Renewal
Leamington, ON

WOOD SCREEN DOORS

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PART 1 – GENERAL

1.1 REFERENCES

- .1 Green Seal Environmental Standards (GS)
 - .1 GS-11-2008, 2nd Edition, Paints and Coatings.

1.2 ACTIONS AND INFORMATION SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for [access door components] and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Submit catalogue details for each type of door illustrating profiles, dimensions and methods of assembly.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit 1 of each type of hand entry access door.
 - .4 Submit one 300 x 300 mm corner sample of each type of body entry door.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for cleaning and maintenance of stainless steel finishes for incorporation into manual.

14. DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 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 off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect access doors from nicks, scratches, and blemishes.
 - .3 Apply temporary protective coating to finished surfaces. Remove coating after installation.
 - .1 Use coatings in accordance with manufacturer's written instructions that are easily removable.
 - .2 Leave protective coating in place until final cleaning of building.
- .4 Replace defective or damaged materials with new.

PART 2 – EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Installation: locate access doors within view of equipment and ensure equipment is accessible for operating, inspecting, adjusting, servicing without using special tools.
 - .1 Tiled surfaces: in accordance with Section 09 30 13.
 - .2 Install gypsum board surfaces: in accordance with Section 09 21 00.

3.3 CLEANING

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

- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 78 00 Closeout Submittals
- .3 Section 06 10 00 Rough Carpentry
- .4 Section 07 24 29.03 Sprayed Insulation – Polyurethane Foam
- .5 Section 07 26 00 Vapour Retarders
- .6 Section 07 27 00 Air And Moisture Barriers
- .7 Section 07 92 00 Joint Sealants
- .8 Section 08 80 50 Glazing

1.2 REFERENCES

- .1 Aluminum Association (AA):
 - .1 AA-DAF 45, Designation System for Aluminum Finishes
- .2 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-1.40, Anticorrosive Structural Steel Alkyd Primer
 - .2 CAN/CGSB-79.1, Insect Screens
- .3 Canadian Standards Association (CSA):
 - .1 CSA-A440-00/A440.1, A440, Windows / Special Publication A440.1, User Selection Guide to CSA Standard A440, Windows
 - .2 CAN/CSA-Z91, Health and Safety Code for Suspended Equipment Operations

1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate materials and details in full size scale for head, jamb and sill, profiles of components, interior and exterior trim junction between combination units, elevations of unit, anchorage details, location of isolation coating, description of related components and exposed finishes fasteners, and caulking. Indicate location of manufacturer's nameplates.
- .3 Shop drawings to indicate continuation of air barrier and vapour barrier between wall assembly and aluminum window.
- .4 Submit one complete full size window sample of each type window.
- .5 Include frame, sash, sill, glazing and weatherproofing method, insect screens, surface finish and hardware. Show location of manufacturer's nameplates.
- .6 Include 150 mm long samples of head, jamb, sill, meeting rail mullions to indicate profile.

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 Deliver, handle and store windows at the job sit in such a manner as to prevent damage.
- .3 Store doors and frames under cover with windows stored in a vertical position on blocking, clear of floor and with blocking between windows to permit air circulation.

1.6 TEST REPORTS

- .1 Submit test reports from approved independent testing laboratories, certifying compliance with specifications, for:
 - .1 Windows classifications
 - .2 Air tightness
 - .3 Water tightness
 - .4 Wind load resistance
 - .5 Condensation resistance
 - .6 Forced entry resistance
 - .7 Insect screens
 - .8 Glazing
 - .9 Sash strength and stiffness
 - .10 Ease of operation - windows with operable lights
 - .11 Mullion deflection - combination and composite windows
 - .12 Anodized finish

1.7 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for windows for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.8 WARRANTY

- .1 Provide a written warranty for work under this section from manufacturer for failure due to defective materials and from contractor for failure due to defective installation and workmanship, for five (5) years respectively from the date of Substantial Completion.

2 PRODUCTS

2.1 MATERIALS

- .1 Materials: to CSA-A440/A440.1 supplemented as follows:
 - .2 All aluminum windows by same manufacturer.
 - .3 Sash: aluminum thermally broken.
 - .4 Main frame: aluminum thermally broken.
 - .5 Glass: Refer to Section 08 80 50 – Glazing.
 - .6 Screens: to CAN/CGSB-79.1.
 - .1 Insect screening mesh: count 18 x 14
 - .2 Fasteners: tamper proof

- .3 Screen frames: aluminum, colour to match window frames
- .4 Mount screen frames for exterior replacement.
- .5 Provide screens to cover operable portion of window.
- .7 Exterior metal sills: extruded aluminum of type and size to suit job conditions; minimum 3 mm thick, complete with joint covers, jamb drip deflectors, chairs, anchors, anchoring devices.
- .8 Isolation coating: alkali resistant bituminous paint.

2.2 FIXED WINDOWS

- .1 Frame: extruded aluminium to ASTM B221, with a total frame depth of 133.4mm
- .2 Interior Colour: clear Anodized
- .3 Exterior Colour: black
- .4 Glazing: thermally broken glass unit – refer to Section 08 80 50 Glazing
- .5 Acceptable Products: Shadowline 970 Series as manufactured by *Alumicor Ltd* or equivalent approved by Departmental Representative

2.3 OPERABLE WINDOWS

- .1 Main frame: extruded aluminium to ASTM B221, with a total frame depth of 133.4mm
- .2 Operation: vertical casement and awning with operable orientation as indicated on the drawings
- .3 Interior Colour: Clear Anodized
- .4 Exterior Colour: Black
- .5 Casement Operation: equip each SHOO window with crank operated, single lever type roto-operator
- .6 Awning Operation: Equip each THPO operable window with 2 locking claw handles or cam handle locks with plated finish
- .7 Hinges: concealed
- .8 Glazing: thermally broken glass unit – refer to Section 08 80 50 Glazing
- .9 Screen: to CAN/CGSB-79.1
- .10 Acceptable products: Univent 1350 Series as manufactured by *Alumicor Ltd* or equivalent approved by Departmental Representative.

2.4 FABRICATION

- .1 Fabricate in accordance with CSA-A440/A440.1
- .2 Fabricate units square and true with maximum tolerance of plus or minus 1.5mm for units with a diagonal measurement of 1800 mm or less and plus or minus 3.0mm for units with a diagonal measurement over 1800mm.
- .3 Face dimensions detailed are maximum permissible sizes.
- .4 Brace frames to maintain squareness and rigidity during shipment and installation.
- .5 Finish steel clips and reinforcement with 380 g/m² zinc coating to CAN/CGSB-1.40.

2.5 ALUMINIUM FINISHES

- .1 Finish exposed surfaces of aluminium components in accordance with Aluminum Association Designation System for Aluminium Finishes.
 - .1 Integral colour anodic finish: designation AA- M32, C12, C22, A42, colour to match sample

2.6 ISOLATION COATING

- .1 Isolate aluminum from following components, by means of isolation coating:
 - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area
 - .2 Concrete, mortar and masonry
 - .3 Wood

2.7 GLAZING

- .1 Glaze windows in accordance with CSA-A440/A440.1 and Section 08 80 00 – Glass and Glazing.

2.8 HARDWARE

- .1 Hardware: stainless steel or white bronze sash locks and aluminum handles to provide security and permit easy operation of units.
- .2 Locks: provide operating sash with spring loading extruded aluminum sash locks, to provide automatic locking in closed position. Provide CMR sweep locks at meeting rail
- .3 Where windows latching devices are located in excess of 1600 mm above floor level:
 - .1 Equip vertical sliding units with ring pull at top sash. Provide operating pole of length required, complete with appropriate tip to suit ring pull. Provide one (1) pole for each room where vent sash occurs.
- .4 Vertical slider windows are not required to have inward tilt action. All vertical slider windows provided for this project are to have the inward tilt action mechanism disabled prior to delivery to the project site.

2.9 AIR BARRIER AND VAPOUR BARRIER

- .1 Provide low expanding, single component polyurethane foam sealant installed at head, jamb and sill perimeter of window for sealing to building air barrier, vapour retarder and window frame. Foam sealant width to be adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder foam interior. Refer to Section 07 21 29.03 – Foamed-In-Place Insulation.

3 EXECUTION

3.1 WINDOW INSTALLATION

- .1 Install in accordance with CSA-A440.
- .2 Arrange components to prevent abrupt variation in colour.

- .3 Install shims between windows and building frame at each installation screw location. Shim and fasten windows in accordance with manufacturer's recommendations and CAN/CSA A440.4.
- .4 Lines and Grades: Obtain bench marks for elevations and building line offset marks for alignment on each floor level. Should any error be found in their location, notify the Owner's Representative in writing. Do not proceed with installation work in the affected area until the errors have been corrected.
- .5 Prior Inspection of the Structure: After lines and grades have been established, and before beginning installation in any area, examine all parts of the structure on which work of this section is to be placed in that area. Should any conditions be found which will prevent the proper execution of work, report such conditions in writing to the Consultant. Do not proceed with installation work until such conditions are corrected or adjusted to the satisfaction of the Owner's Representative and the installation Contractor.
- .6 Workmanship: Erect windows and all parts of the curtain wall plumb and true, in proper alignment and relationship to established lines and grades, as shown on reviewed shop drawings. Make the finished work rigid, neat in appearance, free from defects.
- .7 Erection Tolerances: Erect the work within the following tolerances:
 - .1 Maximum variation from plane or location shown on reviewed shop drawings: 1/8" (3mm) per 10'-0" (3000mm) of length or 6 mm in any total length.
 - .2 Maximum offset from true alignment between two identical members abutting end to end in line or by side: 1/32" (0.8 mm).
- .8 Self-Adhered Air and Vapour Transitions: Seal all joints required for a weatherproof installation and against air/vapour leakage. Use materials in strict accordance with the manufacturer's printed instructions, and apply only by mechanics specially trained or experienced in their use. Before applying sealants or compressible foam air seal, completely remove all mortar, dirt, dust, moisture and other foreign matter from surfaces it will contact.

3.2 GLAZING

- .1 Accurately measure glass openings and calculate glass size based on manufacturer's installation tables allowing for proper minimum edge engagement, rabbet width, rabbet depth, and expansion.
- .2 Before glazing, verify openings to see that they are square, plumb, and in true planes. If found otherwise, do not proceed with glazing until proper corrections are made.
- .3 Set insulating glass lites on setting blocks placed at 1/4 points from each corner of glass.

3.3 SILL INSTALLTION

- .1 Install metal sills with uniform wash to exterior, level in length, straight in alignment with plumb upstands and faces. Use one piece lengths at each location.
- .2 Cut sills to fit window opening.
- .3 Secure sills in place with anchoring devices located at ends joints of continuous sills and evenly spaced 600 mm o/c in between.
- .4 Fabricate and install sills to provide minimum 2% slope away from window.
- .5 Fasten drip deflectors with self tapping stainless steel screws.

- .6 Maintain 6.0 to 9.0 mm space between butt ends of continuous sills. For sills over 1200 mm in length, maintain 3.0 to 6.0 mm space at each end.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- | | | |
|----|------------------|-----------------------------|
| .1 | Section 01 33 00 | Submittal Procedures |
| .2 | Section 01 61 00 | Common Product Requirements |
| .3 | Section 01 78 00 | Closeout Submittals |
| .4 | Section 08 11 00 | Metal Doors and Frames |
| .5 | Section 08 14 66 | Wood Screen Doors |
| .6 | Section 08 71 13 | Automatic Door Operator |
| .7 | Section 08 80 50 | Glazing |

1.2 REFERENCES

- .1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
 - .1 ANSI/BHMA A156.1-2000, 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 and Associated Products.
 - .6 ANSI/BHMA A156.6-2005, Architectural Door Trim.
 - .7 ANSI/BHMA A156.8-2005, Door Controls - Overhead Stops and Holders.
 - .8 ANSI/BHMA A156.10-1999, Power Operated Pedestrian Doors.
 - .9 ANSI/BHMA A156.12-2005, Interconnected Locks and Latches.
 - .10 ANSI/BHMA A156.13-2002, Mortise Locks and Latches Series 1000.
 - .11 ANSI/BHMA A156.14-2002, Sliding and Folding Door Hardware.
 - .12 ANSI/BHMA A156.15-2006, Release Devices - Closer Holder, Electromagnetic and Electromechanical.
 - .13 ANSI/BHMA A156.16-2002, Auxiliary Hardware.
 - .14 ANSI/BHMA A156.17-2004, Self-closing Hinges and Pivots.
 - .15 ANSI/BHMA A156.18-2006, Materials and Finishes.
 - .16 ANSI/BHMA A156.19-2002, Power Assist and Low Energy Power - Operated Doors.
 - .17 ANSI/BHMA A156.20-2006, Strap and Tee Hinges and Hasps.
- .2 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
 - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

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 door hardware and include product characteristics, performance criteria, physical size, finish and limitations.

- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
 - .4 After approval samples will be returned for incorporation in Work.
- .4 Hardware List:
 - .1 Submit contract hardware list.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions: submit manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

1.5 MAINTENACE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
 - .1 Supply maintenance materials in accordance with Section 01 78 00- Closeout Submittals.
 - .2 Tools:
 - .1 Supply two (2) sets of wrenches for locksets and fire exit hardware door closers.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements:
 - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.7 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, labeled with manufacturer's name and address.

- .3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .4 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect door hardware from nicks, scratches, and blemishes.
 - .3 Protect prefinished surfaces with wrapping strippable coating.
 - .4 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 HARDWARE ITEMS

- .1 Use one manufacturer's products only for similar items.

2.2 DOOR HARDWARE

- .1 Locks and latches:
 - .1 Bored and preassembled locks and latches: to ANSI/BHMA A156.2, series 4000 bored lock, grade 1, designed for function [and keyed] as stated in Hardware Schedule.
 - .2 Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, grade 1, designed for function and keyed as stated in Hardware Schedule.
 - .3 Lever handles and Knobs: plain design.
 - .4 Roses: round.
 - .5 Normal strikes: box type, lip projection not beyond jamb.
 - .6 Cylinders: key into keying system as directed.
 - .7 Finished to BHMA 626
- .2 Butts and hinges:
 - .1 Butts and hinges: to ANSI/BHMA A156.1, designated by letter A and numeral identifiers, followed by size and finish, listed in Hardware Schedule.
 - .2 Self-closing hinges and pivots: to ANSI/BHMA A156.17, designated by letter K and numeral identifiers listed in Hardware Schedule
 - .3 Strap and tee hinges and hasps: to ANSI/BHMA A156.20, designated by letter A and numeral identifiers listed in Hardware Schedule, size in accordance with ANSI/BHMA A156.20, table I listed in Hardware Schedule, finished to 603 (zinc plated).
- .3 Exit devices: to ANSI/BHMA A156.3, function, grade and finish as per schedule. Rim type with push pad design.

- .4 Door Closers and Accessories:
 - .1 Door controls (closers): to ANSI/BHMA A156.4, designated by letter C and numeral identifiers listed in Hardware Schedule.
 - .2 Door controls - overhead holders: to ANSI/BHMA A156.8, designated by letter C and numeral identifiers listed in Hardware Schedule,
 - .3 Door co-ordinator: [concealed] [surface]for pairs of doors with overlapping astragal.
- .5 Door Operators:
 - .1 Power-operated pedestrian doors: to ANSI/BHMA A156.10.
 - .2 Power assist and low energy power operated doors: to ANSI/BHMA A156.19.
- .6 Auxiliary locks and associated products: to ANSI/BHMA A156.5, designated by letter E and numeral identifiers listed in Hardware Schedule.
- .7 Architectural door trim: to ANSI/BHMA A156.6, designated by letter J and numeral identifiers listed in Hardware Schedule.
 - .1 Door protection plates: 1.27 mm stainless steel finished to BMHA 630.
 - .2 Push plates: 1.27 mm thick stainless steel finished to BMHA 630.
 - .3 Push/Pull units: stainless steel finished to BMHA 630.
- .8 Auxiliary hardware: to ANSI/BHMA A156.16, designated by letter L and numeral identifiers as listed below in the Hardware Schedule.
 - .1 Combination stop and holder, floor mounted: finished to BMHA 626.
 - .2 Surface bolt lever extension flush bolt: finish to BMHA 626.
- .9 Door bottom seal: heavy duty, door seal of extruded aluminum frame and hollow closed cell neoprene weather seal, surface mounted with drip cap closed ends, clear anodized finish.
- .10 Thresholds: to ANSI/BHMA A156.21 extruded aluminum mill finish, serrated surface, with lip and vinyl door seal insert.
- .11 Weatherstripping:
 - .1 Head and jamb seal:
 - .2 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.
- .12 Astragal: overlapping, extruded aluminum frame with vinyl insert, finished to match doors.
- .13 Barrier Free Pneumatic Door Operator:
 - .1 Heavy duty pneumatically assisted door closer, capable of multi-door operation, complete with actuators, control boxes, pneumatic tubing and compressed air source.
 - .2 Self contained control box/compressor combination for independent operation of two door leaves.
 - .3 Control boxes: complete with electric strike relay.
 - .4 Mount operators on either push side of doors as required placing them inside rooms.
 - .5 Actuation of operators by push button.

- .6 Electrical box and actuator: Hardwired low voltage actuator with stainless steel 114 mm round plate, engraved blue filled with handicap symbol. Box 51 mm wide x 102 mm high x 50 mm deep single gang electrical box, flush mounted in wall, locations indicated.
- .7 Supply switched line voltage to control box. Locate switch adjacent to box.
- .8 Supply low voltage wiring to each actuator and 6 mm diameter air tubing to each operator.
- .9 Mount control box in location at the height and locations shown on the drawings.

2.3 FASTENINGS

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

2.4 KEYING

- .1 Doors, padlocks and cabinet locks to be keyed alike as noted in Hardware Schedule. Prepare detailed keying schedule in conjunction with Departmental Representative.
- .2 Supply keys in duplicate for every lock in this Contract.
- .3 Supply three (3) master keys for each master key or grand master key group.
- .4 Stamp keying code numbers on keys and cylinders.
- .5 Supply construction cores.
- .6 Hand over permanent cores and keys to Departmental Representative.

3 EXECUTION

3.1 EXAMINATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Supply manufacturers' instructions for proper installation of each hardware component.
- .4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
- .5 Where door stop contacts door pulls, mount stop to strike bottom of pull.

- .6 Install key control cabinet.
- .7 Use only manufacturer's supplied fasteners.
 - .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .8 Remove construction cores and locks when directed by Departmental Representative.
 - .1 Install permanent cores and ensure locks operate correctly.

3.2 ADJUSTING

- .1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .2 Lubricate hardware, operating equipment and other moving parts.
- .3 Adjust door hardware to ensure tight fit at contact points with frames.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
 - .3 Remove protective material from hardware items where present.
- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

3.4 DEMONSTRATION

- .1 Keying System Setup and Cabinet:
 - .1 Set up key control system with file key tags, duplicate key tags, numerical index, alphabetical index and key change index, label shields, control book and key receipt cards.
 - .2 Place file keys and duplicate keys in key cabinet on their respective hooks.
 - .3 Lock key cabinet and turn over key to Departmental Representative.
- .2 Maintenance Staff Briefing:
 - .1 Brief maintenance staff regarding:
 - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
 - .2 Description, use, handling, and storage of keys.
 - .3 Use, application and storage of wrenches for fire exit hardware, locksets and door closers.
- .3 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

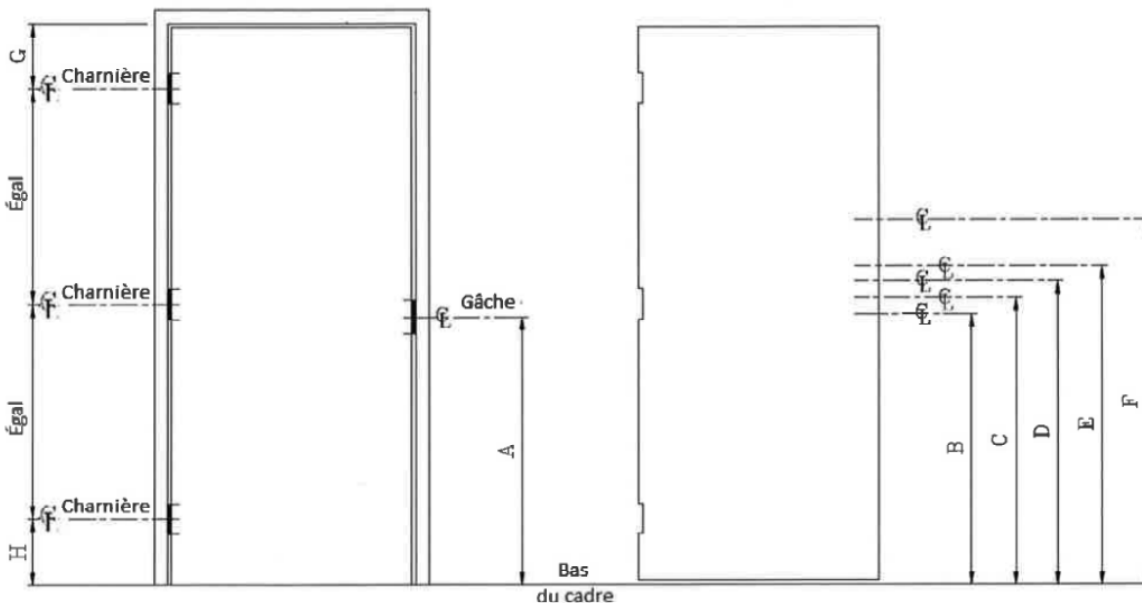
3.5 PROTECTION

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

3.6 DOOR SCHEDULE

- .1 Refer to following page.

Emplacement standard pour la quincaillerie architecturale



Item de quincaillerie		Impériale (jusqu'à)	Métrique (jusqu'à)
A	Ligne du centre pour serrures rondes et à levier, dispositifs de sortie de secours & pènes à rouleau	40 5/16"	1035
B	Ligne de centre d'une poignée à tirer et ensemble de barres à tirer & pousser	42"	1065
C	Ligne du centre d'un pêne de bras à tirer d'hôpital	45"	1145
D	Ligne du centre d'un bras à tirer d'hôpital (type vertical)	47"	1195
E	Ligne du centre d'une plaque à pousser d'hôpital	48"	1220
F	Ligne du centre de la serrure auxiliaire	48"	1220
G	Ligne du centre de la charnière du haut (max)	9 3/4"	250
H	Ligne du centre de la charnière du bas (max)	13"	330

Note : Les dimensions peuvent être sujettes à des variations mineures selon les manufacturiers.

Groupe 001 / Portes# D100

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
1	Charnière continue robuste avec tige continue FM300x 2134mm	630	Markar
1	Verrou anti panique en surface avec garniture extérieur fonction de classe et poignée à levier 43-GL-8813F x 713ETP	626	Adams Rite
1	Cylindre mortaise 41-114 x CM	626	Sargent
1	Boitier d'alimentation BPS24-1 x RB4-24 x B24-5 x CKL	689	Securitron
1	Gâche électrique en surface 310-4 x 24VDC	630	Folger Adam
1	Ouvre porte automatique simple HA-8 (tirer-pousser) x relais / interphase de blocage	628	Ditec/Hunter
2	Bouton poussoir rond CM60/2 x CM-69S	630	Camden
1	Interrupteur à clés MKA	630	Securitron
1	Cylindre mortaise 41-114 x CM	626	Sargent
1	Ensemble de coupe froid W20S 1/914mm x 2/2434mm	628	K.N.Crowder
1	Bas de porte et rejet d'eau W35-1 x 914mm	628	K.N.Crowder
1	Seuil en aluminium avec bris thermique CT48 x 914mm	627	K.N.Crowder

Note :

Conduits électriques, boîtes des jonctions électriques, cordes de tirages, alimentation électrique 120V et contact du panneau d'alarme incendie sont tous fournis, installés et raccordés par l'Électricité, voir les plans et devis électriques pour coordination.
Incluant les filages entre elles. Là où requis l'alimentation électrique 120V et le contact du panneau d'alarme incendie seront raccordés par l'Électricité.

Groupe 002 / Porte# D103

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
3	Charnière robuste avec roulement à billes TA2714 114 x 101	652	Mckinney
1	Serrure mortaise fonction de toilette avec poignée à levier et indicateur 49-8265-LNP	626	Sargent
1	Crochet à linge 3071	630	Trimco/BBW
1	Plaque de protection K0050 915mm x L.P.x C.SUNK K.P.	630	Trimco/BBW
1	Garniture d'étanchéité autocollante W22 aux périmètres	626	K.N.Crowder
1	Butoir murale 1277/79	626	Trimco/BBW

Groupe 003 / Porte# D104

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
3	Charnière robuste avec roulement à billes TA2714 114 x 101	652	Mckinney
1	Poignée à tirer/plaque à pousser 1895-4B	626	Trimco/BBW
1	Serrure à pêne dormant fonction de classe 4877 x CM	626	Sargent
1	Ferme porte en surface avec bras parallèle et cran de retenue ouvert 1431-PH	689	Sargent
1	Plaque de protection K0050 250mm x L.P.x C. SUNK K.P.	630	Trimco/BBW
1	Garniture d'étanchéité autocollante W22 aux périmètres	626	K.N.Crowder
1	Butoir murale 1277/79	626	Trimco/BBW

Groupe 004 / Porte# D105

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
3	Charnière robuste avec roulement à billes TA2714 114 x 101	652	Mckinney
1	Poignée à tirer/plaque à pousser 1895-4B	626	Trimco/BBW
1	Serrure à pêne dormant fonction de classe 4877 x CM	626	Sargent
1	Ferme porte en surface avec bras parallèle, buté intégré et cran de retenue ouvert 1431-CPSH	689	Sargent
1	Plaque de protection K0050 250mm x L.P.x C. SUNK K.P.	630	Trimco/BBW
1	Garniture d'étanchéité autocollante W22 aux périmètres	626	K.N.Crowder

Groupe 005 / Porte# D106, D111, D112

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
3	Charnière robuste avec roulement à billes et fiche non amovible TA2714 114 x 101 FNA	652	Mckinney
1	Serrure mortaise fonction d'entrepôt avec poignée à levier 8204-LNP x CM	626	Sargent
1	Plaque de protection K0050 250 x L.P.x C. SUNK K.P.	630	Trimco/BBW
1	Garniture d'étanchéité autocollante W22 aux périmètres	626	K.N.Crowder
1	Butoir murale 1277/79	626	Trimco/BBW

Note :

Les quantités spécifiées sont les unitaires requises pour chacune des portes citées en références

Groupe 006 / Portes# D107, D203

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
1	Charnière continue robuste avec tige continue FM300x 2134mm	630	Markar
1	Serrure mortaise avec pêne à ressort fonction de dépôt x poignée intérieur à levier x plaque extérieur anti vandale 8204 x ½ LNP x 667-1 AV	630	Sargent
1	Cylindre mortaise 41-114 x CM	626	Sargent
1	Ferme porte en surface avec bras parallèle, buté intégré et cran de retenue ouvert 351-CPS	689	Securitron
1	Ensemble de coupe froid W20S 1/914mm x 2/2434mm	628	K.N.Crowder
1	Bas de porte et rejet d'eau W35-1 x 914mm	628	K.N.Crowder
1	Seuil en aluminium avec bris thermique CT48 x 914mm	627	K.N.Crowder

Note :

Les quantités spécifiées sont les unitaires requises pour chacune des portes citées en références.

Groupe 007 / Portes# D108, D108A, D109

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
1	Charnière continue robuste avec tige continue FM300x 2134mm	630	Markar
1	Verrou anti panique en surface avec garniture extérieur fonction de classe et poignée à levier 43-GL-8813F x 713ETP	626	Adams Rite
1	Cylindre mortaise 41-114 x CM	626	Sargent
1	Ferme porte en surface avec bras parallèle, buté intégré et cran de retenue ouvert 351-CPSH	689	Securitron
1	Ensemble de coupe froid W20S 1/914mm x 2/2434mm	628	K.N.Crowder
1	Bas de porte et rejet d'eau W35-1 x 914mm	628	K.N.Crowder
1	Seuil en aluminium avec bris thermique CT48 x 914mm	627	K.N.Crowder

Note :

Les quantités spécifiées sont les unitaires requises pour chacune des portes citées en références.

Groupe 008 / Porte# D110

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
3	Charnière robuste avec roulement à billes et fiche non amovible TA2714 114 x 101 FNA	652	Mckinney
1	Serrure mortaise fonction de bureau avec poignée à levier 8205-LNP x CM	626	Sargent
1	Plaque de protection K0050 250 x L.P.x C.SUNK K.P.	630	Trimco/BBW
1	Garniture d'étanchéité autocollante W22 aux périmètres	626	K.N.Crowder
1	Butoir murale 1277/79	626	Trimco/BBW

Groupe 009 / Porte# D113, D113A

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
6	Charnière robuste avec roulement à billes TA2314 114 x 101	630	Mckinney
2	Poignée à tirer/plaque à pousser 1895-4B	626	Trimco/BBW
2	Ferme porte en surface avec bras parallèle, buté intégré et cran de retenue ouvert 1431-CPSH	689	Sargent

Note :

Les quantités spécifiées sont les unitaires requises pour chacune des paires de portes citées en références.

Groupe 010 / Porte# D114, D115, D116, D117

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
3	Charnière robuste avec roulement à billes TA2314 114 x 101	630	Mckinney
1	Serrure mortaise fonction de classe avec poignée à levier 8237-LNP	630	Sargent
1	Ferme porte en surface avec bras parallèle 1431-P	689	Sargent
1	Boîtier d'alimentation BPS24-1 x RB4-24 x CKL x B24-5	689	Securitron
1	Retenue Magnétique murale 998 x 24VDC x 55LBS de retenue	630	Rixson
1	Ensemble de coupe froid W20S 1/914mm x 2/2434mm	628	K.N.Crowder
1	Bas de porte et rejet d'eau W35-1 x 914mm	628	K.N.Crowder
1	Seuil en aluminium avec bris thermique CT48 x 914mm	627	K.N.Crowder

Note :

Les quantités spécifiées sont les unitaires requises pour chacune des portes citées en références.

Groupe 011 / Porte# D118

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
3	Charnière robuste avec roulement à billes TA2314 114 x 101	630	Mckinney
1	Serrure mortaise fonction de classe avec poignée à levier 8237-LNP	630	Sargent
1	Ferme porte en surface avec bras parallèle, buté intégré et cran de retenue ouvert 1431-CPSH	689	Sargent
1	Plaque de protection K0050 250 x L.P.x C.SUNK K.P.	630	Trimco/BBW
1	Ensemble de coupe froid W20S 1/914mm x 2/2434mm	628	K.N.Crowder
1	Bas de porte et rejet d'eau W35-1 x 914mm	628	K.N.Crowder
1	Seuil en aluminium avec bris thermique CT48 x 914mm	627	K.N.Crowder
1	Butoir au plancher 1211	626	Trimco/BBW

Groupe 012 / Porte# D200, D201

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
3	Charnière robuste avec roulement à billes TA2314 114 x 101	630	Mckinney
1	Serrure mortaise fonction de classe avec poignée à levier 8237-LNP	630	Sargent
1	Ferme porte en surface avec bras régulier cran de retenue ouvert 351-H	689	Sargent
1	Ensemble de coupe froid W20S 1/914mm x 2/2434mm	628	K.N.Crowder
1	Bas de porte et rejet d'eau W35-1 x 914mm	628	K.N.Crowder
1	Seuil en aluminium avec bris thermique 1/CT43-1 x 1/CT41-1 x 1/CT43-1 x 1/CT40S x 914mm	627	K.N.Crowder
1	Butoir au plancher 1211	626	Trimco/BBW

Note :

Les quantités spécifiées sont les unitaires requises pour chacune des portes citées en références.

Groupe 013 / Porte# D202

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
3	Charnière robuste avec roulement à billes TA2714 114 x 101	652	Mckinney
1	Serrure mortaise fonction de toilette avec poignée à levier et indicateur 49-8265-LNP	626	Sargent
1	Crochet à linge 3071	630	Trimco/BBW
1	Ferme porte en surface avec bras régulier et délai de fermeture 351-DA	689	Sargent
1	Ensemble de coupe froid W20S 1/914mm x 2/2434mm	628	K.N.Crowder
1	Bas de porte et rejet d'eau W35-1 x 914mm	628	K.N.Crowder
1	Seuil en aluminium avec bris thermique 1/CT43-1 x 1/CT41-1 x 1/CT43-1 x 1/CT40S x 914mm	627	K.N.Crowder
1	Butoir murale 1277/79	626	Trimco/BBW

Groupe 014 / Porte# D204, 205

QTÉ	DESCRIPTION	FINI	MANUFACTURIER
3	Charnière robuste avec roulement à billes TA2714 114 x 101	652	Mckinney
1	Poignée à tirer/plaque à pousser 1895-4B	626	Trimco/BBW
1	Serrure à pêne dormant fonction de classe 4877 x CM	626	Sargent
1	Ferme porte en surface avec bras régulier et cran de retenue ouvert 351-H	689	Sargent
1	Plaque de protection K0050 250mm x L.P.x C. SUNK K.P.	630	Trimco/BBW
1	Garniture d'étanchéité autocollante W22 aux périmètres	626	K.N.Crowder
1	Ensemble de coupe froid W20S 1/914mm x 2/2434mm	628	K.N.Crowder
1	Bas de porte et rejet d'eau W35-1 x 914mm	628	K.N.Crowder
1	Seuil en aluminium avec bris thermique 1/CT43-1 x 1/CT41-1 x 1/CT43-1 x 1/CT40S x 914mm	627	K.N.Crowder
1	Butoir murale 1277/79	626	Trimco/BBW

Note :

. Les quantités spécifiées sont les unitaires requises pour chacune des portes citées en références.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 06 10 00 Rough Carpentry
- .3 Section 07 92 00 Joint Sealants
- .4 Section 08 11 00 Metal Doors and Frames
- .5 Section 08 51 13 Aluminium Windows

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM C542-05, Standard Specification for Lock-Strip Gaskets.
 - .2 ASTM D790-07e1, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - .3 ASTM D1003-07e1, Standard Test Method for Haze and Luminous Transmittance of Plastics.
 - .4 ASTM D1929-96(R2001)e1, Standard Test Method for Determining Ignition Temperature of Plastics.
 - .5 ASTM D2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
 - .6 ASTM E84-10, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - .7 ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - .8 ASTM F1233-08, Standard Test Method for Security Glazing Materials and Systems.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
 - .2 CAN/CGSB-12.2-M91, Flat, Clear Sheet Glass.
 - .3 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
 - .4 CAN/CGSB-12.4-M91, Heat Absorbing Glass.
 - .5 CAN/CGSB-12.6-M91, Transparent (One-Way) Mirrors.
 - .6 CAN/CGSB-12.8-97, Insulating Glass Units.
 - .7 CAN/CGSB-12.8-97(Amendment), Insulating Glass Units.
 - .8 CAN/CGSB-12.9-M91, Spandrel Glass.
 - .9 CAN/CGSB-12.10-M76, Glass, Light and Heat Reflecting.
 - .10 CAN/CGSB-12.11-M90, Wired Safety Glass.
 - .11 CAN/CGSB-12.12-M90, Plastic Safety Glazing Sheets.
 - .12 CAN/CGSB-12.13-M91, Patterned Glass.
- .3 Environmental Choice Program (ECP)
 - .1 CCD-045-95(R2005), Sealants and Caulking Compounds.
- .4 Glass Association of North American (GANA)
 - .1 GANA Glazing Manual - 2008.
 - .2 GANA Laminated Glazing Reference Manual - 2009.

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 glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit duplicate 305x305mm size samples of glazing and sealant material.
- .5 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .6 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for glazing and incorporation into manual.

1.5 QUALITY ASSURANCE

- .1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 DELIVERY, STORAGE AND HANDLING

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

- .2 Store and protect glazing and frames from nicks, scratches, and blemishes.
- .3 Protect prefinished aluminum surfaces with strippable coating.
- .4 Replace defective or damaged materials with new.

1.7 AMBIENT CONDITIONS

- .1 Ambient Requirements:
 - .1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.
 - .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

2 PRODUCTS

2.1 MATERIALS

- .1 Design Criteria:
 - .1 Ensure continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
 - .2 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
 - .3 Size glass to withstand wind loads, dead loads and positive and negative live loads to ASTM E330.
 - .4 Limit glass deflection to 1/200 flexural limit of glass with full recovery of glazing materials.
- .2 Flat Glass:
 - .1 Float glass: to CAN/CGSB-12.3, glazing quality 9mm thick
- .3 Tempered Safety glass: to CAN/CGSB-12.1, transparent, 6 mm thick.
 - .1 Type 1, Laminated, Type 2 - tempered
 - .2 Class B – float
 - .3 Category 11
- .4 Silvered mirror glass: to CAN/CGSB-12.5, 4 mm thick
 - .1 Type 1A, Laminated, float glass for normal use
- .5 Glass Screens at Offices: minimum 12.7 mm thick, clear tempered glass
- .6 Insulating glass units: to CAN/CGSB-12.8, double unit, minimum 25mm overall thickness.
 - .1 Glass: to CAN/CGSB-12.3, tempered at sill heights below 915mm
 - .2 Glass thickness: minimum 6 mm each light
 - .3 Inter-cavity space thickness: 13 mm
 - .4 Glass coating: surface number 2 (inside surface of outer light), low "E".
 - .5 Inert gas: argon
 - .6 Light transmittance: minimum 0.70
 - .7 Privacy film: glass altered by acid or film installed on inner face of light and in accordance with

window and glazing manufacturer's recommendations to prevent thermal shock.

2.2 ACCESSORIES

- .1 Setting blocks: neoprene, 80-90 Shore A durometer hardness to ASTM D2240, minimum 100 mm x width of glazing rabbet space minus 1.5 mm x height.
- .2 Spacer shims: neoprene, 50-60 Shore A durometer hardness to ASTM D2240, 75mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.
- .3 Glazing tape:
 - .1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper, black colour.
 - .2 Glazing splines: resilient polyvinyl chloride, extruded shape to suit glazing channel retaining slot, as selected
 - .3 Glazing clips: manufacturer's standard type.
 - .4 Lock-strip gaskets: to ASTM C542.

Mirror attachment accessories:

- .1 Stainless steel clips.
- .2 Mirror frames: stainless steel, 19mm face edge x 8-10mm depth

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
 - .1 Verify that openings for glazing are correctly sized and within tolerance.
 - .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
 - .3 Visually inspect substrate in presence of Departmental Representative.
 - .4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .5 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 Clean contact surfaces with solvent and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION – GENERAL

- .1 Unless otherwise specified, dry glaze all interior glass.
- .2 Remove and replace glazing stops in original locations using original fasteners, securely set and undamaged.
- .3 Use setting blocks and spacers as required to properly support the glass, centred in place in glazing space independent of the materials and to uniformly distribute its load.
- .4 Use a minimum of 2 setting blocks, locate at quarter points. Locate spacers at jamb edges of glass, uniformly spaced at 600 mm o.c. maximum, and 300 mm maximum from top and bottom.
- .5 Ensure rattle-free cushioning.

3.4 INSTALLATION – MIRRORS

- .1 Set mirrors with clips. Anchor rigidly to wall construction.
- .2 Set in frame.
- .3 Place plumb and level.

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.
 - .1 Remove traces of primer, caulking.
 - .2 Remove glazing materials from finish surfaces.
 - .3 Remove labels.
 - .4 Clean glass and mirrors using approved non-abrasive cleaner in accordance with manufacturer's instructions.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

3.6 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 After installation, mark each light with an "X" by using removable plastic tape or paste.
- .3 Do not mark heat absorbing or reflective glass units.
- .4 Repair damage to adjacent materials caused by glazing installation.

3.7 SCHEDULE

- .1 Refer to window and door schedules for glazing types.
- .2 Mirrors:
 - .1 Custom sized mirrors are to be provided in the Mess Hall public washrooms (101 and 102), as well as Comfort Station public washrooms (200 and 201). Refer to interior elevations for dimensions.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 00 Rough Carpentry
- .2 Section 07 26 00 Vapour Retarders
- .3 Section 07 92 00 Joint Sealants
- .4 Section 08 11 00 Metal Doors And Frames
- .5 Section 09 22 16 Non-Structural Metal Framing
- .6 Section 09 91 23 Interior Painting

1.2 REFERENCES

- .1 Aluminum Association (AA)
 - .1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.
- .2 ASTM International
 - .1 ASTM C 475-02(2007), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .2 ASTM C 514-04(2009e1), Standard Specification for Nails for the Application of Gypsum Board.
 - .3 ASTM C 557-03(2009)e1, Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - .4 ASTM C 840-08, Standard Specification for Application and Finishing of Gypsum Board.
 - .5 ASTM C 954-07, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - .6 ASTM C 1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .7 ASTM C 1047-09, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .8 ASTM C 1280-99, Standard Specification for Application of Gypsum Sheathing.
 - .9 ASTM C 1177/C 1177M-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .10 ASTM C 1178/C 1178M-08, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
 - .11 ASTM C1396/C1396M-09a, Standard Specification for Gypsum Wallboard.
- .3 Association of the Wall and Ceilings Industries International (AWCI)
 - .1 AWCI Levels of Gypsum Board Finish-97.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.
- .5 Green Seal Environmental Standards (GS)

- .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-07, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

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 gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit one 300 x 300 mm size samples of gypsum board.

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.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store gypsum board assemblies materials level off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
 - .3 Protect from weather, elements and damage from construction operations.
 - .4 Handle gypsum boards to prevent damage to edges, ends or surfaces.
 - .5 Replace defective or damaged materials with new.

1.5 AMBIENT CONDITIONS

- .1 Maintain temperature 10 degrees C minimum, 21 degrees C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost free surfaces.
- .3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

2 PRODUCTS

2.1 MATERIALS

- .1 Standard board: to ASTM C1396/C1396M in thicknesses indicated, regular and type X, 1200 mm wide x maximum practical length, ends square cut, edges beveled.
- .2 Glass mat water-resistant gypsum backing board used in washrooms, kitchen and dishwashing area walls and ceilings: to ASTM C 1178/C 1178M with glass mat facings, both sides, regular and type X, in thicknesses indicated, 1200 mm wide x maximum practical length.
- .3 Joint Materials:
 - .1 Joint compound: to ASTM C 475, asbestos-free.
 - .2 Joint Reinforcing Tape: 50mm wide x 0.3mm thick perforated paper with chamfered edges.
 - .3 Joint and Skim Compounds: gypsum with latex resin, possessing good adhesion, mixed with fresh, unadulterated water, having no detrimental effect on compounds.
- .4 Accessories: As manufactured by Canadian Gypsum Company, Domtar Construction Materials, Westroc Industries Limited or Bailey Metal Products Limited as follows:
 - .1 Corner Beads: #25 steel, zinc-coated with flanges suitable for thickness of wallboards on which applied, and suitable for taping and plastering over.
 - .2 Casing Beads: #25 steel, zinc-coated, channel-shaped, suitable for taping and plastering over.
 - .3 Ceiling and Wall Reveals / Edge Trims: purposed made, extruded aluminum, edge trims / reveal mouldings as manufactured by Pittcon Industries or Fry Reglet Corporation or alternate approved by the Departmental Representative. The use of "J" moulding or roll formed steel is not permitted.
 - .4 Control Joints: Crimped, roll-formed zinc, as CGC #093, with flanges for tape reinforcement or two casing beads set with gap for movement, and backed with flexible air seal membrane.
 - .5 Thermal Break Tape: No.220D pvc tape manufactured by Sellotape Canada Ltd. or other reputable manufacturer.
- .5 Fastenings and Ties:
 - .1 Nails: to ASTM C 514.
 - .2 Screws: Steel drill screws: to ASTM C 1002.
 - .3 Tie Wire: 1.6mm diameter galvanized soft annealed steel wire
 - .4 Twist Clips: Caddy acoustical tee combination washer - wing nut, as manufactured by Erico Products Ltd, or equivalent approved by Departmental Representative.
 - .5 Laminating compound: as recommended by manufacturer, asbestos-free.
 - .6 Stud adhesive: to [CAN/CGSB-71.25] [ASTM C 557].
- .6 Steel Studs: Depth and gauge to suit span and as shown on the drawings. Knurled flanges 32mm wide with edges doubled back at least 4.8 mm; typical, with girts as required and with service access holes.

- .7 Retainer Studs: As manufactured by Bailey Metal Products, or Insulock Systems.
- .8 Partition Runners: As specified for studs.
- .9 Bracing Channels: For partitions, 19mm x 38.1mm x 1.6mm, cold-rolled, galvanized steel.
- .10 Furring Channels: #25 gauge galvanized, nominal size of 22 mm deep by 32mm face, hat type with knurled face.
- .11 Resilient Channels: CGC RC-1 or equivalent by other reputable manufacturers.
- .12 Ceiling Hanger System:
 - .1 Hangers: Galvanized annealed steel wire, #12 gauge to support a maximum weight of 68 kg. per hanger. #9 gauge to support a maximum weight of 140 kg. per hanger, and galvanized annealed steel rod 4.8mm diameter to support a maximum weight of 250 kg. per hanger.
 - .2 Inserts and Hanger Connection: Steel, galvanized after forming, suitable for structure and ceiling conditions and loading.
 - .3 Runner Channels: Galvanized steel channels, 1.6 mm overall thickness, 38.1 mm high with 19mm wide flanges, for primary furring member in suspended gypsum board ceilings
 - .4 Insulated Attic Access Trap: in conformance with the National Building Code for dimensions, thermal performance and air-tightness. Acceptable product from Attic Hatch Inc. or equivalent from a reputable manufacturer.
- .13 Acoustical Caulking: Refer to Section 07 92 00 – Joint Sealants
- .14 Sound Attenuation Batt Insulation: Refer to Section 07 21 16 – Blanket Insulation
- .15 Control Joint Strip: Roll formed zinc coated metal with a tape protected void, 6 mm wide throat size x 12.7mm deep with flanges for embedding in joint compound.
- .16 Skim Coating: "Durabond 90" compound or equivalent manufactured by Domtar Gypsum.

2.2 FINISHES

- .1 Texture finish: asbestos-free standard white texture coating and primer-sealer, recommended by gypsum board manufacturer.

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies 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.

- .1 Verify that work performed under other Sections as a part of a ULC specification for a fire-rated assembly has been done in accordance with that specification.

3.2 ERECTION

- .1 Do application and finishing of gypsum board to ASTM C 840 except where specified otherwise.
- .2 Do application of gypsum sheathing to ASTM C 1280.
- .3 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C 840 except where specified otherwise.
- .4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.
- .6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.
- .7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .10 Install wall furring for gypsum board wall finishes to ASTM C 840, except where specified otherwise.
- .11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.
- .13 Erect drywall resilient furring transversely across studs, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.
- .14 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

3.3 APPLICATION

- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.
- .2 Apply single layer gypsum board to wood or metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls to ASTM C 840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.

- .3 Ceilings: install gypsum board perpendicular to supports; stagger end joints over supports. Install with 6 mm gap where boards abut other work.
- .4 Apply water-resistant gypsum board where wall tiles, vinyl wall covering is to be applied, adjacent to dishwashing sinks, slop sinks and janitor's closets. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.
- .5 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.
- .6 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
- .7 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .8 Install gypsum board with face side out.
- .9 Do not install damaged or damp boards.
- .10 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.4 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre using contact adhesive for full length.
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Install shadow mould at gypsum board/ceiling juncture as indicated. Minimize joints; use corner pieces and splicers.
- .6 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.
- .7 Provide continuous polyethylene dust barrier behind and across control joints.
- .8 Locate control joints at approximate 10 m spacing on long corridor runs and at approximate 15 m spacing on ceilings.

- .9 Install control joints straight and true.
- .10 Splice corners and intersections together and secure to each member with 3 screws.
- .11 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .12 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .13 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 Level 5: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.
- .14 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .14 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .15 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .16 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .17 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.
- .18 Mix joint compound slightly thinner than for joint taping.
- .19 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.
- .20 Allow skim coat to dry completely.
- .21 Remove ridges by light sanding or wiping with damp cloth.

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.

3.6 PROTECTION

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

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 04 43 13 Stone Masonry Veneer
- .2 Section 06 10 00 Rough Carpentry
- .3 Section 09 21 16 Gypsum Board Assemblies
- .4 Section 10 31 00 Manufactured Fireplaces

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM C 645-11a, Standard Specification for Nonstructural Steel Framing Members.
 - .2 ASTM C 754-11, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .2 Environmental Choice Program (ECP)
 - .1 CCD-047-98(R2005), Architectural Surface Coatings.
 - .2 CCD-048-95(R2006), Surface Coatings - Recycled Water-Borne.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - [current edition].
 - .1 MPI #26, Primer, Galvanized Metal, Cementitious.

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 metal framing and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit 300 mm long samples of non-structural metal framing.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect metal framing from nicks, warping and bending.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 MATERIALS

- .1 Non-load bearing channel stud framing: to ASTM C 645, widths as indicated on the drawings, mm stud size, roll formed from 0.91 mm thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board.
 - .1 Knock-out service holes at 460 mm centres.
- .2 Floor and ceiling tracks: to ASTM C 645, in widths to suit stud sizes, 32 mm flange height.
- .3 Non-load bearing truss stud framing system: to consist of:
 - .1 Studs: sizes shall be as indicated on the drawings
 - .2 Floor track: single piece mm; size to suit studs.
 - .3 Ceiling track: channel shaped track for use with stud shoes and 1.2 mm diameter double wire ties; size to suit studs.
 - .4 After fabrication apply one shop coat of MPI #26 primer to steel surfaces.
 - .1 Descale and clean surfaces before painting.
- .4 Metal channel stiffener: as recommended by the manufacturer.
- .5 Acoustical sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .6 Insulating strip: rubberized, moisture resistant 3 mm thick [cork] [foam] strip, 12 mm wide, with self sticking adhesive on one face, lengths as required.
- .7 Sill Gasket: closed cell, polyethylene foam, 6mm thick, 89mm wide.

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for non-structural metal framing application 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 ERECTION

- .1 Align partition tracks at floor and ceiling and secure at 600 mm on centre maximum.
- .2 Install damp proof course under stud shoe tracks of partitions on slabs on grade.
- .3 Place studs vertically at 400 mm on centre and not more than 50 mm from abutting walls, and at each side of openings and corners.
 - .1 Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .4 Erect metal studding to tolerance of 1:1000.
- .5 Attach studs to bottom and ceiling track using screws.
- .6 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .7 Co-ordinate erection of studs with installation of fireplace and special supports or anchorage for work specified in other Sections.
- .8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified.
 - .1 Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .9 Install heavy gauge single jamb studs at openings.
- .10 Erect track at head of fireplace opening to accommodate intermediate studs.
 - .1 Secure track to studs at each end, in accordance with manufacturer's instructions.
 - .2 Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .11 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .12 Provide 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.
- .13 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .14 Extend partitions to ceiling height except where noted otherwise on drawings.
- .15 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.

- .1 Use 50 mm leg ceiling tracks or double track slip joint.
- .16 Install continuous insulating strips to isolate studs from uninsulated surfaces.
- .17 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

3.3 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.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by non-structural metal framing application.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 04 43 13 Stone Masonry Veneer
- .3 Section 06 10 00 Rough Carpentry
- .4 Section 09 22 16 Non-Structural Metal Framing
- .5 Section 10 31 00 Manufactured Fireplaces

1.2 REFERENCES

- .1 American National Standards Institute (ANSI):
 - .1 ANSI A108.11 - Installation of Cementitious Backer Units
 - .2 ANSI A118.4 - Specifications for Latex Portland Cement Mortar
 - .3 ANSI A118.9- Cementitious Baker Units
 - .4 ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile
 - .5 ASTM C1288 - Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets.

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 cementitious backer board and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit 300 x 300mm sample of cementitious backer board.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect cementitious backer boards from nicks, cracking or delamination.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

- .1 Cementitious Fibre-Mat Reinforced Backing Board in conformance with ASTM C1288 and ANSI A118.9.
- .2 Thickness: 13mm
- .3 Sheet size: 1220mm x longest lengths attainable.
- .4 Acceptable Products: Durock as manufactured by USG, HardieBacker by James Hardie or equivalent approved by Departmental Representative.
- .5 Fasteners:
 - .1 Wood framing: 1-1/2 inches (32 mm) No. 8 by 0.375 inch (9.5 mm) HD self-drilling, corrosion resistant ribbed wafer head screws.
 - .2 Metal framing: Metal framing: 1-1/2 inches (32 mm) No. 8 by 0.375 inch (9.5 mm) HD self-drilling, corrosion resistant ribbed wafer head screws.

3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

- .1 Do not begin installation until substrates have been properly prepared.
- .2 In case of defect, notify Owner's Representative of unsatisfactory preparation before proceeding.

3.3 INSTALLATION

- .1 Install in accordance with manufacturer's instructions. Install sheets with 3 mm gap between sheets.
- .2 Place fasteners 152 mm on center no closer than 9.5 mm from board edges and 51 mm from board corners.
- .3 Boards shall be placed with a minimum 6 mm clearance from the floor surfaces and other horizontal tile termination locations, including above tub edges. This gap shall be free of adhesive and grout and filled with a flexible sealant.
- .4 Boards shall be placed with a minimum 3 mm clearance from wall and cabinet bases, and other horizontal tile termination locations, including above tub edges. This gap shall be free of adhesive and grout and filled with a flexible sealant.

- .5 Joints shall be reinforced with 51 mm wide, high-strength, coated, alkali-resistant, glass fiber reinforcing tape embedded into the wet mastic or modified thinset mortar and allowed to dry thoroughly
- .6 For large tiled areas, movement/control joints shall be provided in accordance with ANSI A108, Section AN-3.7 or as indicated on drawings.
- .7 Wall tiles complying with ANSI A137.1 are attached to the board with flexible Type I mastic adhesives complying with ANSI A136.1, or acrylic or latex-modified thinset mortars complying with ANSI A118.4, in accordance with ANSI A108.

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

1 GENERAL

1.1 RELATED REQUIREMENTS

- | | | |
|----|------------------|-----------------------------|
| .1 | Section 01 33 00 | Submittal Procedures |
| .2 | Section 01 45 00 | Quality Control |
| .3 | Section 01 78 00 | Closeout Submittals |
| .4 | Section 07 92 00 | Joint Sealants |
| .5 | Section 09 21 16 | Gypsum Board Assemblies |
| .6 | Section 09 28 13 | Cementitious Backer Boards |
| .7 | Section 09 67 23 | Epoxy Resin Flooring |
| .8 | Section 10 28 13 | Toilet And Bath Accessories |

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
 - .1 ANSI A108.1-99, Specification for the Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-.13, A118.1-.10, ANSI A136.1).
 - .2 CTI A118.3-92, Specification for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1).
 - .3 CTI A118.4-92, Specification for Latex Cement Mortar (included in ANSI A108.1).
 - .4 CTI A118.5-92, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1).
 - .5 CTI A118.6-92, Specification for Ceramic Tile Grouts (included in ANSI A108.1).
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C 144-04, Specification for Aggregate for Masonry Mortar.
 - .2 ASTM C 207-06, Specification for Hydrated Lime for Masonry Purposes.
 - .3 ASTM C 847-06, Specification for Metal Lath.
 - .4 ASTM C 979-05, Specification for Pigments for Integrally Coloured Concrete.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CGSB 71-GP-22M-78(AMEND.), Adhesive, Organic, for Installation of Ceramic Wall Tile.
 - .3 CAN/CGSB-75.1-M88, Tile, Ceramic.
 - .4 CAN/CGSB-25.20-95, Surface Sealer for Floors.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA A123.3-[05], Asphalt Saturated Organic Roofing Felt.
 - .2 CAN/CSA-A3000-[03(R2006)], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .5 Terrazzo Tile and Marble Association of Canada (TTMAC)
 - .1 Tile Specification Guide 09 30 00 [2006/2007], Tile Installation Manual.
 - .2 Tile Maintenance Guide [2000].

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Include manufacturer's information on:
 - .1 Ceramic tile, marked to show each type, size, and shape required.
 - .2 Chemical resistant mortar and grout (Epoxy and Furan).
 - .3 Cementitious backer unit.
 - .4 Dry-set cement mortar and grout.
 - .5 Divider strip.
 - .6 Elastomeric membrane and bond coat.
 - .7 Reinforcing tape.
 - .8 Levelling compound.
 - .9 Latex cement mortar and grout.
 - .10 Commercial cement grout.
 - .11 Organic adhesive.
 - .12 Slip resistant tile.
 - .13 Waterproofing isolation membrane.
 - .14 Fasteners.
 - .3 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
 - 12 Wall tile: submit [duplicate], [300 x 300] mm sample panels of each colour, texture, size, and pattern of tile.
 - .3 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.
 - .4 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.

1.4 QUALITY ASSURANCE

- .1 Quality Assurance Submittals:
 - .1 Manufacturer's Instructions: manufacturer's installation instructions.
 - .2 Manufacturer's Field Reports: manufacturer's field reports specified.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 AMBIENT CONDITIONS

- .1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C for 48 hours before, during, and 48 hours after, installation.
- .2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.

- .3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

1.7 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Provide minimum 5% of each type and colour of tile required for project for maintenance use. Store where directed.
 - .3 Maintenance material same production run as installed material.

2 PRODUCTS

2.1 WALL AND CEILING TILE

- .1 Ceramic tile: to CAN/CGSB-75.1, Type 5], Class MR 4, 150 mm long x 75 mm high x 8 mm size, rounded edges, glazed surface, stack bond pattern, colour as selected by Departmental Representative.

2.2 TRIM SHAPES

- .1 Conform to applicable requirements of adjoining floor and wall tile.
- .2 Use slip resistant trim shapes for horizontal surfaces of showers, overflow ledges, recessed steps, shower curbs, drying area curbs, and stools.
- .3 Use trim shapes sizes conforming to size of adjoining field wall tile, including existing spaces, unless specified otherwise.
- .4 Ceramic cornice cap: shaped profile with 1/8" (3.2 mm) wide top section and vertical wall section that together form the visible surface, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer. Provide straight anchoring leg. Height as required. Finish Satin Nickel Anodized Aluminum

2.6 MORTAR AND ADHESIVE MATERIALS

- .1 Cement: to CSA-A5, type 10.
- .2 Sand: to ASTM C 144, passing 16 mesh.
- .3 Hydrated lime: to ASTM C 207, Type N.
- .4 Latex additive: formulated for use in cement mortar and thin set bond coat.
- .5 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

2.7 BOND COAT

- .1 Dry set cement mortar: to ANSI A108.1.
- .2 Organic adhesive: to [CGSB 71-GP-22M, Type [1] [2]] [ANSI A136.1].
 - .1 Maximum VOC limit [65] g/L [to SCAQMD Rule 1168].

- .3 Latex Cement mortar: to ANSI A108.1, two-component universal dry-set mortar.
- .4 Epoxy bond coat: non-toxic, non-flammable, non-hazardous during storage, mixing, application, and when cured. To produce shock and chemical resistant mortars having the following physical characteristics:
 - .1 Compressive Strength: 246 kg/cm².
 - .2 Bond Strength: 53 kg/cm².
 - .3 Water Absorption: 4.0% Max.
 - .4 Ozone Resistance, 200 hours @ 200 ppm: no loss of strength.
 - .5 Smoke Contribution Factor: 0.
 - .6 Flame Contribution Factor: 0.
 - .7 Finished mortar and grout to be resistant to urine, dilute acid, dilute alkali, sugar, brine and food waste products, petroleum distillates, oil and aromatic solvents.
 - .8 Bond Coat: maximum VOC limit [65] g/L [to SCAQMD Rule 1168].
- .5 Chemical-Resistant Bond Coat:
 - .1 Epoxy Resin Type: CTI A118.3.
 - .2 Furan Resin Type: CTI A118.5.
 - .3 Bond Coat: maximum VOC limit [65] g/L [to SCAQMD Rule 1168].

2.8 GROUT

- .1 Colouring Pigments:
 - .1 Pure mineral pigments, limeproof and nonfading, complying with ASTM C 979.
 - .2 Colouring pigments to be added to grout by manufacturer.
 - .3 Job coloured grout are not acceptable.
 - .4 Use in Commercial Cement Grout, Dry-Set Grout, and Latex Cement Grout.
- .2 Cement Grout: to ANSI A108.1.
 - .1 Use one part white cement to one part white sand passing a number 30 screen.
- .3 Commercial Cement Grout: to CTI A118.6.
- .4 Dry-Set Grout: to CTI A118.6.
- .5 Latex Cement Grout: to ANSI A108.1, fast curing, high early strength, polymer-modified, stain resistant, sanded mix for floors, unsanded mix for walls and floors with polished tiles commercial tile grout.
- .6 Chemical-Resistant Grout:
 - .1 Epoxy grout: to ANSI A108.1, having quality, colour and characteristics to match epoxy bond coat. Adhesive and grout by same manufacturer.
 - .2 Furan grout: to CTI A118.5.

2.9 ACCESSORIES

- .1 Reinforcing mesh: 50 x 50 x 1.6 x 1.6 mm galvanized steel wire mesh, welded fabric design, in flat sheets.
- .2 Sealant: in accordance with Section 07 92 00 - Joint Sealants.

2.10 MIXES

- .1 Cement:
 - .1 Scratch coat: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand, 1 part water, [and latex additive where required]. Adjust water volume depending on water content of sand.
 - .2 Slurry bond coat: cement and water mixed to creamy paste. Latex additive may be included.
 - .3 Mortar bed for floors: 1 part cement, 4 parts sand, 1 part water. Adjust water volume depending on water content of sand. Latex additive may be included.
 - .4 Mortar bed for walls and ceilings: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand and 1 part water. Adjust water volume depending on water content of sand. [Latex additive may be included].
 - .5 Levelling coat: 1 part cement, 4 parts sand, minimum 1/10 part latex additive, 1 part water including latex additive.
 - .6 Bond or setting coat: 1 part cement, 1/3 part hydrated lime, 1 part water.
 - .7 Measure mortar ingredients by volume.
- .2 Dry set mortar: mix to manufacturer's instructions.
- .3 Mix bond and levelling coats, and grout to manufacturer's instructions.
- .4 Adjust water volumes to suit water content of sand.

2.11 PATCHING AND LEVELLING COMPOUND

- .1 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.
- .2 Have not less than the following physical properties:
 - .1 Compressive strength - 25 MPa.
 - .2 Tensile strength - 7 MPa.
 - .3 Flexural strength - 7 MPa.
 - .4 Density - 1.9.
- .3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being troweled to smooth finish.
- .4 Ready for use in 48 hours after application.

2.12 CLEANING COMPOUNDS

- .1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.
- .2 Materials containing acid or caustic material are not acceptable.

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 WORKMANSHIP

- .1 Do tile work in accordance with TTMAC Tile Installation Manual 2006/2007, "Ceramic Tile", except where specified otherwise.
- .2 Apply tile or backing coats to clean and sound surfaces.
- .3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.
- .4 Maximum surface tolerance 1:800.
- .5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.
- .6 Lay out tiles so perimeter tiles are minimum 1/2 size.
- .7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
- .8 Make internal angles square, external angles rounded.
- .9 Use aluminum trim where tile terminates at the heights indicated
- .10 Install divider strips at junction of tile flooring and dissimilar materials.
- .11 Allow minimum 24 hours after installation of tiles, before grouting.
- .12 Clean installed tile surfaces after installation and grouting cured.

3.3 FLOOR SEALER AND PROTECTIVE COATING

- .1 Apply in accordance with manufacturer's instructions.

3.4 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 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.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 78 00 Closeout Procedures
- .3 Section 07 92 00 Joint Sealants
- .4 Section 09 21 16 Gypsum Board Assemblies

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM F1066-87 Standard Specification for Vinyl Composition Tile Composition 1 - Asbestos Free
- .2 Canadian Standards Association (CSA):
 - .1 CAN/CSA A126.5-M87 Resilient Wall Base

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 metal framing and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit 50 mm long samples of resilient wall base.

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.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect metal wall base from nicks, warping, scratches or blemishes.
 - .3 Replace defective or damaged materials with new.

1.5 AMBIENT CONDITIONS

- .1 Verify that moisture content of concrete slab is within allowable tolerances of flooring manufacturer.

- .2 Install resilient flooring only when base surfaces and air temperatures have been maintained between 21°C and 32°C for 72 hours preceding installation, and will be so maintained during installation and for 7 days thereafter.

2 PRODUCTS

2.1 MATERIALS

- .1 Top set, coved for hard floor surfaces, pure vulcanized virgin rubber material;
 - .1 Height: 100mm
 - .2 Thickness: 3.18mm
 - .3 Colour: to be selected by Departmental Representative at a later date.
 - .4 Length: continuous coil lengths (no joints permitted)
 - .5 Acceptable product: Traditional Rubber Wall Base as manufactured by *Johnsonite* or equivalent approved by Departmental Representative
- .2 Adhesives: as recommended by the manufacturer for each substrate application
- .3 Cleaner: Neutral chemical compound that will not damage tile or affect its colour.

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 Clean substrates and prime concrete surface which are dusting or chalking.
- .2 Lay material in accordance with manufacturer's specifications
- .3 Install bases in lengths as long as possible. Do not make up runs of short lengths. Cut and mitre internal and external corners. Accurately scribe bases around door frames, openings, and other wall breaks. Install bases at columns, walls and built-in fitments in areas where bases are indicated.
- .4 Apply wall base to base of millwork where detailed.
- .5 Ensure proper adhesion to all surfaces.

3.3 CLEANING

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

3.4 PROTECTION

- .1 Prevent traffic and work on newly laid floors by barricading until work has set.

- .2 After floors have set, and until project completion, cover work by methods which will ensure that they are not damaged by traffic.
- .3 Ensure that adequate ventilation and spark-proof electrical equipment are provided, and smoking is prohibited, in areas where flammable adhesives are used. Store materials to prevent spontaneous combustion.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 51 00 Temporary Utilities
- .3 Section 01 78 00 Closeout Submittals
- .4 Section 07 92 00 Joint Sealants

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM D638 Standard Test Method for Tensile Properties of Plastics.
 - .2 ASTM D645 Standard Test Method for Thickness of Paper and Paperboard.
 - .3 ASTM D695 Standard Test Method for Compressive Properties of Rigid Plastics
 - .4 ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - .5 ASTM D2240 Standard Test Method for Rubber Property Durometer Hardness.
 - .6 ASTM D4060 Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
 - .7 ASTM D4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

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 epoxy resin flooring and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit 400 x 200 mm samples of each resinous flooring system specified to show colour and texture with specified coats cascaded.
 - .2 Submit 150mm long sample of cove base clip / trim.

1.4 QUALITY ASSURANCE

- .1 Provide test and evaluation reports showing compliance with specified performance characteristics and physical properties.
- .2 Work of this Section is to be done by an experienced installer with no less than five (5) years of experience of work similar to that required for this project. When requested, provide list of last three (3) comparable jobs including, job name and locations, specifying authority and project manager.

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, labeled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store resinous epoxy flooring systems in accordance with manufacturer's.

1.6 AMBIENT CONDITIONS

- .1 Maintain an ambient temperature of at least 10°C degrees in the 24 hours prior to and the 48 hours that follow the application of all flooring components.
- .2 Ventilation:
 - .1 Work is to be performed in a properly ventilated work area in accordance with Section 01 51 00 – Temporary Utilities.
 - .2 Humidity shall be at most 40% in the area that work is to be performed for a period of seven (7) days before commencement of work and two (2) days following completion of work included in this Section.

1.7 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide minimum 2% of each type and colour of flooring required for project for maintenance use. Store where directed.

2 PRODUCTS

2.1 MATERIALS

- .1 All epoxy flooring products must be single sourced from one manufacturer to ensure product compatibility.
- .2 Epoxy Resin Flooring (EPX):
 - .1 Compressive Strength ASTM D695: 56 MPa (8122 psi)

- .2 Hardness, Shore D ASTM D2240: 76
- .3 Abrasion Resistance: to ASTM D4060, 0.11g
- .4 Thickness: 20-30 Mils
- .5 Colour: To be selected by Departmental Representative after Award of Contract.
- .6 Acceptable Product: Sikafloor 261 by *Sika Canada* or equivalent approved by the Departmental Representative.
- .3 Epoxy Flooring EPX-SR (Slip Resistant)
 - .1 Slip resistant additive for shower and dish washing areas
 - .2 Acceptable Product: Sikafloor Duochem 6 by *Sika Canada* or equivalent approved by the Departmental Representative.
- .4 Accessories
 - .1 Backing Rod for coved based applications: as recommended by the manufacturer.
 - .2 Cove clip / trim: as recommended by the manufacturer.

3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for epoxy resin flooring 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.
- .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
- .3 Verify that the concrete substrate is free of ridges, sharp projections, sound and dry.
- .4 Ensure that concrete surfaces have cured for a minimum of twenty-eight (28) days prior to application.
- .5 Patch and repair areas of damaged concrete as required to properly install flooring.

3.3 PROTECTION AND PREPARATION

- .1 Protect adjacent surfaces and materials from exposure to flooring product. Mask and cover any adjacent surfaces, fixtures, equipment, etc. by suitable means.

- .2 Clean substrate surfaces with equipment or products recommended by the manufacturer to remove oil, grease, dust or other residues.
- .3 Protect finished surfaces for a period of 24 hours or for the duration specified by the manufacturer.

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

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 51 00 Temporary Utilities
- .3 Section 01 78 00 Closeout Submittals
- .4 Section 07 92 00 Joint Sealants
- .5 Section 09 21 16 Gypsum Board Assemblies

1.2 REFERENCES

- .1 American Society for Testing Materials (ASTM):
 - .1 ASTM F570, Standard Test Method for Water Absorption of Plastics
- .2 Canadian General Standards Board (CGSB):
 - .1 CGSB 41-GP-30M, Wall Coverings, Vinyl-Coated Fabrics
- .3 Underwriters Laboratories of Canada (ULC):
 - .1 CAN/ULC-S102, Method of Test for Surface Characteristics of Building Materials and Assemblies

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 metal framing and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS acceptable to Labour Canada, and Health and Welfare Canada for vinyl-coated fabric wall coverings and adhesives. Indicate VOC content.
- .3 Samples:
 - .1 Provide maintenance data for vinyl wall covering in accordance with Section 01 78 00 - Closeout Submittals.

1.5 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for vinyl wall covering in accordance with Section 01 78 00 - Closeout Submittals.

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.

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect metal wall base from nicks, warping, scratches or blemishes.
 - .3 Replace defective or damaged materials with new.

1.5 AMBIENT CONDITIONS

- .1 Temperature: Maintain air temperature and structural base temperature at wall covering installation area above 20°C for 72 hours before, during and 72 hours after installation.
- .2 Ventilation:
 - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
 - .2 Provide continuous ventilation during and after coating application.

1.6 EXTRA MATERIALS

- .1 Provide extra materials of vinyl coated fabric wall covering, adhesives and cleaners in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide 15 m² of full width material of each pattern, texture and colour of vinyl-coated fabric wall covering.
- .3 Provide sufficient adhesive to install extra material vinyl-coated fabric wall covering provided.
- .4 Extra materials to be from same production run and/or dye lot as installed materials.
- .5 Clearly identify each roll of vinyl-coated fabric wall coverings and each container of adhesive.

2 PRODUCTS

2.1 MATERIALS

- .1 Vinyl FRP wall paneling: to ASTM D-5319
 - .1 Thickness: 1.5mm (0.060")
 - .2 Class: A
 - .3 Flame Spread Rating: ≤25
 - .4 Water Absorption per ASTM D-570 : 0.72%
 - .5 Texture: Smooth
 - .6 Colour: to be selected by Departmental Representative after Award of Contract.
 - .7 Acceptable product: Glasliner 180 Series FRP paneling by *Glasteel* or equivalent approved by the Departmental Representative.

- .2 Accessories:
 - .1 Adhesive: as per the manufacturer's recommendations
 - .2 Edge Trim and moldings: as per the manufacturer's installation details

3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

- .1 Unwrap wall covering when ventilation conditions are accelerated, and allow to acclimatize in installation area for 24 hours before application.
- .2 Prepare surfaces according to covering manufacturer's instructions.
- .3 Work penetrating substrate to be completed before installing covering.
- .4 Seal and size surfaces to receive covering.

3.3 INSTALLATION

- .1 Installation Sequence:
 - .1 Use rolls in consecutive numerical sequence of manufacture.
 - .2 Place panels consecutively in exact order they are cut from roll; including spaces above or below windows, doors or similar penetrations.
 - .3 Reverse alternate strips except on match patterns.
- .2 Trim additional salvage where required to achieve colour and pattern match at seams.
- .3 Apply adhesive to fabric back and/or substrate, as recommended by manufacturer.
- .4 Hang non-matched patterns by overlapping edges and double cutting through both thicknesses with metal back-up strip to prevent cutting substrate.
- .5 Wrap fabric 150 mm beyond inside and outside corners. No cutting at corners permitted, unless pattern or colour changes.
- .6 No horizontal seams permitted.
- .7 Install covering before installation of plumbing fixtures, electrical equipment casings, bases and cabinets.
- .8 Remove excess adhesive as work progresses and leave clean.
- .9 Leave completed work smooth, clean, without wrinkles, gaps, overlaps or air pockets.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Clean surfaces to covering manufacturer's written instructions.

3.5 PROTECTION

- .1 Protect finished surfaces and exterior corners from damage until final inspection.

3.6 SCHEDULES

- .1 Install wall coverings in Mess Hall Kitchen – Room 105.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 45 00 Quality Control
- .3 Section 01 51 00 Temporary Utilities
- .4 Section 06 20 00 Finish Carpentry
- .5 Section 08 11 00 Metal Doors and Frames
- .6 Section 08 14 66 Wood Screen Doors

1.2 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - 2010.
 - .2 Standard GPS-1-05, MPI Green Performance Standard for Painting and Coatings.
- .3 National Fire Code of Canada, 2010
- .4 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Contractor: to have a minimum of five (5) years proven satisfactory experience. When requested, provide list of last three (3) comparable jobs including, job name and location, specifying authority, and project manager.
 - .2 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work.
 - .3 Apprentices: may be employed provided they work under direct supervision of qualified journeypersons in accordance with applicable trade regulations.
- .2 Conform to latest MPI requirements for exterior repainting work including cleaning, preparation and priming.
- .3 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, and solvents) to be in accordance with the latest edition of the MPI Approved Product List and to be from a single manufacturer for each system used.
- .4 Paint materials such as linseed oil, shellac, and turpentine, to be the highest quality product of an approved manufacturer listed in MPI Maintenance Repainting Manual and shall be compatible with other coating materials as required.

- .5 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

1.4 PERFORMANCE REQUIREMENTS

- .1 Environmental Performance Requirements:
- .2 Provide paint products meeting MPI "Environmentally Friendly" E2 ratings based on VOC (EPA Method 24) content levels.

1.5 SCHEDULING

- .1 Submit work schedule for various stages of painting to Departmental Representative for approval. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from Departmental Representative for changes in work schedule.
- .4 Schedule repainting operations to prevent disruption by other trades if applicable and by occupants in and about building.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit full range colour sample chips for review and selection. Indicate where colour availability is restricted.
- .3 Provide product data and manufacturer's installation/application instructions for paints and coating products to be used.
- .4 Provide WHMIS Material Safety Data Sheets (MSDS).
- .5 Closeout Submittals:
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .2 Provide records of products used. List products in relation to finish system and include following:
 - .1 Product name, type and use (i.e. materials and location).
 - .2 Manufacturer's product number.
 - .3 Colour code numbers.
 - .4 MPI Environmentally Friendly classification system rating.
 - .5 Manufacturer's Material Safety Data Sheets.

1.7 QUALITY CONTROL

- .1 Quality Assurance Submittals:
 - .1 Manufacturer's Instructions: manufacturer's installation instructions.
 - .2 Provide mock-up in accordance with Section 01 45 00.
 - .3 When requested by Departmental Representative or Paint Inspection Agency, prepare and paint

designated surface, area, room or item to requirements specified herein, with specified paint or coating showing selected colours, number of coats, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.

1.8 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Provide one four litre can of each type and colour of stain, primer and finish coating. Identify type and colour in relation to established colour schedule and finish system.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements, supplemented as follows:
 - .1 Deliver and store materials in original containers, sealed, with labels intact.
 - .2 Labels to indicate:
 - .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 Store and handle in accordance with manufacturer's recommendations.
 - .5 Store materials and equipment in secure, dry, well-ventilated area with temperature range between 7 degrees C to 30 degrees C. Store materials and supplies away from heat generating devices and sensitive products above minimum temperature as recommended by manufacturer.
 - .6 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. Upon completion of operations, return areas to clean condition to approval of Departmental Representative.
 - .7 Remove paint materials from storage in quantities required for same day use.
 - .8 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
 - .9 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site daily.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Paint, stain and wood preservative finishes and related materials are hazardous products and are

- subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
- .3 Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
 - .4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
 - .5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
 - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
 - .6 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.
 - .6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

1.10 AMBIENT CONDITIONS

- .1 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer.
 - .2 Do not perform repainting work when:
 - .1 Ambient air and substrate temperatures are below 10 degrees C.
 - .2 Substrate temperature is over 32 degrees C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
 - .4 Relative humidity is above 85% or when dew point is less than 3 degrees C variance between air/surface temperature.
 - .5 Rain or snow is forecast to occur before paint has thoroughly cured.
 - .6 It is foggy, misty, raining or snowing at site.
 - .3 Conduct moisture tests using properly calibrated electronic Moisture Meter, except test existing painted concrete floors for moisture using simple "cover patch test" on failed areas.
 - .4 Do not perform repainting work when maximum moisture content of substrate exceeds:
 - .1 12% for concrete and masonry (clay and concrete brick/block).
 - .2 15% for wood.
 - .3 12% for stucco.
 - .5 Test painted concrete, masonry and plaster surfaces for alkalinity as required.
- .2 Application Requirements:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind conditions are such that airborne particles will affect quality of finished

- surface.
- .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted.
 - .3 Apply paint when previous coat of paint is dry or adequately cured, unless otherwise pre-approved by specific coating manufacturer.
 - .4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.
 - .5 Do not apply paint when:
 - .1 Temperature is expected to drop below 10 degrees C before paint has thoroughly cured.
 - .2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
 - .3 Surface to be painted is wet, damp or frosted.
 - .6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
 - .7 Schedule repainting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
 - .8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

2 PRODUCTS

2.1 MATERIALS

- .1 Paint materials listed in latest edition of MPI Approved Product List (APL) are acceptable for use on this project.
- .2 Paint materials for repaint systems: products of single manufacturer.
- .3 Only qualified products with E2 and E3 MPI "Environmentally Friendly" rating are acceptable for use on this project.
- .4 Paints, coatings, thinners, solvents, cleaners and other fluids used in repainting to be as follows:
 - .1 Not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
 - .2 Be manufactured without compounds which contribute to ozone depletion in upper atmosphere.
 - .3 Be manufactured without compounds which contribute to smog in lower atmosphere.
 - .4 Be manufactured where matter generating 'Biochemical Oxygen Demand' (BOD) in undiluted production plant effluent discharged to natural watercourse or sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.
 - .5 Be manufactured where total suspended solids (TSS) content in undiluted production plant effluent discharged to natural watercourse or sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.
- .5 Paints and coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).
- .9 Paints and coatings must not be formulated or manufactured with formaldehyde, halogenated solvents,

mercury, lead, cadmium, hexavalent chromium or their compounds.

2.2 COLOURS

- .1 Departmental Representative will provide Colour Schedule after Contract award.
- .2 Colour schedule will be based upon selection of four (4) base colours and two (2) accent colours. No more than six (6) colours will be selected for entire project and no more than three (3) colours will be selected in each area.
- .3 Selection of colours will be from manufacturers full range of colours.
- .4 Where specific products are available in restricted range of colours, selection will be based on limited range.
- .5 First coat in two coat (Premium) repaint system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed with Departmental Representative's written permission.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Where thinner is used, addition not to exceed paint manufacturer's recommendations. Do not use kerosene or such organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

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

Gloss Level Category	Units @ 60 Degrees	Units @ 85 Degrees
G1 - matte finish	0 to 5	maximum 10
G2 - velvet finish	0 to 10	10 to 35
G3 - eggshell finish	10 to 25	10 to 35
G4 - satin finish	20 to 35	minimum 35
G5 -	35 to 70	

semi-gloss finish	
G6 - gloss finish	70 to 85
G7 - high <u>gloss finish</u>	> 85

- .2 Gloss level ratings of repainted surfaces [as specified] [and] [as noted on Finish Schedule] .

2.5 EXTERIOR PAINTING SYSTEMS

- .1 REX 2.1 - Asphalt Surfaces: Zone/Traffic Marking for Drive and Parking Areas, etc.
.1 REX 2.1A - Latex Zone/Traffic Marking Finish.
- .2 REX 3.2 - Concrete Horizontal Surfaces: (parking and court areas).
.1 REX 3.2G - Concrete Floor Sealer.
- .3 REX 5.3 - Galvanized Metal: High Contact/High Traffic Areas (Doors, Frames, Railings, Pipes, and Handrail).
.1 REX 5.3B – Alkyd semi-gloss.
- .4 REX 6.2 - Dimension Lumber: (columns, beams, exposed joists, siding, and trim).
.1 REX 6.2D - Solid Colour Stain (siding trim)
.2 REX 6.2P – Translucent Penetrating Alkyd Varnish G1 Finish (timber framed trusses and columns)
- .5 REX 6.3 - Dressed Lumber: (soffits).
.1 REX 6.3C - Solid Colour Stain
.2 REX 6.2P – Translucent Penetrating Alkyd Varnish G1 Finish

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 EXAMINATION

- .1 Exterior repainting work: inspected by MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor to notify Paint Inspection Agency minimum of one week prior to commencement of work and provide copy of project repainting specification and Finish Schedule (as well as plans and elevation drawings if available).
- .2 Exterior surfaces requiring repainting: inspected by both painting contractor and Paint Inspection Agency who will notify Departmental Representative in writing of defects or problems, prior to commencing repainting work, or after surface preparation if unseen substrate damage is discovered.
- .3 Where an assessed degree of surface degradation of DSD-1 to DSD-3 before preparation of surfaces for repainting is revealed to be DSD-4 after preparation, repair or replacement of such unforeseen defects

discovered are to be corrected, as mutually agreed, before repainting is started.

- .4 Where "special" repainting or recoating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer to provide as part of work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Departmental Representative.

3.3 PREPARATION

- .1 Perform preparation and operations for exterior painting in accordance with MPI Maintenance Repainting requirements except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.
- .3 Clean and prepare exterior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and surface debris by brushing, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent (and bleach where applicable) and clean warm water using a stiff bristle brush to remove dirt, oil and surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Use trigger operated spray nozzles for water hoses.
 - .5 Allow surfaces to drain completely and to dry thoroughly.
 - .6 Use water-based cleaners in place of organic solvents where surfaces will be repainted using water based paints.
 - .7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or such organic solvents to clean up water-based paints.
- .4 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with MPI requirements. Remove such contaminants from surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.
- .5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.
- .6 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.
- .7 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects from previously painting (e.g. runs, and sags) that are visible from distance up to 1000 mm.

3.4 EXISTING CONDITIONS

- .1 Prior to commencing work, examine site conditions and existing exterior substrates to be repainted and report in writing to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions of surfaces that will adversely affect this work.
- .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter,

except test concrete floors for moisture using a simple "cover patch test" and report findings to Departmental Representative. Maximum moisture content not to exceed specified limits.

- .3 No repainting work to commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to Painting Subcontractor and Inspection Agency.

3.5 PROTECTION

- .1 Protect existing building surfaces and adjacent structures from paint splatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such 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 general public and building occupants in and about the building.
- .5 Removal of light fixtures, surface hardware on doors, and surface mounted equipment, fittings and fastenings to be done prior to undertaking painting operations. Store items and re-install after painting is completed.
- .6 Move and cover exterior furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .7 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of Departmental Representative.

3.06 APPLICATION

- .1 Apply paint by method that is best suited for substrate being repainted using brush or roller. Conform to manufacturer's application instructions unless specified otherwise. In each case method of application to be as pre-approved by Departmental Representative before commencing work.
- .2 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using brush and/or roller of types 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 to be free of roller tracking and heavy stipple unless approved by Departmental Representative.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by [Departmental Representative] [DCC Representative] [Consultant].
- .4 Apply paint coats in a continuous manner and allow surfaces to dry and cure between coats for minimum time period as recommended by manufacturer. Minimum dry film thickness of coats not less than that recommended by manufacturer. Repaint thin spots or bare areas before next coat of paint is applied.

- .5 Sand and dust between coats to remove visible defects.
- .6 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.
- .7 Finish to doors include all edges including top and bottom edges. Surfaces concealed by door hardware be repainted unless otherwise pre-approved.

3.7 MECHANICAL / ELECTRICAL EQUIPMENT

- .1 Unless otherwise noted, repainting to include exposed to view/previously painted exterior mechanical and electrical equipment and components (panels, conduits, piping, hangers, and ductwork).
- .2 Touch up scratches and marks and repaint such mechanical and electrical equipment and components with colour and finish to match existing finish unless otherwise noted or scheduled.
- .3 Do not paint over name plates or instruction labels.
- .4 Standard of Acceptance: when viewed using natural prevailing sunlight at peak period of the day (mid-day) on surface viewed, surfaces to indicate following:
 - .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
 - .2 Soffits: no defects visible from grade at 45 degrees to surface.
 - .3 Final coat to exhibit uniformity of colour and sheen across full surface area.

3.8 FIELD QUALITY CONTROL

- .1 Advise Departmental Representative and Paint Inspection Agency when each surface and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .2 Co-operate with Paint Inspection Agency and provide access to areas of work.
- .3 Manufacturer's Field Services:
 - .1 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.

3.9 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- .3 Keep work area free from unnecessary accumulation of tools, equipment, surplus materials and debris.
- .4 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
- .5 Clean equipment and dispose of wash water used for water borne materials, solvents used for oil based materials as well as cleaning and protective materials (e.g. rags, drop cloths, and masking papers), paints,

- thinners, paint removers/strippers in accordance with the safety requirements of authorities having jurisdiction and as specified.
- .6 Clean painting equipment in leak-proof containers that will permit particulate matter to settle out and be collected. Sediment remaining from cleaning operations to be [recycled] [disposed] of in manner acceptable to authorities having jurisdiction.
- .7 Recycle paint and coatings in excess of repainting requirements as specified.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 51 00 Temporary Utilities
- .3 Section 01 61 00 Common Product Requirements
- .4 Section 01 78 00 Closeout Submittals
- .5 Section 06 20 00 Finish Carpentry
- .6 Section 06 40 00 Architectural Woodwork
- .7 Section 07 92 00 Joint Sealants
- .8 Section 08 11 00 Metal Doors And Frames
- .9 Section 09 21 16 Gypsum Board Assemblies
- .10 Section 09 91 13 Exterior Painting

1.2 REFERENCES

- .1 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33
- .2 Environmental Protection Agency (EPA)
 - .1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual, 2004.
- .5 National Fire Code of Canada - 2010
- .6 Society for Protective Coatings (SSPC)
 - .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.
- .7 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34 .

1.3 QUALITY ASSURANCE

- .1 Contractor shall have a minimum of five (5) years proven satisfactory experience. Provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.
- .2 Journeymen: qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work.
- .3 Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

- .4 Conform to latest MPI requirements for interior painting work including preparation and priming. Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.
- .5 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.
- .6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

1.4 QUALITY ASSURANCE

- .1 Provide paint products meeting MPI "Environmentally Friendly" E2 ratings based on VOC (EPA Method 24) content levels.

1.5 SCHEDULING OF WORK

- .1 Submit work schedule for various stages of painting to Departmental Representative for approval. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from Consultant for any changes in work schedule.
- .3 Schedule painting operations to prevent disruption of occupants in and about the building.

1.6 ACTION AND INFORMATIONAL 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 two 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 and curing.
- .3 Samples:
 - .1 Submit full range colour sample chips to indicate where colour availability is restricted.
 - .2 Submit 200 x 300 mm sample panels of each paint, stain and clear coating with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:
 - .1 3 mm plate steel for finishes over metal surfaces.
 - .2 13 mm birch plywood for finishes over wood surfaces.
 - .3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
 - .4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
 - .5 10 mm cedar, siding, plywood for finishes over wood surfaces.
 - .3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
 - .4 Test reports: submit certified test reports for paint from approved independent testing laboratories,

indicating compliance with specifications for specified performance characteristics and physical properties.

- .1 Lead, cadmium and chromium: presence of and amounts.
- .2 Mercury: presence of and amounts.
- .3 Organochlorines and PCBs: presence of and amounts.
- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation and application instructions.
- .7 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 number[s].
 - .4 MPI Environmentally Friendly classification system rating.

1.7 QUALITY CONTROL

- .1 Provide mock-up in accordance with Section 01 45 00.
- .2 When requested by Departmental Representative, prepare and paint designated surface, area, room or item (in each colour scheme) to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.

1.8 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 primer, stain, and 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.

1.9 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 with temperature range [7] degrees C to [30] degrees C.
- .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 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.
- .9 Waste Management and Disposal:
 - .1 Separate waste materials for [reuse] [and] [recycling] in accordance with Section 01 74 21 - 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 [paper] [plastic] [polystyrene] [corrugated cardboard] packaging material [in appropriate on-site bins] for recycling in accordance with Waste Management Plan (WMP).
 - .4 Place materials defined as hazardous or toxic in designated containers.
 - .5 Handle and dispose of hazardous materials in accordance with Regional and Municipal, regulations.
 - .6 Ensure emptied containers are sealed and stored safely.
 - .7 Unused paint and coating materials must be disposed of at official hazardous material collections site as approved by Departmental Representative.
 - .8 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
 - .9 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
 - .10 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and

containers, in containers or areas designated for hazardous waste.

- .11 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
 - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - .4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
 - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
- .13 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

1.10 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 – Temporary Utilities.
 - .2 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
 - .3 Provide continuous ventilation for seven days after completion of application of paint.
 - .4 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
 - .5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
 - .6 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless pre-approved written approval by Specifying body or Paint Inspection Agency Authority and product manufacturer, perform no painting when:
 - .1 Ambient air and substrate temperatures are below 10 degrees C.
 - .2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.
 - .4 The relative humidity is under 85% or when the dew point is more than 3 degrees C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.
 - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
 - .6 Ensure that conditions are within specified limits during drying or curing process, until newly

- applied coating can itself withstand 'normal' adverse environmental factors.
- .2 Perform painting work when maximum moisture content of the substrate is below:
 - .1 Allow new concrete and masonry to cure minimum of 28 days.
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
 - .3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".
 - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .3 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.
- .4 Additional interior application requirements:
- .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
 - .2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

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 Only qualified products with E2 "Environmentally Friendly" rating are acceptable for use on this project.
- .4 Conform to latest MPI requirements for interior painting work including preparation and priming.
- .5 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.
- .4 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:
 - .1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
 - .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

- .5 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.
- .6 Recycled water-borne surface coatings must not contain:
 - .1 Lead in excess of 600.0 ppm weight/weight total solids.
 - .2 Mercury in excess of 50.0 ppm weight/weight total product.
 - .3 Cadmium in excess of 1.0 ppm weight/weight total product.
 - .4 Hexavalent chromium in excess of 3.0 ppm weight/weight total product.
 - .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.
- .7 The following must be performed on each batch of consolidated postconsumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.
 - .1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
 - .2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
 - .3 Organochlorines and PCBs are to be determined by Gas Chromatography

2.2 COLOURS

- .1 Departmental Representative will provide Colour Schedule after Contract award.
- .2 Colour schedule will be based upon selection of five base colours and three accent colours. No more than eight colours will be selected for entire project and no more than three colours will be selected in each area.
- .3 Selection of colours from manufacturers full range of colours.
- .4 Where specific products are available in restricted range of colours, selection based on limited range.
- .5 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. Obtain written approval from Departmental Representative for tinting of painting materials.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of

settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

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

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

- .2 Gloss level ratings of painted surfaces specified herein and in general G5 – semi gloss should be used. Where clear coated wood is used on wall, decks and structural elements, finish should be non-film forming, penetrating type.

2.5 INTERIOR PAINTING SYSTEMS

- .1 Concrete horizontal surfaces: floors:
.1 INT 3.2F - Concrete floor sealer.
- .2 Metal fabrications: if shop primed:
.1 INT 5.1T – Alkyd enamel, semi-gloss finish
- .3 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts.
.1 INT 5.3A – Acrylic Latex G5 finish
- .4 Glue laminated beams and columns:
.1 INT 6.1G - Semi transparent stain finish.

- .5 Dressed lumber: including doors, door and window frames, casings, mouldings:
 - .1 INT 6.3Z - Clear (2 component) polyurethane finish.
- .6 Wood paneling and casework: partitions, panels, shelving, millwork:
 - .1 INT 6.4C - Semi-Transparent stain finish
- .7 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
 - .1 INT 9.2A – two (2) coats Acrylic Latex G5 finish over one (1) latex sealer.

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.
- .2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Maximum moisture content as follows:
 - .1 Stucco, plaster and gypsum board: 12%.
 - .2 Concrete: 12%.
 - .3 Clay and Concrete Block/Brick: 12%.
 - .4 Wood: 15%.

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.
- .2 Surface Preparation:
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
 - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.
- .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.
- .5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .6 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.
- .7 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.
- .8 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. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, blowing with clean dry compressed air or vacuum cleaning.
- .9 Touch up of shop primers with primer as specified.

- .10 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.5 APPLICATION

- .1 Method of application to be as approved by Departmental Representative. Apply paint by brush, roller, air sprayer. 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.
- .9 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .10 Finish closets and alcoves as specified for adjoining rooms.
- .11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ ELECTRICAL EQUIPMENT

- .1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.
- .2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
- .3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .5 Do not paint over nameplates.
- .6 Keep sprinkler heads free of paint.
- .7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .8 Paint fire protection piping [red].
- .9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .10 Paint natural gas piping yellow.
- .11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
- .12 Do not paint interior transformers and substation equipment.

3.7 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.

3.8 FIELD QUALITY CONTROL

- .1 Interior painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and local Painting Contractor's Association. Painting contractor shall notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings including pertinent details as well as a Finish Schedule.
- .2 Interior surfaces requiring painting shall be inspected by Paint Inspection Agency who shall notify Departmental Representative and General Contractor in writing of defects or problems, prior to commencing

- painting work, or after prime coat shows defects in substrate.
- .3 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Departmental Representative.
 - .4 Standard of Acceptance:
 - .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.
 - .5 Field inspection of painting operations to be carried out by independent inspection firm as designated by Departmental Representative.
 - .6 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
 - .7 Cooperate with inspection firm and provide access to areas of work.
 - .8 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

3.9 RESTORATION

- .1 Clean and re-install hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 06 10 00 Rough Carpentry
- .3 Section 10 28 13 Toilet Accessories

1.2 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 A240/A240M-12, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - .3 ASTM A480/A480M-12, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip.
 - .4 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-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 CAN/CGSB-1.104M-91, Semigloss Alkyd, Air Drying and Baking Enamel.
- .3 CSA International
 - .1 CSA B651-12, Accessible Design for the Built Environment.

1.3 ACTION AND INFORMATION 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 metal toilet compartments and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Installation Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.
 - .2 Indicate fabrication details, plans, elevations, hardware, and installation details.

- .4 Samples:
 - .1 Submit duplicate 300 x 300 mm samples of panel showing finished edge and corner construction and core construction.
 - .2 Submit duplicate representative samples of hardware items, including brackets, fastenings and trim.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect [metal toilet compartments from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 MATERIALS

- .1 Metal toilet partitions.
 - .1 Sheet steel: commercial quality to A480/480M with ZF001 designation zinc coating.
 - .2 Minimum base steel thickness:
 - .1 Panels and doors: 0.8 mm.
 - .2 Pilasters: 1.0 mm.
 - .3 Reinforcement: 3.0mm.
 - .3 Headrails: 25 mm x 41mm x 1.5mm thick, clear anodized, extruded aluminum, anti-grip design
 - .4 Pilaster shoe: 0.8 mm stainless steel, 75mm high.
 - .5 Attachment: stainless steel tamperproof type screws and bolts.

- .6 Panel height: 1613mm for water closets and 1829mm doors for shower stalls
- .7 Finish: powder coated with anti-graffiti finish
- .8 Colour: to be selected by Departmental Representative from manufacturer`s standard colour range.
- .2 Metal urinal partitions.
 - .1 Sheet steel: commercial quality to A480/480M with ZF001 designation zinc coating.
 - .2 Minimum base steel thickness:
 - .1 Panels and doors: 0.8 mm.
 - .2 Reinforcement: 3.0mm.
 - .3 Panel: 610 mm deep x 1067 mm high
 - .4 Pilaster shoe: 0.8] mm stainless steel, 75mm high.
 - .5 Attachment: wall anchored, stainless steel tamperproof type screws and bolts.
 - .6 Finish: powder coated with anti-graffiti finish
 - .7 Colour: to be selected by Departmental Representative from manufacturer`s standard colour range.
- .3 Metal shower doors
 - .1 Sheet steel: commercial quality to A480/480M with ZF001 designation zinc coating.
 - .2 Minimum base steel thickness:
 - .1 Panels: 0.8 mm.
 - .2 Reinforcement: 3.0mm.
 - .3 Panel: 610 mm wide x 1829 mm high installed at the height noted on the drawings
 - .4 Attachment: continuous, full height extruded aluminum channel on the hinge side and the same opposite with continuous rubber bumper locked in place the length of the stop. Refer to architectural detail.
 - .6 Finish: powder coated with anti-graffiti finish
 - .7 Colour: to be selected by Departmental Representative from manufacturer`s standard colour range.

2.2 COMPONENTS

- .1 Hinges:
 - .1 Threaded upper hinge pin shall have a metal core and self-lubricating nylon sleeve to ensure smooth, quiet operation.
- .2 Material/finish: chrome plated zinc die casting.

- .3 Swing: inward.
- .4 Return movement: gravity type hinge mounted on the lower pilaster hinge bracket
- .5 Latch set: built-in concealed latch with face mortised flush with the edge of the door.
- .6 Wall and connecting brackets: Hardware accessory: provide continuous, full height extruded aluminum channel on the hinge side and the same opposite with continuous rubber bumper locked in place the length of the stop. Refer to architectural detail.
- .7 Coat hook: combination hook and rubber door bumper.

2.3 FABRICATION

- .1 Doors, panels and screens: 25mm thick, two steel sheets faces pressure bonded to honeycomb core
- .2 Pilasters: 32mm thick, constructed same as door, to sizes indicated.
- .3 Include formed and closed edges for doors, panels and pilasters.
 - .1 Miter and weld corners and grind smooth.
- .4 Include internal reinforcement at areas of attached hardware and fittings.

2.4 FINISHES

- .1 Clean, degrease and neutralize steel components with phosphate or chromate treatment.
- .2 All sheet metal to be thoroughly cleaned, phosphated and finished with a high performance powder coating, electrostatically applied and oven cured to provide a uniform, smooth protective finish.
- .3 Provide anti-graffiti finish.

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for metal toilet compartment 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 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.

3.3 PREPARATION

- .1 Ensure supplementary anchorage, if required, is in place.

3.4 ERECTION

- .1 Partition erection:
 - .1 Install partitions secure, plumb and square.
 - .2 Leave 12 mm space between wall and panel or end pilaster.
 - .3 Anchor mounting brackets to surfaces using screws and shields: blocking/backing must be provided to hollow walls using bolts and toggle type anchors.
 - .4 Attach panel and pilaster to brackets with self-drilling screws with through type sleeve bolt and nut.
- .2 Floor supported and overhead braced partition erection.
 - .1 Attach pilasters to floor with pilaster supports and level, plumb, and tighten installation with levelling device.
 - .2 Secure pilaster shoes in position.
 - .3 Secure headrail to pilaster face with not less than two fasteners per face.
 - .4 Set tops of doors parallel with overhead brace when doors are in closed position.
- .3 Urinal screens erection:
 - .1 Anchor wall-hung screen panels to walls with 2 panel brackets fastened to wood studs with anchors recommended by manufacturer.

3.5 ADJUSTING

- .1 Adjust doors and locks for optimum, smooth operating condition.
- .2 Lubricate hardware and other moving parts.

3.6 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.
- .3 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 Clean surfaces after installation using manufacturer's recommended cleaning procedures.
- .4 Clean aluminum with damp rag and approved non-abrasive cleaner.
- .5 Clean and polish hardware and stainless components.

3.7 PROTECTION

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

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 06 10 00 Rough Carpentry
- .3 Section 08 80 50 Glazing

1.2 REFERENCE

- .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-B651-12 Accessible Design for the Built Environment.
 - .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 ACTION AND INFORMATIONAL 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.
- .2 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, [building-in details of anchors for grab bars].
- .3 Samples:
 - .1 Submit 200 x 200mm samples for custom sized mirror for review by Departmental Representative. Refer to Section 08 80 50 – Glazing.

- .2 Samples will be returned for inclusion into work.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 78 00- Closeout Submittals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Tools:
 - .1 Provide special tools required for assembly, disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00- Closeout Submittals.
 - .2 Deliver special tools to Departmental Representative.

1.6 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, labeled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store products indoors in dry location and in accordance with manufacturer's recommendations.
 - .2 Store and protect toilet and bathroom accessories from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.7 COORDINATION FOR INSTALLATION OF ACCESSORIES AND EQUIPMENT PROVIDED BY OWNER

- .1 Coordinate with Parks Canada for services and blocking if and where required for the acceptance and installation of the following items:
 - .1 Soap Dispensers: Model 2L Proline Heavy Duty as manufactured by DEB
 - .2 Toilet Paper Dispensers: Model JRT Junior Dispenser 4212
 - .3 Hand Dryers: Extreme Air Model GXT9 120/240V

2 PRODUCTS

2.1 MATERIALS

- .1 Sheet steel: to ASTM A653/A653M with ZF001 designation zinc coating.
- .2 Stainless steel sheet metal: to ASTM A167, Type 304, satin finish
- .3 Stainless steel tubing: 16 gauge (1.6mm) thick, 32 mm diameter peened surface tubular stainless steel with welded concealed flanges.

- .4 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.

2.1 COMPONENTS

- .1 Toilet Tissue Dispenser: PROVIDED BY OWNER, installed as part of the contract.
- .2 Soap Dispenser: PROVIDED BY OWNER, installed as part of the contract.
- .3 Paper Towel Dispenser (PTD): for folded paper towels, stainless steel type 304, 22 gauge 90.8mm thickness. Piano hinged door constructed of stainless steel type 304, satin finish and furnished with semi-recessed tumbler lock.
- .4 Sanitary Napkin Disposal Unit (SND): surface mounted unit constructed of stainless steel type 304 with satin finish and min. capacity of 1.0-gal (3.8L).
- .5 Motion activated electrical hand dryer: PROVIDED BY OWNER, installed as part of the contract.
- .6 Shower Curtain: opaque, matt white vinyl, 0.178 mm thick. Provide hooks and curtain hold-back device at each curtain.
- .7 Shower Rods: fixed shower rod constructed of stainless steel type 304, diameter of 32mm, length 915 mm. Shower rod material and anchorage to withstand downward pull of 0.9 kN.
- .8 Folding Shower Seat (FSS): compact design constructed of water-resistant 8mm solid phenolic. Framing and bracket to be constructed of stainless steel type 304 and capable of supporting weights of up to 500lbs (227kg).
- .9 Grab bars (GB-1): 915mm long, 16 gauge (1.6mm) thick, 32 mm diameter peened surface tubular stainless steel with welded concealed flanges and able to withstand downward force of 2.2kN (500lbs).
- .10 Grab bars (GB-2): 610mm long, 16 gauge (1.6mm) thick, 32 mm diameter peened surface tubular stainless steel with welded concealed flanges and able to withstand downward force of 2.2kN (500lbs).
- .11 Back Rest for Wall Mounted Toilet (BR): white solid core plastic laminate with 30mm diameter stainless steel tube support, fixed to the wall behind the toilet. Satin finish.
- .12 Utility Hook (UH): surface mounted utility hook constructed of stainless steel type 304. Flange and support arm constructed of 0.8mm stainless steel with concealed mounting bracket.
- .13 Surface Mounted Shower Shelf (SH): constructed of 18 gauge (1.2mm) stainless steel with front edge hemmed for safety. Approximate dimensions 203mm deep by 457mm long.
- .14 Surface Mounted Horizontal Baby Change Table (CT1): constructed of molded polypropylene and equipped with pneumatic cylinder for controlled opening and closing of bed. Bed supported by metal chassis with concealed hinge. Unit to be provided with antimicrobial embedded into plastic materials.
- .15 Surface Mounted Vertical Baby Change Table (CT2): constructed of molded polypropylene and equipped with pneumatic cylinder for controlled opening and closing of bed. Bed supported by metal chassis with concealed hinge. Unit to be provided with antimicrobial embedded into plastic materials.
- .16 Surface Mounted Mirror (M-1): custom sized mirrors with dimensions to suit each condition. Refer to Section 08 80 50 - Glazing

- .17 Surface Mounted Mirror (M-2): Surface mounted one-piece roll-formed mirror with angle frame. Frame construction of stainless steel type 304 with satin finish and 6mm thick mirror.

2.2 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.

2.3 FINISHES

- .1 Chrome and nickel plating; to ASTM B456, satin finish.
- .5 Manufacturer's or brand names on face of units not acceptable.

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of frames previously installed under other Sections or Contracts are acceptable to receive toilet and bathroom accessories installation in accordance with manufacturer's written instructions.
- .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 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 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.
- .4 Toilet and shower compartments: use male to female through bolts.
- .2 Install grab bars on built-in anchors provided by bar manufacturer.

- .3 Use tamper proof screws/bolts for fasteners.
- .4 Fill units with necessary supplies shortly before final acceptance of building.
- .5 Install mirrors in accordance with Section 08 80 50- Glazing.

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 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 CLEANING

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

3.6 SCHEDULE

- .1 Refer to drawings for accessory locations and installation heights.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 78 00 Closeout Submittals
- .3 Section 04 43 13 Stone Masonry Veneer
- .4 Section 09 22 16 Non-Structural Metal Framing
- .5 Section 09 28 13 Cementitious Backer Boards

1.2 REFERENCES

- .1 American National Standards Institute (ANSI):
 - .1 ANSI Z21.44 - Gas-Fired Gravity and Fan Type Direct Vent Wall Furnaces
 - .2 ANSI Z21.88 - Vented Gas Fireplace Heaters
 - .3 ANSI Z223.1 - National Fuel Gas Code
 - .4 ANSI Z21.50b - Vented Gas Fireplaces
 - .2 Canadian Standards Association (CSA):
 - .1 CSA 2.22b - Vented Gas Fireplaces
 - .2 CSA 2.33 - Vented Gas Fireplace Heaters
- Underwriter's Laboratories of Canada (ULC):
- .1 CAN/ULC S610 - Factory-Built Fireplaces

1.3 SUBMITTALS

- .1 Submit manufacturer's data sheets on each product to be used, including:
 - .1 Preparation instructions and recommendations.
 - .2 Storage and handling requirements and recommendations.
 - .3 Installation methods.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Store products in manufacturer's unopened packaging until ready for installation.

2 PRODUCTS

2.1 MATERIALS

- .1 Gas Burning Manufactured Fireplaces
 - .1 Testing:
 - .1 Products to comply with ANSI Z21.88/CSA 2.33 or Z21.50b/CSA 2.22b, in addition to all

applicable building code, bylaws or other Jurisdictional Authorities.

- .2 Venting: vertical vent termination at roof level
- .3 Minimum heat output: 21, 500 BTU/h
- .4 Accessories: Black vignette door inlay
- .5 Brick panel design: to be selected by Departmental Representative at a later date
- .2 Acceptable products:
 - .1 Model B36XTE-NG10 as manufactured by *Regency Fireplaces* inc. or equivalent approved by the Departmental Representative.

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of framing previously installed under other Sections or Contracts is acceptable for fireplace installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect framing and inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
 - .3 Verify proper power and natural gas sources are available and safe for installation.

3.2 PREPARATION

- .1 Clean surfaces thoroughly prior to installation.
- .2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- .1 Install in accordance with manufacturer's instructions, ANSI Z21.44 and the requirements of authorities having jurisdiction.
- .2 Use manufacturer's guidelines for minimum clearances to combustibles, walls, and finishes.
- .3 Anchor all components firmly in position for long life under hard use.
- .4 Upon completion of installation, visually inspect all exposed surfaces. Touch up scratches and abrasions with touch up paint recommended by the manufacturer; make imperfections invisible to the unaided eye from a distance of 1.5 m.

3.4 PROTECTION

- .1 Protect installed products until completion of project.
- .2 Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

PART 1 - GENERAL

INSTRUCTIONS TO BIDDERS

- 1.1** Before submitting a bid, carefully examine all drawings and specifications. Provide for all items required to attain the completed conditions intended by the contract.

TENDER FORMAT

- 1.2** Conform to the tender form provided at the end of this specification.
- 1.3** Submit an itemized price breakdown of the cost for each piece of equipment specified, including labour and materials. Separately indicate a separate cost for set-up, freight, drawings.
- 1.4** Prices tendered shall be for the manufacturer as specified in the first instance for each piece of equipment listed in the item specification section and shall form a base stipulated price bid.
- 1.5** Prices tendered for any alternate manufactures shall be included on a separate form and shown as either an addition to, or deletion from, the base stipulated price bid. Alternates proposed must meet the physical and technical requirements of the specified item, be of a known and recognized manufacturer and satisfy the performance criteria and design intent originally determined by the consultant in conjunction with the owner. If any alternate is accepted, it is the responsibility of the respective Food Service Equipment sub-contractor to coordinate and bear all costs for mechanical, electrical, structural, architectural and any other adjustments necessary as a result of the substitution. In addition the KEC contractor shall also pay the costs of all professional fees and disbursements to make necessary adjustments to the plans and specifications.
- 1.6** List the item number, name and quantity of each item together with the manufactures name and model number.
- 1.7** Failure to provide the itemized list of equipment with identification of the manufacturer, model number and individual price forming the base stipulated price bid may disqualify the tender submission.
- 1.8** It shall be understood by all bidders that the bid shall be valid, irrevocable and subject to acceptance by the Owner and that no adjustment shall be made to the bid amount for a period of up to and including ninety (90) days from the date of the closing.

ADDENDA

- 1.9** The tender shall include any and all addenda that may change the original plans, specifications or other coordination information.

CERTIFICATES OF APPROVAL

- 1.10** All electrical equipment must conform to the Canadian Hydro Electrical Code, the Electrical Inspection Department Bulletins, the Ontario Hydro Electric Safety Code and the Canadian Standards Association. All equipment must have a C.S.A. approval label. Equipment that is not C.S.A. approved will be rejected, removed from the site and substituted for at no additional cost to the Contract.
- 1.11** Gas equipment shall conform to the Canadian Gas Association, the Gas Utilization Code of the Department of Energy and Resources Management, Ontario and Canadian Standard Association.

PERMITS

- 1.12** The Foodservice Equipment Sub-contractor shall be responsible to obtain and pay for any special permits or inspections. No extra allowances will be considered for costs incurred.

SHOP DRAWINGS AND MECHANICAL AND ELECTRICAL REQUIREMENTS

- 1.13** All fabricated items and assemblies of equipment shall be completely illustrated by shop drawings with detailed descriptions, clearly indicated methods of construction, gauges, assembly, fastenings and services, etc.
- 1.14** Drawings prepared by the Consultant depict equipment design intent only. It is the responsibility of the Foodservice Equipment Subcontractor to prepare shop drawings in conjunction with the consultants drawings, specifications, mechanical and electrical data, details and other information. The Foodservice Equipment Subcontractor shall be responsible to coordinate all shop drawings with Architectural and Engineering plans, as built site conditions and the work of all relevant sections.
- 1.15** Identify and explain any variation in the shop drawings which do not adhere to the original specifications or details. Advise the Consultant in writing of any conditions that would limit or adversely effect the design intent.
- 1.16** Prepare shop drawings on the same size sheet as plans and elevations, in a scale of not less than 1:50 for plans and 1:20 for details and sections so as to clearly illustrate the construction and arrangement of equipment.
- 1.17** Prepare fully dimensioned "roughing-in" and final connection point drawings for mechanical and electrical services. Separate mechanical and electrical, or combined drawings, may be submitted. In either case, drawings must be a minimum of 1:50.

- 1.18** A rough-in and a final connection point drawings must include a list of symbols for each type of connection and must show the location of connections on equipment as well as the location of the rough-in point for all mechanical and electrical services. Both connections to the equipment and the rough-in point must be dimensioned so as to show the relative distances from grid lines or architectural wall reference points as well as the height above the finished floor.
- 1.19** Verify the energy requirements for any piece of equipment that is being supplied by the Owner or is existing and being reused. Incorporate this information into the shop drawings, "rough-in" and connection point drawings.
- 1.20** Submit equipment data sheets and shop drawings in the following order:
1. Catalogue cuts and illustrations.
 2. Plan lay out drawing with mechanical and electrical "roughing-ins and "connection points"
 3. Custom fabricated items

Note: 6 sets required

WORK INCLUDED BY FOODSERVICE DIVISION 11400 SUBCONTRACTORS

GENERAL

- 1.21** The work listed here includes, but is not limited to, the provision of all equipment indicated on the drawings and listed in the specifications together with labour, material, tools, delivery, uncrating, setting-in place of equipment leveling, final assembly of equipment items shipped knocked down or in sections and cleaning herein ready for final connection of services by mechanical and electrical trades.
- 1.22** Coordination with the construction schedule of the delivery and set-into place of all foodservice equipment.
- 1.23** Verification and coordination of all equipment indicated as existing, future or by Others, including field measurements, utility requirements, sizes, etc. as if supplying this equipment.
- 1.24** Removal, cleaning and relocation of existing foodservice equipment as specified in the Itemized List of Equipment in accordance with the schedule set out.
- 1.25** Removal from the site, promptly, all waste materials generated by the unpacking, assembly, set-in-place and cleaning of foodservice equipment.
- 1.26** Arranging and coordinating factory demonstrations of all manufactured equipment and the supply of maintenance manuals.

ELECTRICAL

- 1.27** Supply and installation of all internal wiring on custom fabricated items in a concealed and well supported manner and terminated inside circuit breaker panels or junction boxes ready for final connection by the electrical trades. All equipment shall be inspected by the local hydro authority and carry CSA and ULC approval.
- 1.28** Supply and installation of all necessary junction boxes and circuit breaker panels (electrical load centres) required to terminate internal wiring within custom fabricated equipment.
- 1.29** Tag each multiple electrical wire or cable used in any custom fabricated piece of equipment to indicate the item serviced. When circuit breaker panels are used, identify each circuit.
- 1.30** Supply and installation of cords and plugs on equipment as required and match the plug with the respective receptacle.
- 1.31** Supply and installation of switches for all lights in custom fabricated items.

MECHANICAL

- 1.32** All work shall comply with the standards for material and workmanship specified under Division 15.
- 1.33** Provision and installation of all faucets complete with aerators and replaceable seats, ready for connection by appropriate contractor.
- 1.34** Supply and installation of chrome plated overflow assemblies, drain fittings and traps with tail pieces for all sink type assemblies.

MISCELLANEOUS

- 1.35** Caulking and sealing of equipment to walls, curbs, bases, adjacent units and between any dissimilar materials. Use an approved silicone sealer for gaps under 3/8" and stainless steel trim strips and sealer for wider gaps. Prepare area being siliconed prior to silicone application.
- 1.36** Securing of all permanent equipment to floor or base. Use stainless steel shims for leveling.
- 1.37** Supply and installation of all stainless steel strips and filler pieces necessary to properly finish any individual or combined set of pieces of equipment as part of the contract.
- 1.38** Protection, identification and recessing of all controls, pilot lights, switches and valves on any item of equipment.

- 1.39** Provision of all necessary access panels within each piece of equipment to allow for proper maintenance and service. Allow access when two (2) or more units are adjacent to each other.
- 1.40** Supply of all standard equipment accessories normally furnished with all items specified whether indicated or not.
- 1.41** Provision of all inserts, bolts, anchors, sleeves, ferrules, sleepers and other assorted hardware as may be necessary for the proper anchorage, fixing or attachment of equipment to the building.
- 1.42** Supply and installation of all mechanical refrigeration equipment and systems specified as integral with food equipment, complete with sufficient ventilation louvers for proper air circulation in and around the condensing units as specified.

TEMPLATES

- 1.43** KEC responsible to provide templates for all food service equipment that requires cut-outs and or hole coring of granite / stone top for buffet counter. This includes equipment supplied by KEC and all owner supplied equipment.
- 1.44** KEC responsible for layout of all equipment related to buffet counter and co-ordination of required cutting and hole coring by granite / stone contractor.

RELATED WORK BY OTHER TRADES

WORK PROVIDED BY ELECTRICAL DIVISION 16

- 1.45** Supply, rough-in, installation and connection of all necessary electrical wiring for the complete operation of all food service equipment listed.
- 1.46** Supply and installation of electrical wiring from the building source or distribution point of power, through disconnect switches or starters to the terminals, connection box, circuit breaker panel or plug receptacles located on the equipment. Equipment manufacturer's control panels and switches are not considered to be disconnect switches unless specifically permitted by applicable codes.
- 1.47** Supply and installation of all required disconnect switches and power distribution panels.
- 1.48** Supply and installation of receptacles in all food service areas. All receptacles in wet areas are to be waterproof and must have ground fault interrupters.
- 1.49** Disconnection of all owner designated and/or existing equipment.

- 1.50** Supply, rough-in and installation of all electrical wiring for "Owners Supplied", "Existing" or "NIC" designated equipment, as well as the final hook-up or connections.
- 1.51** Supply and installation of all electrical receptacles located in floors, ceilings or walls.

WORK PROVIDED BY MECHANICAL PLUMBING - DIVISION 15

- 1.52** Supply, installation, rough-in, and connection of all domestic hot and cold water, drains, vents, as per code from building supply to the point of connection required for the complete operation of all foodservice equipment listed.
- 1.53** Supply and installation of domestic hot and cold water lines complete with shut off valves, back flow preventers, line strainers, shock absorbers, pressure, temperature and pressure gauges and control valves or devices (unless otherwise stated and/or supplied with the equipment of this section).
- 1.54** Supply and installation of drain lines complete with traps, vent piping and clean outs.
- 1.55** Supply and installation of all indirect drain lines for foodservice equipment.
- 1.56** Supply and installation of all hand sinks, slop sinks, janitorial sinks, drinking fountains, grease traps and general sanitizing stations.
- 1.57** Disconnection of all owner designated and/or existing equipment.
- 1.58** Connection of all equipment designated as "Owner Supplied" and/or existing.

WORK PROVIDED BY OTHER TRADES

- 1.59** Construction of all walls, partitions or ceilings, openings therein and finishes thereon.
- 1.60** Supply and installation of floors, floor leveling materials and floor finishes throughout the foodservice areas as well as those required for, but not limited to, prefabricated insulated walk-in type refrigerated and frozen room assemblies.
- 1.61** Provision of concrete curbs, sleepers, wood curbs, flashing etc, for condensing units, compressors.
- 1.62** Provision of all building floor leveling, grouting, finishing, cutting and patching required to accommodate installation of prefabricated insulated walk-in refrigerated and frozen room assemblies.
- 1.63** Provision of all core hole drilling through building structural slab, walls or roof to accommodate refrigeration lines, electrical conduit, plumbing lines, gas lines, detergent lines, beverage lines and exhaust/make-up air ducting etc.
- 1.64** Supply and setting of sleeves in floors, walls and ceiling (as well as any related core drilling) for electrical, mechanical refrigeration, plumbing, gas and beverage lines etc.

PART 2 - PRODUCTS AND MATERIALS

2.1 ABBREVIATIONS

S.S.	-	Stainless Steel
c/w	-	Complete With
A.F.F.	-	Above Finished Floor
A	-	Amperes
v	-	Volts
CY	-	Cycle
p	-	Phase
Pl. lam.	-	Plastic Laminate
Kw	-	Kilowatt
kPa	-	Kilopascals
J. B.	-	Junction Box
L/S	-	Litres per Second
L.E.D	-	Light Emitting Diode
mm	-	Millimetres
c	-	Celsius
C.P.	-	Chrome Plated
I.P.S.	-	Inside Pipe Size
N.I.C.	-	Not in Contract
L.C.	-	Load Centre
CBP	-	Circuit Breaker Panel
KEC	-	Kitchen Equipment Contractor

MATERIALS

- 2.2** Stainless steel, denoted by the abbreviation "S.S." in this specification shall be ASTM-A167-81A, (18-8 Analysis) type 304 cold rolled and annealed, No. 4 finish one side, 180 grit finish free of buckles, pits, warps and imperfections. Ensure that direction of grain matches throughout units.
- 2.3** Stainless steel tubing shall be 304, seamless and welded, No. 4 finish, 1.5" sq. for all legs and bracing.
- 2.4** Nuts, bolts, screws, washers and other fastenings shall be type 304 stainless steel.
- 2.5** Gauges of material refer to U.S. Standard Gauges.
- 2.6** Sound deadening, 1/8" thick rigid waterproof insulation, Component Hardware M75-1366 applied under working surfaces.

2.7 Gauges are as follows:

- 1.0 mm - 20 ga.
- 1.2 mm - 18 ga.
- 1.6 mm - 16 ga.
- 2.0 mm - 14 ga.
- 3.0 mm - 12 ga.

ELECTRICAL COMPONENTS

- 2.8** Electrical parts supplied under this Section shall be compatible with materials specified for use on this project. Refer to Division 16. Receptacles shall have stainless steel cover plates and screws. Cords and caps shall be approved type, matching the receptacles for which they are intended, whether or not such receptacles are supplied by the Foodservice Sub-Contractor.
- 2.9** Make receptacles, junction boxes and breaker panels easily accessible without dismantling equipment.
- 2.10** Terminate wiring within equipment at load centre or junction boxes with wires identified by Item No. and load.
- 2.11** Properly rate and ground all receptacles.
- 2.12** Fit all portable and mobile electrical equipment with cord and plug suited for the electrical characteristics and outlets specified for the equipment. Include grounding conductor in the cord.

PLUMBING COMPONENTS

- 2.13** Plumbing components supplied under this section shall be compatible with materials specified for use on this project. Refer to Division 15
- 2.14** All control valves and faucets, pipe fittings, waste and tail pieces etc., must be brass chrome plated, bright finish, new, best quality comply with applicable codes.
- 2.15** Valve handles must be of non-conductive materials.
- 2.16** Faucets, T&S, CSA Approved

HARDWARE

- 2.17** Handles that are an integral part of doors shall be Component Hardware Model P44-1 01 0 full grip stainless steel pulls.

- 2.18** Handles that are an integral part of drawers shall be Component Hardware Model P44-1 01 0 full grip stainless steel pulls.
- 2.19** Catches shall be Component Hardware Model M32-2401, concealed magnetic catch with a 30 lb. pull.
- 2.20** Door track hardware shall be Component Hardware Model B57-0144.
- 2.21** Door guides shall be Component Hardware Model B62-1093 or equal.
- 2.22** Door stops shall be Component Hardware Model B60-1086 or equal.
- 2.23** Refrigerator door hardware: Self closing, heavy duty stainless steel offset pivot hinges with magnetic gaskets and 430 stainless steel door frame and tamper proof cylinder locks and two(2) keys per lock.
- 2.24** Stainless steel drawer slides: Component Hardware Model S52 Series for standard and refrigerated units.
- 2.25** Drawer locks: Component Hardware Model P30 series, stainless steel face (drawers shall not be keyed alike). Supply two (2) keys per lock and hand over to the Owner or Consultant.
- 2.26** Provide locks on all doors and drawers. Key each section of the food services areas with a different series of locks, two (2) keys per lock.
- 2.27** Casters shall be cadmium plated, steel disc cushion non-marking rubber tired wheels with adjustable cup and cone ball bearings. Caster swivel with two rows of ball bearings running in hardened raceways. Capacity per caster, minimum 100 kg. All stem casters with expanding type fittings of size to suit tube. Plate casters mounted with stainless steel bolts and lock washers for easy replacement. All casters on mobile equipment lubricated for efficient use in varied temperatures of kitchen, walk-in refrigerators and freezers. Casters on mobile equipment equipped with cart-washable casters with grease nipples to assure adequate watertight lubrication.
- 2.28** Pilaster strips, stainless steel 1-1/4" wide with 1/2" adjustment.
- 2.29** Clips for shelves shall be die formed stainless steel.

WELDING

FABRICATION

- 2.30** Before fabrication commences, check all dimensions and conditions at the building site, including means of access into and through the building to the area where equipment is to be set in place, for all conditions affecting the delivery and installation of the equipment.
- 2.31** Fix and assemble work in the shop wherever possible. Execute the work in accordance with

details and shop drawings which have been reviewed and accepted by the Consultant. Where complete or final shop fabrication is not possible, make a trial assembly in the shop prior to delivery.

- 2.32** Workmanship shall be of the best grade modern shop and field practice for the manufacturers who specialize in this work.
- 2.33** Fabricate and erect work square, plumb, straight and accurately fitted. Provide adequate reinforcing and anchorage in all places.
- 2.34** The gauge of metal and methods of construction shall in all cases be adequate for the various conditions to be met, with the requirements of the design details and specifications considered as minimum. Finished equipment shall be rigid when assembled and installed.

CONSTRUCTION

WORKTABLES & COUNTERS

- 2.35** 16 gauge stainless steel continuous sheets all welded.
- 2.36** Reinforcing shall be a minimum 14 gauge stainless steel 4" x 1" "top hat" type channel, arranged so that forms are concealed from normal view. Secure reinforcing to tops with stud welding and appropriate silicone.
- 2.37** Table or counters up to 6.0' in length shall have a minimum of 4 legs.
- 2.38** Tables with sinks shall have a marine edge unless otherwise specified.
- 2.39** Worktable and counters with sink, work tops to slope towards sinks at a slope of 3/4" per 3.0'. For dish tables 3/8" per 3.0' toward dishwashing machine. Front edge level over full length.

BACKSPLASH

- 2.40** Integral section of table or counter top turned up on a 3/4" radius to the height specified, then boxed or splayed.

LEGS AND BRACING

- 2.41** 16 gauge stainless steel wall, 1 5/8" O.D. tubular.
- 2.42** Provide framework for table tops to maintain a height of 3.0' above finished floor.

- 2.43** Bullet feet, stainless steel adjustable 1" (+/-). When table has service connections, dowel and secure to floor using Component Hardware Model A1 0-0854. Secure to one set of feet only when bridging a structural expansion joint.
- 2.44** Set crossbracing in pairs at 10" above finished floor and continuously weld to uprights.
- 2.45** Continuously weld uprights to reinforcing saddles under table tops.

SHELVING

- 2.46** 16 gauge stainless steel all welded construction.
- 2.47** Boxed edges on all four (4) sides. Notch corners to fit contour of legs as required for work tables.
- 2.48** Shelves with sides or backs shall be turned up 2" and set to backs or folded if away from walls.
- 2.49** Shelves shall be easily removable and in sections capable of being pulled out through a single door opening.
- 2.50** Over shelves to be boxed with backs set to walls and secured with stainless steel tubular brackets.
- 2.51** Wire shelves to be 1/8" O.D. on 1" centres, set in a 3/8" O.D. perimeter frame either stainless steel or heavy duty chrome plated finish as specified.
- 2.52** Provide a removable bottom shelf in any counter or table set on an enclosed base with mechanical and electrical services.
- 2.53** Removable bottom -shelf in counters or tables with sink for access to clean-out valve on trap.

ANGLE SLIDES

- 2.54** Stainless steel construction.
- 2.55** Provide 2" x 2" slides with lengths as specified to suit application.
- 2.56** Round exposed corners and provide back stops. Mount units in key hole slots to ease cleaning and removal.
- 2.57** Verify tray, pan or basket size to ensure accurate fit.

DRAWERS

- 2.58** Front shall be double pan construction with insulation equal to cabinet body. Where drawer fronts are shown to have a plastic laminate finish, the double pan construction shall be reversed so that the plastic laminate is contained by the outer edges of the back pan.
- 2.59** Frames shall be 16 gauge. stainless steel channel, welded to drawer front.
- 2.60** Pulls shall be formed of stainless steel and welded onto the top edge of drawers; profile shape and size as indicated on the Drawings. Where such formed pulls are not indicated, recessed pulls shall be used, Component Hardware P63-1012 or approved equal.
- 2.61** All slides to be installed so that drawers are self closing.
- 2.62** Housing of 20 gauge stainless steel fully enclosed for drawers under worktables and open cabinets.
- 2.63** Drawers shall accommodate one plastic pan Component Hardware S80 series or one stainless steel pan Component Hardware S81 series for 20" x 20" x 5" insert.
- 2.64** Provide rubber buttons at end of frames to cushion drawer.

SINK BOWL

- 2.65** All of 16 gauge stainless steel integrally welded into table or counter top.
- 2.66** Interior corners radius 3/4" both vertically and horizontally, all welded and polished. Slope bottom to drain fitting.
- 2.67** Undercoat with sound deadening compound when sinks are not exposed.
- 2.68** Multiple sinks to have 18 gauge stainless steel apron to conceal gap between bowls.
- 2.69** Faucets and drains as specified under "Hardware".

HINGED & SLIDING DOOR

- 2.70** Front and back of 16 gauge stainless steel.
- 2.71** All welded, double pan type 3/4" thick sound deadened with fiberglass insulation board.
- 2.72** Hinges for cabinet doors shall be concealed, continuous stainless steel piano type secured to body with stainless steel screws.

PART 3 - EXECUTION

EXECUTION

SITE INSPECTIONS

- 3.1** All dimensions shown on the Drawings or listed in this Section of the Specification are to be considered nominal and for guidance only. It is the responsibility of the Foodservice Equipment Sub-contractor to check dimensions on the site and to co-ordinate any adjustments which may be necessary for the proper fabrication and set-in-place of the foodservice equipment.
- 3.2** Fabricate equipment in sections that will allow easy access into the building and to final location within the foodservice area. Any damage to the building or the equipment will be the Foodservice Equipment Subcontractor's responsibility.
- 3.3** Verify on the job site all actual dimensions of storerooms and walk-in refrigerators and freezers and adjust if necessary the size of shelving units specified in the item specification.
- 3.4** Verify all points of access into the job site and ensure that all pieces of equipment or fabricated items installed or relocated are able to pass through doors, hallways etc. in order to arrive at designated location on Plans.

LABELS

- 3.5** Identify all switches, controls, valves, circuits and characteristics of the equipment to the satisfaction of the Consultant, with engraved colored lamicaid name plates. Letters to be a contrasting colour, 6mm (1/4") high minimum.
- 3.6** Identify each dispenser with the type of product it is designed to dispense, with similar methods used for equipment identification.
- 3.7** The Foodservice Equipment Contractor is responsible to coordinate all phases of the work with the various other contractors involved, in a professional and amicable manner, to ensure a complete understanding of responsibilities, to schedule installation phases, and to avoid delays, interruptions and disagreements.
- 3.8** Supply to the applicable trades, in sufficient time, any information or items, components or equipment which require building-in or which may impact the work of others.
- 3.9** Provide all necessary information within adequate time and in proper sequence regarding the exact location of openings, chases, attachments or other fittings required for foodservice equipment.

DELIVERY OF EQUIPMENT

- 3.10** Coordinate deliveries of equipment in conjunction with construction activity and progress at the site, and as directed by the General Contractor, Architect or Consultant.
- 3.11** Supply and deliver to the site in sufficient time all inserts, anchors, bolts, sleeves, ferrules and similar items for attaching to or building into, masonry, concrete and other work for the proper anchorage and fixing of the equipment. Include necessary templates, instructions, directions and/or assistance in the location and installation of all items by other Subcontractors.
- 3.12** The Foodservice Equipment Contractor shall obtain or hold equipment ready for delivery in accordance with an agreed schedule which will permit completion of the work at the specified date. Any disagreements with this schedule should be brought immediately to the attention of the Consultant.
- 3.13** Deliver foodservice equipment as factory-assembled units with protective crating and covering to the maximum extent possible.
- 3.14** Provide sufficient labour forces to unload delivery trucks and transfer all equipment to the foodservice area or other on site storage location as directed by the General Contractor.
- 3.15** Ensure adequate security for all loose or mobile equipment delivered to the site. Maintain this security until the foodservice areas have been turned over to the Owner. Obtain written confirmation of any equipment/components turned over to other contractors or the Owner.
- 3.16** Clearly identify all items by item number and area of use prior to delivery to the site.
- 3.17** Carefully inspect the installed work of all other trades prior to installation of the work of this Section. Ensure work is complete to the point where the installation can properly commence. Commencement of the work implies acceptance of others work. Notify Consultant of any apparent deficiencies or damages in others work in the area of installation.
- 3.18** Unpack, assemble and set in place all equipment in the designated position, ready for final connection of electrical or mechanical services.

PROTECTION AND CLEANING

- 3.19** Protect all equipment against damages until a formal inspection is conducted and a Deficiency Report is issued by the Consultant.
- 3.20** Protect stainless steel equipment with coloured masking material to be applied to exposed flat, horizontal and vertical surfaces. Remove all protective coating just prior to final cleaning, testing and acceptance. Any protective coatings which will be obstructed by adjacent equipment or building conditions must be removed prior to installation.

- 3.21** Protect all existing work and/or work of other trades from damage resulting from work of this trade. Repair all damaged work at no cost to the Owner, to the satisfaction of the Consultant. Request and inspection of existing work of other trades if damages are apparent before the installation of foodservice equipment.
- 3.22** Remove all markings of pencil, ink, or magic markers on all exposed surfaces, including interiors of cabinets.
- 3.23** Provide final cleaning of all equipment, both inside and out. Wipe all surfaces clean with a damp cloth or sponge to remove all debris, dust, grease, etc. Use a mild detergent if necessary. Final sanitizing of the equipment for operational use shall be the responsibility of the Owner.
- 3.24** Schedule final cleaning just prior to turning equipment over to the Owner. Coordinate cleaning with the General Contractor to avoid trade work after cleaning is complete. All equipment must be turned over in a clean condition regardless of previous cleaning attempts.
- 3.25** Test and adjust all equipment prior to demonstrations and inspection by the Consultant. If necessary, relamp equipment with integral lighting. Repair or replace equipment that is defective in operation, including units that operate below required capacity or that operate with excessive noise or vibration.
- 3.26** Maintain a clean area, free of all debris, dirt and excess material which may result from the work of this Contract. Remove and dispose of all debris, packing material, etc., promptly from the site.

INSTRUCTIONS OF OPERATION

- 3.27** After completion of installation, cleaning, testing and final inspection, instruct the Owner or his authorized personnel in the correct operation and maintenance of the equipment, including procedures and schedules related to startup, shutdown, trouble-shooting, servicing, and preventative maintenance.
- 3.28** Confirm, prior to commencement of demonstrations, that all equipment to be demonstrated has mechanical and electrical services connected and that each item is fully operational.
- 3.29** A detailed demonstration and start-up shall be made of each piece of equipment requested by the Owner or Consultant, and such demonstrations shall be carried out by a competent, factory trained, representative of the equipment manufacturer.
- 3.30** Demonstrations shall be conducted in two stages; one for operational personnel, and the second for maintenance personnel. Review and reference data in the Operation/Maintenance Manuals throughout the demonstration.

- 3.31** The training demonstrations shall cover; safety orientation; use of controls, switches and mechanisms; how to attach and use any accessories; general operating procedures; proper cleaning and daily care of equipment; trouble shooting and most common operational problems; periodic maintenance procedures; recommended spare parts.
- 3.32** Demonstrations shall occur at the equipment and, if appropriate, in a classroom product should be encouraged, and arranged with the Foodservice Operator. Instructors are to be factory trained on the equipment being demonstrated. The Owner's agent may video tape the training sessions.
- 3.33** Correct deficiencies and make adjustments to items which are not functioning properly at the time of demonstration.
- 3.34** The Foodservice Equipment Contractor shall return to the job site within 7 (seven) days after official notice from the Owner's Representative of the commencement of operations for final adjustment and calibration of equipment.

OPERATION/MAINTENANCE MANUALS

- 3.35** Supply to the Owner, prior to equipment demonstrations, three (3)sets of manuals, in accordance with the requirements of Division 1, bound and labeled, incorporating operating and maintenance instructions, including spare parts lists, start-up and shut-down procedures, preventative maintenance requirements, wiring, piping and refrigeration schematic diagrams, and optional accessories for all items specified. Each item document must be numbered in accordance with the Drawings, arranged in numerical sequence and identified with model and serial number. This manual should be produced and provided separately from those which include other components of the building and should relate only to foodservice equipment.
- 3.36** Supply to the Owner, prior to substantial completion, a list of local service agencies authorized by each manufacturer to service all of the foodservice equipment provided on this project. The list should include the name or names of the person(s) to contact, the firm or firms they represent, their complete address, telephone number, and facsimile number where these individuals may be reached during both business and non-business hours. For manufacturers who do not have a local servicing agency, list person(s) or departments(s) to contact at the manufacturer's factory.

GUARANTEE

- 3.37** All equipment shall be guaranteed for a minimum of one year against defects in material, manufacture, assembly, labour and installation.
- 3.38** All mechanical refrigeration system components including compressors, and condensing units shall be supplied with a (1) year replacement guarantee including parts and labour. Compressor only shall be guaranteed for an additional four (4) years.
- 3.39** Further to the requirements of General Conditions, those items or components which have an inherent guarantee period beyond the required minimum of one year shall be sustained to the maximum time provided by the manufacturer.

- 3.40** If defects become apparent during the guarantee period they shall be made good by the Foodservice Equipment Contractor, its supplier or its authorized representative at no cost to the Owner. Any item that can not be satisfactorily repaired shall be replaced. The supplier is meant to be the manufacturer of the item, but under any circumstance it is the responsibility of the Foodservice Equipment Contractor to maintain the obligation of the Guarantee whether or not the supplier provides this service.
- 3.41** The Guarantee shall be subject to review where a defect or malfunction may be due to misuse or neglect by the Owner or his representative.
- 3.42** The guarantee period shall commence upon acceptance of the equipment by the Owner, or such date as may be mutually agreed upon between Owner and Contractor after substantial completion of the work. Any delay that extends the time between installation and acceptance must be covered by coordination between Foodservice Equipment Contractor, Manufacturer's Representatives and Manufacturer. Inform all parties of the date the guarantee begins.
- 3.43** Provide a document at the front of each Maintenance Manual detailing the conditions of the Guarantee, commencement date, instructions to the Owner indicating how and who to contact for a guarantee claim (including 24 hr. emergency service.) As part of the Maintenance Manuals, submit a list of local authorized service agencies for all Manufactured equipment, with address and telephone numbers, for Owner's use following the Guarantee Period.

GENERAL

- 3.44** All equipment supplied under this Section shall be made of the best grade materials and with first class workmanship, and in strict accordance with the Drawings and Specifications.
- 3.45** All equipment must operate within the parameter established by the Owner; ie. Refrigerated temperatures and food warming temperatures.
- 3.46** Where an item is designated "By Others", "N.I.C." (Not in Contract), or "By Owner", read the specification carefully. In general this means that the item will be provided and installed by another contractor or supplier, and no cost should be included in the Bid. However, in some cases the responsibility for receiving the equipment, or the assembly and coordination with related equipment in the Contract, is included in the Work of this Section and a unit cost may be applicable in the Schedule of Quantities and Unit Prices.
- 3.47** Submit an itemized cost breakdown in accordance with the Itemized List of Equipment and as indicated on the Drawings, on the Schedule of Quantities and Unit Prices. Unit prices and other charges listed will be used (directly or prorated) to adjust the Total Cost if an item is increased or decreased in quantity, or if an Item is deleted.

4.1 ACCEPTABLE ALTERNATIVE EQUIPMENT

The following are prices for alternative equipment listed hereunder. Such alternative equipment and amounts are **NOT** included in the base bid stipulated price.

ITEM NO.	DESCRIPTION	ALTERNATIVE MANUFACTURER	UNIT PRICE	ADDITION TO OR DEDUCTION FROM BASE TENDER PRICE
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PART 4 - ITEMIZED TENDER FORM - POINT PEELEE CAMP HENRY RENEWAL						
ITEM	DESCRIPTION	QTY	MFG	MODEL #	UNIT PRICE	TOTAL PRICE
1	REACH-IN FREEZER	1	TRUE			
2	REACH-IN REFRIGERATOR	1	TRUE			
3	HAND SINK	1	TARRISON			
3A	PAPER TOWERL DISPENCER	1	BY OWNER			
4	SOAP DISPENCER	1	BY OWNER			
5	SPARE					
6	SPREADER TABLE	1	FABRICATED			
7	SPARE					
8	RANGE W/ 24" GRIDDLE	1	GARLAND			
9	EXHAUST HOOD	1	SPRING AIR			
10	S/S WORK TABLE	1	FABRICATED			
11	GARBAGE CAN W/ DOLLY	1	RUBBERMAID			
12	SOILED DISHTABLE W/ PRE RINSE	1	FABRICATED			
13	CONDENSATE HOOD	1	SPRING AIR			
14	DISHWASHER	1	HOBART			
15	CLEAN DISHTABLE	1	FABRICATED			
16	WALL SHELF	1	FABRICATED			
17	3 COMPARTMENT SINK W/ FAUCETS	1	FABRICATED			
18	SPARE					
19	SPARE					
20	SPARE					
21	S/S CABINET	1	FABRICATED			
21A	PICK UP SHELF	1	FABRICATED			
22	POKER CHIP DOLLIES	2	METRO			
23	S/S CABINET W/ ADJUSTABLE SHELF	1	FABRICATED			
24	SPARE					
25	DRY STORAGE SHELVING	1	METRO			
26	2 TIER WALL SHELF	1	TARRISON			
27	2 TIER WALL SHELF	1	TARRISON			
	TOTAL FOOD SERVICE EQUIPMENT					
	DELIVERY & SET-UP					
	TOTAL (HST NOT TO BE INCLUDED IN TOTAL)					

Item	Qty	Description
1	1 ea	REACH-IN FREEZER True Food International Canada Model No. T-23F-HC Freezer, Reach-in, -10° F, one-section, stainless steel door, stainless steel front, aluminum sides, clear coated aluminum interior with stainless steel floor, (3) adjustable PVC-coated wire shelves, interior lighting, 4" castors, R290 Hydrocarbon refrigerant, 1/2 HP, 115v/60/1, 5.5 amps, NEMA 5-15P, 9' cord, MADE IN USA
	1 ea	Self-contained refrigeration standard
	1 ea	4" Swivel castors, standard (adds 5" to OA height)
	1 ea	Left Hand Hinging
2	1 ea	REACH-IN REFRIGERATOR True Food International Canada Model No. T-72 Refrigerator, Reach-in, three-section, stainless steel doors, stainless steel front, aluminum sides, aluminum interior with stainless steel floor, (9) adjustable PVC-coated wire shelves, interior lighting, 4" castors, 1/2 HP, 115v/60/1, 9.6 amps, 9' cord, NEMA 5-15P, cULus, UL EPH Classified, CE, MADE IN USA
	1 ea	Self-contained refrigeration standard
	1 ea	4" Swivel castors, standard (adds 5" to OA height)
	1 ea	Left door hinged left, center & right doors hinged right, standard
3	1 ea	HAND SINK Tarrison Products Ltd. Model No. TA-HSF-14 Hand Sink, wall mount, 14" wide x 10" front-to-back x 5" deep, 9-1/2"H backsplash, splash mount faucet with gooseneck spout, includes drain basket, stainless steel construction, NSF & T&S Faucet B-1146
3A	1 ea	SOAP DISPENSER Custom Model No. SOAP DISPENSER SOAP DISPENSER (BY OWNER)
3B	1 ea	PAPER TOWEL DISPENSER Custom Model No. PAPER TOWEL DISPENSER PAPER TOWEL DISPENSER (BY OWNER)

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- 4 1 ea **FIRE SUPPRESSION SYSTEM**
Custom
FIRE SUPPRESSION SYSTEM
WET CHEMICAL FIXED FIRE EXTINGUISHING SYSTEM DESIGNED FOR SURFACE PROTECTION OF ITEM 7 AND EXHAUST HOOD PLENUM AND DUCT WORK, AS REQUIRED TO CONSTITUTE A FULLY APPROVED SYSTEM INSTALLED IN ACCORDANCE WITH N.F.P.A. 96 AND AUTHORITIES HAVING JURISDICTION
- 1 ea BOTTLE BOTTLE AND ENCLOSURE MOUNTED ON WALL AS WHERE SHOWN ENCLOSED IN CABINET C/W FUSIBLE LINK DETECTION DEVICE AND ALL NECESSARY CONTROLS WITH SUFFICIENT CAPACITY INSTALLED IN ACCORDANCE WITH CANADIAN UNDERWRITER'S REGULATIONS AND APPROVALS BY THIS CONTRACTOR
- 1 ea PIPING EXPOSED PIPING CHROME PLATED
- 1 ea FUEL SHUT DOWN SYSTEM C/W FUEL SHUT DOWN DEVICE TO DE-ENERGIZE ELECTRIC SUPPLY TO ITEMS PROTECTED AND UNDER HOOD THRU A SHUNT TRIP OR CONTRACTOR SUPPLIED BY ELECTRICAL CONTRACTOR
- 1 ea MICRO SWITCH SUPPLY C/W FUEL SHUT DOWN DEVICE TO DE-ENERGIZE ELECTRIC SUPPLY TO ITEMS PROTECTED AND UNDER HOOD THRU A SHUNT TRIP OR CONTRACTOR SUPPLIED BY ELECTRICAL CONTRACTOR
- 1 ea PULL STATION ONE MECHANICALLY OPERATED GAS VALVES SUPPLIED FOR INSTALLATION IN MAIN GAS LINE TO ITEMS PROTECTED UNDER HOOD BY MECHANICAL CONTRACTOR
- 1 ea GAS VALVE ONE MECHANICALLY OPERATED GAS VALVES SUPPLIED FOR INSTALLATION IN MAIN GAS LINE TO ITEMS PROTECTED UNDER HOOD BY MECHANICAL CONTRACTOR
- 1 ea TEST COMPLETE SYSTEM TO BE TESTED, COMMISSIONED AND CERTIFIED BY PROFESSIONAL ENGINEER AS PER LOCAL AUTHORITY HAVING JURISDICTION

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- 5 1 ea **SPREADER TABLE**
Custom Model No. FABRICATED
- 765W X 810D X 915H
- ALL STAINLESS STEEL
- BACK AND SIDESPLASH 50MM HIGH
- COMES WITH UNDERSHELF
- 16 GA 304 #4

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- 6 **SPARE NO.**
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Item	Qty	Description
7	1 ea	<p>RANGE, 60", 6 BURNERS, 24" GRIDDLE Garland Canada Model No. G60-6G24RR (Garland/U.S. Range (Garland Canada)) G Starfire Pro Series Restaurant Range, gas, 60", (6) 33,000 BTU open burners, with cast iron top & ring grates, 24" x 23 x 5/8" thick smooth steel griddle plate, (2) standard ovens with 3 position rack guides with oven rack, stainless steel front, sides, plate rail, 2-piece back guard and shelf, 6" stainless steel legs with adjustable feet, 310,000 BTU, CSA Flame, CSA Star, cCSAus, NSF</p> <p>1 ea Natural gas, specify elevation if over 2,000 ft</p> <p>2 ea Thermostatically controlled griddle, with snap-action/modulating thermostat control- 175-425°F, add per thermostat, for each 12" section</p> <p>1 ea Celsius dial for oven thermostat</p> <p>1 st Adjustable height swivel casters, set of 4 with front locks</p> <p>1 ea GAS HOSE WITH QUICK DISCONNECT</p>
8	1 ea	<p>EXHAUST HOOD Spring Air Systems Model No. FN-B-MC-7.50/3.92 UL/ULC LISTED FILTER HOOD, NO FIRE DAMPER, BOX STYLE, PERFORATED FRONT DOWN DISCHARGE, 2286 LONG X 1194 WIDE WITH 2 LED FIXTURE LIGHTS INTER-WIRED, STAINLESS STEEL FILTERS</p> <p>1 ea RPD-P11-MW-LS UL/ULC LISTED STAINLESS STEEL WALL MOUNTED REMOTE PANEL WITH THE FOLLOWING OPTIONS: CANOPY LIGHTS ON/OFF SWITCH</p> <p>1 ea DUCT ZERO CLEARANCE DUCTS</p> <p>1 ea XF-B150 UL/CSA LISTED EXHAUST FAN UNIT, WITH A CAPACITY OF 1875 CFM EXHAUST AT 1.13" W.C. ESP, WITH 1 HP, PERIMETER CURBS, DISCONNECT SWITCH, MOTOR STARTER.</p> <p>1 ea SFA10-OHD SFA SUPPLY FAN WITH A CAPACITY OF 1688 CFM SUPPLY AT 0.7" W.C. ESP, WITH PERIMETER CURBS, OUTDOOR, 1 HP 575V/3/60 MOTOR STARTER, MOTORIZED INLET DAMPER REPLACEABLE BIRD SCREEN FILTERS, DOWN DISCHARGE, MOTOR DISCONNECT</p> <p>1 ea ENCLOSURE PANELS COMES WITH ENCLOSURE PANELS</p>
9	1 ea	<p>S/S WORK TABLE Custom Model No. FABRICATED S/S WORK TABLE 1524W X 762D x 915H 2 ENDS TO BE MITERED FOR SAFETY (REFER TO DRAWING K1.1) ALL STAINLESS STEEL WITH UNDERSHELF 16 GA 304 #4</p>
10	1 ea	<p>WALL PANELING Custom Model No. FABRICATED 2500L X 2032H COMPLETE WITH STAINLESS STEEL JOINING STRIPS AND END CAPS 18 GA 304 #4</p>

11 1 ea **GARGABE CAN W. DOLLY**
Rubbermaid Model No. 2620G & 2640
RUBBERMAID GARBAGE CAN W/ DOLLY

Item	Qty	Description
12	1 ea	SOILED DISHTABLE W/ PRE RINSE Fabricated Soiled Dishtable, straight design, 1520" x 762", 200MM splayed backsplash, with 20" x 20" pre-rinse sink, stainless steel perforated pre-rinse basket, (1) deck mount faucet hole, adjustable bullet feet, all s/s construction 16 ga 304 #4 finish NSF COMPLETE WITH PRE RINSE FAUCET . T&S B-0113B

13	1 ea	CONDENSATE HOOD Spring Air Systems Model No. SA96-C SPRING AIR CONDENSATE HOOD SA96-C 1066 X 1066 X 609 H COMES WITH STAINLESS STEEL ENCLOSURE PANELS
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14	1 ea	DISHWASHER, DOOR TYPE Hobart Canada Model No. AM15-2 Dishwasher, door type, hot water/chemical sanitizing, 58-65 racks/hour, straight-thru or corner, solid-state controls with digital status, with booster heater, electric tank heat, PRV included, auto-fill, stainless steel tank, frame, doors & feet, 208-240/60/3, ENERGY STAR®
	1 ea	DWT-AM15 Drain water tempering kit installed
	1 ea	PRESREG-3/40BR 3/4" brass pressure regulator

15	1 ea	CLEAN DISHTABLE Fabricated Clean Dishtable, straight design, 1270 x 762, stainless steel undershelf, 200mm splayed backsplash, 16 gauge stainless steel construction 304 #4 finish,
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16	1 ea	WALL SHELF Custom Model No. WALL SHELF STAINLESS STEEL WALL SHELF 1270 X 381 COMES WITH 37.5 BACK SPLASH COMES WITH BOXED FRONT EDGE 37.5 COMPLETE WITH WALL BRACKETS 25MM SQUARE TUBING 16 GA 304 #4 FINISH
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Item	Qty	Description
17	1 ea	THREE (3) COMPARTMENT SINK Fabricated Sink, three compartment, 2440 W x 810 D X 900 H with 200mm splayed backsplash, (3) 455 wide x 610 front-to-back x 330 deep compartments with coved corners, left & right drain boards 537 x 810, 200mm O.C. splash mount faucet holes T&S B-0231, marine edge front and sides (height to match item 21) (3) corner drains, includes (3) overflow tubes & (3) 8"H perforated drain guard assemblies, 16 gauge 304 #4 stainless steel construction, stainless steel 3-sided frame, stainless steel legs with adjustable bullet feet Faucet: T&S B-0231 NOTE: Items 17, 21 & 23 to have matching height and profile
18		SPARE NO.
19		SPARE NO.
20		SPARE NO.
21	1 ea	S/S CABINET Custom Model No. S/S CABINET STAINLESS STEEL CABINET WITH OPEN BASE 3 SIDED TO FACILITATE ITEM #22 (POKER CHIP DOLLIES) 1680 X 810 X 900 WITH ADJUSTABLE STAINLESS STEEL LEGS COMES WITH EXTENDED TOP OVER WALL WITH 50MM TURNDOWN 16 GA 304 #4 SEE DETAIL NOTE: Items 17, 21 & 23 to have matching height and profile
21A	1 ea	PICK UP SHELF Fabricated PASS THRU SHELF 1680 X 600 X 850 AFF COMES WITH 38MM BOXED EDGE FRONT AND SIDES COMES WITH 38MM BACKSPLASH COMES WITH 38MM SQUARE TUBING BRACKETS SEE DETAIL
22	2 ea	DISH CART Metro Model No. PCD11A Poker Chip Dish Dolly, 26-5/8"W x 26-5/8"D x 31-15/16"H, adjustable, dish size 4-1/4" to 11-3/4", removable dividers & towers, two-handed access, recessed handles, 5" dia. swivel casters with neoprene wheels (2 with brakes), chip-resistant polymer shell with Microban® antimicrobial protection, aesthetic blue, vinyl dust/water splash cover, NSF

Item	Qty	Description
23	1 ea	STAINLESS STEEL CABINET Fabricated Storage Cabinet, 2540 W x 810D 900 H, adjustable intermediate shelf, fully welded stainless steel construction, adjustable stainless steel legs, with 200mm splayed backsplash 16 GA 304 #4 NOTE: Items 17, 21 & 23 to have matching height and profile
24		SPARE NO.
25	1 ea	DRY STORAGE SHELVING Metro Model No. METRO DRY STORAGE SHELVING 4 SECTIONS METRO SUPER ADJUSTABLE CHROME SHELVING 4 TIER HIGH 3 SECTIONS 457 X 1219 X 1895 H 1 SECTION 457 X 1068 X 1895 H
26	1 ea	2 TIER WALL SHELF Metro Model No. METRO 2 TIER WALL SHELF 2 TIER WALL SHELF METRO SUPER ERECTA POST TYPE INSTALLTION 2 CHROME SHELVES 355 X 1219 2 BRACKETS 1WS14C 1 BRACKET 2WS14C 2 CHROME SHELVES 457 X 1219 2 BRACKETS 1WS18C 1 BRACKET 2WS18C 3 POST KITS 33PDF
27	1 ea	2 TIER WALL SHELF Metro Model No. METRO 2 TIER WALL SHELF 2 TIER WALL SHELF METRO SUPER ERECTA POST TYPE INSTALLTION 1 CHROME SHELVES 355 X 1219 1 CHROME SHELVES 355 X 1066 2 BRACKETS 1WS14C 1 BRACKET 2WS14C 1 CHROME SHELF 457 X 1219 1 CHROME SHELF 457 X 1066 2 BRACKETS 1WS18C 1 BRACKET 2WS18C

PART 1 – GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for equipment purchased under this Division and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .2 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.

1.2 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for ` equipment purchased under this Division for incorporation into manual.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .2 Operation data to include:
 - .1 Description of systems and their controls.
 - .2 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .3 Operation instruction for systems and component.
 - .4 Description of actions to be taken in event of equipment failure.
 - .5 Valves schedule and flow diagram.
 - .6 Colour coding chart.
 - .3 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instruction for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.

- .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test result.
 - .3 Testing, adjusting and balancing reports as specified in Section 23 05 93.
- .5 Approvals:
 - .1 Submit (2) copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
- .6 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
- .7 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .8 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
- .2 Furnish spare parts as follows:
 - .1 One set of packing for each pump.
 - .2 One casing joint gasket for each size pump.

- .3 Provide one set of special tools required to service equipment as recommended by manufacturers

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 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 off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect equipment and materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 – PRODUCTS

2.1 NOT USED

- .1 Not used.

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 equipment 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 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:

- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.4 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
 - .1 Plumbing and Drainage
 - .2 Exhaust air
 - .3 Domestic water
- .3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.

3.5 CLEANING

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

3.6 PROTECTION

- .1 Protect equipment and systems openings from dirt, dust and other foreign materials with materials appropriate to system.

END OF SECTION

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PART 1 – GENERAL

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
 - .3 Fold up material and plastic banding, flatten and place in designated area for recycling.

PART 2 – PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 – EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 CONNECTIONS TO EQUIPMENT

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.3 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.
- .2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, components.

3.4 DRAINS

- .1 Install piping with grade in direction of flow except as indicated.
- .2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.
- .3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.
- .4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.5 AIR VENTS

- .1 Install manual air vents at high points in piping systems. Install automatic vents where shown on drawings.

- .2 Install isolating valve at each automatic air valve.
- .3 Install drain piping to approved location and terminate where discharge is visible.

3.6 DIELECTRIC COUPLINGS

- .1 General: compatible with system, to suit pressure rating of system.
- .2 Locations: where dissimilar metals are joined.
- .3 NPS 2 and under: isolating unions or bronze valves.
- .4 Over NPS 2: isolating flanges.

3.6 PIPEWORK INSTALLATION

- .1 Screwed fittings jointed with Teflon tape.
- .2 Protect openings against entry of foreign material.
- .3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .4 Assemble piping using fittings manufactured to ANSI standards.
- .5 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.
 - .1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.
- .6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
- .7 Install concealed pipework to minimize furring space, maximize headroom, conserve space.
- .8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

- .9 Install, except where indicated, to permit separate thermal insulation of each pipe.
- .10 Group piping wherever possible and as indicated.
- .11 Ream pipes, remove scale and other foreign material before assembly.
- .12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .13 Provide for thermal expansion as indicated.
- .14 Valves:
 - .1 Install in accessible locations.
 - .2 Remove interior parts before soldering.
 - .3 Install with stems above horizontal position unless otherwise indicated.
 - .4 Valves accessible for maintenance without removing adjacent piping.
 - .5 Install globe valves in bypass around control valves.
 - .6 Use ball or butterfly valves at branch take-offs for isolating purposes except where otherwise specified.
 - .7 Use chain operators on valves NPS 2 ½ and larger where installed more than 2400 mm above floor in Mechanical Rooms.
- .15 Check Valves:
 - .1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and elsewhere as indicated.

3.8 SLEEVES

- .1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.
- .2 Material: schedule 40 black steel pipe.
- .3 Construction: foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.
- .4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.
- .5 Installation:

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- .1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.
- .2 Other floors: terminate 25 mm above finished floor.
- .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
- .6 Sealing:
 - .1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.
 - .2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.
 - .3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
 - .4 Ensure no contact between copper pipe or tube and sleeve.

3.9 ESCUTCHEONS

- .1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.
- .2 Construction: one piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.
- .3 Sizes: outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

3.10 PREPARATION FOR FIRE STOPPING

- .1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to Section 07 84 00.
- .2 Uninsulated unheated pipes not subject to movement: No special preparation.
- .3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe movement without damaging fires topping material or installation.
- .4 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.

3.11 FLUSHING OUT OF PIPING SYSTEMS

- .1 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 11 supplemented as specified in relevant mechanical sections.
- .2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.12 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

- .1 Advise Consultant 48 hours minimum prior to performance of pressure tests.
- .2 Pework: test as specified in relevant sections of heating, ventilating and air conditioning work.
- .3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.
- .4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
- .5 Conduct tests in presence of Departmental Representative.
- .6 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.
- .7 Insulate or conceal work only after approval and certification of tests by Departmental Representative.

3.13 EXISTING SYSTEMS

- .1 Connect into existing piping systems at times approved by Consultant.
- .2 Request written approval 10 days minimum, prior to commencement of work.
- .3 Be responsible for damage to existing plant by this work.
- .4 Ensure daily clean-up of existing areas.

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3.14 CLEANING

- .1 Clean in accordance with Section 01 74 11.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCE

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
 - .1 ANSI/ASME B16.15-2011, Cast Copper Alloy Threaded Fittings: Classes 125 and 250.
 - .2 ANSI B16.18-[01(R2005)], Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22-[01(R2005)], Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24-2001(2006), Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.

- .2 ASTM International Inc. (ASTM)
 - .1 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM B88M-05(2011), Standard Specification for Seamless Copper Water Tube (Metric).

- .3 American Water Works Association (AWWA)
 - .1 ANSI/AWWA C111/A21.11-12, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

- .4 Canadian Standards Association (CSA International)
 - .1 CSA B242-05(R2011), Groove and Shoulder Type Mechanical Pipe Couplings.

- .5 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

- .7 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS)
 - .1 MSS-SP-67-2002a, Butterfly Valves.
 - .2 MSS-SP-70-2006, Gray Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71-2005, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
 - .4 MSS-SP-80-2008, Bronze Gate, Globe, Angle and Check Valves.

- .8 National Research Council (NRC)/Institute for Research in Construction
 - .1 NRCC 47668, National Plumbing Code of Canada (NPC) - 2010.
- 9. Transport Canada (TC)
 - .1 Transportation of Dangerous goods Act, 1992, c. 34 (TDGA)

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management:
 - .1 Separate and recycle waste materials.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

PART 2 – PRODUCTS

2.1 PIPING

- .1 Domestic hot, cold and recirculation systems, within building.
 - .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.
 - .2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

2.2 FITTINGS

- .1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.
- .3 Cast copper, solder type: to ANSI/ASME B16.18.
- .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .5 NPS 2 and larger: roll grooved to CSA B242.

2.3 JOINTS

- .1 Rubber gaskets, latex-free 1.6 mm thick: to ANSI/AWWA C111/A21.11.

- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 Solder: 95/5 tin copper alloy.
- .4 Teflon tape: for threaded joints.
- .5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket.
- .6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

2.4 GATE VALVES

- .1 NPS 2 and under, soldered:
 - .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01.
- .2 NPS 2 and under, screwed:
 - .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01.
- .3 NPS 2-1/2 and over, flanged:
 - .1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim specified Section 23 05 23.02.

2.5 GLOBE VALVES

- .1 NPS2 and under, soldered:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet as specified Section 23 05 23.01.
- .2 NPS 2 and under, screwed:
 - .1 To MSS-SP-80, Class 150, 1 MPa, bronze body, screwed over bonnet, renewable composition disc as specified Section 23 05 23.01.
 - .2 Lockshield handles: as indicated.

2.6 SWING CHECK VALVES

- .1 NPS 2 and under, soldered:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23.01.
- .2 NPS 2 and under, screwed:

- .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23.01.
- .3 NPS 2-1/2 and over, flanged:
 - .1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, regrind renewable seat, bronze disc, bolted cap specified Section 23 05 23.02.

2.7 BALL VALVES

- .1 NPS 2 and under, screwed:
 - .1 Class 150.
 - .2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle as specified Section 23 05 23.01.
- .2 NPS 2 and under, soldered:
 - .1 To ANSI/ASME B16.18, Class 150.
 - .2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and [PTFE] seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 23.01.

2.9 BUTTERLY VALVE

- .1 NPS 2-1/2 and over, lug:
 - .1 To MSS-SP-67, Class 200.
 - .2 Cast iron body, ductile iron chrome plated disc, stainless steel stem, EPT liner.
- .2 NPS 2-1/2 and over, grooved ends:
 - .1 Class 300, bubble tight shut-off, bronze body.
 - .2 Operator:
 - .1 NPS 4 and under: lever handle.

PART 3 – EXCUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Install in accordance with NPC, and OBC and local authority.
- .2 Install pipe work in accordance with Section 23 05 01, supplemented as specified herein.
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

3.3 VALVES

- .1 Isolate equipment, fixtures and branches with ball valves.
- .2 Balance recirculation system using pressure independent, self-balancing flow control valves with present flow as indicated on drawings.

3.4 PRESSURE TESTS

- .1 Conform to applicable plumbing code requirements.
- .2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

3.5 FLUSHING AND CLEANING

- .1 Flush entire system for 8 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean to Provincial and Federal potable water guidelines. Let system flush for additional 2 h, then draw off another sample for testing.

3.6 PRE-START-UP INSPECTIONS

- .1 Systems to be complete, prior to flushing, testing and start-up.
- .2 Verify that system can be completely drained.

- .3 Ensure that pressure booster systems are operating properly.
- .4 Ensure that air chambers, expansion compensators are installed properly.

3.7 DISINFECTION

- .1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction.
- .2 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval.

3.8 START-UP

- .1 Timing: Start up after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
 - .4 Water treatment systems operational.
- .2 Provide continuous supervision during start-up.
- .3 Start-up procedures:
 - .1 Establish circulation and ensure that air is eliminated.
 - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
 - .3 Bring HWS storage tank up to design temperature slowly.
 - .5 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
 - .6 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

3.9 PROFORMANCE VERIFICATION

- .1 Scheduling:
 - .1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.
- .2 Procedures:
 - .1 Verify that flow rate and pressure meet Design Criteria.

- .2 TAB HWC in accordance with Section 23 05 93.
 - .3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
 - .4 Sterilize HWS and HWC systems for Legionella control.
 - .5 Verify performance of temperature controls.
 - .6 Verify compliance with safety and health requirements.
 - .7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
 - .8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.
- .3 Reports:
- .1 In accordance with Section 01 91 13: Reports, using report forms as specified in Section 01 91 13: Report Forms and Schematics.
 - .2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM B32-[08], Standard Specification for Solder Metal.
 - .2 ASTM B306-09, Standard Specification for Copper Drainage Tube (DWV).
 - .3 ASTM C564-11, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA B67-[1972(R1996)], Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
 - .2 CSA B70-12, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .3 CAN/CSA-B125.3-11, Plumbing Fittings.

1.2 ACTION AND INFORMATIONAL SUBMITTAL

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: separate and recycle waste materials

PART 2 – PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- .1 Above ground sanitary, storm and vent Type DWV to: ASTM B306.

- .1 Fittings.
 - .1 Cast brass: to CAN/CSA-B125.3.
 - .2 Wrought copper: to CAN/CSA-B125.3.
- .2 Solder: tin-lead, 50:50, type 50A or lead free, tin- 95:5, type TA, to ASTM B 32.

2.2 CAST IRON PIPING AND FITTINGS

- .1 Buried sanitary, storm and vent minimum NPS 3, to: CSA B70, with one layer of protective coating.
 - .1 Joints:
 - .1 Mechanical joints:
 - .1 Neoprene or butyl rubber compression gaskets: to CSA B70. ASTM C564 or
 - .2 Stainless steel clamps.
 - .2 Hub and spigot:
 - .1 Caulking lead: to CSA B67.
 - .2 Cold caulking compounds.
 - .2 Above ground sanitary, storm and vent: to CSA B70.
 - .1 Joints:
 - .1 Hub and spigot:
 - .1 Caulking lead: to CSA B67.
 - .2 Mechanical joints:
 - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

PART 3 – EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 In accordance with Section 23 05 05.
- .2 Install in accordance with National Plumbing Code, Provincial Plumbing Code and local authority having jurisdiction.

3.3 TESTING

- .1 Pressure test buried systems before backfilling.
- .2 Hydraulically test to verify grades and freedom from obstructions.

3.4 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that access doors are correctly located.
 - .2 Open, cover with linseed oil and re-seal.
 - .3 Verify that cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Storm water drainage:
 - .1 Verify domes are secure.
 - .2 Ensure weirs are correctly sized and installed correctly.
 - .3 Verify provisions for movement of roof system.
- .4 Ensure that fixtures are properly anchored, connected to system and effectively vented.
- .5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 11.
- .2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM D2235-04(2011). Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
 - .2 ASTM D2564-04 (2009)el, Standard Specification for Solvent Cements for Poly (Vinyl-Chloride) (PVC) Plastic Piping System
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA – Series B1800-06, Thermoplastic Nonpressure Pipe Compendium – B1800 Series

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacture’s printed product literature and datasheets for piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide two copies WHMIS MSDS – Material Safety Data Sheets

1.3 DELIVERY, STORAGE AND HANDELING

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labeled with manufacturer’s name, address.
- .3 Store at temperatures and conditions recommended by manufacturer.
- .4 Packaging Waste Management: separate and recycle waste materials.

PART 2 – PRODUCTS

2.1 PIPING AND FITTINGS

- .1 For buried DWV piping to:
 - .1 CAN/CSA-B1800

2.2 JOINTS

- .1 Solvent weld for PVC: to ASTM D2564.
- .2 Solvent weld for ABS: to ASTM D2235.

PART 3– EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 In accordance with Section 23 05 05.
- .2 Install in accordance with National Plumbing Code, OBC, and local authority having jurisdiction

3.3 TESTING

- .1 Pressure test buried systems before backfilling
- .2 Hydraulically test to verify grades and freedom from obstructions.

3.4 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that access doors and correctly located.
 - .2 Open, cover with linseed oil and re-seal.
 - .3 Verify cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Storm water drainage:
 - .1 Verify domes are secure.
 - .2 Ensure weirs are correctly sized and installed correctly.
 - .3 Verify provisions for movement of roof system.

- .4 Ensure fixtures are properly anchored, connected to system and effectively vented.
- .5 Affix applicable label (storm, sanitary, vent, pump discharge) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 11.
- .2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.
 - .2 CAN/CSA-C22.2 No.110, Construction and Test of Electric Storage Tank Water Heaters.
 - .3 CAN/CSA-C191, Performance of Electric Storage Tank Water Heaters for Household Service.
 - .4 CAN/CSA-C309, Performance Requirements for Glass-Lined Storage Tanks for Household Hot Water Service.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with General Requirements.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for domestic water heater, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

PART 2 – PRODUCTS

2.1 ELECTRIC WATER HEATER

- .1 To CAN/CSA-C22.2 No.110, CAN/CSA-C191 and CAN/CSA-C309 for glass-lined storage tanks with immersion type elements.
- .2 Refer to schedule on drawings for types and sizes and to Section 22 42 00 COMMERCIAL PLUMBING FIXTURES FOR MFR AND MODEL.

2.2 TRIM AND INSTRUMENTATION

- .1 Drain valve: NPS 1 with hose end.
- .2 Thermometer: 100mm dial type with red pointer and thermowell filled with conductive paste.

- .3 ASME rated temperature and pressure relief valve sized for full capacity of heater, having discharge terminating over floor drain and visible to operators.
- .4 Magnesium anodes adequate for 20 years of operation and located for easy replacement.

PART 3 – EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instruction: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.
- .2 Provide insulation between tank and supports.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.4 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
 - .1 Plumbing and Drainage
 - .2 Exhaust air
 - .3 Domestic water
- .3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and

servicing of all systems and equipment during regular work hours, prior to acceptance.

- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.

3.5 CLEANING

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

3.6 PROTECTION

- .1 Protect equipment and systems openings from dirt, dust and other foreign materials with materials appropriate to system.

END OF SECTION

PART 1 – GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - 1. The supply and installation of Plumbing Fixtures and Trim.
- .2 Products Installed but not Supplied Under this Section:
 - .1 Install rough-in for equipment supplied by others, complete with valves on hot and cold water supplies, waste and vent.
 - .2 Equipment installed by others.
 - .1 Connect with unions.
 - .3 Equipment not installed.
 - .1 Capped for future connection by others.
- .3 Related Sections:
 - .1 Section 01 33 00 – Submittal Procedures.
 - .2 Section 01 78 00 – Closeout Submittals.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CAN/CSA-B45 Series-02(R2008), Plumbing Fixtures.
 - .2 CSA-B125.3-11, Plumbing Fittings.
 - .3 CAN/CSA-B651-04(R2010), Accessible Design for the Built Environment.
- .2 American Society for Mechanical Engineers (ASME)/Canadian Standards Association (CSA International).
 - .1 ASME A112.18.1-2011/CSA B125.1-11, Plumbing Supply Fittings.
 - .2 ASME A112.18.2-2011/CSA B125.2-11, Plumbing Waste Fittings.

1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets.
 - .1 Submit shop drawings and product data in accordance with Section 01 33 00.
 - .2 Indicate, for all fixtures and trim:

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.3 Dimensions, construction details, roughing-in dimensions.

.3 Closeout Submittals:

.1 Submit maintenance data in accordance with section 01 78 00.

.2 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

1.4 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety procedures.

1.4 DELIVERY, STORAGE AND DISPOSAL

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.3 Fold up metal and plastic banding, flatten and place in designated area for recycling.

PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series and equal to products specified on drawings.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125 and equal to products specified on drawings.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: architectural drawings to govern.

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- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one location to be product of one manufacturer and of same type.
- .7 Janitor mop sink (equal to model shown on drawings) (drawing reference – M5)
 - .1 Sink: moulded stone, 300 mm high undrilled integral back. Size: 610 x 915 x 254 mm.
 - .2 Supply fitting: with built-in vacuum breaker, indexed cross handles, 1400 mm long rubber hose, escutcheons, union inlets, heavy cast brass spout with pail hook, aerator, brace to wall, integral stop valves. Provide accessories to limit maximum flow rate to 5.8 l/minute at 413 kPa.
- .8 Three compartment stainless steel pot sink (drawing reference item No.17 – Kitchen Supplier)
 - .1 Heavy duty stainless steel construction, 13” deep body, all coved corners, provided by Kitchen Equipment Supplier.
 - .2 Equal to model CDS3-18 by Tarrison Products LTD.
- .9 Wall mount hand sink (drawing reference HS – item No.3 Kitchen Supplier)
 - .1 Heavy duty stainless steel construction, complete with facet, 200 mm high backsplash, equal to model HSF 14 by Tarrison Products LTD. – supplied by Kitchen Equipment Supplier.
- .10 Grease interceptor: (Mechanical drawing M4. Mess Hall Drainage Plan)
Equal to watts drainage products WD-CSA series, model WD – 120: Epoxy coated inside and outside fabricated steel grease inceptor with flow rating 4 to 7.5 gpm and grease capacity of 40lb. Unit shall include one piece removable baffle assembly, code approved deep seal trap, secured and gasketed non slip cover, NH outlet and inlet and exterior flow control.
- .11 Hot Water Heaters (drawing reference WH)
 - .1 Commercial gas water heater equal to AO Smith, gas, 284 liter capacity, model BTXL – 100.

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 Mounting heights:
 - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.

- .2 Wall-hung fixtures: as indicated, measured from finished floor.
- .3 Physically handicapped: to comply with most stringent of either NBCC and CAN/CSA-B651.

3.2 ADJUSTING

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
- .3 Checks:
 - .1 Aerators: operation, cleanliness.
 - .2 Vacuum breakers, backflow preventers: operation under all conditions.
- .4 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A126-04(2009), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA B64 Series-11, Backflow Preventers and Vacuum Breakers.
 - .3 CSA B356-00(R2005), Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .5 Plumbing and Drainage Institute (PDI).
 - .1 PDI-G101-96, Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.
 - .2 PDI-WH201-92, Water Hammer Arresters Standard.

1.2 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
 - .2 Indicate dimensions, construction details and materials for specified items.
- .3 Shop Drawings:
 - .1 Submit shop drawings to indicate materials, finishes, [method of anchorage, number of anchors, dimensions construction and assembly details and accessories.
- .4 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00, include:
 - .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.

1.3 QUALITY ASSURANCE

.1 Health and Safety:

- .1 Do construction occupational health and safety in accordance with regulations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

- .1 Separate waste materials for reuse and recycling.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .5 Fold up metal and plastic banding, flatten and place in designated area for recycling.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Not used.

2.2.1 FLOOR DRAINS

- .1 Floor Drains and Trench Drains: to CSA B79.
- .2 Floor Drain (drawing reference FD1)
 - .1 Equal to Watts Drainage Products FD-200-L epoxy coated cast iron floor drain with anchorage flange, weep holes, 13mm thick reinforced 178mm x 178mm adjustable square nickel bronze strainer and no hub.
 2. 76mm pipe size, no hub outlet type, 127mm x 127 mm strainer nickel bronze, vandal proof.
- .3 Trench Drain (drawings reference FD2)
 - .1 Equal to Watts Drainage products TD-940(152mm) wide epoxy coated steel. Steel Trench Drain with loose set heavy duty epoxy coated ductile iron gates.

- .2 102mm pipe size, ductile iron frame grate with stainless steel veneer and body, vandal proof, anchor flange.

2.3 WALL HYDRANTS (DRAWING REFERENCE HB)

- .1 Equal to Watts Drainage HY-72S concealed non-freeze key operated wall hydrant with nickel bronze box and door, chrome plated hydrant face, internal vacuum breaker (19mm) hose connection (19mm) female X 25mm male pipe connection, all bronze head, seat casting and integral working parts, bronze wall casing and loose key.

2.4 GREASE INTERCEPTOR (DRAWING REFERENCE GI)

- .1 Equal to Watts drainage products WD-CSA series epoxy coated inside and outside fabricated steel grease interceptor with flow rating of 4 to 75 GPM and grease capacity of 8 to 150 LBS. Unit shall include one piece removable baffle assembly, code approved deep steel trap, secured and gasketed non-slip cover.
- .2 Flow rate 10 GPM, flange and clamp device, 76mm inlet/outlet.

2.5 COIN METER SHOWER KIT (DRAWING REFERENCE CM)

- .1 Equal to PCL Coin Meter Shower Kit complete with electronic accumulative meter, transformer and solenoid valve.
- .2 Dollar coin activation, switch selectable 1-7 coins before timing starts, cumulative timing, time selectable from .25 to 32 minutes each coin, heavy duty metal housing, sturdy lock.

2.6 WATER HAMMER ARRESTORS

- .1 Copper construction, piston type: to PDI-WH201.

2.7 TRAP SEAL PRIMERS

- .1 Brass, with integral vacuum breaker, NPS1/2 solder ends, NPS1/2 drip line connection.

2.8 STRAINERS

- .1 860kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.

- .2 NPS2 and under, bronze body, screwed ends, with brass cap.
- .3 NPS1/2 and over, cast iron body, flanged ends, with bolted cap.

2.8 CLEANOUTS

- .1 Cleanout plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-cualked lead seat or neoprene gasket.
- .2 Access Covers:
 - .1 Wall Access: face or wall type, nickel bronze cover with flush head securing screws, beveled edge frame complete with anchoring lugs.
 - .2 Floor Access: cast iron body and frame with adjustable secured nickel bronze top and:
 - .1 Plugs: bolted bronze plug with neoprene gasket.
 - .2 Cover for unfinished concrete floors: nickel bronze, gasket, vandal-proof screws.

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 INSTALLATION

- .1 Install in accordance with National Plumbing Code of Canada provincial codes, and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

3.3 CLEANOUTS

- .1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.
- .2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
- .3 Building drain cleanout and stack base cleanouts: line size to maximum NPS4.

3.4 WATER HAMMER ARRESTORS

- .1 Install on branch supplies to fixtures or group of fixtures where indicated.

3.5 TRAP SEAL PRIMERS

- .1 Install for floor drains and elsewhere, as indicated.
- .2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Engineer.
- .3 Install soft copper tubing to floor drain.

3.6 STRAINERS

- .1 Install with sufficient room to remove basket.

3.7 GREASE INTERCEPTORS

- .1 Install with sufficient space, as indicated for ease of maintenance.

3.8 START-UP

- .1 General:
 - .1 In accordance with General Requirements, supplemented as specified.
- .2 Timing:
 - .1 After start-up deficiencies rectified.
 - .2 After certificate of completion has been issued by authority having jurisdiction.
- .3 Application tolerances:
 - .1 Pressure at fixtures: +/- 70kPa.
 - .2 Flow rate at fixtures: +/- 20%.
- .4 Adjustments:
 - .1 Verify that flow rate and pressure meet design criteria.
 - .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum

3.9 TESTING AND ADJUSTING

- .1 General:
 - .1 In accordance with General Requirements, supplemented as specified.
- .2 Timing:
 - .1 After start-up deficiencies rectified.
 - .2 After certificate of completion has been issued by authority having jurisdiction.
- .3 Application tolerances:
 - .1 Pressure at fixtures: +/- [70] kPa.
 - .2 Flow rate at fixtures: +/- 20%.
- .4 Adjustments:
 - .1 Verify that flow rate and pressure meet design criteria.
 - .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.
- .5 Floor drains:
 - .1 Verify operation of trap seal primer.
 - .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
 - .3 Check operations of flushing features.
 - .4 Check security, accessibility, removability of strainer.
 - .5 Clean out baskets.
- .6 Access doors:
 - .1 Verify size and location relative to items to be accessed.
- .7 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .8 Water hammer arrestors:
 - .1 Verify proper installation of correct type of water hammer arrester.
- .9 Strainers:
 - .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.
 - .3 Verify that cleanout plug does not leak.
- .10 Grease interceptors:
 - .1 Activate, using manufacturer's recommended procedures and materials.

- .11 Commissioning Reports:
 - .1 In accordance with Section 01 91 00: Reports, supplemented as specified.

- .12 Training:
 - .1 In accordance with Training of O&M Personnel, supplemented as specified.
 - .2 Demonstrate full compliance with Design Criteria.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International):
 - .1 CAN/CSA-B45 Series-(R2008), Plumbing Fixtures.
 - .2 CSA-B125.3-11, Plumbing Fittings.
 - .3 CSA-B651-12, Accessible Design for the Built Environment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for washroom fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Indicate fixtures and trim:
 - .1 Dimensions, construction details, roughing-in dimensions.
 - .2 Factory-set water consumption per flush at recommended pressure.
 - .3 For water closets, urinals: minimum pressure required for flushing.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for washroom fixtures, for incorporation into manual specified in Section 01 78 00.
- .2 Include:
 - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
 - .2 Details of operation, servicing, maintenance.
 - .3 List of recommended spare parts.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.
 - .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waster Management Plan.
 - .3 Fold up metal and plastic banding, flatten and place in designated area for recycling.

PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CSA-B125.3.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: architectural drawings to govern.
- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one location to be product of one manufacturer and of same type.
- .7 Water closet (drawing reference WC):
 - .1 Water closet, equal to American Standard (Barrier Free) AFWALL MILLENIUM FLoWise ELONGATED FLUSHMETER TOILET MODEL 3351.101, elongated bowl only top spud. Colour: white.
 - .2 Vitreous china, high efficiency, low consumption. Operates in the range of 1.2 – 6.0 Lpf. Permanent EVERCLEAN antimicrobial surface to inhibit the growth of stain and odour causing bacteria, mold and mildew.
 - .3 Flushmeter valve for top spud: equal to 6.0Lpf American Standard, sensor operated selectronic, A.C. power #6067161.002
 - .4 Toilet Seat: solid plastic seat, elongated, institutional, heavy duty, equal to Centoco Series 300. Colour: white. Model #500STSCCSS.
 - .5 Water closet carrier: Watts Drainage Products ISCA-101-L/R industry standard single horizontal adjustable water closet carrier with epoxy coated cast iron fitting 102mm (4”), no hub waste and 51mm (2”) no hub vent connections, epoxy coated cast iron compression seal faceplate assembly, epoxy coated cast iron foot supports, adjustable heights, adjustable ABS nipple with test cap and neoprene bowl gasket plated hardware and chrome cap nuts.
- .8 Urinal (drawing reference U):
 - .1 Urinal, equal to American Standard (Barrier Free) WASHBROOK FloWise UNIVERSAL URINAL Model 6590.001 universal top spud.
 - .2 Vitreous china, ultra high efficiency, low consumption operating in the range of 0.5 to 3.8Lpf, flushing rim, wash out flush action, extended sides for privacy, 3/4” inlet spud. Colour: white.
 - .3 Flush valve: 0.8 gpf/3.8/1 flush valve, sensor operated, Model – Selectronic 6063101.002 DC power (top spud).

- .3 Urinal carrier: Watts Drainage Products CA-321 floor mounted urinal carrier with heavy gauge steel uprights with integral welded feet, universal steel hanger support plate and bottom bearing plate and plated hardware.

- .9 Barrier-free Shower (drawing reference SH):
 - .1 Prefabricated shower unit equal to MAXX Model – Outlook BFS-60F, CSA B651-01 Compliant.
 - .2 Supply with L-shaped folding seat (Phenolic), 600mm straight S.S. grab bar, 1050mm straight S.S. grab bar, 1500mm S.S. curtain rod with grommets and solid brass drain with S.S. grid.

- .10 Barrier-free Lavatory (drawing reference LAV1):
 - .1 Vitreous china wall mount sink with front overflow for concealed arm support complete with faucet ledge equal to American Standard. Colour: white.
 - .2 Size 508 x 686mm, bowl size 356mm wide x 375mm front to back x 121mm deep; centre hole only.
 - .3 Deck mount electric lavatory faucet with technicians mixer to adjust temperature, equal to Delta Model #DEMD series: above deck electronics, chrome, sensor detects User's hands to activate water flow, complete with 6-1.5 AA batteries, red light low battery indicator: 1.9L/min minimum spray outlet.
 - .4 Floor mounted lavatory carrier with concealed arms equal to Watts Drainage Products Model #CA 411-WC with heavy steel gauge uprights with integral feet, adjustable epoxy coated cast iron arms with levelling screws and basin locking device, upper tie rod and plated hardware.

- .11 Vanity Basins (drawing reference LAV2):
 - .1 Single compartment self-rimming oval vanity basin with faucet ledge 18 gauge (1.2mm) type 304 stainless steel. Mirror finished rim #44 satin finished bowl, undercoated to reduce condensation and resonance, include factory applied rim seal, cutout template and installation hardware.
 - .2 Equal to FRANKE Model #OV1619/5/1.
 - .3 Bowl depth 127mm, bowl front to back 416mm, bowl width 470mm with overflow, number of faucet holes; 1.
 - .4 Deck mount electric lavatory faucet with technicians mixer to adjust temperature, equal to Delta Model # DEMD series: above deck electronics, chrome, sensor detect User's hands to activate water flow, complete with 6-1.5 AA batteries, red light low battery indicator: 1.9L/min minimum spray outlet.

- .12 Shower Heads (drawing reference SH-HD):
 - .1 Wall mounted shower head, vandal resistant cast brass construction; includes pressure compensating flow control device.
 - .2 Equal to American Standard Institutional Showerhead Model #1660244, 5.7Lpm.
 - .3 Shower valve equal to TECH Commercial by Delta Model #R10000-UNWS rough-in only, concealed in wall multi-choice universal back capability, integral screwdriver stops, heavy duty forged brass valve body, shower only, complete with vandal resistant metal lever volume control handle with temperature adjustment complete with T17TH135 trim.

- .13 Drop-in Sink (drawing reference KS):
 - .1 Double compartment self-rimming drop-in sink without ledge 1.2mm gauge type 304 stainless steel. Exposed surfaces are #4 satin finished. Undercoated to reduce condensation and resonance, include waste fittings, factory applied rim seal, cutout template and factory installed e-z torque fasteners. Center back waste installation includes 89mm crumb cup strainer with DN38 brass tailpiece. Sink to have spillway partition.
 - .2 Equal to FRANKE Model #LBD410, no faucet holes, bowl depth 254mm, bowl front to back 356mm, bowl left to right 356mm, complete with spill way and faucet ledge.
 - .3 Pre-rinse faucet equal to TECH Commercial DELTA Model #55P1513, 8” heavy duty cast brass wall mount pre-rinse sink, integral check stops, polished chrome plated finish, T4F-TECK compression structures, ADA compliant colour indexed 76mm metal lever blade handles, 9.5mm IPS rigid riser, heavy duty gooseneck spring and 1118mm stainless steel clad high pressure rubber hose, 6.08Lpm spray head, self-closing insulated stop valve and spray head hook.

PART 3 – EXECUTION

3.1 APPLICATION

- .1 Manufacturer’s Instructions: comply with manufacturer’s written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Mounting heights:
 - .1 Standard: to manufacturer's recommendations, unless otherwise indicated.
- .2 Wall-hung fixtures: as indicated, measured from finished floor.

3.3 ADJUSTING

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
 - .3 Adjust flush valves to suit actual site conditions.
 - .4 Adjust urinal flush timing mechanisms.
 - .5 Set controls of automatic flush valves for WCs and urinals to prevent unnecessary flush cycles.
- .3 Checks:
 - .1 Water closets, urinals: flushing action.
 - .2 Aerators: operation, cleanliness.
 - .3 Vacuum breakers, backflow preventers: operation under all conditions.
- .4 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

3.3 CLEANING

- .1 Clean in accordance with Section 01 74 11.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
 - .2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 51 00 – Temporary Utilities.

1.2 USE OF SYSTEMS

- .1 Use of new and or existing permanent heating, cooling and ventilating systems for supplying temporary heat or ventilation is not permitted.
- .2 Filters referred to herein are over and above those specified elsewhere in this specification.
- .3 Exhaust systems are not included in any approvals for temporary heating ventilation.

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

1.3 CLOSEOUT

- .1 Submit in accordance with General Requirements Section
- .2 Operation and Maintenance Data: submit operation and maintenance data for all equipment under this Division for incorporation in to manual.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .2 Operation data to include:
 - .1 Control schematics for every system including environmental controls.
 - .2 Description of systems and their controls
 - .3 valves schedule and floor diagram.
 - .4 Colour coding chart
 - .3 Maintenance data to include
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified
 - .4 Testing, adjusting and balancing reports.
 - .5 Approvals:
 - .1 Submit (2) copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
 - .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

- .7 Site Records:
 - .1 Departmental Representatives will provide [1] set of reproducible mechanical drawings. Provide sets of [white] prints as required for each phase of work. Mark changes as work progresses and as changes occur.
 - .2 Transfer information [weekly] to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purpose and inspection.

- .8 As-built drawings
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS-BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED"
(Signature of Contractor) (Date)
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

- .9 Submit copies of as-built drawings for inclusion in final TAB report.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers.

PART 3 – EXECUTION

3.2 PAINTING AND RESTORATION

- .1 Do painting in accordance with section 09 91 23.
- .2 Prime and touch up marred finished paintwork to match original.

- .3 Restore to new condition, finishes which have been damaged.

3.2 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
 - .1 Exhaust air
 - .2 Electric space vent.
- .3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular hours, prior to acceptance.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.
- .6 Departmental Representative will record these demonstrations on video tape for future reference.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
 - .1 ANSI/ASHRAE 90.1-2010, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings (ANSI/ASHRAE/IES).
- .2 Electrical Equipment Manufacturers' Advisory Council (EEMAC)

1.2 SECTIONS INCLUDES

- .1 Electrical work to conform to Electrical Divisions including the following:
 - .1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
- .2 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 23. Refer to Division 26 for quality of materials and workmanship.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 01 33 00.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.
- .3 Remove from site and dispose of packaging materials at appropriate recycling facilities.

- .4 Dispose and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with waste management plan.

PART 2 - PRODUCTS

2.1 GENERAL

- .1 Motors to be high efficiency, in accordance with local Hydro company standards and the requirements of ASHRAE 90.1.

2.2 MOTORS

- .1 Provide motors for mechanical equipment as specified.
- .2 If delivery of specified motor will delay delivery or installation of equipment, install motor approved by Departmental Representative for temporary use. Final acceptance of equipment will not occur until specified motor is installed.
- .3 Motors under 373 W (1/2 HP): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.
- .4 Motors 373 W (1/2 HP) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40 ° C, 3 phase, 600 V, unless otherwise specified or indicated.

2.3 TEMPORARY MOTORS

- .1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Departmental Representative for temporary use. Work will only be accepted when specified motor is installed.

2.4 BELT DRIVES

- .1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.
- .2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise specified.
- .3 For motors under 7.5 kW (10 HP): standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.

- .4 For motors 7.5 kW (10 HP) and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.
- .5 Correct size of sheave to be determined during commissioning.
- .6 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.
- .7 Motor slide rail adjustment plates to allow for centre line adjustment.
- .8 Supply one set of spare belts for each set installed in accordance with Section 01 78 00.

2.5 DRIVE GUARDS

- .1 Provide guards for unprotected drives.
- .2 Guards for belt drives;
 - .1 Expanded metal screen welded to steel frame.
 - .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
 - .3 38 mm dia holes on both shaft centres for insertion of tachometer.
 - .4 Removable for servicing.
- .3 Provide means to permit lubrication and use of test instruments with guards in place.
- .4 Install belt guards to allow movement of motors for adjusting belt tension.
- .5 Guard for flexible coupling:
 - .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
 - .2 Securely fasten in place.
 - .3 Removable for servicing.
- .6 Unprotected fan inlets or outlets:
 - .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
 - .2 Net free area of guard: not less than 80% of fan openings.
 - .3 Securely fasten in place.
 - .4 Removable for servicing.

PART 3 – EXECTION

3.1 INSTALLATION

- .1 Fasten securely in place.
- .2 Make removable for servicing, easily returned into, and positively in position.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM A53/A53M-10, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A105/A105M-10a, Standard Specification for Carbon Steel Forgings, for Piping Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Manufacturer, model number, line contents, pressure and temperature rating.
 - .2 Movement handled, axial, lateral, angular and the amounts of each.
 - .3 Nominal size and dimensions including details of construction and assembly.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance and operation data in accordance with Section 01 78 00.
 - .1 Data to include:
 - .1 Servicing requirements, including special requirements, stuffing box packing, lubrication and recommended procedures.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Separate and recycle waste materials
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

- .5 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .6 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins recycling in accordance with Waste Management Plan.

PART 2 – PRODUCTS

2.1 FLEXIBLE CONNECTION

- .1 Application: to suit motion as indicated on drawings.
- .2 Minimum length 600 mm.
- .3 Inner hose: stainless steel corrugated.
- .4 Braided wire mesh stainless steel outer jacket.
- .5 Diameter and type of end connection: as indicated on drawings.
- .6 Operating conditions:
 - .1 Working pressure: 1034 kPa.
 - .2 Working temperature: 200 degrees C.
 - .3 To match system requirements.

2.2 ANCHORS AND GUIDES

- .1 Anchors:
 - .1 Provide as indicated.
- .2 Alignment guides:
 - .1 Provide as indicated.
 - .2 To accommodate specified thickness of insulation.
 - .3 Vapour barriers, jackets to remain uninterrupted.

PART 3 – EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Install expansion joints and flexible connections in accordance with manufacturer's instructions.
- .3 Install pipe anchors and guides as indicated. Anchors to withstand 150% of axial thrust.

3.3 PIPE CLEANING AND START-UP

- .1 In accordance with Section 23 08 02.

3.4 CLEANING

- .1 Clean in accordance with Section 01 74 11.
- .2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
 - .1 ASME B31.1-2012, Power Piping.
 - .2 ANSI/ASME B31.3-2006, Process Piping.
 - .3 ASME Boiler and Pressure Vessel Code BPVC-2010:
 - .1 BPVC 2010 Section I: Power Boilers.
 - .2 BPVC 2010 Section V: Nondestructive Examination.
 - .3 BPVC 2010 Section IX: Welding and Brazing Qualifications.
- .2 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA C206-[03], Field Welding of Steel Water Pipe.
- .3 American Welding Society (AWS)
 - .1 AWS C1.1M/C1.1-[2000(R2006)], Recommended Practices for Resistance Welding.
 - .2 AWS Z49.1-[2005], Safety in Welding, Cutting and Allied Process.
 - .3 AWS W1-[2000], Welding Inspection Handbook.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA W47.2-M1987(R2008), Certification of Companies for Fusion Welding of Aluminum.
 - .2 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
 - .3 CSA B51-03(R2007), Boiler, Pressure Vessel and Pressure Piping Code.
 - .4 CSA-W117.2-2006, Safety in Welding, Cutting and Allied Processes.
 - .5 CSA W178.1-2008, Certification of Welding Inspection Organizations.
 - .6 CSA W178.2-2008, Certification of Welding Inspectors.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Welders:

- .1 Welding qualifications in accordance with CSA B51.
- .2 Use qualified and licensed welders possessing certificate for each procedure performed from authority having jurisdiction.
- .3 Submit welder's qualifications to Departmental Representative.
- .4 Each welder to possess identification symbol issued by authority having jurisdiction.
- .5 Certification of companies for fusion welding of aluminum in accordance with CSA W47.2.
- .2 Inspectors:
 - .1 Inspectors qualified to CSA W178.2.
- .3 Certifications:
 - .1 Registration of welding procedures in accordance with CSA B51.
 - .2 Copy of welding procedures available for inspection.
 - .3 Safety in welding, cutting and allied processes in accordance with CSA-W117.2.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Separate and recycle waste materials.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .6 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan

PART 2 - PRODUCTS

2.2 ELECTRODES

- .1 Electrodes: in accordance with CSA W48 Series.

PART 3 - EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 QUALITY OF WORK

- .1 Welding: in accordance with ANSI/ASME B31.1, B31.3, ANSI/ASME Boiler and Pressure Vessel Code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS B3.0, AWS C1.1, and special procedures specified elsewhere in Mechanical Divisions applicable requirements of provincial authority having jurisdiction.

3.3 INSTALLATION REQUIREMENTS

- .1 Identify each weld with welder's identification symbol.
- .2 Backing rings:
 - .1 Where used, fit to minimize gaps between ring and pipe bore.
 - .2 Do not install at orifice flanges.
- .3 Fittings:
 - .1 NPS 2 and smaller: install welding type sockets.
 - .2 Branch connections: install welding tees or forged branch outlet fittings.

3.4 INSPECTION AND TESTS - GENERAL REQUIREMENTS

- .1 Review weld quality requirements and defect limits of applicable codes and standards with Departmental Representative before work is started.
- .2 Formulate "Inspection and Test Plan" in co-operation with Departmental Representative.
- .3 Do not conceal welds until they have been inspected, tested and approved by

inspector.

- .4 Provide for inspector to visually inspect welds during early stages of welding procedures in accordance with Welding Inspection Handbook. Repair or replace defects as required by codes and as specified.

3.5 SPECIALIST EXAMINATIONS AND TESTS

- .1 General:
 - .1 Perform examinations and tests by specialist qualified to CSA W178.1 and CSA W178.2 and approved by Departmental Representative.
 - .2 To ANSI/ASME Boiler and Pressure Vessels Code, Section V, CSA B51 and requirements of authority having jurisdiction.
 - .3 Inspect and test 10% of welds in accordance with "Inspection and Test Plan" by non-destructive visual examination and magnetic particle (hereinafter referred to as "particle") tests.
- .2 Hydrostatically test welds to ANSI/ASME B31.1.
- .3 Visual examinations: include entire circumference of weld externally and wherever possible internally.
- .4 Failure of visual examinations:
 - .1 Upon failure of welds by visual examination, perform additional testing as directed by Departmental Representative of total of up to 10% of welds, selected at random by Departmental Representative by particle tests.

3.6 DEFECTS CAUSING REJECTION

- .1 As described in ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure Vessels Code.
- .2 In addition, chilled water systems:
 - .1 Undercutting greater than 0.8 mm adjacent to cover bead on outside of pipe.
 - .2 Undercutting greater than 0.8 mm adjacent to root bead on inside of pipe.
 - .3 Undercutting greater than 0.8 mm at combination of internal surface and external surface.
 - .4 Incomplete penetration and incomplete fusion greater than total length of 38 mm in 1500 mm length of weld depth of such defects being greater than 0.8mm.
 - .5 Repair cracks and defects in excess of 0.8mm in depth.
 - .6 Repair defects whose depth cannot be determined accurately on basis of visual examination or radiographic particle tests.

3.7 REPAIR OF WELDS WHICH FAILED TESTS

- .1 Re-inspect and re-test repaired or re-worked welds at Contractor's expense.

3.8 CLEANING

- .1 Clean in accordance with Section 01 74 11.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 American Society of Mechanical Engineers (ASME):
 - .1 ASME B40.100-2005, Pressure Gauges and Gauge Attachments.
 - .2 ASME B40.200-2008, Thermometers, Direct Reading and Remote Reading.
- .2 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-14.4-M88, Thermometers, Liquid-in-Glass, Self Indicating, Commercial/Industrial Type.
 - .2 CAN/CGSB-14.5-M88, Thermometers, Bimetallic, Self-Indicating, Commercial/Industrial Type.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Submit shop drawings and product data.
- .3 Submit manufacturer's product data:
 - .1 Thermometers.
 - .2 Pressure gauges.
 - .3 Stop cocks.
 - .4 Syphons.
 - .5 Wells.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 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 thermometers and pressure gauges off ground, indoors and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect thermometers and pressure gauges from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Separate and recycle waste materials.

- .5 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.
- .6 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .7 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

PART 2 – PRODUCTS

2. GENERAL

- .1 Design point to be at mid-point of scale or range.

2.2 DIRECT READING THERMOMETERS

- .1 Industrial, variable angle type, liquid filled, 125mm scale length: to CAN/CGSB-14.4 ASME B40.200.

2.3 REMOTE READING THERMOMETERS

- .1 100mm diameter liquid filled vapour activated dial type: to CAN/CGSB-14.5 ASME B40.200, accuracy within one scale division, brass movement, stainless steel capillary, stainless steel spiral armour, stainless steel bulb and polished brass or stainless steel case for wall mounting.

2.4 THERMOMETER WELLS

- .1 Copper pipe: copper or bronze.
- .2 Steel pipe: brass or stainless steel.

2.5 PRESSURE GAUGES

- .1 112mm, liquid filled to ASME B40.100, Grade 2A, stainless steel bourdon tube having 0.5% accuracy full scale unless otherwise specified.
- .2 Provide:
 - .1 Bronze stop cock.

PART 3 – EXECUTION

3.1 GENERAL

- .1 Install thermometers and gauges so they can be easily read from floor or platform.

.1 If this cannot be accomplished, install remote reading units.

.2 Install between equipment and first fitting or valve.

3.2 THERMOMETERS

.1 Install in wells on piping. Include heat conductive material inside well.

.2 Install in locations as indicated and on inlet and outlet of:

.1 Air handling unit cooling coils

.3 Install wells as indicated only for balancing purposes.

.4 Use extensions where thermometers are installed through insulation.

3.3 PRESSURE GAUGES

.1 Install in locations as follows:

.1 Suction and discharge of pumps.

.2 Upstream and downstream of PRV's.

.3 Upstream and downstream of control valves.

.4 Inlet and outlet of coils.

.5 In other locations as indicated.

.2 Install gauge cocks.

.3 Use extensions where pressure gauges are installed through insulation.

3.4 NAMEPLATES

.1 Install engraved lamicoid nameplates in accordance with Section 23 05 53.01, identifying medium.

3.5 CLEANING

.1 Progress Cleaning:

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

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

.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 Repair damage to adjacent materials caused by thermometer and gauge installation.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B1.20.1-1983(R2006), Pipe Threads, General Purpose (Inch).
 - .2 ASME B16.18-2001, Cast Copper Alloy Solder Joint Pressure Fittings.
- .2 ASTM International
 - .1 ASTM A276-10, Standard Specification for Stainless Steel Bars and Shapes.
 - .2 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - .3 ASTM B283/B283M-11a, Standard Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
 - .4 ASTM B505/B505M-11, Standard Specification for Copper-Base Alloy Continuous Castings.
- .3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)
 - .1 MSS SP-25-2008, Standard Marking System for Valves, Fittings, Flanges and Unions.
 - .2 MSS SP-80-2008, Bronze Gate Globe, Angle and Check Valves.
 - .3 MSS SP-110-2010, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for equipment and systems and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets.
- .3 Shop Drawings:
 - .1 Submit data for valves specified in this Section.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

1.4 MAINTENANCE MATERIALS SUBMITTALS

- .1 Extra Materials/Spare Parts:
 - .1 Furnish following spare parts:
 - .1 Valve seats: one for every 10 valves each size, minimum 1.
 - .2 Discs: one for every 10 valves, each size. Minimum 1.
 - .3 Stem packing: one for every 10 valves, each size. Minimum 1.
 - .4 Valve handles: 2 of each size.
 - .5 Gaskets for flanges: one for every 10 flanged joints.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Separate and recycle waste materials.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by departmental representative.
- .5 Remove from site and dispose of packaging materials at appropriate recycling.
- .6 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packing materials in appropriate on-site bins for recycling in accordance with waste management plan.

PARTS 2 – PRODUCTS

2.1 MATERIALS

- .1 Valves:
 - .1 Except for specialty valves, to be single manufacturer.
 - .2 Products to have CRN registration numbers.
- .2 End Connections:
 - .1 Connection into adjacent piping/tubing:
 - .1 Steel pipe systems: screwed ends to ANSI/ASME B1.20.1.
 - .2 Copper tube systems: solder ends to ASME B16.18.

- .3 Lockshield Keys:
 - .1 Where lockshield valves are specified, provide 10 keys of each size: malleable iron cadmium plated.

- .4 Gate Valves:
 - .1 Requirements common to gate valves, unless specified otherwise:
 - .1 Standard specification: MSS SP-80.
 - .2 Bonnet: union with hexagonal shoulders.
 - .3 Connections: screwed with hexagonal shoulders.
 - .4 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic.
 - .5 Packing: non-asbestos.
 - .6 Handwheel: non-ferrous.
 - .7 Handwheel Nut: bronze to ASTM B62.

 - .5 NPS 2 and under, non-rising stem, solid wedge disc, Class 150
 - .1 Body: with long disc guides, screwed bonnet.
 - .2 Operator: Handwheel.

 - .6 Globe Valves:
 - .1 Requirements common to globe valves, unless specified otherwise:
 - .1 Standard specification: MSS SP-80.
 - .2 Bonnet: union with hexagonal shoulders.
 - .3 Connections: screwed with hexagonal shoulders.
 - .4 Pressure testing: to MSS SP-80. Tests to be hydrostatic.
 - .5 Stuffing box: threaded to bonnet with gland follower, packing nut, high grade non-asbestos packing.
 - .6 Handwheel: non-ferrous.
 - .7 Handwheel Nut: bronze to ASTM B62.

 - .2 NPS 2 and under, composition disc, Class 150:
 - .1 Body and bonnet: screwed bonnet.
 - .2 Disc and seat: renewable rotating PTFE disc composition to suit service conditions], regrindable bronze seat, loosely secured to bronze stem to ASTM B505/B505M.
 - .3 Operator: handwheel.

 - .3 NPS 2 and under, plug disc, Class 150, screwed ends:
 - .1 Body and bonnet: union bonnet.
 - .2 Disc and seat ring: tapered plug type with disc stem ring of AISI S420 stainless steel to ASTM A276, loosely secured to stem.
 - .3 Operator: [handwheel] [lockshield].

- .7 Check Valves:
 - .1 Requirements common to check valves, unless specified otherwise:
 - .1 Standard specification: MSS SP-80.
 - .2 Connections: screwed with hexagonal shoulders.
 - .2 NPS 2 and under, swing type, bronze disc, Class 125:
 - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
 - .2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
 - .3 NPS 2 and under, swing type, bronze disc:
 - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
 - .2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
 - .4 NPS 2 and under, swing type, composition disc, Class 200:
 - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
 - .2 Disc: renewable rotating disc of number 6 composition to suit service conditions, bronze two-piece hinge disc construction.
 - .5 NPS 2 and under, horizontal lift type, composition disc, Class 150:
 - .1 Body: with integral seat, union bonnet ring with hex shoulders, cap.
 - .2 Disc: renewable PTFE no. 6 composition rotating disc in disc holder having guides top and bottom, of bronze to ASTM B62.
 - .6 NPS 2 and under, vertical lift type, bronze disc, Class 125:
 - .1 Disc: rotating disc having guides top and bottom, disc guides, retaining rings.
- .8 Silent Check Valves:
 - .1 NPS 2 and under:
 - .1 Body: cast high tensile bronze to ASTM B62 with integral seat.
 - .2 Pressure rating: Class 125.
 - .3 Connections: screwed ends to ANSI/ASME B1.20.1 and with hex. shoulders.
 - .4 Disc and seat: renewable rotating disc.
 - .5 Stainless steel spring, heavy duty.
 - .6 Seat: regrindable.
- .9 Ball Valves:
 - .1 NPS 2 and under:
 - .1 Body and cap: cast high tensile bronze to ASTM B62.
 - .2 Pressure rating: 2760-kPa CWP, 4140-kPa CWP, 860 kPa steam.
 - .3 Connections: screwed ends to ASME B1.20.1 and with hexagonal shoulders, solder ends to ANSI.

- .4 Stem: tamperproof ball drive.
- .5 Stem packing nut: external to body.
- .6 Ball and seat: replaceable stainless steel solid ball and Teflon seats.
- .7 Stem seal: TFE with external packing nut.
- .8 Operator: removable lever handle.

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 Install rising stem valves in upright position with stem above horizontal.
- .2 Remove internal parts before soldering.
- .3 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

3.2 CLEANING

- .1 Clean in accordance with Section 01 74 11.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Valves, gate, globe, and check.
- .2 Related Sections:
 - .1 Section 01 35 29.06 - Health and Safety Requirements.
 - .2 Section 23 05 01 - Installation of Pipework.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME).
 - .1 ANSI/ASME B16.1-2005, Cast Iron Pipe Flanges and Flanged Fittings.
- .2 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A49-01(2006), Specification for Heat-Treated Carbon Steel Joint Bars.
 - .2 ASTM A126-04, Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - .3 ASTM B61-08, Specification for Steam or Valve Bronze Castings.
 - .4 ASTM B62-09, Specification for Composition Bronze or Ounce Metal Castings.
 - .5 ASTM B85/B85M-09, Specification for Aluminum-Alloy Die Castings.
 - .6 ASTM B209-10, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
 - .1 MSS SP-70-2006, Gray Iron Gate Valves, Flanged and Threaded Ends.
 - .2 MSS SP-71-2005, Gray Iron Swing Check Valves, Flanged and Threaded Ends.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets

- .1 Submit shop drawings and product data in accordance with Section 01 33 00.
- .2 Submit data for valves specified in this section.
- .3 Closeout Submittals:
 - .1 Submit maintenance data for incorporation into manual specified in Section 01 78 00.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Ministry of Labour Regulations

1.5 DELIVERY STORAGE AND DISPOSAL

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturers written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labeled with manufacturers name, address.
- .3 Separate and recycle waste materials.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .6 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

PART 2 - PRODUCTS

2.1 MATERIAL

- .1 Valves:
 - .1 Except for specialty valves, to be of single manufacturer.
- .2 Standard specifications:

- .1 Gate valves: MSS SP-70.
- .2 Globe valves: MSS SP-85.
- .3 Check valves: MSS SP-71.

- .3 Requirements common to valves, unless specified otherwise:
 - .1 Body, bonnet: cast iron to ASTM B209 Class B.
 - .2 Connections: flanged ends plain face with 2 mm raised face with serrated finish to ANSI B16.1.
 - .3 Inspection and pressure testing: to MSS SP-82.
 - .4 Bonnet gasket: non-asbestos.
 - .5 Stem: to have precision-machined Acme or 60 degrees V threads, top screwed for handwheel nut.
 - .6 Stuffing box: non-galling two-piece ball-jointed packing gland, gland bolts and nuts.
 - .7 Gland packing: non-asbestos.
 - .8 Handwheel: Die-cast aluminum alloy to ASTM B85 or malleable iron to ASTM A49. Nut of bronze to ASTM B62.
 - .9 Identification tag: with catalogue number, size, other pertinent data.

- .4 All products to have CRN registration numbers.

2.2 GATE VALVES

- .1 NPS 2 1/2 - 8, non rising stem, outside screw and yoke (OS & Y), bronze trim, solid wedge disc:
 - .1 Body and multiple-bolted bonnet: with bosses in body and bonnet for taps and drains, full length disc guides designed to ensure correct re-assembly, yoke, yoke hub, yoke sleeve and unit. Class 125.
 - .2 Disc: solid offset taper wedge, bronze to ASTM B62 up to NPS, cast iron with bronze disc rings on other sizes, secure to stem through integral forged T-head disc-stem connection.
 - .3 Seat rings: renewable bronze to ASTM B62, screwed into body.
 - .4 Stem: nickel-plated steel.
 - .5 Pressure-lubricated operating mechanism.
 - .6 Operator: Handwheel

2.3 UNDERWRITERS APPROVED GATE VALVE

- .1 NPS 2 1/2 - 14, OS&Y:
 - .1 Approvals: UL and FM approved for fire service.
 - .2 UL and FM Label: on valve yoke.

- .3 Body, Bonnet: cast iron to ASTM A126 Class B. Wall thicknesses to ANSI B16.1 and ULC 262 (B).
- .4 Bonnet bushing, yoke sleeve: bronze, to FM requirements.
- .5 Packing gland: bronze.
- .6 Stem: manganese bronze. Diameter to ULC C-262 (B).
- .7 Stuffing box dimensions, gland bolt diameter: to ULC C-262 (B).
- .8 Bosses for bypass valve, drain: on NPS 4 and over.
- .9 Disc: solid taper wedge. Up to NPS 3: bronze. NPS 4 and over: cast iron with bronze disc rings.
- .10 Disc seat ring: self-aligning, Milwood undercut on NPS 3 - 12.
- .11 Pressure rating:
 - .1 NPS 2-1/2 - 12: 1.7 Mpa CWP.
 - .2 NPS 14-1.2: 1.2 MPa CWP.
- .12 Operator: handwheel.

2.4 GLOBE VALVES

- .1 NPS 2 1/2 - 10, OSY:
 - .1 Body: with multiple-bolted bonnet.
 - .2 WP: 860 kPa steam, 1.4 MPa CWP.
 - .3 Bonnet-yoke gasket: non-asbestos.
 - .4 Disc: bronze to ASTM B62, fully guided from bottom, securely yet freely connected to stem for swivel action and accurate engagement with disc.
 - .5 Seat ring: renewable, regrindable, screwed into body.
 - .6 Operator: Handwheel

2.5 CHECK VALVES

- .1 Swing check valves, Class 125:
 - .1 Body and bolted cover: with tapped and plugged opening on each side for hinge pin. Flanged ends: plain faced with smooth finish.
 - .1 Up to NPS 16: cast iron to ASTM A126 Class B.
 - .2 NPS and over: cast iron to ASTM A126 Class C.
 - .2 Ratings
 - .1 NPS 2 ½-12: 860 kPa steam; 1.4 MPa CWP.
 - .3 Disc: rotating for extended life.
 - .1 Up to NPS 6: bronze to ASTM B62.
 - .4 Seat rings: renewable bronze to ASTM B62.
 - .5 Hinge pin, bushings: renewable bronze to ASTM B62
 - .6 Disc: ASTM A126 Class B, secured to stem, rotating for extended life.

- .7 Seat: cast iron, integral with body.
 - .8 Hinge pin: exelloy; bushings: malleable iron.
 - .9 Identification tag: fastened to cover.
 - .10 Hinge galvanized malleable iron
-
- .2 Swing check valves, NPS 2 1/2 - 8 Class 250:
 - .1 Body and bolted cover: cast iron to ASTM A126 Class B with tapped and plugged opening on each side for hinge pin.
 - .2 Flanged ends: 2 mm raised face with serrated finish.
 - .3 Rating: 250 psi steam; 500 psi CWP.
 - .4 Disc: rotating for extended life.
 - .1 Up to NPS 3: bronze to ASTM B61.
 - .2 NPS 4 - 8: Iron faced with ASTM B61 bronze.
 - .5 Seat rings: renewable bronze to ASTM B61, screwed into body.
 - .6 Hinge pin, bushings: renewable, bronze to ASTM B61.
 - .7 Hinge: galvanized malleable iron.
 - .8 Identification tag: fastened to cover.

2.6 SILENT CHECK VALVES

- .1 Construction:
 - .1 Body: cast or forged steel with integral seat.
 - .2 Pressure rating: class 125, WP = 860 kPa.
 - .3 Connections: grooved ends.
 - .4 Disc: stainless steel renewable rotating disc.
 - .5 Seat: renewable, EPDM.
 - .6 Stainless steel spring, heavy duty.

PART 3 – EXECUTION

3.2 VERIFICATION

- .1 Install rising stem valves in upright position with stem above horizontal.

END OF SECTION

PART 1 – GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Butterfly Valves.
- .2 Related Sections:
 - .1 Health and Safety Requirements.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME).
 - .1 ANSI/ASME B1.20.1-1983(R2001), Pipe Threads, General Purpose (Inch).
 - .2 ANSI/ASME B16.1-2005, Cast Iron Pipe Flanges and Flanged Fittings.
 - .3 ANSI/ASME B16.5-2009, Pipe Flanges and Flanged Fittings.
 - .4 ANSI/ASME B16.11-2009, Forged Fittings, Socket-Welding and Threaded.
 - .5 ANSI/ASME B16.25-2007, Buttwelding Ends.
 - .6 ANSI/ASME B16.34-2009 and 2009 supplement, Valves - Flanged, Threaded and Welding Ends.
- .2 American National Standards Institute (ANSI)/American Petroleum Institute (API).
 - .1 ANSI/API 609-2009, Lug- and Water-Type Butterfly Valves.
- .3 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A126-04, Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - .2 ASTM B62-09, Specification for Composition Bronze or Ounce Metal Castings.
 - .3 ASTM B209M-10, Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- .4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
 - .1 MSS SP-67-2002a, Butterfly Valves.

1.3 SUBMITTALS

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

- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section [02 62 00.01].
 - .1 Submit shop drawings and product data in accordance with Section 01 33 00.
 - .2 Submit product data in accordance with Section 01 33 00.
 - .3 Submit data for valves specified this section.
- .3 Closeout Submittals:
 - .1 Submit maintenance data for incorporation into manual specified in Section 01 78 00.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Ministry of Labor Standards.

1.5 DELIVERY STORAGE AND DISPOSAL

- .1 Waste Management and Disposal:
 - .2 Separate and recycle waste materials.
 - .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

PART 2 – PRODUCTS

2.1 BUTTERFLY VALVES – RESILIENT SEAT – 200 PSIG

- .1 Except to specialty valves, to be of single manufacturer.
- .2 To be suitable for dead-end service.
- .3 CRN registration number required for products.
- .4 Sizes: type: NPS 2 to 6.
- .5 Pressure rating for tight shut-off at temperatures up to maximum for seat material.
 - .1 NPS 2 - 12: 200 psig.

- .6 Minimum seat temperature ratings to 135°C.
- .7 Application: on-off operation.
- .8 Full lug body (threaded).
- .9 Operators:
 - .1 NPS 2 - 6: Handles capable of locking in any of ten (10) positions - 0 degrees to 90 degrees. Handle and release trigger - ductile iron. Return spring and hinge pin: carbon steel. Latch plate and mounting hardware: cadmium plated carbon steel. Standard coating: black laquer.
- .10 Designed to comply with MSS SP-67 and API 609.
- .11 Compatible with ANSI Class 125/Class 150 flanges.
- .12 Construction:
 - .1 Body ductile iron.
 - .2 Disc: aluminum bronze.
 - .3 Seat: EPDM.
 - .4 Shaft: 316 stainless steel.
 - .5 Taper pin: 316 SS.
 - .6 Key: stainless.
 - .7 O-Ring: Buna-N.
 - .8 Bushings: Teflon.

2.2 BUTTERFLY VALVES – RESILIENT SEAT – 285 PSIG

- .1 Sizes: Lug type: NPS 2 to 48.
- .2 Pressure rating: 285 psig at 135°C.
- .3 Lug body: 150 ANSI bolt pattern.
- .4 Full lug body (threaded).
- .5 Application: for on-off service.
- .6 Operators:
 - .1 NPS 2 - 6: Handles capable of locking in any of ten (10) positions - 0 degrees to 90 degrees. Handle and release trigger - ductile iron. Return

spring and hinge pin: carbon steel. Latch plate and mounting hardware:
cadmium plated carbon steel.

- .7 Designed to comply with MSS SP-67 and API 609.
- .8 Compatible with ANSI B16.1 Class 125 (iron) and ANSI B16.5 Class 150 (steel) flanges.
- .9 Construction:
 - .1 Body: ductile iron.
 - .2 Disc: aluminum bronze.
 - .3 Seat: EPDM.
 - .4 Refer to manufacturer's literature for additional materials.
 - .5 Shaft: NPS 2 - 12: 416 stainless steel.
 - .6 Taper pin: 316 SS.
 - .7 Blowout proof stem.
 - .8 O-Ring: Buna-N.
 - .9 Bushings: teflon.
 - .10 Disc shall not be pinned to shaft.
 - .11 Bubble tight shutoff with downstream flanges removed, class 6 shutoff.

2.3 MOUNTING FLANGES

- .1 Class 125 cast iron to ANSI B16.1 or Class 150 steel to B16.5 pipe flanges.

PART 3 – EXECUTION

3.1 PREPARATION

- .1 Valve and mating flange preparation.
 - .1 Inspect adjacent pipeline, remove rust, scale, welding slag, other foreign material.
 - .2 Ensure that valve seats and pipe flange faces are free of dirt or surface irregularities which may disrupt flange seating and cause external leakage.
 - .3 Install butterfly valves with disc in almost closed position.
 - .4 Inspect valve disc seating surfaces and waterway and eliminate dirt or foreign material.

3.2 INSTALLATION OF VALVES

- .1 Install in accordance with manufacturer's instructions.

- .2 Do not use gaskets between pipe flanges and valves unless instructed otherwise by valve manufacturer.
- .3 Verify suitability of valve for application by inspection of identification tag.
- .4 Mount actuator on to valve prior to installation.
- .5 Handle valve with care so as to prevent damage to disc and seat faces.
- .6 Valves in horizontal pipe lines should be installed with stem in horizontal position to minimize liner and seal wear.
- .7 Ensure that valves are centered between bolts before bolts are tightened and then opened and closed to ensure unobstructed disc movement. If interference occurs due, for example to pipe wall thickness, taper bore adjacent piping to remove interference.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B31.1-2012, Power Piping.
- .2 ASTM International
 - .1 ASTM A125-96(2007), Standard Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts.
- .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada For New Construction and Major Renovations 2009.
 - .2 LEED Canada For Core and Shell 2009.
 - .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 Factory Mutual (FM)
- .5 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP 58-2009, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 MSS SP 69-2003, Pipe Hangers and Supports - Selection and Application.
 - .3 MSS SP 89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .6 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section [01 33 00].
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

- .2 Submit shop drawings for:
 - .1 Bases, hangers and supports.
 - .2 Connections to equipment and structure.
 - .3 Structural assemblies.
- .4 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.
 - .1 Departmental Representative will make available [1] copy of systems supplier's installation instructions.
- 1.3 CLOSEOUT SUBMITTALS
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.
- 1.4 DELIVERY, STORAGE AND HANDLING
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
 - .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
 - .3 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials.

PART 2 – PRODUCTS

2.1 SYSTEM DESCRIPTION

- .1 Design Requirements:
 - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
 - .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP 58.
 - .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

- .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP 58.

.2 Performance Requirements:

- .1 Design supports, platforms, catwalks, hangers to withstand seismic events.

2.2 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with MSS SP 58 and ASME B31.1.
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.3 PIPE HANGERS

.1 Finishes:

- .1 Pipe hangers and supports: galvanized after manufacture.
- .2 Use hot dipped galvanizing process.
- .3 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.

.2 Upper attachment structural: suspension from lower flange of I-Beam:

- .1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and retaining clip.
 - .1 Rod: 13 mm FM approved.
 - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, to MSS-SP 58 and MSS-SP 69.

.3 Upper attachment structural: suspension from upper flange of I-Beam:

- .1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, to MSS SP 69.
- .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut.

.4 Upper attachment to concrete:

- .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6mm minimum greater than rod diameter.

- .2 Concrete inserts: wedge shaped body with knockout protector plate to MSS SP 69.
 - .5 Shop and field-fabricated assemblies:
 - .1 Trapeze hanger assemblies.
 - .2 Steel brackets.
 - .3 Sway braces for seismic restraint systems.
 - .6 Hanger rods: threaded rod material to MSS SP 58:
 - .1 Ensure that hanger rods are subject to tensile loading only.
 - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
 - .3 Do not use 22mm or 28mm rod.
 - .7 Pipe attachments: material to MSS SP 58:
 - .1 Attachments for steel piping: carbon steel black galvanized.
 - .2 Attachments for copper piping: copper plated black steel.
 - .3 Use insulation shields for hot pipework.
 - .4 Oversize pipe hangers and supports.
 - .8 Adjustable clevis: material to MSS SP 69, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
 - .1 Ensure "U" has hole in bottom for rivetting to insulation shields.
- 2.4 RISER CLAMPS
- .1 Steel or cast iron pipe: galvanized carbon steel to MSS SP 58, type 42, FM approved.
 - .2 Copper pipe: carbon steel copper plated to MSS SP 58, type 42.
 - .3 Bolts: to ASTM A307.
 - .4 Nuts: to ASTM A563.
- 2.5 INSULATION PROTECTION SHIELDS
- .1 Insulated cold piping:
 - .1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP 69, galvanized sheet carbon steel. Length designed for maximum 3m span.
 - .2 Insulated hot piping:
 - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP 69.

2.6 EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 23. Submit calculations with shop drawings.

2.7 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

- .1 Provide templates to ensure accurate location of anchor bolts.

2.8 HOUSE-KEEPING PADS

- .1 Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 50mm larger than equipment; chamfer pad edges.
- .2 Concrete: to Section 03 30 00.

2.9 OTHER EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports from structural grade steel.
- .2 Submit structural calculations with shop drawings.

PART 3 – EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install in accordance with:
 - .1 Manufacturer's instructions and recommendations.
- .2 Vibration Control Devices:
 - .1 Install on piping systems at pumps and as indicated.
- .3 Clamps on riser piping:
 - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
 - .2 Bolt-tightening torques to industry standards.
 - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
 - .4 Cast iron pipes: install below joint.
- .4 Clevis plates:
 - .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

- .5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

3.3 HANGER SPACING

- .1 Plumbing piping: to Canadian Plumbing Code, OBC.
- .2 Fire protection: to applicable fire code.
- .3 Copper piping: up to NPS 1/2: every 1.5 m.
- .4 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.
- .6 Within 300mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.4 m	1.8 m
1-1/2	3.0 m	2.4 m
2	3.0 m	2.4 m
2-1/2	3.7 m	3.0 m
3	3.7 m	3.0 m
3-1/2	3.7 m	3.3 m
4	3.7 m	3.6 m
5	4.3 m	
6	4.3 m	
8	4.3 m	

3.4 HANGER INSTALLATION

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
 - .1 Ensure that rod is vertical under operating conditions.
 - .2 Equalize loads.
- .2 Adjustable clevis:
 - .1 Tighten hanger load nut securely to ensure proper hanger performance.
 - .2 Tighten upper nut after adjustment.
- .3 C-clamps:
 - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
 - .1 Hammer jaw firmly against underside of beam.

3.7 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.8 CLEANING

- .1 Clean in accordance with Section 01 74 11.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-B149.1-10, Natural Gas and Propane Installation Code.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.
 - .2 CAN/CGSB-24.3-92, Identification of Piping Systems.
- .3 National Fire Protection Association (NFPA)
 - .1 NFPA 13-2010, Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 14-2010, Standard for the Installation of Standpipe and Hose Systems.

1.2 SUBMITTALS

- .1 Product Data: submit product data for each item specified.
- .2 Submittals: in accordance with Section 01 33 00.
- .3 Product data to include paint colour chips, other products specified in this section.

1.3 QUALITY ASSURANCE

- .1 Quality assurance submittals: submit following in accordance with Section 01 33 00.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Ministry of Labor Regulations.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 61 00.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

- .2 Dispose of unused paint coating material at official hazardous material collections site approved by Departmental Representative.
- .3 Do not dispose of unused paint coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

PART 2 – PRODUCTS

2.1 MANUFACTURER’S EQUIPMENT NAMEPLATES

- .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers raised or recessed.
- .3 Information to include, as appropriate:
 - .1 Equipment: manufacturer's name, model, size, serial number, capacity.
 - .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

- .1 Colours:
 - .1 Hazardous: red letters, white background.
 - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
 - .1 3 mm thick [laminated plastic] [or] [white anodized aluminum], matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
 - .1 Conform to following table:

Size # mm	Sizes (mm) Lines	No. of Letters (mm)	Height of
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Identification for PWGSC Preventive Maintenance Support System (PMSS):

.1 Use arrangement of Main identifier, Source identifier, Destination identifier.

.2 Equipment in Mechanical Room:

.1 Main identifier: size #9.

.2 Source and Destination identifiers: size #6.

.3 Terminal cabinets, control panels: size #5.

.3 Equipment elsewhere: sizes as appropriate.

2.3 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Departmental Representative.

2.4 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:

.1 Sprinklers: to NFPA 13.

.2 Standpipe and hose systems: to NFPA 14.

2.5 IDENTIFICATION OF PIPING SYSTEMS

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB-24.3 except where specified otherwise.
- .2 Pictograms:
 - .1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.
- .3 Legend:
 - .1 Block capitals to sizes and colours listed in CAN/CGSB-24.3.
- .4 Arrows showing direction of flow:
 - .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
 - .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
 - .3 Use double-headed arrows where flow is reversible.
- .5 Extent of background colour marking:
 - .1 To full circumference of pipe or insulation.
 - .2 Length to accommodate pictogram, full length of legend and arrows.
- .6 Materials for background colour marking, legend, arrows:
 - .1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
 - .2 Other pipes: pressure sensitive [plastic-coated cloth] [vinyl] with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.
- .7 Colours and Legends:
 - .1 Where not listed, obtain direction from Departmental Representative.
 - .2 Colours for legends, arrows: to following table:

Background colour: Legend, arrows:

Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
Chilled water return	Green	CH. WTR. RETURN
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
Boiler feed water	Yellow	BLR. FEED WTR
Chilled drinking water	Green	CH. DRINK WTR
Drinking water return	Green	CH. DRINK WTR.
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Waste water	Green	WASTE WATER
Storm water	Green	STORM
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
Fire protection water	Red	FIRE PROT. WTR
Sprinklers	Red	SPRINKLERS

2.6 IDENTIFICATION DUCTWORK SYSTEMS

- .1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.
- .2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.7 VALVES, CONTROLLERS

- .1 Brass tags with 12 mm stamped identification data filled with black paint.
- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item. Update existing valve charts to reflect added or removed valves.

2.8 CONTROLS COMPONENTS IDENTIFICATION

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.
- .2 Inscriptions to include function and (where appropriate) fail-safe position.

2.9 LANGUAGE

- .1 Identification in English and French.
- .2 Use one nameplate and label for both languages.

PART 3 – EXECUTION

3.1 MANUFACTURER’S INSTRUCTIONS

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

3.2 TIMING

- .1 Provide identification only after painting has been completed.

3.3 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Provide ULC or CSA registration plates as required by respective agency.
- .3 Identify systems, equipment to conform to PWGSC PMSS.

3.4 NAMEPLATES

- .1 Locations:
 - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs:
 - .1 Provide for nameplates on hot and/or insulated surfaces.

- .3 Protection:
 - .1 Do not paint, insulate or cover.

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.
- .3 At least once in each small room through which piping or ductwork passes.
- .4 On both sides of visual obstruction or where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.
- .6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.
- .7 At beginning and end points of each run and at each piece of equipment in run.
- .8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.
- .9 Identification easily and accurately readable from usual operating areas and from access points.
 - .1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 VALVES, CONTROLLERS

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

- .2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.
- .3 Number valves in each system consecutively.

3.7 CLEANING

- .1 Proceed in accordance with Section 01 74 11.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL

- .1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 QUALIFICATIONS OF TAB PERSONNEL

- .1 Names of personnel it is proposed to perform TAB to be submitted to and approved by Consultant within 90 days of award of contract.
- .2 Provide documentation confirming qualifications, successful experience.
- .3 TAB: performed in accordance with requirements of standard under which TAB Firm's qualifications are approved:
 - .1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.
 - .2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environment System-1998.
 - .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC System – Testing, Adjusting and Balancing-2002.
- .4 Recommendation and suggested practices contained in the TAB Standards: mandatory
- .5 Use TAB Standards provisions, including checklists, and report forms to satisfy Contract requirements.
- .6 Use TAB standards for TAB, including qualifications for Tab Firm and Specialist and calibration of TAB instruments.
- .7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standards, use manufacturer's recommendations.

- .8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.
 - .1 For system or system components not covered in TAB Standards, use TAB procedures developed by TAB Specialist.
 - .2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 PURPOSE OF TAB

- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads.
- .2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.
- .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.4 EXCEPTIONS

- .1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 PRE-TAB REVIEW

- .1 Review contract documents before project construction is started and confirm in writing to Consultant adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.
- .2 Review specified standards and report to Consultant in writing all proposed procedures which vary from standard.
- .3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere.

1.8 OPERATION OF SYSTEMS DURING TAB

- .1 Operate systems for length of time required for TAB and as required by Consultant for verification of TAB reports.

1.9 START OF TAB

- .1 Notify Consultant 7 days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
- .3 Installation of ceilings, doors, windows, other construction affecting TAB.
- .4 Application of weatherstripping, sealing, caulking.
- .5 All pressure, leakage, other tests specified elsewhere in Division 23.
- .6 All provisions for TAB installed and operational.

- .7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
 - .1 Proper thermal overload protection in place for electrical equipment.
 - .2 Air systems:
 - .1 Filters in place, clean.
 - .2 Duct systems clean.
 - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
 - .4 Correct fan rotation.
 - .5 Fire, smoke, volume control dampers installed and open.
 - .6 Coil fins combed, clean.
 - .7 Access doors, installed, closed.
 - .8 Outlets installed, volume control dampers open.
 - .3 Liquid systems:
 - .1 Flushed, filled, vented.
 - .2 Correct pump rotation.
 - .3 Strainers in place, baskets clean.
 - .4 Isolating and balancing valves installed, open.
 - .5 Calibrated balancing valves installed, at factory settings.
 - .6 Chemical treatment systems complete, operational.

1.10 APPLICATION TOLERANCES

- .1 Do TAB to following tolerances of design values:
 - .1 HVAC systems: plus 5%, minus 5%.
 - .2 Hydronic systems: plus or minus 10%.

1.11 ACCURACY TOLERANCES

- .1 Measured values to be accurate to within plus or minus 2% of actual values.

1.12 INSTRUMENTS

- .1 Prior to TAB, submit to Consultant list of instruments to be used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

- .3 Calibrate within 3 months of TAB. Provide certificate of calibration to Consultant.

1.13 SUBMITTAL

- .1 Submit, prior to commencement of TAB:
- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

- .1 Submit for checking and approval of Consultant, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
 - .1 Details of instruments used.
 - .2 Details of TAB procedures employed.
 - .3 Calculations procedures.
 - .4 Summaries.

1.15 TAB REPORT

- .1 TAB report to show results in SI units and to include:
 - .1 Project record drawings.
 - .2 System schematics.
- .2 Submit 3 copies of TAB Report to Consultant for verification and approval, in English in D-ring binders, complete with index tabs.

1.16 VERIFICATION

- .1 Reported results subject to verification by Consultant.
- .2 Provide manpower and instrumentation to verify up to 30% of reported results.
- .3 Number and location of verified results to be at discretion of Consultant.
- .4 Bear costs to repeat TAB as required to satisfaction of Consultant.

1.17 SETTINGS

- .1 After TAB is completed to satisfaction of Consultant, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.
- .2 Permanently mark settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.18 COMPLTION OF TAB

- .1 TAB to be considered complete when final TAB Report received and approved by Consultant.

1.19 AIR SYSTEM

- .1 Standard: TAB to be to most stringent of this section or TAB standards of AABC] NEBB, SMACNA, ASHRAE.
- .2 Do TAB of:
 - .1 New Air Handling Units and associated ductwork.
 - .2 New Exhaust System.
- .3 Qualifications: personnel performing TAB to be current member in good standing of AABC or NEBB.
- .4 Quality assurance: Perform TAB under direction of supervisor qualified to standards of AABC or NEBB.
- .5 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
- .6 Locations of equipment measurements: To include, but not be limited to, following as appropriate:
 - .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
 - .2 At controllers, controlled device.

- .7 Locations of systems measurements to include, but not be limited to, following as appropriate: Main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.20 HYDRONIC SYSTEMS

- .1 Definitions: for purposes of this section, to include low pressure hot water heating, chilled water systems.
- .2 Standard: TAB to be to most stringent of this section or TAB standards of AABC, NEBB, SMACNA, ASHRAE.
- .3 Do TAB of:
- .1 Hydronic heating System.
 - .2 Chilled water system.
- .4 Qualifications: personnel performing TAB to be current member in good standing of AABC or NEBB.
- .5 Quality assurance: perform TAB under direction of supervisor qualified [by] [to standards of AABC or NEBB].
- .6 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: Flow rate, static pressure, pressure drop (or loss), temperature, specific gravity, density, RPM, electrical power, voltage, noise, vibration.
- .7 Locations of equipment measurement: To include, but not be limited to, following as appropriate:
- .1 Inlet and outlet of coils, humidifier, pump, control valve, other equipment causing changes in conditions.
 - .2 At controllers, controlled device.
- .8 Locations of systems measurements to include, but not be limited to, following as appropriate: Supply and return of primary and secondary loops (main, main branch, branch, sub-branch of all hydronic systems, inlet connection of make-up water).

1.21 OTHER TAB REQUIREMENTS

- .1 General requirements applicable to work specified this paragraph:
 - .1 Qualifications of TAB personnel: as for air systems specified this section.
 - .2 Quality assurance: as for air systems specified this section.
- .2 Building pressure conditions:
 - .1 Adjust HVAC systems, equipment, controls to ensure specified pressure conditions at all times.
- .3 Smoke management systems:
 - .1 Test for proper operation of all smoke and fire dampers, installed as component parts of air systems specified Division 23.

1.22 POST-OCCUPANCY TAB

- .1 Measure DBT, WBT (or %RH), air velocity, air flow patterns, NC levels, in occupied zoneS.
- .3 Participate in systems checks twice during Warranty Period - #1 approximately 3 months after acceptance and #2 within 1 month of termination of Warranty Period.

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 GENERAL

- .1 Ducts over 5 m in length, forming part of a supply, return or exhaust ductwork system directly or indirectly connected to air handling equipment to be pressure tested for leaks.

1.2 TIMING

- .1 Ducts to be tested before installation of insulation or any other form of concealments.
- .2 Test after seals have cured.
- .3 Test when ambient temperature will not affect effectiveness of seals, gaskets, etc.

1.3 EXCLUSIONS

- .1 Flexible connections to VAV boxes.

1.4 REFERENCES

- .1 SMACNA HVAC Air Duct Leakage Test Manual, 1985.

1.5 TEST PROCEDURES

- .1 Maximum lengths of ducts to be tested to be consistent with capacity of test equipment.
- .2 Section of duct to be tested to include:
 - .1 Fittings, branch ducts, tap-ins.
- .3 Repeat tests until specified pressures are attained. Bear costs for repairs and repetition to tests.
- .4 Base partial system leakage calculations on Reference Standard.
- .5 Seal leaks that can be heard or felt, regardless of their contribution to total leakage.

1.6 TESTING AGENCY

- .1 Installing Contractor.

1.7 VERIFICATION

- .1 Consultant to witness tests and to verify reported results.
- .2 To be certified by the same TAB agency approved by Consultant to undertake TAB on this project.

1.8 TEST INSTRUMENTS

- .1 Testing agency to provide instruments for tests.
- .2 Test apparatus to include:
 - .1 Fan capable of producing required static pressure.
 - .2 Duct section with calibrated orifice plate mounted and accurately located pressure taps.
 - .3 Flow measuring instrument compatible with the orifice plate.
 - .4 Calibration curves for orifice plates used.
 - .5 Flexible duct for connecting to ductwork under test.
 - .6 Smoke bombs for visual inspections.
- .3 Test apparatus to be accurate to within +/- 3 % of flow rate and pressure.
- .4 Submit details of test instruments to be used to Consultant at least three months before anticipated start date.
- .5 Test instruments to be calibrated and certificate of calibration deposited with Consultant no more than 28 days before start of tests.
- .6 Instruments to be re-calibrated every six months thereafter.

1.9 SYSTEM LEAKAGE TOLERANCES

- .1 System leakage tolerances specified herein are stated as a percentage of total flow rate handled by the system. Therefore, when testing sections of ductwork this acceptable leakage shall be pro-rated to entire system. Leakage for sections of duct systems shall not exceed the total allowable leakage.
- .2 Leakage tests on following systems not to exceed specified leakage rates.

- .1 Small duct systems up to 250 Pa: Leakage [2] %.
 - .2 VAV box and duct on downstream side of VAV box: Leakage 2%.
 - .3 Large low pressure duct systems up to 500 Pa: Leakage [2] %.
 - .4 HP duct systems up to 1000 Pa pressure classification, including upstream side of VAV boxes: Leakage 1 %.
- .3 Evaluation of test results to use surface area of duct and pressure in duct as basic parameters.

1.10 REPORT FORMS

- .1 Submit proposed report form and test report format to Consultant for approval at least three months before proposed date of first series of tests. Do not start tests until approval received in writing from Consultant.

1.11 PRESSURE TEST REPORTS

- .1 Prepare report of results and submit to Consultant within 24 hours of completion of tests. Include:
 - .1 Schematic of entire system.
 - .2 Schematic of section under test showing test site.
 - .3 Required and achieved static pressures.
 - .4 Orifice differential pressure at test sites.
 - .5 Permissible and actual leakage flow rate (L/s) for test sites.
 - .6 Witnessed certification of results.
- .2 Include test reports in final TAB report.

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 DEFINITIONS

- .1 Definitions:
 - .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - means "not concealed" as previously defined.
 - .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
 - .2 TIAC Codes:
 - .1 CRD: Code Round Ductwork,
 - .2 CRF: Code Rectangular Finish.

1.2 REFERENCE STANDARDS

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ANSI/ASHRAE/IES 90.1-2010, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .2 ASTM International Inc.
 - .1 ASTM B209M-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - .2 ASTM C335-10e1, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
 - .3 ASTM C411-11, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449-07, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C547-11, Standard Specification for Mineral Fiber Pipe Insulation.
 - .6 ASTM C553-11, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .7 ASTM C612-10, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - .8 ASTM C795-08, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .9 ASTM C921-10, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).

- .5 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 ACTION AND INFORMATION SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Description of equipment giving manufacturer's name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.
 - .3 Shop Drawings:
 - .1 In accordance with Section 01 33 00.
 - .4 Samples:
 - .1 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed.
 - .2 Mount sample on 12 mm plywood board.
 - .3 Affix typewritten label beneath sample indicating service.
 - .5 Manufacturers' Instructions:
 - .1 Provide manufacture's written duct insulation jointing recommendations and special handling criteria, installation sequence and cleaning procedures.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project, qualified to standards member of TIAC.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Separate and recycle waste materials.
- .4 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

PART 2 – PRODUCTS

2.1 FIRE AND SMOKE RATING

- .1 To CAN/ULC-S102:
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

- .1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with or without factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).
- .4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with or without factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to ASTM C553.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to ASTM C553.

2.3 JACKETS

- .1 Canvas:
 - .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .2 Lagging adhesive: compatible with insulation.

2.4 ACCESSORIES

- .1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.

- .2 ULC Listed Canvas Jacket:
 - .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921 untreated.

PART 3 – EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 PRE-INSTALLATION REQUIREMENTS

- .1 Pressure test ductwork systems complete, witness and certify.
- .2 Ensure surfaces are clean, dry, and free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturer's instructions and as indicated.
- .3 Use two layers with staggered joints when required nominal thickness exceeds 75mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Ensure hangers, and supports are outside vapour retarder jacket.
- .5 Hangers and supports in accordance with Section 23 05 29.
 - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .6 Fasteners: install at 300mm on centre in horizontal and vertical directions, minimum two rows each side.
- .7 Externally insulate all ductwork in mechanical room. Cover for canvas.
- .8 Externally insulate all exhaust ducts within 1.5m from roofs or walls.

3.4 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature supply air ducts	C-1	Yes	50
Round cold and dual temperature supply air ducts	C-2	Yes	50
Rectangle warm air ducts	C-1	No	25
Round warm air ducts	C-1	No	25
Supply, return and exhaust ducts exposed in space being served		None	
Outside air ducts to mixing plenum	C-1	Yes	25
Mixing plenums	C-1	Yes	25
Exhaust duct between dampers and louvres	C-1	No	25
Rectangle ducts outside	C-1	Special	50
Round ducts outside	C-1	Special	50
Acoustically lined ducts		none	

.2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.1 Finishes: conform to following table:

	<u>TIAC Code</u>	<u>Rectangular</u>	<u>Round</u>
Indoor, concealed		None	none
Indoor, exposed within mechanical room	CRF/1	CRD/2	
Indoor, exposed elsewhere	CRF/2	CRD/3	
Outdoor, exposed to precipitation	CRF/3	CRD/4	
Outdoor, elsewhere	CRF/4	CRD/5	

3.5 CLEANING

- .1 Clean in accordance with:
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste management: separate waste materials for reuse and recycling.

END OF SECTION

PART 1 - GENERAL

1.2 REFERENCES

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 90.1-2013, Energy Standard for Buildings Except Low-Rise Residential Buildings (ANSI approved; IESNA co-sponsored).
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM B209M-10, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).
 - .2 ASTM C335/C335M-10e1, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C411-11, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449-07, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C533-07, Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
 - .6 ASTM C547-07e1, Standard Specification for Mineral Fiber Pipe Insulation.
 - .7 ASTM C795-08, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .8 ASTM C921-10, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-[89], Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .2 CAN/CGSB-51.53-[95], Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts.
- .4 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 1992, c. 37.
 - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 Manufacturer's Trade Associations

- .1 Thermal Insulation Association of Canada (TIAC): Mechanical Insulation Best Practice Guide(Revised 2005).
- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.
 - .2 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC-S702-09, Thermal Insulation, Mineral Fibre, for Buildings
 - .4 ULC-S702.2-10, Standard for Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.3 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as specified.
- .2 TIAC ss:
 - .1 CRF: Code Rectangular Finish.
 - .2 CPF: Code Piping Finish.

1.4 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00. Include product characteristics, performance criteria, and limitations.
 - .1 Submit [two] copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).
- .3 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00.
 - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

1.5 QUALITY ASSURANCE

.1 Qualifications:

- .1 Installer: specialist in performing work of this Section, and have at least [3] years successful experience in this size and type of project, [qualified to standards] [member] of TIAC.

.2 Health and Safety:

- .1 Do construction occupational health and safety in accordance with Ministry of Labour Regulations

1.6 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

- .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and Protection:

- .1 Protect from weather, construction traffic.
- .2 Protect against damage.
- .3 Store at temperatures and conditions required by manufacturer.

.3 Waste Management and Disposal:

- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
- .2 Place excess or unused insulation and insulation accessory materials in designated containers.
- .3 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
- .4 Dispose of unused adhesive material at official hazardous material collections site.

PART 2 - PRODUCTS

2.2 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.3 INSULATION

- .1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.
 - .1 Mineral fibre: to CAN/ULC-S702 ASTM C547.
 - .2 Maximum "k" factor: to CAN/ULC-S702.
- .4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.
 - .1 Mineral fibre: to CAN/ULC-S702 ASTM C547.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to CAN/ULC-S702 ASTM C547.
- .5 TIAC Code C-2: mineral fibre blanket faced [with] [without] factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to [CAN/ULC-S702] [ASTM C547].
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to [CAN/ULC-S702] [ASTM C547].
- .6 TIAC Code A-6: flexible unicellular tubular elastomer.
 - .1 Insulation: [with vapour retarder jacket] [_____].
 - .2 Jacket: to CGSB 51-GP-52Ma
 - .3 Maximum "k" factor
 - .4 Certified by manufacturer: free of potential stress corrosion cracking corrodents.

2.4 INSULATION SECUREMENT

- .1 Tape: self-adhesive, aluminum, plain reinforced, 50mm wide minimum.
- .2 Contact adhesive: quick setting.

2.5 CEMENT

- .1 Thermal insulating and finishing cement:
 - .1 Hydraulic setting on mineral wool, to ASTM C449.

2.6 VAPOUR RETARDER LAP ADHESIVE

- .1 Water based, fire retardant type, compatible with insulation.

2.7 INDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.

2.9 JACKETS

- .1 Polyvinyl Chloride (PVC):
 - .1 One-piece moulded type to CAN/CGSB-51.53 with pre-formed shapes as required.
 - .2 Colours: Consultant
 - .3 Minimum service temperatures: -20 degrees C.
 - .4 Maximum service temperature: 65 degrees C.
 - .5 Moisture vapour transmission: 0.02 perm.
 - .6 Thickness: 20 mm.
 - .7 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
- .2 Aluminum:
 - .1 To ASTM B209M.
 - .2 Thickness: 0.50mm sheet.
 - .3 Finish: smooth.
 - .4 Joining: longitudinal and circumferential slip joints with 50mm laps.

- .5 Fittings: 0.5mm thick die-shaped fitting covers with factory-attached protective liner.
- .6 Metal jacket banding and mechanical seals: stainless steel, 19mm wide, 0.5mm thick at 300mm spacing.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturer's instructions and this specification.
- .3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Install hangers, supports outside vapour retarder jacket.
- .5 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

- .1 Application: at valves, primary flow measuring elements flanges and unions at equipment.
- .2 Design: to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.
- .3 Insulation:
 - .1 Insulation, fastenings and finishes: same as system.
 - .2 Jacket: aluminum

3.5 INSTALLATION OF ELASTOMERIC INSULATION

- .1 Insulation to remain dry. Overlaps to manufacturer's instructions. Ensure tight joints.
- .2 Provide vapour retarder as recommended by manufacturer.

3.6 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
- .2 TIAC Code: A-1.
 - .1 Securements: SS wire bands at 300mm on centre.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code 1501-H.
- .3 TIAC Code: A-3.
 - .1 Securements: SS wire bands Tape at 300mm on centre.
 - .2 Seals: VR lap seal adhesive, VR lagging adhesive.
 - .3 Installation: TIAC Code:1501-C
- .4 TIAC Code: A-6.
 - .2 Seals: lap seal adhesive, lagging adhesive.
- .5 TIAC Code: C-2 with vapour retarder jacket.
 - .1 Seals: lap seal adhesive, lagging adhesive.

.2 Installation: TIAC Code: 1501-C.

.6 Thickness of insulation as listed in following table.

- .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
- .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp Degree C	TIAC Code	Pipe Sizes (mm)	(NPS) and insulation thickness				
				Run Out to 1	1 ¼ to 2	2 ½ to 4	5 to 6	8 & over
Steam		[A-3]	65	65	65	65	80	80
Domestic Hot		[A-3]	25	25	25	38	38	38
Domestic CWS		[A-3]	25	25	25	38	38	38
Chilled Water		[A-3]	25	25	25	38	38	38
Storm Condensate		[A-3]	25	25	25	25	25	25
Hot Water heating		[C-2]	25	25	25	25	25	25
Refrigerant HG		[A-1]	38	38	38	50	50	50
Refrigerant Suction		[A-6]	25	38	38	38	38	38
Refrigerant Liquid		[A-6]	25	38	38	38	38	38
Refrigerant		[A-6]	28	38	38	38	38	38

.7 Finishes:

- .1 Exposed indoors: PVC jacket.
- .2 Mechanical rooms: canvas
- .3 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
- .4 Finish attachments: SS screws bands, at 150mm on centre.
Seals: wing closed.
- .5 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.8 CLEANING

- .1 Proceed in accordance with Section 01 74 11.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 74 20 - Construction/Demolition Waste Management and Disposal.
- .2 Section 23 05 93 - Testing Adjusting and Balancing for HVAC.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.
- .2 Dispose of unused cleaning solutions at official hazardous material collections site approved by the Departmental Representative.
- .3 Do not dispose of unused cleaning solutions into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.
- .4 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .5 Dispose of corrugated cardboard, polystyrene, plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

PART 2 – PRODUCTS

2.1 CLEANING SOLUTIONS

- .1 Tri-sodium phosphate: 0.40 kg per 100 L water in system.
- .2 Sodium carbonate: 0.40 kg per 100 L water in system.
- .3 Low-foaming detergent: 0.01 kg per 100 L water in system.

PART 3 – EXECUTION

3.1 CLEANING HYDRONIC AND STEAM SYSTEMS

- .1 Timing
 - .1 Systems to be operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.
- .2 Cleaning Agency:
 - .1 Retain qualified water treatment specialist to perform system cleaning.

- .3 Install instrumentation such as flow meters, orifice plates, pitot tubes, and flow metering valves only after cleaning is certified as complete by water treatment specialist.
- .4 Cleaning procedures:
 - .1 Provide detailed report outlining proposed cleaning procedures at least 4 weeks prior to proposed starting date. Report to include:
 - .1 Cleaning procedures, flow rates, elapsed time.
 - .2 Chemicals and concentrations to be used.
 - .3 Inhibitors and concentrations.
 - .4 Specific requirements for completion of work.
 - .5 Special precautions for protecting piping system materials and components.
 - .6 Complete analysis of water to be used to ensure water will not damage systems or equipment.
- .5 Conditions at time of cleaning of systems
 - .1 Systems to be free from construction debris, dirt and other foreign material.
 - .2 Control valves to be operational, fully open to ensure that terminal units can be cleaned properly.
 - .3 Strainers to be clean prior to initial fill.
 - .4 Install temporary filters on pumps not equipped with permanent filters.
 - .5 Install pressure gauges on strainers to detect plugging.
- .6 Report on Completion of Cleaning
 - .1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.
- .7 Hydronic Systems:
 - .1 Fill system with water, ensure air is vented from system.
 - .2 Fill expansion tanks 1/3 to 1/2 full, charge system with compressed air to at least 35 kPa (does not apply to diaphragm type expansion tanks).
 - .3 Use water metre to record volume of water in system to +/- 0.5%.
 - .4 Add chemicals under direct supervision of chemical treatment supplier.
 - .5 Closed loop systems: circulate system cleaner at 60° C for at least 36 h. Drain as quickly as possible. Refill with water and inhibitors. Test concentrations and adjust to recommended levels.
 - .6 Flush velocity in system mains and branches so as to ensure removal of debris. System pumps may be used for circulating cleaning solution provided that velocities are adequate.
 - .7 Add chemical solution to system.

- .8 Establish circulation, raise temperature slowly to maximum design 82° C minimum. Circulate for 12 h, ensuring flow in all circuits. Remove heat, continue to circulate until temperature is below 38° C. Drain as quickly as possible. Refill with clean water. Circulate for 6 h at design temperature. Drain and repeat procedures specified above. Flush through low point drains in system. Refill with clean water adding to sodium sulphite (test for residual sulphite).

3.2 START-UP OF HYDRONIC SYSTEMS

- .1 After cleaning is completed and system is filled:
 - .1 Establish circulation and expansion tank level, set pressure controls.
 - .2 Ensure air is removed.
 - .3 Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.
 - .4 Dismantle system pumps used for cleaning, inspect, replace worn parts, install new gaskets and new set of seals.
 - .5 Clean out strainers repeatedly until system is clean.
 - .6 Commission water treatment systems as specified in Section 23 25 00.
 - .7 Check water level in expansion tank with cold water with circulating pumps OFF and again with pumps ON.
 - .8 Repeat with water at design temperature.
 - .9 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.
 - .10 Bring system up to design temperature and pressure slowly.
 - .11 Perform TAB as specified in Section 23 05 93.
 - .12 Adjust pipe supports, hangers, springs as necessary.
 - .13 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.
 - .14 If sliding type expansion joints bind or if bellows type expansion joints flex incorrectly, shut down system, re-align, repeat start-up procedures.
 - .15 Re-tighten bolts, etc. using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.
 - .16 Check operation of drain valves.
 - .17 Adjust valve stem packings as systems settle down.
 - .18 Fully open all balancing valves (except those that are factory-set).
 - .19 Check operation of over-temperature protection devices on circulating pumps.
 - .20 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)/American Welding Society (AWS)
 - .1 ANSI/AWS A5.8/A5.8M-2011, Specification Filler Metals for Brazing and Bronze Welding.
- .2 American Society of Mechanical Engineers (ASME)
 - .1 ANSI/ASME B16.4-2006, Gray Iron Threaded Fittings.
 - .2 ANSI/ASME B16.15-2006, Cast Bronze Threaded Fittings.
 - .3 ANSI B16.18-2001(R2005), Cast Copper Alloy, Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.22-2001(R2005), Wrought Copper and Copper-Alloy Solder Joint Pressure Fittings.
- .3 American Society for Testing and Materials International (ASTM)
 - .1 ASTM B32-08, Standard Specification for Solder Metal.
 - .2 ASTM B61-08, Standard Specification for Steam or Valve Bronze Castings.
 - .3 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - .4 ASTM B88M-05, Standard Specification for Seamless Copper Water Tube Metric.
 - .5 ASTM E202-09, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Manufacturers Standardization Society (MSS)
 - .1 MSS SP-67-2002a, Butterfly Valves.
 - .2 MSS SP-70-2006, Gray Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS SP-71-2005, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
 - .4 MSS SP-80-2008, Bronze Gate, Globe, Angle and Check Valves.
 - .5 MSS SP-85-2002, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00. Include product characteristics, performance criteria, and limitations.

- .1 Submit 2 copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00.
 - .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00.
 - .3 Quality assurance submittals: submit following in accordance with Section 01 33 00.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - .4 Closeout Submittals:
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.
- 1.3 QUALITY ASSURANCE
- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial /Territorial regulations.
 - .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Ministry of Labour regulations.
- 1.4 MAINTENANCE
- .1 Extra materials:
- 1.5 DELIVERY, STORAGE AND HANDLING
- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00.
 - .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 – PRODUCTS

2.1 TUBING

- .1 Type L hard drawn copper tubing: to ASTM B88M.

2.2 FITTINGS

- .1 Cast bronze threaded fittings: to ANSI/ASME B16.15.
- .2 Wrought copper and copper alloy solder joint pressure fittings: to ANSI/ASME B16.22.
- .3 Cast iron threaded fittings: to ANSI/ASME B16.4.
- .4 Cast copper alloy solder joint pressure fittings: to ANSI B16.18.

2.3 FLANGES

- .1 Brass or bronze: threaded.
- .2 Cast iron: threaded.
- .3 Orifice flanges: slip-on, raised face, 2100 kPa.

2.4 JOINTS

- .1 Solder, tin-antimony, 95:5: to ASTM B32, lead free.
- .2 Silver solder BCUP: to ANSI/AWS A5.8.
- .3 Brazing: as indicated.

2.5 VALVES

- .1 Connections:
 - .1 NPS 2 and smaller: ends for soldering.
 - .2 NPS 2 1/2 and larger: flanged or grooved ends.
- .2 Gate Valves [Application: isolating equipment:
 - .1 NPS 2 and under:
 - .1 Class 125, rising stem, split wedge disc, as specified Section 23 05 23.01.
 - .2 NPS 2 1/2 and over:
 - .1 Rising stem, split wedge disc, bronze trim, as specified Section 23 05 23 .02.
- .3 Butterfly valves: application: isolating each cell or section of multiple component equipment (eg. multi-section coils):
 - .1 NPS 2 1/2 and over: lug type grooved ends: as specified Section 23 05 17.

- .4 Balancing, for TAB:
 - .1 Sizes: calibrated balancing valves, as specified.
 - .2 NPS 2 and under:
 - .1 Mechanical Rooms: globe, with plug disc as specified Section 23 05 23.01.
 - .2 Elsewhere: globe, with plug disc as specified Section 23 05 23.01.
- .5 Drain valves: gate, Class 125, non-rising stem, solid wedge disc, as specified Section 23 05 23.01.
- .6 Swing check valves:
 - .1 NPS 2 and under:
 - .1 Class 125, swing, with composition disc, as specified Section 23 05 23.01.
 - .2 NPS 2 1/2 and over:
 - .1 Flanged Grooved ends: as specified Section 23 05 23.02.
- .7 Silent check valves:
 - .1 NPS 2 and under:
 - .1 As specified Section 23 05 23.01.
 - .2 NPS 2 1/2 and over:
 - .1 Flanged Grooved ends: as specified Section 23 05 23.02.
- .8 Ball valves:
 - .1 NPS 2 and under: as specified Section 23 05 23.01.

PART 3 – EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PIPING INSTALLATION

- .1 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.
- .2 Install concealed pipes close to building structure to keep furring space to minimum. Install to conserve headroom and space. Run exposed piping parallel to walls. Group piping where ever practical.
- .3 Slope piping in direction of drainage and for positive venting.

- .4 Use eccentric reducers at pipe size change installed to provide positive drainage or positive venting.
- .5 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings.
- .6 Assemble piping using fittings manufactured to ANSI standards.

3.3 VALVE INSTALLATION

- .1 Install rising stem valves in upright position with stem above horizontal.
- .2 Install valves at branch take-offs and to isolate each piece of equipment, and as indicated.
- .3 Install globe valves in by-pass around control valves.
- .4 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and as indicated.
- .5 Install chain operators on valves NPS 2 ½ and over where installed more than 2400mm above floor in Boiler Rooms and Mechanical Equipment Rooms.

3.4 CIRCUIT BALANCING VALVES

- .1 Install flow balancing valves as indicated.
- .2 Remove handwheel after installation and TAB is complete.
- .3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

3.5 FLUSHING AND CLEANING

- .1 Flush after pressure test for a minimum of 4h.
- .2 Fill with solution of water and non-foaming, phosphate-free detergent 3% solution by weight. Circulate for minimum of 8h.
- .3 Refill system with clean water. Circulate for at least 4h. Clean out strainer screens/baskets regularly. Then drain.
- .4 Refill system with clean water. Circulate for at least 2h. Clean out strainer screens/baskets regularly. Then drain.
- .5 Drainage to include drain valves, dirt pockets, strainers, low points in system.

.6 Re-install strainer screens/baskets only after obtaining approval.

3.6 FILLING OF SYSTEM

.1 Refill system with clean water adding water treatment as specified.

3.7 FIELD QUALITY CONTROL

.1 Testing:

.1 Test system.

.2 Balancing:

.1 Balance water systems to within plus or minus 5% of design output.

.2 Refer to Section 23 05 93 for applicable procedures.

3.8 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA C111/A21.11-12, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .2 American Society of Mechanical Engineers (ASME)
 - .1 ASME B16.1-10, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
 - .2 ASME B16.3-11, Malleable Iron Threaded Fittings: Classes 150 and 300.
 - .3 ASME B16.5-09, Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch Standard.
 - .4 ASME B16.9-07, Factory-Made Wrought Butt welding Fittings.
 - .5 ASME B18.2.1-10, Square Hex, Heavy Hex and Askew Head Bolts and Hex, Heavy Hex, Hex Flange. Loded Head and Lag Screws (Inch Series).
 - .6 ASME B18.2.2-10, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).
- .3 ASTM International
 - .1 ASTM A47/A47M-99(2009), Standard Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A53/A53M-[10], Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
 - .3 ASTM A536-84(2009), Standard Specification for Ductile Iron Castings.
 - .4 ASTM B61-08, Standard Specification for Steam or Valve Bronze Castings.
 - .5 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - .6 ASTM E202-10, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.
- .4 CSA International
 - .1 CSA B242-05(R2011), Groove and Shoulder Type Mechanical Pipe Couplings.
 - .2 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
- .5 Manufacturer's Standardization of the Valve and Fittings Industry (MSS)
 - .1 MSS-SP-67-2002, Butterfly Valves.
 - .2 MSS-SP-70-06, Gray Iron Gate Valves, Flanged and Threaded Ends.

- .3 MSS-SP-71-05, Gray Iron Swing Check Valves Flanged and Threaded Ends.
- .4 MSS-SP-80-08, Bronze Gate, Globe, Angle and Check Valves.
- .5 MSS-SP-85-02, Gray Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets in accordance with Section 01 33 00. Include product characteristics, performance criteria and limitations.
 - .2 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
- .4 Closeout Submittals:
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

1.3 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEAA, TDG, and applicable Provincial / Territorial regulations.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Ministry of Labour Regulations..

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00.

- .2 Waste Management and Disposal:
 - .2 Construction / Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 – PRODUCTS

2.1 PIPE

- .1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:
 - .1 To NPS 6: Schedule 40.

2.2 PIPE JOINTS

- .1 NPS 2 and under: screwed fittings with PTFE tape.
- .2 NPS 2-1/2 and over: welding fittings and flanges to CSA W48.
- .3 Flanges: raised face weld neck to ANSI/AWWA C111/A21.11.
- .4 Flange gaskets: to ANSI/AWWA C111/A21.11.
- .5 Pipe thread: taper.
- .6 Bolts and nuts: to ASME B18.2.1 and ASME B18.2.2.

2.3 FITTINGS

- .1 Screwed fittings: malleable iron, to ASME B16.3, Class 150.
- .2 Pipe flanges and flanged fittings:
 - .1 Cast iron: to ASME B16.1, Class 125.
 - .2 Steel: to ASME B16.5.
- .3 Butt-welding fittings: steel, to ASME B16.9.
- .4 Unions: malleable iron, to ASTM A47/A47M and ASME B16.3.

2.4 VALVES

- .1 Connections:
 - .1 NPS 2 and smaller: screwed ends.

- .2 NPS 2-1/2 and larger: flanged ends.
- .2 Gate valves: to MSS-SP-70 and to MSS-SP-80. Application: isolating equipment, control valves, pipelines:
 - .1 NPS 2 and under:
 - .1 Class 125, rising stem, split wedge disc.
 - .2 NPS 2-1/2 and over:
 - .1 Mechanical Rooms: rising stem, split wedge disc, bronze trim.
- .3 Butterfly valves: to MSS-SP-67:
 - .1 NPS 2-1/2 and over: lug type, grooved ends.
- .4 Globe valves: to MSS-SP-80 8: Application: throttling, flow control, emergency bypass:
 - .1 NPS 2 and under:
 - .1 Mechanical Rooms: with PTFE disc.
 - .2 Elsewhere: Globe, with composition disc.
- .5 Balancing, for TAB:
 - .1 Sizes: Calibrated balancing valves, as specified this section.
 - .2 NPS 2 and under:
 - .1 Globe, with disc.
- .6 Swing check valves: to MSS-SP-71.
 - .1 NPS 2 and under:
 - .1 Class 125, swing, with composition disc.
 - .2 NPS 2-1/2 and over:
 - .1 Flanged Grooved ends: as specified Section 23 05 23.02.
- .10 Ball valves:
 - .1 NPS 2 and under.

PART 3 – EXECUTION

3.1 PIPING INSTALLATION

- .1 Install pipework in accordance with Section 23 05 05.

3.2 CIRCUIT BALANCING VALVES

- .1 Install flow balancing valves as indicated.

- .2 Remove handwheel after installation and when TAB is complete.
- .3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

3.3 CLEANING, FLUSHING AND START-UP

- .1 In accordance with Section 23 08 02.

3.4 TESTING

- .1 Test system.

3.5 BALANCING

- .1 Balance water systems to within plus or minus 5% of design output.
- .2 In accordance with Section 23 05 93 for applicable procedures.

3.6 PREFORMANCE VERIFICATION

- .1 In accordance with Section 23 08 01.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .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.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME-04(2007), Boiler and Pressure Vessel Code.
- .2 ASTM International Inc.
 - .1 ASTM A47/A47M-99(2009), Standard Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A278/A278M-[01(2006)], Standard Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650 degrees F (350 degrees C).
 - .3 ASTM A516/A516M-[06], Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.
 - .4 ASTM A536-84(2009), Standard Specification for Ductile Iron Castings.
 - .5 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA B51-09, Boiler, Pressure Vessel, and Pressure Piping Code.
 - .2 CSA B51-09, Boiler, Pressure Vessel, and Pressure Piping Code, Supplement #1.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section [01 11 01] [01 33 00].
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for expansion tanks, air vents, separators, valves, and strainers, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate on product data air cents, separators, valves, strainers, and all accessories require for product installation

1.3 CLOSEOUT SUBMITTALS

- .1 Submit maintenance and operation data in accordance with Section 01 78 00.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Separate and recycle waste materials in accordance with section 01 74 20
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative
- .5 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .6 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate recycling facility.

PART 2 - PRODUCTS

2.1 WALL MOUNTED RADIATOR SYSTEM.

- .1 Shall be equal to Runtal radiators model type R3F
- .2 Provide steel double panel radiators of the lengths and in locations as indicated of required capacities complete with all accessories for wall mounting application. The double heating panel radiation shall be of one piece all welded steel construction, consisting of a pair of flattened water tube panels welded to headers at each end. Welded to the inside of each panel shall be steel corrugated fins to increase the convective output of the radiator. The fins shall start no less than 3” from the end of the radiator. Radiators shall increase an integral heavy gauge (0.08” minimum all welded perforated top grill.
- .3 The radiator shall include all necessary inlet, outlet and vent connections as required. Standard connection sizes are ½” NPA tapered thread for supply and return piping, and 1/8” for vent connection. Internal baffling to be provided for proper water flow.
- .4 Radiant heating panels to be provided in lengths shown on drawings. Appropriate to wall mounting brackets
- .5 Pressure rating for the radiation shall be “Standard” – a working pressure of 56

PSI maximum, test pressure 74 PSI maximum.

2.2 INFLOOR RADIANT HEAT SYSTEM

- .1 Equal to Uponor radiant ready 30E system.
- .2 System is a pre-wired, pre-piped hydronic mechanical unit combining a 9kw electric boiler, expansion tank, air vent, system circulator, isolation valves, pressure relief valve, radiant distribution manifold and thermostat, will out up to 30,000 BTU/H. Unit to be equipped with three-speed circulator for use in a wide range of system sizes.
- .3 16-gauge back plate galvanized
Steel; 18-gauge powder coated steel.
Cover; 3/4" multi-layer composite tubing and 3/4" "brass" ; good for indoor use only of ambient conditions of 0 deg C to 50 deg C; 240 VAC, 50A; maximum operating pressure of 30psi; maximum operating temperature 85 deg C; heat source 9kw electric boiler.
- .4 Provide Uponor heat only thermostat.
- .5 Provide compatible PEX tubing as per manufacturers approved recommendations spaced as per manufacturers installation complete with all accessories.

PART 3 - EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 GENERAL

- .1 Install as indicated and to manufacturers recommendations.
- .2 Run drain lines and blow off connections to terminate above nearest drain.
- .3 Maintain adequate clearance to permit service and maintenance.
- .4 Should deviations beyond allowable clearances arise, request and follow

consultant's directive.

- .5 Check shop drawings for conformance of tappings for ancillaries and for equipment operating weights.

3.3 CLEANING

- .1 Clean in accordance with Section 01 74 11.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
 - .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

END OF SECTION

PART 1 – GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation of low-pressure metallic ductwork, joints and accessories.
 - .2 Related Sections:
 - .1 Section 07 84 00 – Firestopping
 - .2 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.
 - .3 Section 23 05 94 – Pressure Testing of Ducted Air Systems.

1.2 REFERENCES

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .2 ASTM International.
 - .1 ASTM A480/A480M-13, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A635/A635M-09b, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
 - .3 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .4 National Fire Protection Association (NFPA).
 - .1 NFPA 90A-2012, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B-2012, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
 - .3 NFPA 96-2011, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition [2005].
 - .2 SMACNA HVAC Air Duct Leakage Test Manual, [1985], 1st Edition.

- .3 SMACNA IAQ Guidelines for Occupied Buildings Under Construction 2nd edition 2007; ANSI/SMACNA 008-2008.

1.2 SECTIONS INCLUDES

- .1 Electrical work to conform to Electrical Divisions including the following:
 - .1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
 - .2 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 23. Refer to Division 26 for quality of materials and workmanship.

1.3 SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Section 01 33 00.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets for the following:
 - .1 Sealants.
 - .2 Tape.
 - .3 Proprietary Joints.

1.4 QUALITY ASSURANCE

- .1 Certification of Ratings:
 - .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06.
- .3 Indoor Air Quality (IAQ).
 - .1 During construction meet or exceed the requirements of SMACNA IAQ Guidelines for Occupied Building under Construction.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Protect on site stored or installed absorptive material from moisture damage.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 47 20.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
 - .4 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.
 - .5 Place materials defined as hazardous or toxic in designated containers.
 - .6 Handle and dispose of hazardous materials in accordance with Provincial regulations.
 - .7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 SEAL CLASSIFICATION

- .1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	[A]

- .2 Seal classification:
 - .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.

2.2 SEALANT

- .1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30°C to plus 93°C.

2.3 TAPE

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 DUCT LEAKAGE

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows.
 - .1 Rectangular: standard radius.
 - .2 Round: smooth radius.
- .3 Mitred elbows, rectangular:
 - .1 To 400mm: with double thickness turning vanes.
 - .2 Over 400mm: with double thickness turning vanes.
- .4 Branches:
 - .1 Rectangular main and branch: with radius on branch 1.5 times width of duct 45 degrees' entry on branch.
 - .2 Round main and branch: enter main duct at 45 degrees with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with splitter damper.
- .5 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.
 - .2 Converging: 30 degrees maximum included angle.
- .6 Offsets:
 - .1 Full radiused.

- .7 Obstruction deflectors: maintain full cross-sectional area.
 - .1 Maximum included angles: as for transitions.

2.6 FIRE STOPPING

- .1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00.
- .2 Fire stopping material and installation must not distort duct.

2.7 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to SMACNA.
- .3 Joints: to SMACNA.

2.8 HANGERS AND SUPPORTS

- .1 Hangers and Supports: in accordance with Section 23 05 29.
 - .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
 - .1 Maximum size duct supported by strap hanger: 500.
 - .2 Hanger configuration: to SMACNA.
 - .3 Hangers: galvanized steel angle with galvanized steel rods to SMACNA.

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

- .4 Upper hanger attachments:
 - .1 For concrete: manufactured concrete inserts.
 - .2 For steel joist: manufactured joist clamp.
 - .3 For steel beams: manufactured beam clamps:

PART 3 – EXECUTION

3.1 GENERAL

- .1 Do work in accordance with SMACNA.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
 - .1 Insulate strap hangers 100 mm beyond insulated duct.
- .3 Support risers in accordance with SMACNA.
- .4 Install breakaway joints in ductwork on sides of fire separation.
- .5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

3.2 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with SMACNA:

<u>Duct Size</u>	<u>Spacing</u>
(mm)	(mm)
to 1500	3000
1501 and over	2500

3.3 SEALING AND TAPING

- .1 Seal all traverse joints, longitudinal seams and duct wall penetrations to SMACNA Seal Class A standards.
- .2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

3.4 LEAKAGE TESTS

- .1 Refer to Section 23 05 94.
- .2 In accordance with SMACNA HVAC Duct Leakage Test Manual.
- .3 Do leakage tests in sections.
- .4 Make trial leakage tests as instructed to demonstrate workmanship.
- .5 Do not install additional ductwork until trial test has been passed.
- .6 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows.
- .7 Complete test before performance insulation or concealment Work.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 2005.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00.
- .2 Indicate the following:
 - .1 Flexible connections.
 - .2 Duct access doors.
 - .3 Turning vanes.
 - .4 Instrument test ports.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 – PRODUCTS

2.1 GENERAL

- .1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

- .1 Frame: galvanized sheet metal frame 50 mm thick with fabric clenched by means of double locked seams.
- 2 Material:
 - .1 Fire resistant, self-extinguishing, neoprene coated glass fabric, temperature rated at minus 40°C to plus 90°C, density of 1.3 kg/m².

2.3 ACCESS DOORS IN DUCTS

- .1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.
- .2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.
- .3 Gaskets: neoprene.

2.4 TURNING VANES

- .1 Factory or shop fabricated double thickness to recommendations of SMACNA and as indicated.

2.5 INSTRUMENT TEST

- .1 1.6 mm thick steel zinc plated after manufacture.
- .2 Cam lock handles with neoprene expansion plug and handle chain.
- .3 28 mm minimum inside diameter. Length to suit insulation thickness.
- .4 Neoprene mounting gasket.

2.6 SPIN IN COLLARS

- .1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.
- .2 Sheet metal thickness to co-responding round duct standards.

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 Flexible connections:
 - .1 Install in following locations:

- .1 Inlets and outlets to supply air units and fans.
- .2 Inlets and outlets of exhaust and return air fans.
- .3 As indicated.
- .2 Length of connection: 100 mm.
- .3 Minimum distance between metal parts when system in operation: 75 mm.
- .4 Install in accordance with recommendations of SMACNA.
- .5 When fan is running:
 - .1 Ducting on sides of flexible connection to be in alignment.
 - .2 Ensure slack material in flexible connection.
- .2 Access doors and viewing panels:
 - .1 Size:
 - .1 For duct dimensions up to 300 mm, use 250 x 150 mm door.
 - .2 For duct dimensions up to 600 mm, use 380 x 250 mm door.
 - .3 For larger duct dimensions, use 660 x 510 mm door.
 - .2 Locations:
 - .1 Fire and smoke dampers.
 - .2 Control dampers.
 - .3 Devices requiring maintenance.
 - .4 Required by code.
 - .5 Reheat coils.
 - .6 Elsewhere as indicated.
- .3 Instrument test ports.
 - .1 General:
 - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
 - .2 Locate to permit easy manipulation of instruments.
 - .3 Install insulation port extensions as required.
 - .4 Locations.
 - .1 For traverse readings:
 - .1 Ducted inlets to roof and wall exhausters.
 - .2 Inlets and outlets of other fan systems.
 - .3 Main and sub-main ducts.
 - .4 And as indicated.
 - .2 For temperature readings:
 - .1 At outside air intakes.
 - .2 At inlet and outlet of coils.
 - .4 Downstream of junctions of two converging air streams of different temperatures.
- .4 Turning vanes:

- .1 Install in accordance with recommendations of SMACNA and as indicated.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 Sheet Metal and Air Conditioning National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-2005.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section [01 74 20], and with the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

2.1 GENERAL

- .1 Manufacture to SMACNA standards.

2.3 SINGLE BLADE DAMPERS

- .1 Of same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA, except maximum height 100mm as indicated.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness.
- .4 Inside and outside [nylon] [bronze] end bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

2.4 MULTI-BLADED DAMPERS

- .1 Factory manufactured of material compatible with duct.
- .2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
- .3 Maximum blade height: 100 mm] as indicated.
- .4 Bearings: pin in bronze bushings self-lubricating nylon.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 For supply, return and exhaust systems, locate balancing dampers in each branch duct.
- .4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- .5 All dampers to be vibration free.
- .6 Ensure damper operators are observable and accessible.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED SECTIONS

- .1 Section 23 33 00 – Air Duct Accessories.

1.2 REFERENECS

- .1 ASTM International
 - .1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00.
- .2 Indicate the following:
 - .1 Performance data.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

1.5 WASTE MANAGEMENT AND SUBMITTALS

- .1 Separate and recycle waste materials in accordance with Section 01 74 20, and with the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 – PRODUCTS

2.1 MULTI - LEAF DAMPERS

- .1 Opposed and Parallel blade type as indicated.

- .2 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, extruded aluminum frame.
- .3 Pressure fit self-lubricated bronze bearings.
- .4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.
- .5 Operator: Electric.
- .6 Performance:
 - .1 Leakage: in closed position to be less than 2% of rated air flow at Pa differential across damper.
 - .2 Pressure drop: at full open position to be less than Pa differential across damper at m/s.
- .7 Insulated aluminum dampers:
 - .1 Frames: insulated with extruded polystyrene foam with R factor of 5.0.
 - .2 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane or polystyrene foam, R factor of 5.0.

2.2 BACK DRAFT DAMPERS

- .1 Automatic gravity operated, multi leaf, aluminum construction with nylon bearings, counterweighted.
- .2 Factory or shop fabricated double thickness to recommendations of SMACNA and as indicated.

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.

- .3 Seal multiple damper modules with silicon sealant.
- .4 Install access door adjacent to each damper. See Section 23 33 00.
- .5 Ensure dampers are observable and accessible.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-2012, Installation of Air Conditioning and Ventilating Systems.
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S112-10, Standard Method of Fire Test of Fire Damper Assemblies.
 - .2 CAN/ULC-S112.2-07, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies.
 - .3 ULC-S505-1974, Fusible Links for Fire Protection Service.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00.
- .2 Indicate the following:
 - .1 Fire dampers.
 - .2 Smoke dampers.
 - .3 Fire stop flaps.
 - .4 Operators.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into annual specified in Section 01 78 00.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20, and with the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 – PRODUCTS

2.1 FIRE DAMPERS

- .1 Fire dampers: arrangement Type B, C, listed and bear label of ULC, meet requirements of provincial fire authority. Fire damper assemblies to be fire tested in accordance with CAN/ULC-S112.

- .2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.
 - .1 Fire dampers: 1 hour fire rated unless otherwise indicated.
 - .2 Fire dampers: automatic operating type and have dynamic rating suitable for maximum air velocity and pressure differential to which it will be subjected.
- .3 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.
- .4 40 x 40 x 3mm retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.
- .5 Equip fire dampers with steel sleeve or frame installed disruption ductwork or impair damper operation.
- .6 Equip sleeves or frames with perimeter mounting angles attached on both sides of wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce ceiling to conform with ULC.
- .7 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.
- .8 Dampers shall be installed so that the centerline of the damper depth or thickness is located in the centerline of wall, partition or floor slab depth or thickness.
- .9 Unless otherwise indicated, the installation details given in SMACNA Install Fire Damp HVAC and in manufacturer's instructions for fire dampers shall be followed.

2.2 FIRE STOP FLAPS

- .1 To be ULC listed and labelled and fire tested in accordance with CAN/ULC-S112.2.
- .2 Construct of minimum 1.5 mm thick sheet steel with 1.6 mm thick non-asbestos ULC listed insulation and corrosion-resistant pins and hinges.
- .3 Flaps to be held open with fusible link conforming to ULC-S505 and close at 74°C or as indicated.

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with NFPA 90A and in accordance with conditions of ULC listing.
- .2 Maintain integrity of fire separation.
- .3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.
- .4 Install access door adjacent to each damper. See Section 23 33 00.
- .5 Coordinate with installer of firestopping.
- .6 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.
- .7 Install break-away joints of approved design on each side of fire separation.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-2012, Installation of Air Conditioning and Ventilating Systems.
 - .2 NFPA 90B-2012, Installation of Warm Air Heating and Air Conditioning Systems.
- .2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S110-07, Fire Tests for Air Ducts.
 - .2 UL 181-2005, Factory Made Air Ducts and Connectors.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section [01 33 00].
- .2 Indicate the following:
 - .1 Thermal properties.
 - .2 Friction loss.
 - .3 Acoustical loss.
 - .4 Leakage.
 - .5 Fire rating.

1.3 CERTIFICATION OF RATINGS

- .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

- .3 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 GENERAL

- .1 Factory fabricated to CAN/ULC-S110.
- .2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.
- .3 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

2.8 NON-METALLIC - ACOUSTIC INSULATED

- .1 Non-collapsible, coated mineral base perforated fabric type helically supported by and mechanically bonded to wire with factory applied flexible glass fibre acoustic insulation and encased in metalized vapour barrier.
- .2 Performance:
 - .1 Factory tested to 2.5 kPa without leakage.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- .1 Install in accordance with: CAN/ULC-S110 UL-181, NFPA 90A, NFPA 90B and SMACNA.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C177-10, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-12, Standard for the Installation of Air Conditioning and Ventilating Systems.
 - .2 NFPA 90B-12, Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
- .3 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-95 (Addendum No.1, Nov. 97).
- .4 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00.

1.3 WASTE MANAGEMENT AND SUBMITTALS

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.
- .2 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.
- .3 Remove from site and disposal of packaging materials at appropriate recycling facilities.
- .4 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

PART 2 – PRODUCTS

2.1 DUCT LINER

- .1 Supply Ducts: Fiber Free Duct Liner/Wrap to meet the requirements of NFPA 90A, NFPA 90B for Duct Coverings and Linings, and UL 181. Approved for use in return air plenums. Conforms to ASTM C 1534 requirements. This product withstands temperatures of 250°F (121°C) when tested according to ASTM C 411. Liner meets the energy code requirements of International Energy Conservation Code (IECC) and ASHRAE for R-Value 4 at 25 mm wall thickness.
- .2 For return and exhaust ducts use: fiberglass duct liner with air stream surface protected with acrylic coating. Coating to be treated with anti-microbial agent so as not to support growth of fungus or bacteria as determined by ASTM G21 and G22. Liner to meet or exceed Life Safety Standards as established by NFPA 90A and 90B, have a NRC not less than 0.7, and a thermal conductivity of 0.36 W/m.K (0.0208 Btuh x ft x °F) at 23.9°C.

2.2 ADHESIVE

- .1 Meet requirements of NFPA 90A and NFPA 90B.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 29°C to plus 93°C.
- .3 Water base type.

PART 3 – EXECUTION

3.1 GENERAL

- .1 Do work in accordance with recommendations of SMACNA duct liner standards as indicated in SMACNA HVAC Duct Construction Standards, Metal and Flexible, except as specified otherwise.
- .2 Line inside of ducts where indicated.
- .3 Duct dimensions, as indicated, are clear inside duct lining.

3.2 DUCT LINER

- .1 Install in accordance with manufacturer's recommendations.

3.3 JOINTS

- .1 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:
 - .1 Bed tape in sealer.
 - .2 Apply two coats of sealer over tape.
- .2 Protect leading [and trailing] edges of duct sections with sheet metal nosing having 15 mm overlap and fastened to duct.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 23 05 13 - Common Motor Requirements for HVAC Equipment.
- .2 Section 23 33 00 - Air Duct Accessories.

1.2 REFERENCES

- .1 Air Movement and Control Association (AMCA)
 - .1 AMCA 99-10, Standards Handbook.
 - .2 ANSI/AMCA 210-07/ANSI/ASHRAE 51-2007, Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.
 - .3 ANSI/AMCA 300-08, Reverberant Room Method for Sound Testing of Fans.
 - .4 ANSI/AMCA 301-06, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- .2 CAN/CGSB-1.181-99, Coating, Zinc Rich, Organic, Ready Mixed.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section [01 33 00].
- .2 Provide:
 - .1 Fan performance curves showing point of operation, [BHP] [kW] and efficiency.
 - .2 Sound rating data at point of operation.
- .3 Indicate:
 - .1 Motors, sheaves, bearings, shaft details.
 - .2 Minimum performance achievable with variable speed controllers as appropriate.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00.

1.5 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 78 00.
 - .1 Spare parts to include:
 - .1 Matched sets of belts.

1.6 MANUFACTURED ITEMS

- .1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

PART 2 – PRODUCTS

2.1 FANS GENERAL

- .1 Capacity: flow rate, static pressure, bhp W, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.
- .2 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.
- .3 Sound ratings: comply with ANSI/AMCA 301, tested to ANSI/AMCA 300. Unit shall bear AMCA certified sound rating seal.
- .4 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210/ANSI/ASHRAE 51. Unit shall bear AMCA certified rating seal, except for propeller fans smaller than 300 mm diameter.
- .5 Motors:
 - .1 In accordance with Section 23 05 13 supplemented as specified herein.
- .6 Accessories and hardware: matched sets of V-belt drives, adjustable [slide rail] motor bases, belt guards, coupling guards fan [inlet] [and] [or] [outlet] safety screens as indicated and as specified in Section [23 05 13]. [inlet] [outlet] dampers and vanes and as indicated.
- .7 Factory primed before assembly in colour standard to manufacturer.
- .8 Scroll casing drains: as indicated.

- .10 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.
- .11 Vibration isolation: as required
- .12 Flexible connections: to Section 23 33 00.

2.2 ROOF MOUNTED EXHAUST FANS

- .1 Provide CSA approved and labeled roof-mounted exhaust fans of capacities and performance as indicated on the drawings.
- .2 Exhaust fans shall be belt-driven centrifugal type complete with spun aluminum housing, centrifugal wheel, aluminum birdscreen, backdraft damper, unit-mounted disconnect switch.

PART 3 - EXECUTION

3.1 FAN INSTALLATION

- .1 Install fans as indicated, complete with resilient mountings specified in Section 23 05 48, flexible electrical leads and flexible connections in accordance with Section 23 33 00.
- .2 Provide sheaves and belts required for final air balance.
- .3 Bearings and extension tubes to be easily accessible.
- .4 Access doors and access panels to be easily accessible.

END OF SECTION

PART 1 – GENERAL

1.1 MAINTENANCE MATERIAL SUBMITTALS

- .1 Provide maintenance materials in accordance with General Requirements.
- .2 Include:
 - .1 Keys for volume control adjustment.
 - .2 Keys for air flow pattern adjustment.

PART 2 – PRODUCTS

2.1 SYSTEM DESCRIPTION

- .1 Performance Requirements:
 - .1 Catalogued or published ratings for manufactured items: obtained from test carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

2.2 GENERAL

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.
- .2 Frames:
 - .1 Full perimeter gaskets.
 - .2 Plaster frames where set into plaster or gypsum board and as specified.
 - .3 Concealed fasteners.
- .3 Concealed manual volume control damper operators.
- .4 Colour: standard or as directed by Departmental Representative.

2.3 MANUFACTURED UNITS

- .1 Grilles, registers and diffusers of same generic type, products of one manufacturer.
- .2 Refer to grille as noted on drawings for type, size as indicated.

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with manufacturers instructions.
- .2 Install with stainless steel screws in countersunk holes where fastenings are visible.
- .3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .2 Sheet Metal and Air Conditioning Contractors' National Association (SMCNA)

PART 2 – PRODUCTS

2.1 SYSTEM DESCRIPTION

- .1 Performance Requirements:
 - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

2.2 FIXED LOUVERS - ALUMINIUM

- .1 Construction: welded with exposed joints ground flush and smooth.
- .2 Material: extruded aluminum alloy AA 6063-T5.
- .3 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of 1500 mm.
- .4 Frame, head, sill and jamb: 100 mm deep one piece extruded aluminum, minimum 3 mm thick with approved caulking slot, integral to unit.
- .6 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.
- .7 Screen: 12 mm exhaust mesh, 2 mm diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.
- .8 Finish: factory applied enamel. Colour: to Departmental Representative's approval.

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 In accordance with manufacturer's and SMACNA recommendations.
- .2 Reinforce and brace as indicated.
- .3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 Definitions:
 - .1 Catalogued or published ratings: ratings obtained from tests carried out by manufacturer or manufacturer's designated independent testing agency which signify adherence to codes and standards in force.
- .2 Reference Standards:
 - .1 National Fire Prevention Association (NFPA)
 - .1 NFPA-90A-12, Standard for the Installation of Air Conditioning and Ventilating Systems, 2009 Edition.
 - .2 American Society of Heating, Refrigeration and Air Condition Engineers (ASHRAE)
 - .1 ASHRAE 90.1-2010, (I-P) Energy Standard for Buildings Except Low-Rise Residential Buildings.
 - .2 ASHRAE 52.2-[2007], Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
 - .3 Air Conditioning and Refrigeration Institute (ARI)
 - .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
 - .5 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for refrigerant, insulation, filters, and paints, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate following:
 1. Coils
 2. Fans
 3. Filters
 4. Unit Construction
 5. Motors
 6. Dampers

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Separate and recycle waste materials in accordance with Section 01 74 20.
- .4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan
- .5 Fold up metal banding, platen and plate in designated are for recycling.

PART 2 - PRODUCTS

2.1 REFERENCES

- .1 General: Provide air handling unit (HRV) equal to “Lifebreath”; Model 1200DD for mess and model 700 FD for comfort station
- .2 Model 1200DD: Modular (3Section) heat recovery cores for efficient counter flow ventilation. Motor-two PSC, 3 speed double shafted, 1200 VAC, 9.5 amp each, HP – ½, 16252 RPM, 2256 watts on high speed. Filters: Washable in both exhaust and supply streams. Blowers: centrifugal type rated at 1200 CFM free air delivery; both air streams have one double shafted motor driving 2 centrifugal blowers. Connection duct sizes: 4-20x8 (500mmx200mm). Mounting: Unit to be set on mounting brackets and rods by others. Drain connections required: 2 – 12mm O.D electronics: integrated microprocessor circuit board with built in interlock contacts. Defrost controls: Supply bypass route indoor air to defrost core. Weigh: 285 lbs *130kg). Supply with control model 99-BC02: 2 speed fan setting (low/high; humidity control through adjustable dehumidistat; compatible timer model 99-DET02 wireless; 3 wire connections @ 20GA wire.

- .3 Model 7DOFD; Modular (2 section) heat recovery cores arranged for efficient counter flow ventilation. Motor: 2PHC, 2 sped single shafted, 120 VAC, 4.5amps each. HP-1/4, 1450 RPM, MCA-11.3 MOP, 15 watts on high speed – 1032. Filters: Washable in supply and exhaust air streams. Blowers: centrifugal type rated at 700 cfm (326 ½) free delivery, with each air stream having a single shafted motor driving a centrifugal blower. Connection duct sizes: four (4) at 14x9” (356mm x 200mm). Mounting to be by brackets and threaded rods by others. Case: to have front and rear access doors and electrical panel can be switched to either side for flexibility in duct direction; insulated with foil faced insulation; fabricated on 20 GA galvanized steel and pre-painted; drain connections are two (2) – ½” (12mm) O.D electronics; integrated microprocessor circuit board with built in interlock contacts. Defrosts control: model 700FD, interrupts supply air while exhaust air defrosts core. Wight of unit is 260lbs (118 kg). Control: model 99-BC02; 2 speed fan setting (low/ high); humidity control through adjustable humidistat; compatible with 99 – DET02 wireless timers; 3 wire connection with minimum 20GA wire.

2.2 SUBMITTALS

- .1 Product data to indicate dimensions, weights, capacities ratings, fan performance, motor electrical characteristics, metal gauges and finishes of materials.
- .2 Provide fan curves with specified operating point clearly plotted. Submit sound power levels for both fan inlet and outlet at rated capacity. Provide sound power levels at the inlet and outlet of the unit.
- .3 Submit product data of filter media, filter performance data, filter assembly, and filter frames.
- .4 Submit electrical requirements for power supply wiring including wiring diagrams for interlocking and control wiring, clearly indicating factory – installed and field-installed wiring.
- .5 Submit manufacturers recommended installation instructions. Shop drawings to include all general information defined by Section 23 00.
- .6 Deliver unit to site with a minimum 10 mil poly shrink wrap for protection from the element’s.

PART – 3 EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 CLEANING

- .1 Clean in accordance with Section 01 74 11.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.1-12, Canadian Electrical Code, Part 1 (21st Edition), Safety Standard for Electrical Installations.
 - .2 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 The Ontario Electrical Safety Code 2012, and all bulletins (Ontario).
- .4 Electrical Safety Authority (ESA) requirements and local applicable codes and regulations.

1.2 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.3 SUBMITTALS

- .1 Submittals: in accordance with Section 01 11 01.
- .2 Product Data: submit WHMIS MSDS.
- .3 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario.
 - .2 Submit 6 number of copies of 600 x 600 mm minimum size drawings and product data to authority having jurisdiction.
 - .3 If changes are required, notify Departmental Representative of these changes before they are made.
- .4 Quality Control: in accordance with Division 1 Specification.

- .1 Provide CSA certified equipment and material.
- .2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to site.
- .3 Submit test results of installed electrical systems and instrumentation.
- .4 Permits and fees: in accordance with General Conditions of contract. Pay associated fees. Departmental Representative will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.
- .5 Submit, upon completion of Work, load balance report as described in PART 3 - Load Balance.
- .6 Submit certificate of acceptance from Electrical Safety Authority having jurisdiction upon completion of Work to Departmental Representative.

1.4 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Division 1 Specification.
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices as per the conditions of Provincial Act respecting manpower vocational training and qualification.
 - .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:
 - .1 In accordance with Division 1 Specification.
- .4 Health and Safety Requirements: do construction occupational health and safety standards.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.
- .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

1.6 SYSTEM STARTUP

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- .1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - Submittals.
- .2 Factory assemble control panels and component assemblies.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring and conduit: except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

2.3 WARNING SIGNS

- .1 Warning signs: in accordance with requirements of authority having jurisdiction.
- .2 Porcelain enamel signs: minimum size 175 x 250 mm.

2.4 WIRING TERMINATIONS

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

2.5 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: plastic laminate 3 mm thick plastic engraving sheet, matt white finish face, black core, mechanically attached with self-tapping screws.
 - .2 Sizes as follows:

NAMEPLATE SIZES

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

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY No. " as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.

2.6 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, 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 coding: to CSA-C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

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

	Prime	Auxillary
Up to 250V	Yellow	
Telephone	Green	

2.8 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint indoor distribution enclosures light gray.

2.9 DISTRIBUTION SYSTEM

- .1 120/208V, 3 phase, 4W, 60 Hz (verify existing services being relocated and/or reused).
- .2 Inform other Divisions of electrical system characteristics.

2.10 WIRING SYSTEM

- .1 Power and lighting circuits in EMT with drawn-in conductors. 2 and EMT on SP3-5.
- .2 Use heavy wall rigid conduit for service entrance and where required by codes.
- .3 RW-90, XLPE insulated wire for panel feeder and branch circuits, GTF insulated wire for final fixture connection.
- .4 #12 AWG minimum wire size, #10 AWG or larger shall be stranded.
- .5 Copper conductors.
- .6 Size branch circuits and panel feeders for maximum 2% voltage drop.
- .7 Provide insulated green ground conductor in EMT conduits.
- .8 Provide nylon insulated bushings on the ends of all conduits in junction boxes, pullboxes, panelboards, etc.
- .9 Minimum size conduit for lighting and power circuits is 21 mm.

2.11 GROUNDING

- .1 Ground service entrance and equipment with approved conductors and connectors.
- .2 Make tests required by code and authorities having jurisdiction.

2.12 MOTOR AND CONTROL WIRING

- .1 Provide wiring and connections for motors and electrical equipment supplied under other Divisions.

- .2 Mechanical Divisions shall wire control circuits 50 volts and under.

2.13 PANELBOARD

- .1 Provide panelboard of the circuit breaker type.
- .2 Install branch circuit breakers shown on panel schedule.
- .3 Panel to be in dead front metal cabinet with hinged door and catches.
- .4 Breakers: toggle type, bolt-on, quick-make, quick-break, 40°C ambient temperature compensated and trip-free of operating handles on overloads.
- .5 Lock-on handle devices for breakers not controlling lighting. 2P and 3P breakers to be with single handle common trip type.
- .6 Typed directory card showing load supplied by each circuit, mounted inside cabinet door.
- .7 Mount panel at 1500 mm above finished floor with the top of panel not higher than 2000 mm.
- .8 Copper bus with neutral of same ampere rating as mains.

2.14 OUTLET BOXES

- .1 Light fixture outlet boxes: standard, octagonal or square as required.
- .2 Switch outlet boxes: standard, single or ganged as required.
- .3 Receptacle outlet boxes: standard.
- .4 Steel construction.
- .5 Masonry type in masonry construction.
- .6 Standard FS conduit fittings for surface mounted outlets in exposed areas.

2.15 SWITCHES

- .1 Specification grade, toggle type, 20 amps, 120 volts, back and side wired, chrome plated yoke, silver cadmium oxide contacts, switch mechanism on neoprene cushion.
- .2 Locate switches on latch side of door, 1.4 m above finished floor unless noted otherwise.

2.16 RECEPTACLES

- .1 Specification grade, 15 amp, 125 volt, AC, 'U' ground parallel blade slots, triple wiping contacts, double grounding terminals, break- off feature for separate feeds, built-in strap in plastic moulded body and back and side wiring terminals.
- .2 Locate receptacles 400 mm above finished floor unless noted otherwise.
- .3 Provide outlets with various configurations as indicated on electrical drawings.

2.17 COVER PLATES

- .1 Common cover plate at ganged outlet boxes. Split plates not allowed.

2.18 MANUAL STARTERS

- .1 Overload protection to suit motor size.
- .2 Trip-free handle indicating open, closed and tripped position.
- .3 Flush mounted in finished areas, EEMAC 1 enclosure elsewhere.
- .4 Red pilot light indicating starter "on".
- .5 Single phase starters rated 740W at 250V AC.

2.19 FIXTURE MOUNTING

- .1 Provide mounting and supports required for safe installation to Departmental Representative's satisfaction.

2.20 LIGHTING FIXTURES

- .1 Provide lighting fixtures with lamps as illustrated in electrical standard details.
- .2 Shop drawings to consist of catalogue cuts and photometric data from an independent test lab.

2.21 LED FIXTURES

- .1 Fixture LED's must be tested in conformance with IESNA LM80 standard.
- .2 LED's must be selected using a binning algorithm to ensure colour and lumen output of a given fixture are consistent, as well as meet or surpass ANSI C78.377 specification for the rated lifetime of the fixture. Colour accuracy between products must be within a 2-step MacAdam ellipse.
- .3 Luminaires must be tested to IESNA LM79 by an independent approved laboratory.

- .4 Luminaires must be tested prior to shipping.
- .5 Luminaires must be ULC certified and approved for use in Canada.
- .6 Fixtures must maintain a minimum of 90% of their initial light output for 60,000 hours. Submit test results upon request.
- .7 Lumen values indicated for fixtures in the project documents are to be considered as “absolute” or “delivered” values.
- .8 Other than for specialty fixtures, and unless otherwise indicated, the maximum driver current is to 750 mA.

2.22 DISCONNECT SWITCHES

- .1 Heavy duty, quick-make, quick-break.
- .2 Enclosure EEMAC 1 for interiors, EEMAC 3 weatherproof for outdoors.

2.23 FUSES

- .1 HRC, Class J dimension, time delay.
- .2 Provide 1 spare set of fuses.

2.24 TELEPHONE SYSTEM

- .1 Empty conduit system and outlets.
- .2 E.M.T. conduit from terminal board to outlets unless indicated otherwise.
- .3 Fish wire in each conduit.

2.25 EMERGENCY LIGHTING UNITS

- .1 To CSA C22.2 No. 141-(latest edition).
- .2 12-volt, long life lead battery, operating unattended without the addition of water or electrolyte for 3 years minimum. Unit to operate connected lamps for 30 minutes minimum and 20% spare capacity.
- .3 Low voltage disconnect circuit to protect battery from overdischarge.
- .4 Steel shelf for mounting unit.
- .5 Lighting fixtures, integral and remote heads, 360° horizontal and 180° vertical adjustment, 18W sealed beam lamp.

- .6 Provide adjacent to unit outlet, specification grade, single, twist-lock, 15A, 125V, AC.
- .7 Guarantee emergency lighting units for 10 years unconditionally. Guarantee batteries for 5 years unconditionally and a further 10 years on a pro-rated basis. Equipment to be repaired or replaced within one month of notification.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .2 CSA International
 - .1 CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65-03(R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .3 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .4 National Electrical Manufacturers Association (NEMA).

1.2 ACTION AND UNFORMATIONAL SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 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 off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan Waste Reduction Workplan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan Waste Reduction Workplan.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper, 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 stranded round copper aluminum conductors tube bar.
 - .2 Clamp for stranded round copper conductors bar.
 - .3 Clamp for stranded aluminum ACSR conductors round aluminum bar.
 - .4 Stud clamp bolts.
 - .5 Bolts for copper conductors bar.
 - .6 Sized for conductors tubes bars as indicated.
- .4 Clamps or connectors for armoured cable, TECK cable aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

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 wire and box connectors installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

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

3.2 CLEANING

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

END OF SECTION

PARKS CANADA
Point Pelee National Park
Camp Henry Renewal
Leamington, ON

WIRE AND BOX CONNECTORS
(0-1000 V)

Section 26 05 20

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PART 1 - GENERAL

1.1 PRODUCT DATA

- .1 Provide product data in accordance with Section 01 33 00.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 1000 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE non Jacketted. For use with variable frequency drives.
- .3 Copper conductors: size as indicated, with thermoplastic insulation type T90 Nylon rated at 600 V.

2.3 MINERAL-INSULATED CABLES

- .1 Conductors: solid bare soft-annealed copper, size as indicated.
- .2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.
- .3 Outer covering: annealed seamless copper sheath, Type M1 rated 600 V, 250 degrees C.

- .4 Two hour fire rating.
- .5 Connectors: watertight, field installed and tested approved for MI cable.

2.4 ARMOURED CABLES

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from galvanized steel.
- .4 Connectors: anti short connectors.
- .5 To be factory coated Red for final connection to Fire Alarm Devices. Cable to match Fire Alarm manufacturers requirement's.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00.
- .2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

- .1 Install cable in trenches in accordance with Section 33 71 73.02.
- .2 Terminate cables in accordance with Section 26 05 20.
- .3 Cable Colour Coding: to Section 26 05 00.
- .4 Conductor length for parallel feeders to be identical.

- .5 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .6 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .7 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.
- .8 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34.
 - .2 In surface and lighting fixture raceways in accordance with Section 26.

3.5 INSTALLATION OF MINERAL-INSULATED CABLES

- .1 Install cable exposed, concealed, securely supported by staples, straps, hangers.
- .2 Support 2 hour fire rated cables at 1 m intervals.
- .3 Make cable terminations by using factory-made kits.
- .4 Cable terminations: use thermoplastic sleeving over bare conductors.
- .5 Where cables are buried in cast concrete or masonry, sleeve for entry, exit of cables.
- .6 Do not splice cables unless indicated.

3.6 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible on channels.

END OF SECTION

PART 1 – GENERAL

1.1 SECTIONS INCLUDES

- .1 Materials and installation for connectors and terminations.

1.2 RELATED SECTIONS

- .1 Section 26 05 33 - Raceway and Boxes for Electrical Systems.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.41-07, Grounding and Bonding Equipment.

1.4 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00.

1.5 CERTIFICATES

- .1 Obtain inspection certificate of compliance covering high voltage stress coning from [inspection authority] Engineer and include it with [as-built drawings] [maintenance manuals].

PART 2 - PRODUCTS

2.1 CONNECTORS AND TERMINATIONS

- .1 Copper long barrel compression connectors to CSA C22.2 No. as required sized for conductors.
- .2 2, 3, or 4 way joint boxes dry location type in accordance with Section 26 05 33.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.
- .2 Bond and ground as required to CSA C22.2 No.41.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- 1 American National Standards Institute /Institute of Electrical and Electronics Engineers ANSI/IEEE
 - .1 ANSI/IEEE 837-02, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.
 - .2 CSA International
 - .1 CSA Z32-09, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 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 off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect grounding equipment from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

PART 2 – PRODUCTS

2.1 EQUIPMENT

- 1 Clamps for grounding of conductor: size as indicated to electrically conductive underground water pipe.
- .2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated.
- .3 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.
- .4 Insulated grounding conductors: green, copper conductors, size as indicated.
- .5 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .6 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Thermit welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

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 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, using permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 Install bonding wire for flexible conduit, connected at both 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 Install grounding resistance bank as indicated.
- .11 Install zig-zag grounding transformer where required as indicated on line side of main interrupter.
- .12 Connect building structural steel and metal siding to ground by welding copper to steel.
- .13 Make grounding connections in radial configuration only, with connections terminating at single grounding point street side of water pipe. Avoid loop connections.

.14 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

.15 Ground secondary service pedestals.

3.3 TESTING

.1 Pressure test buried systems before backfilling

.2 Hydraulically test to verify grades and freedom from obstructions.

3.4 SYSTEM AND CIRCUIT GROUNDING

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

3.6 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

3.7 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical room and communication equipment room.

.2 Ground 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.

3.8 COMMUNICATION SYSTEMS

.1 Install grounding connections for telephone, sound, fire alarm, security systems, intercommunication systems as follows:

.1 Telephones: make telephone grounding system in accordance with telephone company's requirements.

.2 Sound, fire alarm, security systems, intercommunication systems as indicated.

3.11 FIELD QUALITY

- .1 Perform tests in accordance with Section 26 05 00.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

3.12 CLEANING

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

END OF SECTION

PART 1 – GENERAL

1.1 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 – PRODUCTS

2.1 SUPPORT CHANNELS

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

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 Secure equipment to masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 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 For surface mounting of two or more conduits use channels spaced to meet electrical code.
- .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .10 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-[09], Canadian Electrical Code, Part 1, 22nd Edition.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .3 Provide shop drawings: in accordance with Section 01 33 00.
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 SPLITTERS

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: main and branch lugs connection blocks to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals lugs on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on flat covers.

2.3 CABINETS

- .1 Construction: welded sheet steel hinged door, handle and catch

PART 3 - EXECUTION

3.1 SPLITTER INSTALLATION

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

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.
- .3 Install terminal block as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

- .1 Equipment Identification: to Section 26 05 00.
- .2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1, 22st Edition.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Submit samples for floor box in accordance with Section 01 33 00.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 0.

PART 2 – PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.

- .2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .5 Extension and plaster rings for flush mounting devices in finished plaster or tile walls.

2.3 MASONRY BOXES

- .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 FLOOR BOXES

- .1 Flush poke through device boxes as indicated on plans and detail drawings.

2.6 CONDUIT BOXES

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

2.7 CONDUIT BOXES FOR NON-METALLIC SHEATHED CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.8 FITTINGS – GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

- .4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.40-M1989 (R2009), Cutout, Junction and Pull Boxes.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for raceway and boxes for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 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 off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect raceway and boxes from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

- .4 Develop Construction Waste Management Plan, related to Work of this Section and in accordance with Section 01 35 21.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20 and Section 01 35 21.

PART 2 - PRODUCTS

2.1 SPLICE BOXES

- .1 Splice boxes cast iron enclosures 6 mm thick painted with chromate primer and gray enamel to provide mechanical protection and moisture seal for direct buried cable splices rated 0.6 kV and consisting of:
 - .1 Two halves, split along cable axis, finely ground matching surfaces, fastened with galvanized steel bolts, top half with large filling holes with gasketed plugs for medium hard asphalt base compound, bottom half with screws on inside for bonding armour, and box end openings sealed by:
 - .1 Wrapping cables with anhydrous tape and clamping to make snug fit, for splices.

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 raceway and boxes installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install splice boxes at cable joint, on floor of trench. Tighten armour clamps and fill with compound.
 - .1 Ground splice boxes as required.
- .3 Install junction boxes on trench floor around cable splice to CSA C22.2 No.40. Connect cable terminals to box contacts.
 - .1 Ground junction boxes as required.
 - .2 Fasten lid securely and check for air leaks before trench is backfilled.

3.3 CLEANING

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

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2 No. 18-98 R2003, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CAN/CSA-C22.2 NO. 18.1-04, Metallic Outlet Boxes.
 - .3 CAN/CSA-C22.2 NO. 18.2-06, Nonmetallic Outlet Boxes.
 - .4 CAN/CSA-C22.2 No. 18.3-04 R2009, Conduit, Tubing, and Cable Fittings (Tri-National standard, with ANCE NMX-J-017 and UL 514B).
 - .5 CSA C22.2 No. 45.1-07, Electrical Rigid Metal Conduit - Steel (Tri-National standard, with UL 6 and NMX-J-534-ANCE-2007).
 - .6 CSA C22.2 No. 56-04 R2009, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .7 CSA C22.2 No. 83-M1985 R2008, Electrical Metallic Tubing.
 - .8 CSA C22.2 No. 211.2-06 R2011, Rigid PVC (Unplasticized) Conduit.
 - .9 CAN/CSA-C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
- .2 Place materials defined as hazardous or toxic waste in designated containers.

- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

2.1 CABLES AND REELS

- .1 Provide cables on reels or coils.
 - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.
- .4 Reel and mark shielded cables rated 2,001 volts and above

2.8 CONDUITS

- .1 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings all conduits for fire alarm system to be factory coated red.
- .3 Rigid pvc conduit: to CSA C22.2 No. 211.2.
- .4 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

2.3 CONDUIT FASTENINGS

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

2.4 CONDUIT FITTINGS

- .1 Fittings: [to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for NPS 1 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

- .1 Polypropylene.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms in unfinished areas.
- .3 Use electrical metallic tubing (EMT) except in cast concrete above 2.4 m not subject to mechanical injury.

- .4 Use rigid pvc conduit underground in corrosive areas.
- .5 Use flexible metal conduit for connection to motors in dry areas connection to recessed incandescent fixtures without prewired outlet box connection to surface or recessed fluorescent fixtures work in movable metal partitions.
- .6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .7 Minimum conduit size for lighting and power circuits: NPS 3/4 19 mm.
- .8 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .9 Mechanically bend steel conduit over 19 mm diameter.
- .10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .11 Install fish cord in empty conduits.
- .12 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .21 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended or surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

- .1 Locate to suit reinforcing steel.
 - .1 Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.
 - .1 Use cold mastic between sleeve and conduit.
- .5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

- .1 Run conduits [NPS 1] [25 mm] and larger below slab and encase in 75 mm concrete envelope.
 - .1 Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND

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

3.8 CLEANING

- .1 Proceed in accordance with Section 01 74 11.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Shop Drawings:
 - .1 Provide shop drawings in accordance with Section 01 33 00.
 - .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Ship fuses in original containers.
- .2 Do not ship fuses installed in switchboard.
- .3 Store fuses in original containers in moisture free location.

1.3 MAINTENANCE MATERIAL

- .1 Provide maintenance materials in accordance with Section 01 78 00.

PART 2 - PRODUCTS

2.1 FUSES - GENERAL

- .1 Fuse type references J1 have been adopted for use in this specification.
- .2 Fuses: product of one manufacturer.

2.3 FUSE STORAGE CABINET

- .1 Fuse storage cabinet, manufactured from 2.0mm thick aluminum 75 mm high, 600 mm wide, 300 mm deep, hinged, lockable front access door finished in accordance with Section 26 05 00.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Ensure correct fuses fitted to physically matched mounting devices.

END OF SECTION

PART 1 – GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 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 off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect grounding equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 – PRODUCTS

2.1 EQUIPMENT

- .1 Fused disconnect switch: in accordance with Section 26 28 23, rating as indicated.
- .2 Panelboard breaker type: in accordance with Section 26 24 16.01, rating.

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 SERVICE equipment installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from departmental representative.

3.2 INSTALLATION GENERAL

- .1 Install service equipment.
- .2 Connect to incoming service.
- .3 Connect to outgoing load circuits.
- .4 Install ground fault equipment.
- .5 Make grounding connections in accordance with Section 26 05 28.
- .6 Make provision for power supply authority's metering.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.29-11, Panelboards and Enclosed Panelboards.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Include on drawings:
 - .1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect [panelboards] from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Develop [Construction Waste Management Plan] [Waste Reduction Workplan] related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 PANELBOARDS

- .1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 208 and 600 V panelboards: bus and breakers rated for 22,00A symmetrical interrupting capacity or as indicated.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Minimum of 2 flush locks for each panel board.
- .6 Two keys for each panelboard and key panelboards alike.
- .7 Copper bus with neutral of same ampere rating of mains.
- .8 Mains: suitable for bolt-on breakers.
- .9 Trim with concealed front bolts and hinges.
- .10 Trim and door finish: baked enamel as per colour schedule.

2.2 BREAKERS

- .1 Breakers: to Section 26 28 16.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .4 Positive Lock-on devices for breakers serving exit lighting, security systems, fire alarm equipment and emergency lighting battery chargers.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01.
- .2 Nameplate for each panelboard size 4 engraved as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

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 panelboards installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 12. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 00 or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .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.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20 and 01 35 21.
 - .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 panelboards installation.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CAN/CSA-C22.2 No.42.1-00(R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA C22.2 No.55-M1986(R2008), Special Use Switches.
 - .4 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 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 off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wiring devices from nicks, scratches, and blemishes.

- .3 Replace defective or damaged materials with new.

PART 2 – PRODUCTS

2.1 SWITCHES

- .1 20 A, 120 V AND 347 V (as required) single pole, three-way, four-way switches to: CSA C22.2 No.55 and CSA C22.2 No.111.
- .2 Manually-operated general purpose AC switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Ivory toggle.
- .3 Toggle operated locking fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads and or heating loads.
- .4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R or 5-20R (indicated on plans), 125V, 15 A/20 A, U ground, to: CSA C22.2 No.42 with following features:
 - .1 Ivory urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Other receptacles with ampacity and voltage as indicated.
- .3 Receptacles of one manufacturer throughout project.

2.3 COVER PLATES

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

- .3 Stainless steel, vertically brushed, 1 mm thick cover cover plates, thickness for wiring devices mounted in flush-mounted outlet box.
- .4 Cast] cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.4 LABELLING

- .1 Identify the panel and circuit number for each wiring device with self-adhesive label on the coverplate. Use clear tape with black 14 pt Arial or Helvetica typeface. Locate labels for recetacles on front of coverplate and label for switches on rear of coverplate.

2.5 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

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 wiring devices installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION GENERAL

- .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 Mount toggle switches at height [in accordance with Section 26 05 00.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height [in accordance with Section 26 05 00.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
 - .4 Install GFI type receptacles as indicated.
- .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.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .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.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with section 01 74 20.
 - .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 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 CSA International (CSA)
 - .1 CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.
 - .3 Include time-current characteristic curves for breakers with ampacity of 60A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.
 - .4 Certificates:
 - .1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit [3] copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 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 circuit breakers indoors in dry location and in

- accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect [circuit breakers] from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.

PART 2 - PRODUCTS

2.1 BREAKERS GENERAL

- .1 Moulded-case circuit breakers, Circuit breakers and ground-fault circuit-interrupters, Fused circuit breakers, and accessory high-fault protectors: to CSA C22.2 No. 5
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
- .3 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
- .4 Common-trip breakers: with single handle for multi-pole applications.
- .5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .6 Circuit breakers with interchangeable trips as indicated.
- .7 Circuit breakers to have minimum 22000 symmetrical rms interrupting capacity rating.

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.

2.5 SOLID STATE TRIP BREAKERS DESIGN D

- .1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time short time instantaneous tripping for circuit protection. To be used for any breaker sized 250 amps and over.
- .1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time short time instantaneous tripping for ground fault short circuit protection. To be used for any breaker sized 1000 amps and over.

2.6 OPTIONAL FEATURES

- .1 Include:
 - .1 Shunt trip.
 - .2 Auxiliary switch.
 - .3 Motor-operated mechanism c/w time delay unit.
 - .4 Under-voltage release.
 - .5 On-off locking device.
 - .6 Handle mechanism.

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.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install circuit breakers as indicated.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .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.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 – GENERAL

1.1 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00.

PART 2 – PRODUCTS

2.1 DISCONNECT SWITCHES

- .1 Fusible, non-fusible, as indicated, horsepower rated disconnect switch in CSA Enclosure drip proof type, size as indicated.
- .2 Provision for padlocking in on-off switch position by three locks.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Fuses: size as indicated, required.
- .5 Fuseholders: relocatable and suitable without adaptors, for type and size of fuse indicated.
- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00.
- .2 Indicate name of load controlled on size 4 name plate

PART 3 – EXECUTION

3.1 EXAMINATION

- .1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI C82.1-2004, American National Standard for Lamp Ballasts - Line Frequency Fluorescent Lamp Ballasts.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
 - .1 ASTM F1137-00 (2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 Canadian Standards Association (CSA International)
- .5 ICES-005-[07], Radio Frequency Lighting Devices.
- .6 Underwriters' Laboratories of Canada (ULC)
- .7 IESNA LM-80-08 "Approved Method: Measuring Lumen Maintenance of LED Light Sources" and IESNA LM-79-08 "Approved Method: Electrical and photometric Measurements of Solid-State Lighting Products"

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Departmental Representative.
 - .3 Photometric data to include: VCP Table where applicable] [spacing criterion.

- .3 Quality assurance submittals: provide following in accordance with Section 01 45 00.
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures and.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .5 Disposal and recycling of fluorescent lamps as per local regulations.
- .6 Disposal of old PCB filled ballasts.

PART 2 – PRODUCTS

2.1 LAMPS

- .1 Fluorescent lamps to be - T8, 32 Watt, medium bi-pin, rapid-start, 4100 K, 30,000 hour lamp life, 2950 initial lumens, CRI 80; or as indicated.

2.2 BALLASTS

- .1 Fluorescent ballast: CBM and CSA certified, energy efficient type, IC electronic.
 - .1 Rating: 60 Hz voltage as indicated, for use with 2-32W, rapid start lamps.
- .2 Totally encased and designed for 40 degrees Celsius ambient temperature.
- .3 Power factor: minimum 95% with 95% of rated lamp lumens.
- .4 Current crest factor: 1.7 maximum.
- .5 Harmonics: 10% maximum THD.
- .6 Operating frequency of electronic ballast: 20 kHz minimum.
- .7 Total circuit power: 62 Watts.
- .8 Ballast factor: greater than 0.90.
- .9 Sound rated: Class A.
- .10 Mounting: integral with luminaire.

2.3 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.4 OPTICAL CONTROL DEVICES

- .1 As indicated in luminaire schedule.

2.5 LED LUMINEERS

- .1 All LED luminaires must bear an approved certification mark as per Ontario Electrical Safety Code Bulletin 2-7-29. A UL certification mark without the “c” is not an approved certification mark.
- .2 Luminaires design for LED lamps with integral driver as specified below shall adhere to LED lamp manufacturers guidelines, certification programs, and test procedures for thermal management to guarantee the minimum lamp life and lumen maintenance as specified below. Luminaire manufacturers must reference LM-80 publications in manufacture and design of luminaire.
- .3 Luminaires designed with integrated custom LED’s shall be as specified on drawings or approved equal meeting the following requirement’s.
 - .1 Only products from manufacturers that have been in in the lighting manufacturing business for minimum 10 years will be considered.
 - .2 Modularity, shall be designed to allow for replacement of; driver, LED’s without specialized tools and without removing luminaire from the ceiling.
 - .3 Performance – LED luminaire with custom lamps must exceed LED lamp parameters specified below for efficacy and lumen maintenance by minimum 15%
 - .4 Lumen maintenance – at least 70% of initial lumens for at least 50,000 hours.
 - .5 Minimum luminous efficacy 50 lumens per watt (lm/W)
 - .6 Warranty – Written warranty covering repair or replacement for a minimum of five (5) years from the data of purchase. Warranty must be included with maintenance manuals and have a toll free (e.g., “800”) number or mailing address or web site address for consumer complaint resolution and future LED replacement upgrade.

2.6 LUMINAIRES

- .1 As indicated in luminaire schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated on drawings.
- .2 Provide adequate support to suit ceiling system.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support luminaires independently of ceiling using hangers to structure in accordance with local inspection requirements and manufacturers written instructions.
- .2 Provide adequate additional chain hanger supports for all luminaires in suspended ceiling systems to approval of the consultant and in accordance with Ontario Electrical Safety Board Code Bulletin No. 30-4-4.1996.
- .3 All existing luminaires to be removed and reinstalled are to have new chain hangers provided.
- .4 Coordinate with the Architect and ceiling contractor to determine which ceilings have been designed and constructed to carry the weight of the luminaires so that the support chains can be eliminated. Ensure all luminaires are mechanically secured to the ceiling system with manufacturer approved clips.

3.4 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 CLEANING

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

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.141-10, Emergency Lighting Equipment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for emergency lighting for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect emergency lighting from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.5 WARRANTY

- .1 For batteries in this Section 26 52 00 - Emergency Lighting, 12 months warranty period is extended to 120 months.

PART 2 – PRODUCTS

2.1 EQUIPMENT

- .1 Emergency lighting equipment: to CSA C22.2 No.141.
- .2 Supply voltage: 120 V, AC.
- .3 Output voltage: 12 V DC.
- .4 Operating time: 30 minutes.
- .5 Battery: sealed, maintenance free.
- .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.
- .7 Solid state transfer circuit.
- .8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .9 Signal lights: solid state, for 'AC Power ON' and 'High Charge'.
- .10 Lamp heads: integral on unit and remote, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: tungsten 9W.
- .11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .12 Finish: white.
- .13 Auxiliary equipment:
 - .1 Ammeter.
 - .2 Voltmeter.
 - .3 Test switch.
 - .4 Time delay relay.
 - .5 Battery disconnect device.
 - .6 AC input and DC output terminal blocks inside cabinet.
 - .7 Shelf.
 - .8 Cord and single twist-lock plug connection for AC.

.9 RFI suppressors.

2.2 WIRING OF REMOTE HEADS

- .1 Conduit: type, in accordance with Section 26 05 34.
- .2 Conductors: type in accordance with Section 26 05 21, sized as indicated in accordance with manufacturer's recommendations].

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 emergency lighting installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install unit equipment and remote mounted fixtures.
- .2 Direct heads.
- .3 Connect exit lights to unit equipment.

3.3 CLEANING

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

3.4 PROTECTION

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

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.141-10, Unit Equipment for Emergency Lighting.
 - .2 CAN/CSA-C860-07, Performance of Internally Lighted Exit Signs.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 101-2009, Life Safety Code.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 ULC/ORD-924-02, Standard for Emergency Lighting and Power Equipment.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit manufacturer's written material warranty for lamination of photo-luminescent exit signs. For the Work of this Section 26 53 00 Exit Lights the 12 months warranty period prescribed in subsection GC 3.13 of General Conditions is extended to 25 years.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

PART 2 – PRODUCTS

2.1 STANDARD UNITS

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860.
- .2 Housing: extruded aluminum housing, brush aluminum finish.
- .3 Face and back plates: cast aluminum alloy.
- .4 Lamps: One led – MAX 3w 120 v 100,000 HOURS
- .5 Operation: designed for over 100,000 hours of continuous operation without relamping.
- .6 Signs to meet CSA 22.2-141-10 “Pictogram Exit Signs” Standards. Provide signs complete with Pictogram Films for each face. Pictogram to indicate egress direction. Where multiple directions of egress exit, provide two signs indicating opposing directions.
- .7 Face plate to remain captive for relamping.

2.5 MOUNTING

- .1 Surface wall and ceiling mounting. Coordinate with plans and ceiling plans.
- .2 Single and Double face as required with die-cast face plate to remain captive for relamping.
- .3 Pictograms – in opposite directions for dual egress locations.
- .4 Wireguard as noted.

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 exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Connect exit lights to exit light circuits as noted on plans.
- .3 Connect emergency lamp sockets to emergency circuits.
- .4 Ensure that exit light circuit breaker is locked in on position.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 74 11.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Approved: 2010-12-31

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section [_____].

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM D698-[07e1], Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
- .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 CSA A3000-[08], Cementitious Materials Compendium.
- .4 Ministère des Transports du Québec
 - .1 CCDG 14.02, Cahier des charges et devis généraux.
- .5 Ontario Provincial Standard Specifications (OPSS)/Ontario Ministry of Transportation
 - .1 OPSS 1004-[05], Material Specification for Aggregates - Miscellaneous.
 - .2 OPSS 1010-[04], Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.
- .6 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 ADMINISTRATIVE REQUIREMENTS

- .1 Co-ordination: arrange with authority having jurisdiction for relocation of buried services that interfere with execution of work.
 - .1 Pay costs of relocating services.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Samples: submit to designated testing agency, [23] kg sample of backfill for fill material proposed for use, no later than 1 week before backfilling or filling work.

- .3 Site Quality Control Submittals: submit in accordance with Section [01 45 00 - Quality Control].
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article.
 - .2 Submit testing results [report] as described in PART 3 - FIELD QUALITY CONTROL.
- .4 Sustainable Design Submittals:
 - .1 LEED Canada-[NC Version 1.0] Submittals: in accordance with [Section 01 35 21 - LEED Requirements].
 - .2 Erosion and Sedimentation Control: submit erosion and sedimentation control plan in accordance with EPA 832/R92-005.
 - .3 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50 % of construction wastes were recycled or salvaged.

Part 2 Products

2.1 MATERIALS

- .1 Granular A to OPSS 1010.
- .2 Gravel and Sand to CCDG 14.02.
- .3 Unshrinkable fill: proportioned and mixed to provide:
 - .1 Maximum compressive strength of [0.4] MPa at 28 days.
 - .2 Maximum Portland cement content of [25] kg/m³.
 - .3 Minimum strength of [0.07]MPa at 24 hours.
 - .4 Concrete aggregates: to [CSA A23.1/A23.2].
 - .5 Cement: to CSA A3000, Type [GU].
 - .6 Slump: [160 to 200] mm.

Part 3 Execution

3.1 EXAMINATION

- .1 Evaluation and Assessment:
 - .1 Examine soil report available at Baird AE.
 - .2 Before commencing work verify locations of buried services on and adjacent to site.

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.
 - .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 Protection of in-place conditions:
 - .1 Protect excavations from freezing.
 - .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 Consultant's approval.
 - .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
 - .5 Protect buried services that are required to remain undisturbed.
- .3 Removal:
 - .1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
 - .2 Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade elsewhere.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

3.3 EXCAVATION

- .1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial regulations whichever is more stringent.
- .2 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.
 - .1 Stockpile topsoil on site for later use.
- .3 Excavate as required to carry out work.
 - .1 Do not disturb soil or rock below bearing surfaces.
 - .2 Notify Consultant when excavations are complete.
 - .3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.

- .4 Excavation taken below depths shown without Departmental Representative's written authorization to be filled with concrete of same strength as for footings at Contractor's expense.
- .4 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground.
 - .1 Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.
- .5 Excavate for slabs and paving to subgrade levels.
 - .1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

3.4 FIELD QUALITY CONTROL

- .1 Testing of materials and compaction of backfill will be carried out by testing laboratory designated by Consultant.
- .2 Not later than [1] week minimum before backfilling or filling, submit to designated testing agency, samples of backfill as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Do not begin backfilling or filling operations until material has been approved for use by Consultant.
- .4 Not later than [48] hours before backfilling or filling with approved material, notify Consultant to allow compaction tests to be carried out by designated testing agency.

3.5 BACKFILLING

- .1 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .2 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .3 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as fill.
 - .1 Fill excavated areas with selected subgrade material compacted as specified for fill.
- .4 Placing:
 - .1 Place backfill, fill and base course material in 150 mm lifts: add water as required to achieve specified density.
Place unshrinkable fill in areas as indicated: consolidate and level unshrinkable fill with internal vibrators.
- .5 Compaction: compact each layer of material to following densities for material to ASTM D698:
 - .1 To underside of base courses: 95%.

- .2 Base courses: 100%.
- .3 Elsewhere: 90%.
- .6 Under slabs and paving:
 - .1 Use 150 mm up to bottom of granular base courses.
 - .2 Use 150 mm for base courses.
- .7 In trenches:
 - .1 Up to 300 mm above pipe or conduit: sand placed by hand.
 - .2 Over 300 mm above pipe or conduit: [native material approved by Consultant.
- .8 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.
- .9 Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material
- .10 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.
- .11 Underground tanks: use sand to bottom of granular base courses or to bottom of topsoil, as applicable.

3.6 GRADING

- .1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved Consultant.
 - .1 Grade to be gradual between finished spot elevations shown on drawings.

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 Dispose of cleared and grubbed material off site daily.
- .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] [recycling] [organics] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [01 35 21 - LEED Requirements].

END OF SECTION

Approved: 2012-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section [_____].

1.2 REFERENCES

.1 ASTM International

.1 ASTM D4791-[10], Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

.2 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum [2007]).

.2 LEED Canada-NC-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.

.3 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Commercial Interiors.

.4 LEED Canada-EB: O M-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Existing Buildings: Operations and Maintenance 2009.

.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 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 [aggregate materials] and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Submit [3] samples.

.2 Allow continual sampling by Departmental Representative during production.

.3 Provide Departmental Representative with access to source and processed material for sampling.

- .4 Install sampling facilities at discharge end of production conveyor, to allow Departmental Representative to obtain representative samples of items being produced. Stop conveyor belt when requested by Departmental Representative to permit full cross section sampling.
 - .5 Provide front end loader or other suitable equipment including trained operator for stockpile sampling as necessary. Move samples to storage place as directed by Departmental Representative.
 - .6 Supply new or clean sample bags or containers according appropriate to aggregate materials.
 - .7 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.
 - .8 Provide water, electric power and propane to Departmental Representative laboratory trailer at production site.
- .4 Sustainable Design Submittals:
- .1 LEED Canada submittals: in accordance with [Section 01 35 21 - LEED Requirements].
 - .2 Construction Waste Management:
 - .1 Submit project [Waste Management Plan] [Waste Reduction Workplan] highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that [50]% of construction wastes were recycled or salvaged.
 - .3 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with [authorities having jurisdiction] [Section 01 35 21 - LEED Requirements].

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section [01 61 00 - Common Product Requirements] [with manufacturer's written instructions].
- .2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.
- .3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

Part 2 Products

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.

- .1 Greatest dimension to exceed [5] times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
 - .1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
 - .2 Reclaimed asphalt pavement.
 - .3 Reclaimed concrete material.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
 - .1 Crushed rock.
 - .2 Gravel [and crushed gravel] composed of naturally formed particles of stone.
 - .3 Light weight aggregate, including slag and expanded shale.
 - .4 Reclaimed asphalt pavement.
 - .5 Reclaimed concrete material.

2.2 SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling [4] weeks minimum before starting production.
- .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
- .3 Advise Departmental Representative [4] weeks minimum in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions are acceptable for topsoil stripping.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with topsoil stripping only after unacceptable conditions have been remedied [and after receipt of written approval to proceed Departmental Representative].

3.2 PREPARATION

- .1 Topsoil stripping:

- .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
- .2 Begin topsoil stripping of areas [as indicated] or as directed by Departmental Representative after area has been cleared of [brush] [weeds] [grasses] and removed from site.
- .3 Strip topsoil to depths [as indicated] or [as directed by Departmental Representative]. Avoid mixing topsoil with subsoil.
- .4 Stockpile in locations as [indicated] or directed by Departmental Representative. Stockpile height not to exceed [2] m.
- .5 Dispose of topsoil [to location as indicated] [off site] [as directed by Departmental Representative].
- .2 Aggregate source preparation:
 - .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as [approved by authority having jurisdiction] or directed by Departmental Representative.
 - .2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
 - .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
 - .4 When excavation is completed dress sides of excavation to nominal [1.5:1] slope, and provide drains or ditches as required to prevent surface standing water.
 - .5 Trim off and dress slopes of waste material piles and leave site in neat condition.
 - .6 Provide silt fence or other means to prevent contamination of existing watercourse or natural wetland features.
- .3 Processing:
 - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
 - .2 Blend aggregates, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation requirements for material and, percentage of crushed particles, or particle shapes specified.
 - .1 Use methods and equipment approved in writing by Departmental Representative.
- .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.
- .5 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.
 - .1 Use only equipment approved in writing by Departmental Representative.
- .6 Stockpiling:

- .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
- .2 Stockpile aggregates in sufficient quantities to meet project schedules.
- .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than [300] mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom [300] mm of pile into Work.
- .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
- .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within [48] hours of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
 - .1 Maximum [1.5] m for coarse aggregate and base course materials.
 - .2 Maximum [1.5] m for fine aggregate and sub-base materials.
 - .3 Maximum [1.5] m for other materials.
- .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .9 Do not cone piles or spill material over edges of piles.
- .10 Do not use conveying stackers.
- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.3 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 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .4 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.
- .5 Waste Management: separate waste materials for [reuse] [recycling] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [01 35 21 - LEED Requirements].
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .6 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

- .7 Restrict public access to temporary or permanently abandoned stockpiles by means acceptable to Departmental Representative.

END OF SECTION

Approved: 2006-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section [_____].

1.2 MEASUREMENT PROCEDURES

- .1 Measure following items in hectares within limits as indicated:
 - .1 Clearing.
 - .2 Grubbing.
 - .3 Close cut clearing.
 - .4 Underbrush clearing.
- .2 Measure clearing isolated trees [and grubbing isolated tree stumps] as number of isolated trees cleared [and number of isolated stumps grubbed].
- .3 Fixed price payment[s] will be made for:
 - .1 Clearing.
 - .2 Close cut clearing.
 - .3 Clearing isolated trees.
 - .4 Grubbing.

1.3 REFERENCES

- .1 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.

1.4 DEFINITIONS

- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- .4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.

- .5 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than specified depth below existing ground surface.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Samples:
 - .1 Submit [3] samples of each material listed below for approval prior to delivery of materials to project site.
 - .2 Tree wound paint: one liter can with manufacturer's label.
 - .3 Herbicide: one liter can with manufacturer's label.
- .3 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Submit manufacturer's installation instructions.

1.6 QUALITY ASSURANCE

- .1 Do construction occupational health and safety in accordance with Section [01 35 29.06 - Health and Safety Requirements].
- .2 Safety Requirements: worker protection.
 - .1 Workers must wear gloves, respirators, long sleeved clothing, eye protection, protective clothing when applying herbicide materials.
 - .2 Workers must not eat, drink or smoke while applying herbicide material.
 - .3 Clean up spills of preservative materials immediately with absorbent material and safely discard to landfill.

1.7 STORAGE AND PROTECTION

- .1 Prevent damage to trees, existing buildings, existing pavement, utility lines, site appurtenances, water courses, root systems of trees which are to remain.
 - .1 Repair damaged items to approval of Departmental Representative.
 - .2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal].

Part 2 Products

2.1 MATERIALS

- .1 Bituminous based paint of standard manufacture specially formulated for tree wounds.

- .2 Herbicide: effective for killing annual and perennial weeds, and bamboo grass, by being absorbed through roots and foliage.
 - .1 Spray applied on non-crop land areas.
- .3 Soil Material for Fill:
 - .1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.
 - .2 Remove and store soil material for reused.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION

- .1 Inspect site and verify with Departmental Representative, items designated to remain.
- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
 - .1 Notify Consultant immediately of damage to or when unknown existing utility line[s] are encountered.
 - .2 When utility lines which are to be removed are encountered within area of operations, notify Consultant in ample time to minimize interruption of service.
- .3 Notify utility authorities before starting clearing.
- .4 Keep roads and walks free of dirt and debris.

3.3 APPLICATION

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

3.4 CLEARING

- .1 Clearing includes felling, trimming, cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, rubbish occurring within cleared areas.

- .2 Clear as directed] by Departmental Representative, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.
- .3 Cut off branches overhanging area cleared as directed by Departmental Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.
- .5 Apply herbicide in accordance with manufacturer's label to top surface of stumps designated not to be removed.

3.5 CLOSE CUT CLEARING

- .1 Close cut clearing to within 100 mm of ground surface.
- .2 Cut off branches overhanging area cleared as directed by Departmental Representative.
- .3 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.6 ISOLATED TREES

- .1 Cut off isolated trees as directed by Departmental Representative at height of not more than 300 mm above ground surface.
- .2 Grub out isolated tree stumps.
- .3 Prune individual trees as indicated.
- .4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.
- .5 Cut limbs and branches to be trimmed close to bole of tree or main branches.
- .6 Paint cuts more than 3 cm in diameter with approved tree wound paint.

3.7 UNDERBRUSH CLEARING

- .1 Clear underbrush from areas as indicated to within 100 mm of ground surface.

3.8 GRUBBING

- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.
- .2 Grub out stumps and roots to not less than 200 mm below ground surface.
- .3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m³.
- .4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.9 REMOVAL AND DISPOSAL

- .1 Remove cleared, grubbed, materials off site designated by Departmental Representative.

- .2 Cut timber greater than 125 mm diameter to 150 mm lengths and stockpile as indicated. Stockpiled timber becomes property of Departmental Representative.
- .3 Mulch and stockpile cleared and grubbed vegetative material on site as directed by Departmental Representative.
- .4 Remove diseased trees identified by Departmental Representative and dispose of this material to approval of Departmental Representative.

3.10 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for immediate grading operations to approval of Consultant.

3.11 CLEANING

- .1 Proceed in accordance with Section [01 74 11 - Cleaning].
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Approved: 2006-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section [_____].

1.2 REFERENCES

- .1 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.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to [requirements of authorities having jurisdiction] [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.

3.2 STRIPPING OF TOPSOIL

- .1 Ensure that procedures are conducted in accordance with applicable [Provincial] [Territorial] [Municipal] requirements.
- .2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.
- .3 Handle topsoil only when it is dry and warm.
- .4 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by [alternative disposal] [composting].

- .5 Remove brush from targeted area by non-chemical means and dispose of through [alternative disposal] [mulching].
- .6 Strip topsoil [by scraper] to depths [as indicated] [as directed by Departmental Representative].
 - .1 Avoid mixing topsoil with subsoil.
- .7 Pile topsoil [by mechanical hoe] in berms in locations as [directed by Departmental Representative].
 - .1 Stockpile height not to exceed [2.5 - 3] m.
- .8 Dispose of unused topsoil [off-site] or [by alternative disposal] [for later use] [in location as indicated by Departmental Representative].
- .9 Protect stockpiles from contamination and compaction.

3.3 PREPARATION OF GRADE

- .1 Verify that grades are correct and notify Departmental Representative if discrepancies occur do not begin work until instructed by Departmental Representative.
 - .1 Grade area only when soil is dry to lessen soil compaction.
 - .2 Grade soil [with scrapers] establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

3.4 PLACING OF TOPSOIL

- .1 Place topsoil only after Departmental Representative has accepted subgrade.
- .2 Spread topsoil during dry conditions [by mechanical hoe] in uniform layers not exceeding [150] mm, over unfrozen subgrade free of standing water.
- .3 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.
- .4 Cultivate soil following spreading procedures.

3.5 SUB-SOILING

- .1 Work sub-soil area following natural grade contour lines, with vibrating sub-soiler to depth of [40] cm.
- .2 Cross sub-soil the area following the first pass.
- .3 Cultivate the soil with a chain harrow to de-clod the soil.

3.6 CLEANING

- .1 Proceed in accordance with Section [01 74 11 - Cleaning].
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Approved: 2012-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section [_____].

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM D698-[07e1], Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
 - .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum [2007]).
 - .2 LEED Canada-NC-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
 - .3 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Commercial Interiors.
 - .4 LEED Canada-EB: O M-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Existing Buildings: Operations and Maintenance 2009.
- .3 Underwriters' Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Sustainable Design Submittals:
 - .1 LEED Canada submittals: in accordance with [Section 01 35 21 - LEED Requirements].
 - .2 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50 of construction wastes were recycled or salvaged.
 - .3 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with authorities having jurisdiction.

1.4 EXISTING CONDITIONS

- .1 Examine subsurface investigation report which is [available for inspection at [____]] [bound into specification following Section [____]].
- .2 Known underground and surface utility lines and buried objects are as indicated on site plan.
- .3 Refer to dewatering in Section [31 23 33.01 - Excavating, Trenching and Backfilling].

Part 2 Products

2.1 MATERIALS

- .1 Fill material: Type [I, II or III] in accordance with of Section [31 23 33.01 - Excavating, Trenching and Backfilling] or as directed by Departmental Representative.
- .2 Excavated or graded material existing on site suitable to use as fill for grading work if approved by Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for rough grading 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 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] [as directed by Departmental Representative] after area has been cleared of [brush] [weeds] [grasses] and removed from site.
- .3 Stockpile in locations as [indicated] or [directed by Departmental Representative]. Stockpile height not to exceed 2 m.
- .4 Dispose of unused topsoil [to location as indicated] or [off site] [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 following depths below finish grades:
 - .1 [as indicated on drawings] mm for grassed areas.
 - .2 [as indicated on drawings] mm for flowerbeds.
 - .3 [as indicated on drawings] mm for shrub beds.
 - .4 [as indicated on drawings] mm for [asphalt] [gravel] paving.
 - .5 [as indicated on drawings] mm for concrete [paving] [walks] [precast paving units].
- .3 Slope rough grade away from building [1:50 minimum] [as indicated] [as directed] (offers more choice).
- .4 Grade ditches to depth [required for maximum run-off] [as indicated] [as directed].
- .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 [corrected maximum dry density] [maximum dry density] to ASTM D698, as follows:
 - .1 [90]% under landscaped areas.
 - .2 [98]% under paved and walk areas.
- .7 Do not disturb soil within branch spread of trees or shrubs to remain.

3.4 TESTING

- .1 Inspection and testing of soil compaction will be carried out by testing laboratory designated by ULC. Costs of tests will be paid [under a Cash Allowance] by Departmental Representative in accordance with Sections [01 29 83 - Payment Procedures for Testing Laboratory Services] and [01 45 00 - Quality Control].
- .2 Submit testing procedure, frequency of tests, [testing laboratory as designated by ULC or certified testing personnel] to Departmental Representative for [approval] [review].

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] [recycling] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [01 35 21 - LEED Requirements].
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

- .1 Protect [_____] transplant existing [fencing] [trees], [landscaping], [natural features], [bench marks], [buildings], [pavement], [surface or underground utility lines] which are to remain as directed by Departmental Representative. 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

Approved: 2006-09-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section [_____].

1.2 MEASUREMENT PROCEDURES

- .1 Excavated materials will be measured in cubic metres in their original location.
 - .1 Common excavation quantities measured will be actual volume removed within following limits:
 - .1 Width for trench excavation as indicated.
 - .2 Width for excavation for structures as indicated.
 - .3 Depth from ground elevation immediately prior to excavation, to elevation as directed by Consultant.
 - .2 Rock quantities measured will be actual volume removed within following limits:
 - .1 Width for trench excavation as indicated.
 - .2 Width for excavation for structures to be bounded by vertical planes up to 500 mm outside of and parallel to neat lines of footings as indicated.
 - .3 Depth from rock surface elevations immediately prior to excavation, to elevation as indicated.
 - .4 Where design elevation is less than 300 mm below original rock surface, depth will be considered to be 300 mm below original rock surface.
 - .5 Volume of individual boulders and rock fragments will be determined by measuring three maximum mutually perpendicular dimensions.
- .2 Sheeting and bracing left in place on direction of Consultant will be measured in square metres of surface area of plane surface of sheeting.
- .3 Shoring, bracing, cofferdams, underpinning and de-watering of excavation will not be measured separately for payment.
- .4 Backfilling to authorized excavation limits will be measured in [cubic metres compacted in place] [tonnes] for each type of material specified.
- .5 Placing and spreading of topsoil will be measured for payment in cubic metres calculated from cross sections taken in area of excavation from original location.
 - .1 If double handling of topsoil is directed by Departmental Representative (stockpiling and later placing), then quantities will be measured twice; on excavation from original location and on excavation from stockpile.

1.3 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/ft³) (600 kN-m/m³).
- .5 ASTM D1557-[02e1], Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
- .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 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
 - .2 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .4 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.
- .5 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.

1.4 DEFINITIONS

- .1 Excavation classes: [two] classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock : solid material in excess of 1.00 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters 1 inch in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .6 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: Sieve sizes to [CAN/CGSB-8.1] [CAN/CGSB-8.2].
 - .2 Table:
 - .3 Coarse grained soils containing more than [20] % by mass passing 0.075 mm sieve.
- .7 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.

Sieve Designation	% Passing
2.00 mm	[100]
0.10 mm	[45 - 100]
0.02 mm	[10 - 80]
0.005 mm	[0 - 45]

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section [01 33 00 - Submittal Procedures].
- .2 LEED Submittals:
 - .1 Submit erosion and sedimentation control plan for Credit SSp1 in accordance with LEED Canada-NC.
- .3 Quality Control: in accordance with Section [01 45 00 - Quality Control]:
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
 - .2 Submit for review by Consultant proposed dewatering methods as described in PART 3 of this Section.
 - .3 Submit to Consultant written notice at least 7 days prior to excavation work, to ensure cross sections are taken.

- .4 Submit to Consultant written notice when bottom of excavation is reached.
- .5 Submit to Consultant testing results report as described in PART 3 of this Section.
- .4 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
 - .2 Submit records of underground utility locates, indicating: [location plan of existing utilities as found in field] [clearance record from utility authority] [location plan of relocated and abandoned services, as required].
- .5 Samples:
 - .1 Submit samples in accordance with Section [01 33 00 - Submittal Procedures].
 - .2 Inform Departmental Representative at least [4] weeks prior to beginning Work, of proposed source of [fill] [unshrinkable fill] materials and provide access for sampling.
 - .3 Submit [70] kg samples of type of [fill] [unshrinkable fill] specified [including representative samples of excavated material].
 - .4 Ship samples [prepaid] to Departmental Representative, in tightly closed containers to prevent contamination and exposure to elements.
 - .5 At least [4] weeks prior to beginning Work, inform Departmental Representative source of fly ash and submit samples to Departmental Representative.
 - .1 Do not change source of Fly Ash without written approval of Departmental Representative.

1.6 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Submit design and supporting data at least [2] weeks prior to beginning Work.
- .3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.
- .4 Keep design and supporting data on site.
- .5 Engage services of qualified professional Engineer who is registered or licensed in Province of Ontario, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .6 Do not use soil material until written report of soil test results are approved by Consultant.
- .7 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section [01 35 29.06 - Health and Safety Requirements].

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for [reuse] [recycling] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal].
- .2 Divert excess aggregate materials from landfill to local facility for reuse as directed by Departmental Representative.

1.8 EXISTING CONDITIONS

- .1 Examine soil report.
- .2 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to beginning excavation Work, notify applicable Consultant establish location and state of use of buried utilities and structures. Departmental Representative to clearly mark such locations to prevent disturbance during Work.
 - .6 Confirm locations of buried utilities by careful test excavations or soil hydrovac methods.
 - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .8 Where utility lines or structures exist in area of excavation, obtain direction of Consultant before removing or re-routing. Costs for such Work to be paid by Departmental Representative.
 - .9 Record location of maintained, re-routed and abandoned underground lines.
 - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
 - .1 Conduct, with Departmental Representative condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
 - .3 Where required for excavation, cut roots or branches as directed by Consultant in accordance with Section 32 01 90.33 - Tree and Shrub Preservation.

Part 2 Products

2.1 MATERIALS

.1 Type 1 and Type 2 fill: properties to Section [31 05 16 - Aggregate Materials] and the following requirements:

- .1 Crushed, pit run or screened stone, gravel or sand.
- .2 Gradations to be within limits specified when tested to ASTM C136. Sieve sizes to CAN/CGSB-8.1.

.3 Table:

Sieve Designation	% Passing
Type 1	Type 2
75 mm	-
50 mm	-
37.5 mm	-
25 mm	[100]
19 mm	[75-100]
12.5 mm	-
9.5 mm	[50-100]
4.75 mm	[30-70]
2.00 mm	[20-45]
0.425 mm	[10-25]
0.180 mm	-
0.075 mm	[3-8]

- .2 Type 3 fill: selected material from excavation or other sources, approved by Consultant for use intended, unfrozen and free from rocks larger than [75] mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 Unshrinkable fill: proportioned and mixed to provide:
 - .1 Maximum compressive strength of [0.4] MPa at 28 days.
 - .2 Maximum cement content of [25] kg/m³ [with [40] [by volume] fly ash replacement]: to CSA-A3001, Type [GU].
 - .3 Minimum strength of [0.07]MPa at 24 h.
 - .4 Concrete aggregates: to CSA-A23.1/A23.2.
 - .5 Cement: Type GU.
 - .6 Slump: 160 to 200 mm.
- .4 Shearmat: honeycomb type bio-degradable cardboard [100] mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.
- .5 Geotextiles: to Section [31 32 19.01 - Geotextiles].

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to [requirements of authorities having jurisdiction] [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.

3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly [in accordance with Section [02 41 13 - Selective Site Demolition]].

3.3 PREPARATION/PROTECTION

- .1 Protect existing features in accordance with Section [01 56 00 - Temporary Barriers and Enclosures] and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Consultant approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

3.4 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas Consultant after area has been cleared of brush, weeds grasses and removed from site.
- .2 Strip topsoil to depths as directed by Consultant.
 - .1 Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Departmental Representative.
 - .1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .4 Dispose of unused topsoil as directed by Departmental Representative.

3.5 STOCKPILING

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

3.6 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with [Section [01 35 29.06 - Health and Safety Requirements]]Health and Safety Act for the Province of Ontario.
 - .1 Where conditions are unstable, Consultant to verify and advise methods.
- .2 Obtain permit from authority having jurisdiction for temporary diversion of water course.
- .3 Construct temporary Works to depths, heights and locations as approved by Consultant.
- .4 During backfill operation:
 - .1 Unless otherwise indicated or directed by Consultant, 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.
- .5 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .6 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.
 - .2 Remove excess materials from site and restore watercourses as directed by Consultant.

3.7 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative approval 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 collection and in a 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.

3.8 EXCAVATION

- .1 Advise Consultant at least [7 days] in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as indicated.
- .3 Remove concrete, walks, demolished foundations and rubble and other obstructions encountered during excavation in accordance with Section [02 41 13 - Selective Site Demolition].
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 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.
- .6 For trench excavation, unless otherwise authorized by Consultant in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Consultant.
- .8 Restrict vehicle operations directly adjacent to open trenches.
- .9 Dispose of surplus and unsuitable excavated material in approved location on site.
- .10 Do not obstruct flow of surface drainage or natural watercourses.
- .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify Consultant when bottom of excavation is reached.
- .13 Obtain Consultant approval of completed excavation.
- .14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Consultant.
- .15 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with fill concrete Type 2 fill compacted to not less than 100% of corrected Standard Proctor maximum dry density.
 - .2 Fill under other areas with Type 2 fill compacted to not less than 95 % of corrected Standard Proctor maximum dry density.
- .16 Hand trim, make firm and remove loose material and debris from excavations.

- .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
- .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

3.9 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698.
 - .1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 95% of corrected maximum dry density.
 - .2 Within building area: use Type 2 to underside of base course for floor slabs. Compact to 100 % of corrected maximum dry density.
 - .3 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill topped with shearmat filler as indicated] to underside of slab. Compact base course to 100 %.
 - .4 Retaining walls: use Type 2 fill to subgrade level on high side for minimum 500 mm from wall and compact to 95 %. For remaining portion, use Type 3 fill compacted to 95 %.
 - .5 Place unshrinkable fill in areas as indicated.

3.10 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.

3.11 BACKFILLING

- .1 Vibratory compaction equipment: Plate tamper
- .2 Do not proceed with backfilling operations until completion of following:
 - .1 Consultant has inspected and approved installations.
 - .2 Consultant has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of concrete formwork.
 - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.

- .2 Do not backfill around or over cast-in-place concrete within [24] hours after placing of concrete.
- .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 0.5m.
- .4 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 Consultant:
 - .2 If approved by Consultant, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Consultant.
- .7 Place unshrinkable recycled fill in areas as indicated.
- .8 Consolidate and level unshrinkable fill with internal vibrators.

3.12 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 - Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by Consultant.
- .2 Replace topsoil as directed by Consultant.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work as directed by Consultant.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Approved: 2014-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section [_____].

1.2 REFERENCES

- .1 Definitions:
 - .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.
- .2 Reference Standards:
 - .1 ASTM International
 - .1 ASTM A1064/A1064M-[13], Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
 - .2 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
 - .3 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.
 - .4 LEED Canada for Existing Buildings, Operations and Maintenance-[2009], LEED Canada 2009 Leadership In Energy and Environmental Design Green Building Rating System Reference Guide.
 - .3 CSA Group
 - .1 CSA G30.18-[09], Carbon Steel Bars for Concrete Reinforcement.
 - .4 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .2 Fertilizers Act (R.S. 1985, c. F-10).
 - .3 Fertilizers Regulations (C.R.C., c. 666).
 - .4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
 - .5 Health Canada - Pest Management Regulatory Agency (PMRA)
 - .1 National Standard for Pesticide Education, Training and Certification in Canada (1995).

- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling:
 - .1 Obtain approval from Departmental Representative of schedule indicating beginning of Work.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for [tree and shrub preservation materials] and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit monthly written reports on maintenance during warranty period, to Departmental Representative identifying:
 - .1 Maintenance work carried out.
 - .2 Development and condition of plant material.
 - .3 Preventative or corrective measures required which are outside Contractor's responsibility.
 - .3 Submit [2] copies of WHMIS MSDS in accordance with Section [01 35 29.06 - Health and Safety Requirements] [01 35 43 - Environmental Procedures].
- .3 Sustainable Design Submittals:
 - .1 LEED Canada submittals: in accordance with [Section 01 35 21 - LEED Requirements].
 - .2 Construction Waste Management:
 - .1 Submit project [Waste Management Plan] [Waste Reduction Workplan] highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that [50] % of construction wastes were recycled or salvaged.
 - .3 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of [post-consumer] [post-industrial] content, and total cost of materials for project.
 - .4 Regional Materials: submit evidence that project incorporates required percentage [_____] % of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section [01 61 00 - Common Product Requirements] [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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect tree and shrub preservation materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section [01 35 21 - LEED Requirements].

1.6 MAINTENANCE DURING WARRANTY PERIOD

- .1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.
 - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
 - .2 Apply pesticides in accordance with National Standard for Pesticide Education, Training and Certification in Canada, Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from Departmental Representative prior to application.
 - .3 Apply fertilizer when instructed by Parks Canada in early spring [at manufacturer's suggested rate] [at rate of [0.025] kg of nitrogen/m²].
 - .4 Remove dead, broken or hazardous branches from plant material. Dispose of debris through composting or mulching.

Part 2 Products

2.1 MATERIALS

- .1 Fill:
 - .1 Type (A): clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.
 - .2 Type (B): excavated soil, free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc). Excavated material shall be approved by Consultant before use as fill.
- .2 Coarse washed stones: 35-75 mm diameter clean round hard stone.
- .3 Drintile: 100 mm diameter corrugated plastic perforated tubing complete with snap couplings. Fill vents with 20 mm clear stone.

- .4 Peatmoss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous.
 - .3 Free of wood and deleterious material which could prohibit growth.
 - .4 Shredded minimum particle size: 5 mm.
- .5 Fertilizer:
 - .1 To Canada Fertilizer Act and Fertilizers Regulations.
 - .2 Complete, commercial, slow release with 35% of nitrogen content in water-insoluble form.
- .6 Anti-desiccant: commercial, wax-like emulsion.
- .7 Filter Cloth:
 - .1 Type 1: 100 % non-woven needle punched polyester, 2.75 mm thick, 240 g/m² mass.
 - .2 Type 2: biodegradable burlap.
- .8 Wood posts 38x 89 x 2400 mm length.

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 tree and shrub preservation installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant 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 Consultant.

3.2 IDENTIFICATION AND PROTECTION

- .1 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.
- .2 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.
- .3 Ensure no pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

3.3 ROOT CURTAIN SYSTEM

- .1 Identify limits for required construction excavation as approved by Departmental Representative.

- .2 Prior to construction excavation, hand dig trench minimum [500] mm wide x [1500] mm deep, along perimeter of excavation limits.
- .3 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards.
- .4 Install wooden posts against construction edge of trench.
- .5 Securely attach Type 2 filter fabric on plant side of wire mesh. Wire mesh to be approved by Parks Canada.
- .6 Prepare homogeneous mixture of fertilizer, parent material and organic matter.
 - .1 Add organic matter to mixture to achieve 7-9% organic matter content by weight.
 - .2 Incorporate with mixture grade 2:12:8 ratio fertilizer (dry) at rate of 1.5 kg/m³.
- .7 Backfill with homogeneous mixture between curtain wall and plants to be preserved in layers not exceeding 150 mm in depth. Compact each layer to 85% Standard Proctor Density.
- .8 Protect root curtain from damage during construction operations.
- .9 Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.
- .10 Remove root curtain before during backfill operations. Ensure root curtain is cut down to 300 mm below finished grade and remove cut material.

3.4 AIR LAYERING SYSTEM

- .1 Using manual methods, carefully remove turf, plants, leaves and organic matter in area of root system, dispose of plant matter through compost site and slightly loosen topsoil surface. Avoid damage to root system.
- .2 Lay horizontal system of perforated drain pipe on surface of existing grade.
 - .1 Slope drain tile minimum 3% for drainage away from trunk of tree.
 - .2 Connect system with general site drainage system or drain to low point on site.
- .3 Install plastic vent pipes vertically over joints in horizontal pipe system or where indicated. Top of vent pipe to be [20] mm above finished grade of fill. Keep top of vent pipe covered during construction.
- .4 Cover joints with Type 1 filter fabric and place coarse washed stone around joints and vertical pipes to secure their position.
- .5 Construct drywell around trunk of tree.
 - .1 Ensure open ends of horizontal pipe system are left exposed for air circulation to root system.
 - .2 Protect openings from blockage during construction.
 - .3 Install protective caps on exposed horizontal openings.
- .6 Place 200 mm depth of coarse washed stone on surface of original ground and horizontal pipe system to limits.

- .7 Place Type 1 filter fabric over surface of granular layer.
- .8 Place Type A fill over filter fabric to required depth without disturbing or damaging drain pipe system. Avoid damage to filter fabric.
- .9 Complete topsoil and sodding over area of sub-surface system within 1 week of placing fill.
- .10 Remove temporary protective covering from vent pipe openings. Install protective caps flush with finished grade.

3.5 TRENCHING AND TUNNELING FOR UNDERGROUND SERVICES

- .1 Method of utility installation will correspond with the civil drawings. The Contractor will be responsible to follow civil drawings. Upon request of the Consultant or Parks Canada, the Contractor may be asked to directional bore or open cut a section of trench that does not correspond with the civil drawings.
- .2 Centre line location and limits of trench/tunnel excavation to be approved by Consultant prior to excavation. Tunnel excavation to extend 2000 mm from edge of trunk on either side.
- .3 Excavate manually within zone of root system. Do not sever roots greater than 40 mm diameter except at greater than 500 mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.
- .4 Excavate tunnel under centre of tree trunk using methods and equipment approved by Consultant.
- .5 Minimum acceptable depth to top of tunnel: 1000 mm.
- .6 Backfill for tunnel and trench to [85]% Standard Proctor Density. Avoid damage to trunk and roots of tree.
- .7 Complete tunnelling and backfilling at tree within [2] weeks of beginning Work.

3.6 LOWERING GRADE AROUND EXISTING TREE

- .1 Begin Work in accordance with schedule approved by Departmental Representative.
- .2 Cut slope not less than 500 mm from tree trunk to new grade level.
- .3 Excavate to depths as indicated. Protect from damage root zone which is to remain.
- .4 When severing roots at excavation level, cut roots with sharp tools.
- .5 Cultivate excavated surface manually to 15 mm depth.
- .6 Prepare homogeneous soil mixture consisting by volume of:
 - .1 60% excavated soil cleaned of roots, plant matter, stones, debris.
 - .2 25% coarse, clean sterile sand.
 - .3 15% organic matter.
 - .4 Grade [2:12:8] fertilizer at rate of [1.5] kg/m³.

- .7 Place soil mixture over area of excavation to finished grade level. Compact to [85]% Standard Proctor Density.
- .8 Water entire root zone to optimum soil moisture level.
- .9 Install surface cover of [seeding] [sodding] in accordance with Section [32 92 19.13 - Mechanical Seeding] Section [32 92 19.16 - Hydraulic Seeding] [32 92 23 - Sodding].

3.7 PRUNING

- .1 Prune in accordance with Section [32 93 43.01 - Tree Pruning].
- .2 Prune crown to compensate for root loss while maintaining general form and character of plant. Dispose of debris through composting or mulching.

3.8 ANTI-DESICCANT

- .1 Apply anti-desiccant to foliage when directed by Parks Canada and as directed by Consultant.

3.9 VERIFICATION

- .1 Verification requirements in accordance with Section [01 47 17 - Sustainable Requirements: Contractor's Verification], include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Local/regional materials.
 - .5 Low-emitting materials.

3.10 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] [recycling] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [01 35 21 - LEED Requirements].
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Approved: 2011-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section [_____].

1.2 MEASUREMENT AND PAYMENT

- .1 Measure granular sub-base in tonnes of material incorporated into Work and accepted by Consultant.
- .2 Measure excavation of sub-base and subgrade materials to correct deficiencies in subgrade discovered during proof rolling as common excavation.
 - .1 Measure backfill of subgrade with common materials as common excavation and subgrade compaction.
 - .2 Measure backfill of subgrade with sub-base material and replacement of sub-base material under this Section.
- .3 Measure hauling granular sub-base material in tonne-kilometres computed by taking product of number of tonnes of material placed multiplied by haul distance in kilometres.
 - .1 Measure haul distance from source of material to centre of volume of material after placing, measured along shortest route determined by Departmental Representative as being feasible and satisfactory.
- .4 Measure water in units of 1000 L for water authorized by Departmental Representative and applied.
- .5 Measure compaction of granular sub-base in hours for particular compaction units employed including operator, fuel and maintenance.

1.3 REFERENCES

- .1 ASTM International
 - .1 ASTM C117-[04], Standard Test Methods for Material Finer Than 0.075 mm 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 D422-[63(2007)], Standard Test Method for Particle-Size Analysis of Soils.
 - .5 ASTM D698-[07e1], Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).

- .6 ASTM D1557-[09], Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³) (2,700kN-m/m³).
- .7 ASTM D1883-[07e2], Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- .8 ASTM D4318-[10], Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
- .3 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.
- .4 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.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Sustainable Design Submittals:
 - .1 LEED Canada-[NC Version 1.0] Submittals: in accordance with [Section 01 35 21 - LEED Requirements].
 - .2 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with [EPA 832/R-92-2005] [authorities having jurisdiction] [Section 01 35 21 - LEED Requirements].
 - .3 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.
 - .4 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Handling Requirements:

- .1 Store materials in accordance with manufacturer's recommendations
- .2 Replace defective or damaged materials with new.
- .3 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section [01 35 21 - LEED Requirements].

Part 2 Products

2.1 MATERIALS

- .1 Granular sub-base material: in accordance with Section [31 05 16 - Aggregate Materials] and following requirements:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to [ASTM C136] and [ASTM C117]. Sieve sizes to [CAN/CGSB-8.1] [CAN/CGSB-8.2].
 - .3 Table

Sieve Designation	% Passing
100 mm	-
75 mm	[100]
50 mm	-
37.5 mm	-
25 mm	[55-100]
19 mm	-
12.5 mm	-
9.5 mm	-
4.75 mm	[25-100]
2.00 mm	[15-80]
0.425 mm	[4-50]
0.180 mm	-
0.075 mm	[0-8]

- .4 Other properties as follows:
 - .1 Liquid Limit: to [ASTM D4318], Maximum 25.
 - .2 Plasticity Index: to [ASTM D4318], Maximum 6.
 - .3 Los Angeles degradation: to [ASTM C131].
 - .1 Maximum loss by mass: 40 %.
 - .4 Particles smaller than 0.02 mm: to [ASTM D422], Maximum 3%.
 - .5 Soaked CBR: to [ASTM D1883], Minimum [40] when compacted to 100% of [ASTM D1557].

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for granular sub-base installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant 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 Consultant.

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.

3.3 PLACING

- .1 Place granular sub-base after subgrade is inspected and approved by Consultant.
- .2 Construct granular sub-base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Begin spreading sub-base material on crown line or high side of one-way slope.
- .6 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
- .8 Place material to full width in uniform layers not exceeding [150] mm compacted thickness.
 - .1 Consultant may authorize thicker lifts if specified compaction can be achieved.
- .9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

- .10 Remove and replace portion of layer in which material has become segregated during spreading.

3.4 COMPACTION

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Consultant before use.
- .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compact to density of not less than 98% maximum dry density in accordance with ASTM D698.
- .5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .6 Apply water as necessary during compaction to obtain specified density.
- .7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Consultant.
- .8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 PROOF ROLLING

- .1 For proof rolling use standard roller of [45400] kg gross mass with four pneumatic tires each carrying [11350] kg and inflated to [620] kPa. Four tires arranged abreast with centre to centre spacing of [730] mm maximum.
- .2 Obtain written approval from Consultant to use non standard proof rolling equipment.
- .3 Proof roll at level in sub-base as indicated.
 - .1 If non standard proof rolling equipment is approved, Consultant will determine level of proof rolling.
- .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .5 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove sub-base and subgrade material to depth and extent as directed by Departmental Representative.
 - .2 Backfill excavated subgrade with [sub-base material and compact in accordance with this section] [common material and compact in accordance with Section [31 22 14 - Airfield Grading]].
 - .3 Replace sub-base material and compact.
- .6 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section [01 74 11 - Cleaning].
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section [01 74 11 - Cleaning].
- .3 Waste Management: separate waste materials for [reuse] [recycling] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [01 35 21 - LEED Requirements].
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 SITE TOLERANCES

- .1 Finished sub-base surface to be within [10] mm of elevation as indicated but not uniformly high or low.

3.8 PROTECTION

- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Consultant.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section [_____].

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/American Water Works Association (AWWA)
- .1 ANSI/AWWA C500-[09], Metal-Seated Gate Valves for Water Supply Service (Includes Addendum C500a-95).
- .2 ANSI/AWWA C504-[10], Rubber-Seated Butterfly Valves.
- .3 ANSI/AWWA C508-[09], Swing-Check Valves for Waterworks Service, 2 inch (50 mm) through 24 inch (600 mm) NPS.
- .2 ASTM International
- .1 ASTM C 478M-[11], Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric].
- .3 Canada Green Building Council (CaGBC)
- .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum [2007]).
- .2 LEED Canada-NC-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
- .3 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Commercial Interiors.
- .4 LEED Canada-EB: O M-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Existing Buildings: Operations and Maintenance 2009.
- .4 CSA International
- .1 CAN/CSA-A257 Series-[09], Standards for Concrete Pipe.
- .2 CSA B70-[06], Cast Iron Soil Pipe, Fittings and Means of Joining.

1.3 SCHEDULING

- .1 Schedule work to minimize interruptions to existing services.
- .2 Maintain existing sewage flows during construction.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for packaged sewage lift and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Submit drawings for civil, structural, hydraulic, mechanical and electrical elements.
- .4 Sustainable Design Submittals:
 - .1 LEED Canada submittals: in accordance with [Section 01 35 21 - LEED Requirements].
 - .2 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.
 - .3 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages of recycled content materials and products, showing their costs and percentages of post-consumer content, and total cost of materials for project.
 - .4 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.5 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section [01 78 00 - Closeout Submittals].
- .2 Operation and Maintenance Data: submit operation and maintenance data for [sewage lift station] for incorporation into manual.
- .3 Include information as follows:
 - .1 Record drawings, wiring diagrams, electrical schematics of equipment as installed.
 - .2 Interconnections with numbers and wire sizes.
 - .3 Certified pump characteristic curves.
 - .4 Detailed operation and maintenance instructions.
 - .5 Parts list comprising complete schedule clearly identified to facilitate re-ordering.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section [01 61 00 - Common Product Requirements] [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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect packaged sewer lift from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section [01 35 21 - LEED Requirements].
- .5 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [Section 01 35 21 - LEED Requirements].

Part 2 Products

2.1 DESCRIPTION

- .1 Reinforced concrete enclosure.
 - .1 Pumping system: factory assembled and disassembled for shipment with mating components clearly identified.
 - .2 Principal items of equipment to include [2] identical submersible sewage pumping units, internal piping and valves, liquid level controls, lifting chains, guide bars, debris [screen] [grate], vents complete with screens, cover, electrical wiring, control panel with circuit breakers and motor starters.
- .2 Equipment and installation including as follows:
 - .1 Temporary sheet piling.
 - .2 Excavation for sewage lift station.
 - .3 Placement of mud slab.
 - .4 Connection of power to control panel as indicated.
 - .5 Connections to [sanitary sewers] [force mains].
 - .6 Supply and installation of packaged sewage lift station in accordance with manufacturer's recommendations.
- .3 Wet well sewage lift station:
 - .1 Fully automatic, consisting of duplex submersible pumps mounted on rail system.
 - .1 Ensure control is by series of liquid level bulbs.

- .2 Ensure pumps alternate as lead pump on each cycle.
- .3 Incorporate time delay relays in control circuits to allow continuation of pump for pre-set time after normal pump shut down signal is received.
- .4 Operate both pumps when lag pump "on" water level is reached in wet well.
 - .1 Ensure lag pump shuts off when water level drops to pump "off" water level.
- .5 Locate control system in control station [mounted above lift station cover plate].

2.2 WET WELL STRUCTURE

- .1 Structure : leak free, precast reinforced concrete with access opening, ladder and designed for following forces:
 - .1 Dead load of station and components, dynamic and kinetic forces of rotating equipment.
 - .2 Dead load from soil over structure, superimposed live load of [12] kN/m² or single wheel load of [54] kN over area of [750 x 750] mm.
 - .3 Hydrostatic uplift forces.
- .2 Waterproof exterior surfaces below grade in accordance with Section [07 52 00 - Modified Bituminous Membrane Roofing].
- .3 Materials:
 - .1 Precast concrete to [ASTM C478M] [CAN/CSA-A257] and in accordance with Section [03 41 00 - Precast Structural Concrete].
 - .2 Cast-in-place concrete in accordance with Section [03 30 00 - Cast-in-Place Concrete].

2.3 PUMPS

- .1 [2] vertical, single stage, bottom suction, non-clog, heavy duty, totally submersible centrifugal pumps, direct connected to motor by solid stainless steel shaft and fitted with thrust bearings.
- .2 Volute casing: cast iron, minimum grade Class [30], close coupled.
- .3 Impeller: bronze, open in static and dynamic balance. All fasteners to be stainless steel.
- .4 Capable of passing 75 mm solid sphere.

2.4 PUMP LIFTING SYSTEM

- .1 Ensure pumps are complete with sliding guide and brackets, chains and quick leak-proof disconnect to discharge piping, all allowing for withdrawal of pumps.
- .2 Include galvanized lifting chain or stainless steel cable for each pump accessible from roof access hatches.
- .3 Use galvanized steel pipe as quick rails for pump.

2.5 SUBMERSIBLE MOTORS

- .1 Motors:
 - .1 [3] phase.
 - .2 Capable of operating pump at any point on selected impeller curve without exceeding motor nominal rating.
 - .3 Fully overload protected.
 - .4 Assembly capable of operating continuously in air without overheating.
 - .5 Complete with NEMA approved winding temperature sensor.
- .2 Motor speed: maximum 1800 rpm.
- .3 Motor enclosure and seal housing: corrosion resistant, completely watertight, cast iron.
- .4 Bearing: anti-friction type, greasable, with lubrication lines and fittings, 50,000 hours minimum, [B-10] life.
- .5 Terminal box: watertight, with waterproof cable entry glands mounted at motor.
- .6 Shaft seals: double mechanical seals with tungsten/carbide faces.
- .7 Motor leads and power cords to be sealed and locked in place using strain bushings. All cables to be waterproof.

2.6 PUMP CONTROL SYSTEM

- .1 Liquid level switches: shock-proof mercury switches enclosed in leak-proof polypropylene body.
- .2 Include independently adjustable control levels as follows:
 - .1 Lead pump start level.
 - .2 Lead pump stop level.
 - .3 Lag pump start level.
 - .4 Lag pump stop level.
 - .5 High water alarm.
- .3 Ensure lead pump and lag pump controls include alternator relay to provide automatic pump alteration for each pumping cycle when pump sequence selection switch is on automatic.

2.7 PIPING AND VALVES

- .1 Cast iron pipe, fittings and joints: to CSA B70, [100] mm minimum.
- .2 Butterfly valves: to ANSI/AWWA C504.
- .3 Gate valves: solid wedge, Class 125, flanged, to ANSI/AWWA C500.
- .4 Check valves: Class 125, swing check type, spring loaded lever, stainless steel shaft, to ANSI/AWWA C508.

2.8 ELECTRICAL CONTROL PANEL AND WIRING

- .1 Use only CSA approved components.
- .2 Electrical equipment in station in accordance with requirements for Hazardous Locations, Class 1, Group D, Division 2.
- .3 Panel enclosure to NEMA 4X weather proof of fabricated steel suitably braced, double door equipped with locking device, suitable for pole mounting.
- .4 Ensure panel is complete with required components including:
 - .1 [1] main circuit breaker with thermal magnetic trip and suitable current rating for station load.
 - .2 [1] 3 phase ground detector, neon lamp type with resistors and fuse cut-outs.
 - .3 [1] motor circuit interruptor with toggle handle for each pump motor with adjustable instantaneous trip.
 - .4 [1] magnetic full voltage starter with 120 volts coils and 3 overload relays for each pump.
 - .5 [1] time delay-relay, 2 - 50 second range, 10 amp minimum resistive contacts to prevent concurrent starting of pumps after power restoration.
 - .6 Dry contacts, normally open, on high water alarm relay for remote indication.
- .5 Mount following switches and instrumentation on door of panel:
 - .1 Pump mode selector switches for hands-off-automatic operation of each pump.
 - .2 Pump sequence selector switch to permit override of automatic pump alternation and selection of either pump to run as lead pump.
 - .3 [1] high level alarm complete with alarm relay and red light on panel door.
- .6 Terminals in circuit of start float switch of lag pump.
- .7 Ground connection lug.
- .8 Labels: all components on and inside panel to indicate operating routine.
 - .1 Labels: anodized aluminum with [5] mm minimum letters.
- .9 Schematic wiring diagram: mounted inside panel door, varnish protected.
- .10 Conductors: copper.
- .11 Control wiring: number 14 AWG minimum, stranded type TEW.
- .12 Power wire: number 12 AWG minimum, type RW 90.
- .13 Wire:
 - .1 Numbered with printed permanent indelible identifying plastic tapes to correspond to schematic diagram.
 - .2 Terminated for external control connections by tubular screw type terminal blocks with barrier and labels.
 - .3 Equipped with grommet and shields for mechanical protection.

- .4 Adequately supported and installed in accordance with written approval of Departmental Representative.

2.9 PACKAGE SYSTEM

- .1 Precast concrete enclosure complete with components specified.

2.10 SOURCE QUALITY CONTROL

- .1 Perform operational tests on pumps at factory to check for excessive vibration, for leaks in piping or seals and for correct operation of automatic control system and auxiliary equipment. Pump suction and discharge lines to be coupled to reservoir and pumps to recirculate water for minimum of [1] our under simulated service conditions.
- .2 Provide certification that pumps and controls have been factory tested and deficiencies rectified prior to delivery to site.

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 sewage lift installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant 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 Consultant.

3.2 EXCAVATION BACKFILLING AND COMPACTION

- .1 Excavate, backfill and compact in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.3 EQUIPMENT INSTALLATION

- .1 Install equipment, piping and controls in accordance with manufacturers' recommendations.

3.4 FIELD QUALITY CONTROL

- .1 After completion of installation, demonstrate functional operation of systems, including sequence of operation, to approval of Consultant.
- .2 Test in presence of Consultant and representative from equipment supplier.
- .3 Provide labour and ancillary equipment necessary to fulfill tests.
- .4 Test to demonstrate that:
 - .1 Pumps and equipment run free from heating, or vibration.

- .2 Operation meets requirements of these specifications.
- .3 Pumps and pumping are free and clear of debris and obstructions.
- .5 Replace equipment found defective.
 - .1 Repeat test until equipment is accepted by Departmental Representative.

3.5 DEMONSTRATION

- .1 Operating Personnel Training
 - .1 Provide on site training by qualified personnel for designated operating personnel prior to final commissioning.
 - .1 Schedule and deliver training in accordance with training plan approved in writing by Departmental Representative.
 - .2 Include training for [3] designated personnel on routine maintenance procedures, minor repairs, replacement of parts, including disassembly of major components.
 - .3 Include safety precaution procedures for systems.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section [01 74 11 - Cleaning].
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section [01 74 11 - Cleaning].
- .3 Waste Management: separate waste materials for [reuse] [recycling] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [01 35 21 - LEED Requirements].
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Approved: 2006-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section [_____].

1.2 MEASUREMENT PROCEDURES

- .1 Measure tree pruning for payment per tree.

1.3 REFERENCES

- .1 American National Standard Institute (ANSI)
 - .1 ANSI A300 (Part 1)-[2001], Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices (revision and re-designation of ANSI A300-1995) (includes supplements).
 - .2 ANSI A300 (Part 2)-[1998], Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices - Part 2 - Fertilization.
 - .3 ANSI A300 (Part 3)-[2000], Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance: Standard Practices - Part 3 - Tree Support Systems (a. Cabling, Bracing, and Guying) (supplement to ANSI A300-1995).
- .2 Canadian Nursery Landscape Association (CNLA)
- .3 International Society of Arboriculture (ISA)
- .4 Ontario Ministry of Agriculture, Food and Rural Affairs
 - .1 Publication 483-[2004], Pruning Ornamentals.

1.4 DEFINITIONS

- .1 Crown Cleaning: consists of selective removal of one or more of following items: dead, dying or diseased branches, weak branches and water sprouts.
- .2 Crown Thinning: consists of selective removal of branches to increase light penetration, air movement and reduce weight.
- .3 Crown Raising: consists of removal of lower tree branches to provide clearance.
- .4 Crown Reduction or Crown Shaping: decreases tree height and/or spread.
- .5 Vista Pruning: is selective thinning of framework limbs or specific crown areas to improve views.
- .6 Crown Restoration: improves structure, form and appearance of trees that have been severely headed or vandalized.

1.5 QUALITY ASSURANCE

- .1 Certification: provide International Society of Arboriculture or Canadian Nursery Landscape Association certification.
- .2 Regulatory requirements: provide safety certificate as approved by local hydro utility.
- .3 Field Samples: do sample pruning in manner to enable Departmental Representative to identify:
 - .1 Knowledge of target areas including branch bark ridge and branch collars.
 - .2 Technique for selection process and pruning used to establish desired form and shape for [each species].
- .4 Acceptance of Work will be determined by Departmental Representative from field sample.
- .5 Health and Safety Requirements: do construction occupational health and safety in accordance with Section [01 35 29.06 - Health and Safety Requirements].

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Dispose of unused disinfectant at official hazardous material collections site approved by Departmental Representative.
- .4 Ensure emptied containers are sealed and stored safely.
- .5 Divert wood materials from landfill for composting as directed by Departmental Representative.

1.7 TOOL MAINTENANCE

- .1 Ensure that tools are clean and sharp throughout pruning operation: do not use tools that crush or tear bark.
- .2 Disinfect tools before each tree is pruned.
- .3 On diseased plant material disinfect tools before each cut.

Part 2 Products

2.1 DISINFECTANT

- .1 20% solution of sodium hypochlorite or 70% solution of ethyl alcohol.

Part 3 Execution

3.1 APPLICATION

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

3.2 GENERAL

- .1 Prune in accordance with Pruning Ornamentals ANSI A300, and as directed by Departmental Representative. Where discrepancies occur between standard and specifications, specifications govern.
- .2 Notify immediately Departmental Representative conditions detrimental to health of plant material or operations.
- .3 Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below [minus 10 degrees C].
- .4 Prune each species when in full leaf.
- .5 Retain natural form and shape of plant species.
- .6 Do not:
 - .1 Flush cut branches.
 - .2 Crush or tear bark.
 - .3 Cut behind branch bark ridge.
 - .4 Damage branch collars.
 - .5 Damage branches to remain.

3.3 PRUNING

- .1 Remove dead, dying, diseased and weak growth from plant material in order to promote healthy growth.
- .2 Remove live branches that:
 - .1 Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.
 - .2 Are of weak structure including narrow crotches.
 - .3 Obstruct development of more important branches.
 - .4 Are broken.
- .3 Remove live branches to re-establish natural species form including:
 - .1 One or more developing leaders.
 - .2 Multiple growth due to previous topping.
 - .3 Branches extending outward from natural form.
 - .4 Undesirable sucker growth.

- .4 Remove loose branches, twigs and other debris lodged in tree.
- .5 Remove vines.
- .6 For branches under [50] mm in diameter:
 - .1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to branch bark ridge.
 - .2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.
 - .3 Do not cut lead branches unless directed by Departmental Representative.
- .7 For branches greater than [50] mm in diameter:
 - .1 Make first cut on lower side of branch 300 mm from trunk, one third diameter of branch.
 - .2 Make second cut on upper side of branch 500 mm from trunk until branch falls off.
 - .3 Make final cut adjacent to and outside branch collar.
- .8 Ensure that trunk bark and branch collar are not damaged or torn during limb removal.
 - .1 Repair areas which are damaged, or remove damaged area back to next branch collar.
- .9 Remove additional growth designated by Departmental Representative.

3.4 ROOT GIRDLING

- .1 For girdling roots one-quarter size of trunk diameter or larger, V-cut girdling root one-half way through at point where root is crossing.
- .2 Remove exposed portion of girdling root as directed by Departmental Representative after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

3.5 CARE OF WOUNDS

- .1 Shape bark around wound to oblong configuration ensuring minimal increase in wound size. Retain peninsulas of existing live bark.

3.6 CLEAN-UP

- .1 Proceed in accordance with Section [01 74 11 - Cleaning].
- .2 Collect and compost/recycle whenever applicable pruned material daily and remove from site.
- .3 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Approved: 2012-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section [_____].

1.2 PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION

- .1 Departmental Representative will supply material as follows:
 - .1 [_____].

1.3 MEASUREMENT PROCEDURES

- .1 Measure trenching and backfilling, other than granular bedding and surround in accordance with Section [31 23 33.01 - Excavating, Trenching and Backfilling].
- .2 Measure water main [including trenching and backfilling], in metres of each size of pipe installed.
 - .1 Horizontal measurement will be made over surface, through valves and fittings, after work has been completed.
 - .2 Measure lateral connections from water main to hydrants as water main and include curb valve and adjustable valve box.
- .3 Measure tunnelling, boring or jacking for under crossings, including encasing pipes and grouting, in metres, as indicated.
- .4 Measure hydrants [including excavation and backfilling], in units installed.
- .5 Measure service connections [including trenching and backfilling], in metres of each size of pipe installed.
- .6 Measure valves in units installed [including] [excavation and backfilling], [valves and valve boxes] [and thrust blocks].
- .7 Measure valve chambers [including excavation and backfilling], in units installed.
- .8 Measure granular bedding and surround material in [cubic metres] [tonnes].
- .9 Measure concrete for bedding, encasement of pipes, supports [and thrust blocks] in cubic metres.

1.4 REFERENCES

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA B300-[10], Standard for Hypochlorites.
 - .2 ANSI/AWWA B301-[10], Standard for Liquid Chlorine.
 - .3 ANSI/AWWA B303-[10], Standard for Sodium Chlorite.

- .4 ANSI/AWWA C104/A21.4-[08], Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
- .5 ANSI/AWWA C105/A21.5-[10], Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
- .6 ANSI/AWWA C111/A21.11-[07], American National Standard for Rubber-Gasket Joints for Ductile-Iron and Fittings.
- .7 ANSI/AWWA C110/A21.10-[08], American National Standard for Ductile-Iron and Gray Iron Fittings for Water.
- .8 ANSI/AWWA C150/A21.50-[08], Standard for Thickness Design of Ductile-Iron Pipe.
- .9 ANSI/AWWA C151/A21.51-[09], Standard for Ductile-Iron Pipe, Centrifugally Cast.
- .10 ANSI/AWWA C153/A21.53-[11], Standard for Ductile-Iron Compact Fittings.
- .11 ANSI/AWWA C200-[05], Standard for Steel Water Pipe - 6 Inch (150 mm) and Larger.
- .12 ANSI/AWWA C203-[08], Standard for Coal Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.
- .13 ANSI/AWWA C205-[07], Standard for Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 Inch (100 mm) and Larger - Shop Applied.
- .14 ANSI/AWWA C206-[11], Standard for Field Welding of Steel Water Pipe.
- .15 ANSI/AWWA C207-[07], Standard for Steel Pipe Flanges for Waterworks Service, 4 Inch through 144 Inch (100 mm through 3,600 mm).
- .16 ANSI/AWWA C208-[07], Standard for Dimensions for Fabricated Steel Water Pipe Fittings.
- .17 ANSI/AWWA C300-[11], Standard for Reinforced Concrete Pressure Pipe, Steel-Cylinder Type.
- .18 ANSI/AWWA C301-[07], Standard for Prestressed Concrete Pressure Pipe, Steel-Cylinder Type.
- .19 ANSI/AWWA C303-[08], Standard for Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type.
- .20 ANSI/AWWA C500-[09], Standard for Metal-Seated Gate Valves for Water Supply Service.
- .21 ANSI/AWWA C504-[10], Standard for Rubber-Seated Butterfly Valves.
- .22 ANSI/AWWA C600-[10], Standard for Installation of Ductile-Iron Water Mains, and Their Appurtenances.
- .23 ANSI/AWWA C602-[11], Standard for Cement-Mortar Lining of Water Pipelines - 4 Inch (100 mm) and Larger.
- .24 ANSI/AWWA C651-[05], Standard for Disinfecting Water Mains.
- .25 ANSI/AWWA C800-[05], Standard for Underground Service Line Valves and Fittings.

- .26 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.
- .2 ASTM International
 - .1 ASTM A53/A53M-[10], Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.
 - .2 ASTM A123/A123M-[09], Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM A307-[10], Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
 - .4 ASTM B88M-[05(2011)], Standard Specification for Seamless Copper Water Tube [Metric].
 - .5 ASTM C117-[04], Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .6 ASTM C136-[06], Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .7 ASTM C478M-[11], Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric].
 - .8 ASTM D698-[07e1], Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - .9 ASTM D2310-[06], Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe.
 - .10 ASTM D2657-[07], Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
 - .11 ASTM D2992-[06], Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fitting.
 - .12 ASTM D2996-[01(2007) e1], Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe.
 - .13 ASTM F714-[10], Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
 - .14 ASTM C618-[08a], Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- .3 American Water Works Association (AWWA)/Manual of Practice
 - .1 AWWA M9-[2008], Concrete Pressure Pipe.
 - .2 AWWA M11-[2004], Steel Pipe - A Guide for Design and Installation.
 - .3 AWWA M17-[2006], Installation, Field Testing, and Maintenance of Fire Hydrants.
- .4 Canada Green Building Council (CaGBC)

- .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum [2007]).
- .2 LEED Canada-NC-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
- .3 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Commercial Interiors.
- .4 LEED Canada-EB: O M-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Existing Buildings: Operations and Maintenance 2009.
- .5 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 CAN/CGSB-34.1-[94], Pipe, Asbestos Cement, Pressure.
 - .4 CGSB 41-GP-25M-[77], Pipe, Polyethylene, for the Transport of Liquids.
- .6 CSA International
 - .1 CAN/CSA-A257 Series-[09], Standards for Concrete Pipe (Consists of A257.0, A257.1, A257.2, A257.3 and A257.4).
 - .2 CAN/CSA-A3000-[08], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .3 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.
 - .4 CSA G30.18-[09], Carbon and Steel Bars for Concrete Reinforcement.
- .7 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - [current edition].
- .8 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.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for [distribution piping materials] and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Pipe certification to be on pipe.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in [Province] [~~Territory~~] of [Ontario], Canada.
 - .2 Submit complete drawings and construction schedule for water mains [600] mm diameter and larger. Include method for installation of water main.
- .4 Samples:
 - .1 Submit: [3].
 - .2 Inform Departmental Representative of proposed source of bedding materials and provide access for sampling at least [4] weeks prior to commencing work.
 - .3 Submit for testing [4] weeks minimum prior to beginning work, samples of materials proposed for use as follows:
 - .1 [_____].
 - .4 Submit manufacturer's test data and certification that pipe materials meet requirements of this section [4] weeks minimum prior to beginning work. Include manufacturer's drawings, information and shop drawings where pertinent.
- .5 Sustainable Design Submittals:
 - .1 LEED Canada submittals: in accordance with [Section 01 35 21 - LEED Requirements].
 - .2 Construction Waste Management:
 - .1 Submit project [Waste Management Plan] [Waste Reduction Workplan] highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that [50] [~~75~~] % of construction wastes were recycled or salvaged.
 - .3 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages of recycled content materials and products, showing their costs and percentages of [post-consumer] [post-industrial] content, and total cost of materials for project.
 - .2 Submit evidence, when Supplementary Cementing Materials (SCMs) are used, to certify [reduction in cement from Base Mix to Actual SCMs Mix, as percentage].
 - .4 Regional Materials: submit evidence that project incorporates required percentage [10] [~~20~~] % of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.6 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section [01 78 00 - Closeout Submittals].
- .2 Submit [data to produce] record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details.
 - .1 Include top of pipe, horizontal location of fittings and type, valves, valve boxes, valve chambers and hydrants.
- .3 Operation and Maintenance Data: submit operation and maintenance data for [pipe, valves, valve boxes, valve chambers and hydrants] for incorporation into manual.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section [01 61 00 - Common Product Requirements] [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 [off ground] [indoors] [in dry location] and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect [water distribution piping] from [nicks, scratches, and blemishes].
 - .3 Replace defective or damaged materials with new.
- .4 Develop [Construction Waste Management Plan] [Waste Reduction Workplan] related to Work of this Section and in accordance with Section [01 35 21 - LEED Requirements].
- .5 Packaging Waste Management: remove for reuse [and return] [by manufacturer] of [pallets,] [crates,] [padding,] [packaging materials] as specified in [Construction Waste Management Plan] [Waste Reduction Workplan] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [Section 01 35 21 - LEED Requirements].

1.8 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 [building] [occupants] [superintendent] minimum of [24] hours in advance of interruption in service.
- .4 Do not interrupt water service for more than [4] hours and confine this period between [10:00] [16:00] hours local time unless otherwise authorized.
- .5 Notify fire department of planned or accidental interruption of water supply to hydrants.
- .6 Provide and post "Out of Service" sign on hydrant not in use.

- .7 Advise local police department of anticipated interference with movement of traffic.

1.9 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section [01 78 00 - Closeout Submittals].
- .2 Tools: provide tools as follows:
- .1 [_____] service post wrenches for curb stops.
 - .2 [_____] hydrant wrenches.
 - .3 [_____] tee-handle operating keys for valves.

Part 2 Products

2.1 PIPE, JOINTS AND FITTINGS

- .1 Ductile iron pipe: to [ANSI/AWWA C151/A21.51], pressure class [_____] for [_____] kPa [cement mortar lined to ANSI/AWWA C104/A21.4.]
- .2 Joints and fittings for [ductile iron] pipe.
- .1 Joints:
 - .1 Push-on joints: to [ANSI/AWWA C111/A21.11].
 - .2 Rubber gasket for mechanical pipe joints: to [ANSI/AWWA C111/A21.11].
 - .3 Rubber gasket for flange pipe joints [1.6] mm thick: to [ANSI/AWWA C111/A21.11].
 - .4 Bolts, nuts, hex head with washers: to [ASTM A307], heavy series.
 - .5 Ensure electrical conductivity across joints.
 - .2 Fittings:
 - .1 Mechanical joint cast iron and ductile iron fittings NPS [3] and larger: to [ANSI/AWWA C110/A21.10].
 - .2 Flanged cast iron fittings NPS 3 and larger: to [ANSI/AWWA C110/A21.10].
 - .3 Compact Fittings to [ANSI/AWWA C153/A21.53].
- .3 Reinforced concrete pipe: to [CAN/CSA-A257] [ANSI/AWWA C300] [ANSI/AWWA C301] [ANSI/AWWA C303] class [_____] .
- .1 Pipe joints: [flanged to ANSI/AWWA C207] [push-on joints with performance requirements to [ANSI/AWWA C111/A21.11]].
 - .2 Fitting joints: [flanged to ANSI/AWWA C207] [push-on with performance requirements to ANSI/AWWA C111/A21.11].
 - .3 Pipe fittings: reinforced concrete to [ANSI/AWWA C301] [ANSI/AWWA C303].
- .4 Polyvinyl chloride pressure pipe: to [ANSI/AWWA C900], pressure class 150, DR 18, 1 MPa [gasket bell end], [cast iron outside diameter].

- .1 CAN/CSA-B137.3, PVC series 160, 1.1 MPa elastomeric gasket [coupling].
- .2 Composite epoxy impregnated fibreglass PVC pipe to [ASTM D2996], class H. Unplasticized PVC core over wrapped with bonded fibreglass reinforced epoxy resin. Pressure class 300, 2.4 MPa with cast iron outside diameter and integral bell gasketed joints to [ANSI/ASTM D2992]. Material to [ASTM D2310], classification RTRP-11HZ-5001-PVC-13223.
- .3 Cast iron fittings: to [ANSI/AWWA C110/A21.10], and for pipe diameters larger than NPS 4 [cement mortar lined to ANSI/AWWA C104/A21.4].
- .5 Polyethylene pressure pipe:
 - .1 NPS 1/2 to NPS 6: to [CAN/CSA-B137.1 type [PE 3406] [160]] [ASTM F714, type [PE 3408] [DR 11]].
 - .2 [90] mm to [1600] mm: to [CGSB 41-GP-25M], type [PE 1404], series [250].
 - .3 Polyethylene to polyethylene joints: to be [thermal butt fusion joined, to ASTM D2657] [flanged with [steel] [aluminum] [ductile iron] backing flanges].
 - .4 Cast iron fittings with flanged ends: to [ANSI/AWWA C110/A21.10] for pipe size above NPS 4, [Cement mortar lined to ANSI/AWWA C104/A21.4].
 - .5 Polyethylene fittings: to [CAN/CSA-B137.1], for pipe sizes NPS 4 and less.
- .6 Steel water pipe: to [ASTM A53] [ANSI/AWWA C200] wall thickness [_____] mm, Grade [A] [B] [steel] [electrically welded] [seamless].
 - .1 Exterior finish: to [ANSI/AWWA C203].[hot applied coal tar enamel] [hot applied coal tar tape] [polyethylene jacket]
 - .2 Interior finish: to [ANSI/AWWA C205], cement mortar lined.
 - .3 Pipe joints: to be [mechanical joints] [field welded slip joints] [butt welded joints] [field welded butt straps] [riveted joints] [rubber gasket bell and spigot joints] [flanged joints] [field driven joints] [threaded joints].
 - .4 Flanges: to [ANSI/AWWA C207], class [B] [D] [E] [ring] [hub] type.
 - .5 Pipe fittings: to [ANSI/AWWA C208], cement mortar lined to [ANSI/AWWA C205], and exterior protected with [hot applied coal tar enamel] [hot applied coal tar tape] to [ANSI/AWWA C203].

2.2 PIPE PROTECTION

- .1 Provide means of protection for iron pipe in corrosive soils in accordance with [local practices] [authorities having jurisdiction] [to ANSI/AWWA C105/A21.5].

2.3 VALVES AND VALVE BOXES

- .1 Valves to open [clockwise] [counter clockwise] in same direction as local standard. Verify direction of opening with local authorities.
- .2 Gate valves: to [ANSI/AWWA C500], standard iron body, [brass] [bronze] mounted [wedge] [double disc] valves with non-rising stems, suitable for 1 Pa with [mechanical] [flanged] [push-on] [grooved type coupling] joints.

- .3 Butterfly valves: to [ANSI/AWWA C504], [short body] [long body], class [1] MPa with [mechanical] [flanged] joints.
- .4 Underground type indicator valve where indicated. Indicator post to accurately indicate valve open or closed. [Valve to be electrically supervised.]
- .5 Air and vacuum release valves: heavy duty combination air release valves employing direct acting kinetic principle.
 - .1 Fabricate valves of cast iron body and cover, with bronze trim, stainless steel floats with shock-proof synthetic seat suitable for [2] MPa working pressure.
 - .2 Valves to expel air at high rate during filling, at low rate during operation, and to admit air while line is being drained.
 - .3 Valve complete with surge check unit.
 - .4 Ends to be flanged to [ANSI/AWWA C110/A21.10].
- .6 Cast iron valve boxes: [bituminous coated screw type] [three piece sliding type] adjustable over minimum of [450] mm [complete with valve operating extension rod, [150] mm below cover].
 - .1 Base to be large round type with minimum diameter of [300] mm.
 - .2 Top of box to be marked "WATER"/"EAU".

2.4 VALVE CHAMBERS

- .1 Concrete and reinforcing steel: to Section [03 30 00 - Cast-in-Place Concrete] and Section [03 20 00 - Concrete Reinforcing].
- .2 Precast concrete sections to [ASTM C478M]. Cast ladder rungs integral with unit; field installation not permitted.
- .3 Valve chamber frames and covers: gray iron castings, minimum tensile strength [200] MPa, with two coats, shop applied, approved asphalt coating [with a mass of approximately [215] kg per set].
 - .1 Design and dimensions as indicated.
 - .2 Cover to be marked "WATER"/"EAU" .
- .4 Jointing materials:
 - .1 [Manufacturer's rubber ring gaskets.]
 - .2 [Mastic joint filler.]
 - .3 [Cement mortar.]
 - .4 [Combination of above types.]
- .5 Mortar:
 - .1 Aggregate in accordance with Section [04 05 12 - Mortar and Masonry Grout].
 - .2 Masonry cement to CAN/CSA-A3000.
- .6 Ladder rungs for valve chambers: [20] mm diameter deformed rail steel bars to [CSA G30.18], hot-dipped galvanized after fabrication to [ASTM A123/A123M]. Rungs to be safety pattern.

2.5 SERVICE CONNECTIONS

- .1 Copper tubing: to [ASTM B88M] type K, annealed.
- .2 Ductile iron pipe: to [ANSI/AWWA C151/A21.51] pressure class [_____] for [_____] kPa [cement mortar lined to ANSI/AWWA C104/A21.4].
- .3 Polyvinyl chloride pressure pipe: to [CAN/CSA-B137.3], type [1120] series [160] [1.1 MPa].
- .4 Polyethylene pressure pipe:
 - .1 To [CAN/CSA-B137.1, type PE, series [160]] [ASTM F714, Type PE, series DR 11]].
 - .2 [90] mm to [1600] mm: to [CGSB 41-GP-25M], [type PE], series [250].
- .5 Copper tubing joints: compression type suitable for 1 MPa working pressure.
- .6 PVC joints: solvent welded in accordance with manufacturer's specifications.
- .7 Polyethylene pipe joints: [thermal butt fusion welded] [plastic insert type serrated sleeves with four stainless steel screws and band-type clamps per joint].
- .8 Joints for ductile iron pipe: push-on joints to [ANSI/AWWA C111/A21.11]. Rubber gaskets to [ANSI/AWWA C111/A21.11]. [Verify requirement to maintain electrical conductivity between pipes.]
- .9 Brass corporation stops: red brass to [_____] , [compression type] having threads to [ANSI/AWWA C800].
- .10 Brass inverted key-type curb stops: red brass to [ASTM B62], compression type [with] [without] drains.
 - .1 Curb stops to have adjustable [bituminous coated] cast iron service box with stem to suit depth of bury.
 - .2 Top of cast iron box marked "WATER"/"EAU".
- .11 Polyethylene tapping tees or multi-saddle tees: for Polyethylene pipe. Tees to be socket fused to pipe.
- .12 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.
- .13 Bronze type service clamps: for PVC pipe service connections.
 - .1 Service clamps to be of strap-type, with confined "O" ring seal cemented in place.
 - .2 Clamps to be tapped with threads to [ANSI/AWWA C800].

- .14 Tee connections: for services above NPS 1. 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.
- .15 [_____] mm diameter stainless steel liners for plastic pipe where pipe is used with compression fitting.

2.6 HYDRANTS

- .1 [Post type] hydrants: compression type hydrant, to [CAN/ULC-S520], designed for working pressure of [1034] kPa with two [65] mm [threaded] hose outlets, one [100] mm [threaded] pumper connection, [150] mm riser barrel, [125] mm bottom valve and [150] mm connection for main.
 - .1 Hydrants to open [counter clockwise], [threads to local standard], [fittings to be internal lug quick-connect to CAN/ULC-S543]. [Provide metal caps and chains.]
 - .2 Provide key operated gate valve located [1] m from hydrant.
 - .3 Depth of bury [1.5] m.
- .2 Hydrant paint: exterior enamel to [MPI #96].

2.7 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular material to: Section [31 05 16 - Aggregate Materials] and following requirements:
 - .1 Crushed or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to [ASTM C136] [ASTM C117]. Sieve sizes to [CAN/CGSB-8.1] [CAN/CGSB-8.2].
 - .3 Table

Sieve Designation	% Passing	
Stone/Gravel	Gravel/Sand	
200 mm	-	-
75 mm	-	-
50 mm	-	-
38.1 mm	-	-
25 mm	[100]	-
19 mm	-	-
12.5 mm	[65-90]	[100]
9.5 mm	-	-
4.75 mm	[35-55]	[80-100]
2.00 mm	-	[50- 90]
0.425 mm	[10-25]	[10- 50]
0.180 mm	-	-
0.075 mm	[0- 8]	[0- 10]

- .2 Concrete mixes and materials required for bedding cradles, encasement, supports, thrust blocks: to Section [03 30 00 - Cast-in-Place Concrete].

2.8 BACKFILL MATERIAL

- .1 [As indicated.] [Type [3] [31 23 33.01 - Excavating, Trenching and Backfilling] .]

2.9 PIPE DISINFECTION

- .1 [Sodium hypochlorite] [Calcium hypochlorite] [Liquid chlorine] [Sodium chlorite] to [ANSI/AWWA B300] [ANSI/AWWA B301] [ANSI/AWWA B303] to disinfect water mains.
- .2 Disinfect water mains in accordance with [ANSI/AWWA C651].

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 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 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.
- .1 Inspect materials for defects to approval of Departmental Representative.
- .2 Remove defective materials from site as directed by Departmental Representative.

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 [1.7] m minimum from finished grade [or as indicated].
- .3 Trench alignment and depth require Departmental Representative's approval prior to placing bedding material and pipe.

3.4 CONCRETE BEDDING AND ENCASEMENT

- .1 Do concrete work in accordance with Section [03 30 00 - Cast-in-Place Concrete].

- .1 Place concrete to details [as indicated] [as directed by Departmental Representative].
- .2 Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
- .3 Do not backfill over concrete within [24] hours after placing.

3.5 GRANULAR BEDDING

- .1 Place granular bedding material in uniform layers not exceeding [150] mm compacted thickness [to depth as indicated] [to depth of [150] mm 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 [[98] % minimum of corrected maximum dry density] [[98] % maximum density to ASTM D698].
- .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] [compacted type 3 fill] [lean mix concrete].

3.6 PIPE INSTALLATION

- .1 Terminate building water service [at property line] [[1] m outside building wall] opposite point of connection to main.
 - .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 [ANSI/AWWA C600] [ANSI/AWWA [M-9] [M-11]] manufacturer's standard instructions and specifications.
 - .1 Do not use blocks except as specified.
- .3 Join pipes in accordance with [ANSI/AWWA C600] [ANSI/AWWA C602] [ANSI/AWWA C206] [AWWA [M-9] [M-11]] manufacturer's recommendations.
- .4 Bevel or taper ends of PVC pipe to match fittings.
- .5 Handle pipe by methods [recommended by pipe manufacturer] [approved by Departmental Representative]. 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 Position and join pipes with equipment and methods approved by Departmental Representative.
- .11 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.
- .12 Align pipes before jointing.
- .13 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.
- .14 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.
- .15 Complete each joint before laying next length of pipe.
- .16 Minimize deflection after joint has been made.
- .17 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- .18 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Departmental Representative.
- .19 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- .20 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.
- .21 Do not lay pipe on frozen bedding.
- .22 Do hydrostatic and leakage test and have results approved by Departmental Representative before surrounding and covering joints and fittings with granular material.
- .23 Backfill remainder of trench.

3.7 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 [concrete located between valve and solid ground.] [Bedding same as adjacent pipe.] [Maximum length of pipe on each end of valve shall be [1] m.] Valves not to be supported by pipe.
- .3 Install underground post-type indicator valves as indicated.

3.8 VALVE CHAMBERS

- .1 Use [cast-in-place] [precast] units as approved by Departmental Representative.
- .2 Construct units as indicated, plumb and centred over valve nut, true to alignment and grade, and not resting on pipe.
- .3 Place reinforcing steel and miscellaneous metals required to be embedded in concrete to details indicated and in accordance with Section [03 30 00 - Cast-in-Place Concrete].
- .4 [Cast bottom slabs for precast units directly on undisturbed ground] [when permitted by Departmental Representative [150] mm minimum of compacted granular bedding].
- .5 Set bottom section of precast unit in bed of cement mortar and bond to bottom slab.
 - .1 Make each successive joint watertight with approved rubber ring gaskets, mastic joint filler, cement mortar, or combination thereof.
- .6 Clean surplus mortar and joint compounds from interior surface of valve chamber as work progresses.
- .7 Plug lifting holes with [precast concrete plugs set in cement mortar] [mastic compound] [mortar].
- .8 Set frame and cover to required elevation on [at least [four] courses of brick].
 - .1 Make brick joints and join brick to frame with cement mortar, parge and trowel smooth. [Concrete ring with preformed bituminous gasket.]
- .9 Place frame and cover on top section to elevation indicated. If adjustment is required use concrete ring.
- .10 Clean valve chambers of debris and foreign materials; remove fins and sharp projections.

3.9 UNDERCROSSING

- .1 Excavate working pit [to dimensions indicated,] outside [right-of-way] [facility] to be crossed.
- .2 Excavate working pit to not less than [0.6] m below lowest invert of [encasing] pipe.
- .3 Dewater excavation.
- .4 Dewater area of undercrossing.
- .5 Install [heavy timber] [steel frame] backstop.
- .6 Place encasing pipe to exact line and grade indicated. Encasing pipe to cross under obstruction at an angle of [_____] degrees.
- .7 Install encasing pipe by [jacking] [boring] [tunnelling].

- .8 Ensure encasing pipe is not in tension.
- .9 Joints for encasing pipe: [mechanical] [welded] type.
- .10 Place concrete grout levelling pad in encasing pipe. Control level of grout during placing.
- .11 Insert water main into encasing pipe, in end with largest open area, after placement of levelling pad.
- .12 Use approved blocking method to guide water main in true alignment.
- .13 Clearance between blocks and encasing pipe: maximum [15] mm when water main is in position.
- .14 Join water main one length at time outside encasing pipe. [Push] [Pull] water main into position.
- .15 Couplings of water main shall not rest on levelling pad when water main is in position.
- .16 Place concrete cradle around water main after it is positioned. Cradle to be minimum of [225] mm and maximum of [300] mm above levelling pad.
- .17 Pressure grout remaining void, with[_____] kPa, maximum pressure with mixture of [1] part Portland cement and [2] parts clean washed sand, with only sufficient water added to allow placing. [Do not use additives.]

3.10 SERVICE CONNECTIONS

- .1 Terminate building water service [at property line] [[1] m outside building wall] opposite point of connection to main.
 - .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 and leakage tests of water main.
- .3 Construct service connections at right angles to water main unless otherwise directed. Locate curb stops [300] mm inside [right-of-way] [roadway allowance].
- .4 Tappings on ductile iron, [asbestos cement] or PVC-C900 pipe, may be threaded without service clamps.
 - .1 Double strap service connections with galvanized malleable iron body and neoprene gasket cemented in place may be used.
 - .2 [Tappings on asbestos-cement must use double strap service clamps.]
 - .3 Tappings for asbestos cement or PVC-C900 pipe to conform to following:

Pipe Diameter (mm)	Maximum Tap Without Clamp (mm)	Maximum Tap With Clamp (mm)
100	20	25
150	20	40
200	25	50
250	25	50

300	40	75
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.5 Maximum dried direct tappings (mm) for ductile iron pipe to conform to:

Nominal Pipe Size (mm)	Pressure Class/Max.				
150	200	250	300	350	
75	-	-	-	-	19
102	-	-	-	-	19
152	-	-	-	-	25
203	-	-	-	-	25
254	-	-	-	-	25
305	-	-	-	-	32
356	-	-	32	38	38
406	-	-	38	50	50
457	-	-	50	50	50
508	-	-	50	50	50
610	-	50	50	50	50
762	50	50	50	50	50

- .6 Tappings on PVC pipe to be either PVC valve tees or [bronze type service clamps, strap type with "O" ring seal cemented in place].
- .7 Tappings for PE pipe: PE tapping tees or multi-saddle tees.
- .8 Employ only competent workmen equipped with suitable tools to carry out tapping of mains, cutting and flaring of pipes.
- .9 Install single and multiple tap service connections on top half of main, between 45 degrees and 90 degrees measured from apex of pipe.
- .10 Install multiple corporation stops, [30 degrees] apart around circumference of pipe and minimum of [300] mm apart along pipe.
- .11 Tap main at 2:00 o'clock or 10:00 o'clock position only; not closer to joint nor closer to adjacent service connections than recommended by manufacturer, or 1 m minimum, whichever is greater.
- .12 Leave corporation stop valves fully open.
- .13 In order to relieve strain on connections, install service pipe in "Goose Neck" form "laid over" into horizontal position.
- .14 Install rigid stainless steel liners in small diameter plastic pipes with compression fittings.
- .15 Install curb stop with corporation box on services NPS 2 or less in diameter.
 - .1 Equip larger services with gate valve and cast iron box.
 - .2 Set box plumb over stop and adjust top flush with final grade elevation.
 - .3 Leave curb stop valves fully closed.
- .16 Place temporary location marker at ends of plugged or capped unconnected water lines.
 - .1 Each marker to consist of [38 x 89] mm stake extending from pipe end at pipe level to [600] mm above grade.

- .2 Paint exposed portion of stake [red] with designation "WATER SERVICE LINE" in [black].

3.11 HYDRANTS

- .1 Install hydrants at locations as indicated.
- .2 Install hydrants in accordance with [AWWA M17].
- .3 Install [150] mm gate valve and cast iron valve box on hydrant service leads as indicated.
- .4 Set hydrants plumb, with hose outlets parallel with edge of pavement or curb line, with pumper connection facing roadway and with body flange set at elevation of 50 mm above final grade.
- .5 Place concrete thrust blocks as indicated and specified [ensuring that drain holes are unobstructed].
- .6 To provide proper draining for each hydrant, excavate pit measuring not less than [1 x 1 x 0.5] m deep and backfill with coarse gravel or crushed stone to level [150] mm above drain holes.
- .7 Place appropriate sign on installed hydrants indicating whether or not they are in service during construction.

3.12 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 [24] hours after placing.
- .5 For restrained joints: only use restrained joints approved by Departmental Representative.

3.13 HYDROSTATIC AND LEAKAGE TESTING

- .1 Do tests in accordance with ANSI/AWWA [C600].
- .2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.
- .3 Notify Departmental Representative at least [24] 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 or [2] days if high early strength concrete is used.
- .5 Test pipeline in sections not exceeding [365] m in length, unless otherwise authorized by Departmental Representative.

- .6 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes between joints with approved granular material placed [to dimensions indicated] or [as directed by Departmental Representative].
- .7 Leave hydrants, valves, joints and fittings exposed.
- .8 When testing is done during freezing weather, protect hydrants, valves, joints and fittings from freezing.
- .9 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.
- .10 Open valves.
- .11 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.
- .12 Fill asbestos cement pipe and concrete pipe at least [24] hours before testing to allow water absorption by pipe material.
- .13 Thoroughly examine exposed parts and correct for leakage as necessary.
- .14 Apply hydrostatic test pressure of [1034] kPa minimum based on elevation of lowest point in main and corrected to elevation of test gauge, for period of [1] hour.
- .15 Examine exposed pipe, joints, fittings and appurtenances while system is under pressure.
- .16 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.
- .17 Repeat hydrostatic test until defects have been corrected.
- .18 Apply leakage test pressure of [1034] 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.
- .19 Define leakage as amount of water supplied from water [storage tank] [metre] in order to maintain test pressure for [2] hours.
- .20 Do not exceed allowable leakage of [0.03] L/mm of pipe, including lateral connections.
- .21 Locate and repair defects if leakage is greater than amount specified.
- .22 Repeat test until leakage is within specified allowance for full length of water main.

3.14 PIPE SURROUND

- .1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated.
- .2 Hand place surround material in uniform layers not exceeding [150] mm compacted thickness as indicated.
 - .1 Do not dump material within [1.5] m of pipe.

- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Do not place material in frozen condition.
- .5 Compact each layer from pipe invert to [mid height] of pipe to at least [[98] % of corrected maximum dry density] [[98] % maximum density to ASTM D698].
- .6 Compact each layer from [mid height] of pipe to underside of backfill to at least [[90] % of corrected maximum dry density] [[90] % maximum density to ASTM D698].

3.15 BACKFILL

- .1 Place backfill material, above pipe surround, in uniform layers not exceeding [150] mm compacted thickness up to grades as indicated.
- .2 Do not place backfill in frozen condition.
- .3 Under paving and walks, compact backfill to at least [98% maximum density to ASTM D698] [[98] % corrected maximum dry density].
 - .1 In other areas, compact to at least [95% corrected maximum dry density] [[95] % maximum density to ASTM D698].

3.16 HYDRANT FLOW TESTS

- .1 Conduct flow tests on every hydrant to determine fire flows prior to painting hydrant caps and ports.

3.17 PAINTING OF HYDRANTS

- .1 After installation, paint hydrants [red] [yellow].
- .2 After hydrant flow tests, paint caps and ports to meet colour selections approved by authority having jurisdiction.

3.18 FLUSHING AND DISINFECTING

- .1 Flushing and disinfecting operations: [under direct control of] [witnessed by] Departmental Representative [carried out by specialist contractor] [local water work department].
 - .1 Notify Departmental Representative at least [4] days in advance of proposed date when disinfecting operations will begin.
 - .2 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of [1.5] m/s, within pipe for minimum [10] minutes, or until foreign materials have been removed and flushed water is clear.
 - .3 Flushing flows as follows:

Pipe Size NPS	Flow (L/s) Minimum
6 and below	38
8	75
10	115
12	150

- .4 Provide connections and pumps for flushing as required.
- .5 Open and close valves, hydrants and service connections to ensure thorough flushing.
- .6 When flushing has been completed to Departmental Representative approval, [introduce strong solution of chlorine as approved by Departmental Representative into water main and ensure that it is distributed throughout entire system].
- .7 [Disinfect water mains.] [Specialist contractor to perform disinfection.] [Disinfect water mains to the requirements of local authority.]
- .8 Rate of chlorine application to be proportional to rate of water entering pipe.
- .9 Chlorine application to be close to point of filling water main and to occur at same time.
- .10 Operate valves, hydrants and appurtenances while main contains chlorine solution.
- .11 Flush line to remove chlorine solution after [24] hours.
- .12 Measure chlorine residuals at extreme end of pipe-line being tested.
- .13 Perform bacteriological tests on water main, after chlorine solution has been flushed out.
 - .1 Take samples daily for minimum of [2] days.
 - .2 Should contamination remain or recur during this period, repeat disinfecting procedure.
 - .3 [Specialist contractor to submit certified copy of test results.]
- .14 Take water samples at hydrants and service connections, in suitable sequence, to test for chlorine residual.
- .15 After adequate chlorine residual [not less than [50] ppm] has been obtained leave system charged with chlorine solution for [24] hours.
 - .1 After [24] hours, take further samples to ensure that there is still not less than [10] ppm of chlorine residual remaining throughout system.

3.19 SURFACE RESTORATION

- .1 After installing and backfilling over water mains, restore surface to original condition as directed by Departmental Representative.

3.20 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] [recycling] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [01 35 21 - LEED Requirements].
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Approved: 2011-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section [_____].

1.2 PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION

- .1 Departmental Representative will supply following material: [_____].

1.3 MEASUREMENT AND PAYMENT

- .1 Measure excavation and backfill under Section [31 23 33.01 - Excavating Trenching and Backfilling].
- .2 Measure [supply and] installation of sanitary sewer including testing [and including excavation and backfilling] [and granular bedding and surround] horizontally from manhole face to manhole face in metres of each size pipe and depth class installed.
- .3 Measure concrete bedding and encasement of pipes in cubic metres in place.
- .4 Measure granular bedding and surround in cubic metres compacted in place.
- .5 After video and photographic pipe inspections:
 - .1 If no defective work is found, Departmental Representative will pay costs for inspectors, trained operators, equipment rental and materials.
 - .2 If defective Work is found, pay Departmental Representative part of total inspection cost proportional to number of defective pipe sections of sewer to total number of pipe sections inspected.

1.4 REFERENCES

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA C111/A21.11-[07], Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .2 ASTM International
 - .1 ASTM C12-[09], Standard Practice for Installing Vitrified Clay Pipe Lines.
 - .2 ASTM C14M-[07], Standard Specification for Nonreinforced Concrete Sewer, Storm Drain and Culvert Pipe (Metric).
 - .3 ASTM C76M-[10a], Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
 - .4 ASTM C117-[04], Standard Test Method for Material Finer Than 75 [MU] m (No. 200) Sieve in Mineral Aggregates by Washing.
 - .5 ASTM C136-[06], Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

- .6 ASTM C425-[09], Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
- .7 ASTM C428-[05(2006)], Standard Specification for Asbestos-Cement Nonpressure Sewer Pipe.
- .8 ASTM C443M-[07], Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
- .9 ASTM C663-[98(2008)], Standard Specification for Asbestos Cement Storm Drain Pipe.
- .10 ASTM C700-[09], Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
- .11 ASTM C828-[06], Standard Test Method for Low-pressure Air Test of Vitrified Clay Pipe Lines.
- .12 ASTM D698-[07e1], Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft⁴-lbf/ft³ (600 kN-m/m³)).
- .13 ASTM D1869-[95(2005) e1], Standard Specification for Rubber Rings for Asbestos Cement Pipe.
- .14 ASTM D2680-[01(2009)], Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
- .15 ASTM D3034-[08], Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .16 ASTM D3350-[10], Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- .3 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]).
- .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.
 - .3 CAN/CGSB-34.9-[M94], Pipe, Asbestos Cement, Sewer.
- .5 CSA International
 - .1 CSA A3000-[08], Cementitious Materials Compendium.
 - .2 CSA A257 Series-[09], Standards for Concrete Pipe and Manhole Sections.
 - .3 CAN/CSA-B70-[06], Cast Iron Soil Pipe, Fittings, and Means of Joining.
 - .4 CSA B1800-[11], Thermoplastic Non-pressure Pipe Compendium.
 - .1 CSA B182.1-[11], Plastic Drain and Sewer Pipe and Pipe Fittings.
 - .2 CSA B182.2-[11], PSM Type Polyvinylchloride PVC Sewer Pipe and Fittings.

- .3 CSA B182.6-[11], Profile Polyethylene (PE) Sewer Pipe and Fittings for Leak-Proof Sewer Applications.
- .4 CSA B182.11-[11], Standard Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.
- .6 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.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling:
 - .1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.
 - .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.
 - .3 Notify Departmental Representative and building [manager] [superintendent] [24] hours minimum in advance of any interruption in service.

1.6 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 [pipes, and backfill] and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in [Province] of [Ontario], Canada.
 - .2 Indicate on drawings proposed method for installing carrier pipe for undercrossings.
- .4 Samples:
 - .1 Inform Departmental Representative at least [4] weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
 - .2 Submit for testing at least [2] weeks prior to beginning Work, samples of materials proposed for use as follows:
 - .1 [_____].
- .5 Certificates:
 - .1 Certification to be marked on pipe.
- .6 Test and Evaluation Reports:

- .1 Submit manufacturer's test data and certification [2] weeks minimum before beginning Work.
- .7 Sustainable Design Submittals:
 - .1 LEED Canada submittals: in accordance with [Section 01 35 21 - LEED Requirements].
 - .2 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with [EPA 832/R-92-2005] [authorities having jurisdiction] [Section 01 35 21 - LEED Requirements].
 - .3 Construction Waste Management:
 - .1 Submit project [Waste Management Plan] [Waste Reduction Workplan] highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that [50] % of construction wastes were recycled or salvaged.
 - .4 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of [post-consumer] [post-industrial] content, and total cost of materials for project.
 - .2 Submit evidence, when Supplementary Cementing Materials (SCMs) are used, to certify [reduction in cement from Base Mix to Actual SCMs Mix, as percentage].
 - .5 Regional Materials: submit evidence that project incorporates required percentage [_____] % of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section [01 61 00 - Common Product Requirements] [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.
 - .2 Store and protect [pipes] from [damage].
 - .3 Replace defective or damaged materials with new.
- .4 Develop [Construction Waste Management Plan] [Waste Reduction Workplan] related to Work of this Section and in accordance with Section [01 35 21 - LEED Requirements].
- .5 Packaging Waste Management: remove for reuse [and return] [by manufacturer] of [pallets,] [crates,] [padding,] [packaging materials] as specified in [Construction Waste Management Plan] [Waste Reduction Workplan] in accordance with Section [01 74 21 -

Construction/Demolition Waste Management and Disposal] [Section 01 35 21 - LEED Requirements].

Part 2 Products

2.1 VITRIFIED CLAY PIPE [FOR MAIN SEWERS]

- .1 Vitrified clay pipe and fittings: to [ASTM C700], [unglazed] bore, [bell and spigot] [plain end] type.
- .2 Pipe joints: to [ASTM C425], [flexible], Type [1].

2.2 ASBESTOS- CEMENT PIPE [FOR MAIN SEWERS]

- .1 Asbestos-cement pipe and fittings: to [CAN/CGSB-34.9] [ASTM C428] [ASTM C663], class [_____].
- .2 Pipe joints: rubber gaskets to [ASTM D1869].

2.3 CONCRETE PIPE

- .1 Recycled content: incorporate SCM's in concrete mix, minimum of [_____] % post-industrial recycled content in accordance with Section [01 35 21 - LEED Requirements].
- .2 Non-reinforced circular concrete pipe and fittings: to [CSA A257] [ASTM C14M] [as indicated] [[_____] mm diameter, Class [_____]], designed for flexible rubber gasket joints to [CSA A257] [ASTM C443M].
- .3 Reinforced circular concrete pipe and fittings: to [CSA A257] [ASTM C76M] [as indicated] [[_____] mm diameter, strength classification [_____]], designed for flexible rubber gasket joints to [CSA A257] [ASTM C443M].
- .4 Lifting holes:
 - .1 Pipe [900] mm and less diameter - no lift holes.
 - .2 Pipe greater than [900] mm diameter - lift holes not to exceed [two] in a piece of pipe.
 - .3 Provide pre-fabricated plugs to seal lift holes [air] [water] tight after installation of pipe.

2.4 PLASTIC PIPE

- .1 Type PSM Polyvinyl Chloride (PVC): to [ASTM D3034] [CSA B182.2].
 - .1 Standard Dimensional Ratio (SDR): [28] [35] [41].
 - .2 [Locked-in] [Separate] gasket and integral bell system.
 - .3 Nominal lengths: [4] [6] m.
- .2 Acrylonitrile - Butadiene - Styrene (ABS): to [ASTM D2680] [CSA B182.2].
- .3 Corrugated High Density Polyethylene (HDPE): to [ASTM D3350] [CSA B182.6].
 - .1 [320 kPa] [180 kPa] pipe stiffness.

- .2 [Sewer] [Storm sewer] class.
- .3 [Gasket and bell] [Mechanical non-gasket] coupling system.

2.5 SERVICE CONNECTIONS

- .1 Type PSM Poly (Vinyl) Chloride: to CSA B182.2.
- .2 Plastic pipe: to CSA B182.1, with push-on joints.
- .3 Vitrified clay pipe and fittings: to [ASTM C700], [standard] strength, [unglazed] bore, [bell and spigot] type with [flexible] type [_____] joints.
- .4 Asbestos-cement pipe: to [ASTM C428], class [_____] with rubber gasket joints to [ASTM D1869].
- .5 Cast iron pipe: to [CAN/CSA-B70], with rubber gasket push-on joints to [ANSI/AWWA C111/A21.11]. Fittings: to [CAN/CSA-B70].
- .6 Cast iron service saddles: with oil resistant gaskets, [bronze] [stainless steel] clamp and oil resistant "O" rings in branch end.

2.6 CEMENT MORTAR

- .1 Portland cement: to [CSA A3000], [normal type [10]].
- .2 Mix mortar 1 part by volume of cement to two parts of clean, sharp sand mixed dry.
 - .1 Add only sufficient water after mixing to give optimum consistency for placement.
 - .2 Do not use additives.

2.7 PIPE BEDDING AND SURROUND MATERIALS

- .1 Granular material to Section [31 05 16 - Aggregate Materials] and following requirements:
 - .1 Crushed or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to [ASTM C136] [ASTM C117].
 - .1 Sieve sizes to [CAN/CGSB-8.1] [CAN/CGSB-8.2].
- .2 Table:

Sieve Designation	% Passing Stone/Gravel	% Passing Gravel/Sand
200 mm	-	-
75 mm	-	-
50 mm	-	-
38.1 mm	-	-
25 mm	[100]	-
19 mm	-	-
12.5 mm	[65-90]	[100]
9.5 mm	-	-
4.75 mm	[35-55]	[50-100]

2.00 mm	-	[30-90]
0.425 mm	[10-25]	[10-50]
0.180 mm	-	-
0.075 mm	[0-8]	[0-10]

- .3 Concrete mixes and materials for cradles, encasement, supports: to Section [03 30 00 - Cast-in-Place Concrete].
 - .1 Recycled content: incorporate SCM's in concrete mix, minimum of [_____] % post-industrial recycled content in accordance with Section [01 35 21 - LEED Requirements].

2.8 BACKFILL MATERIAL

- .1 As indicated.
- .2 Type [3], in accordance with Section [31 23 33.01 - Excavating, Trenching and Backfilling].
- .3 Unshrinkable fill: to Section [31 23 33.01 - Excavating, Trenching and Backfilling].

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 sewer pipe 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 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 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.
- .3 Clean and dry pipes and fittings before installation.
- .4 Obtain Departmental Representative's approval of pipes and fittings prior to installation.

3.3 TRENCHING

- .1 Do trenching Work in accordance with Section [31 23 33.01 - Excavating, Trenching and Backfilling].
- .2 Protect trench from contents of sewer or sewer connection.
- .3 Trench alignment and depth require approval of Departmental Representative prior to placing bedding material and pipe.

3.4 CONCRETE BEDDING AND ENCASEMENT

- .1 Do concrete Work in accordance with Section [03 30 00 - Cast-in-Place Concrete].
 - .1 Place concrete to details as [indicated] [[directed] Departmental Representative].
- .2 Position pipe on concrete blocks to facilitate placing of concrete.
 - .1 When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
- .3 Do not backfill over concrete within [24] hours after placing.

3.5 GRANULAR BEDDING

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding materials in uniform layer[s] not exceeding [150] mm compacted thickness [to depth as indicated] [to depth of [_____] mm].
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
 - .1 Do not use blocks when bedding pipe.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least [98] % [corrected maximum dry density] [maximum density to ASTM D698].
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with [compacted bedding material] [common backfill] [lean mix concrete].

3.6 INSTALLATION

- .1 Lay and join pipes to: [ASTM C12].
- .2 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.
- .3 Handle pipe using methods approved by Departmental Representative.

- .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .4 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.
 - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length. [Tolerances: [_____]].
- .5 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .6 Joint deflection permitted within limits recommended by pipe manufacturer.
- .7 Water to flow through pipe during construction, only as permitted by Departmental Representative.
- .8 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .9 Install plastic pipe and fittings in accordance with [CSA B182.11].
- .10 Pipe jointing:
 - .1 Install gaskets [in accordance with manufacturer's written recommendations] [as indicated].
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .3 Align pipes before joining.
 - .4 Maintain pipe joints free from mud, silt, gravel and foreign material.
 - .5 Avoid displacing gasket or contaminating with dirt or foreign material. Gaskets so disturbed to be removed, cleaned and lubricated and replaced before joining is attempted.
 - .6 Complete each joint before laying next length of pipe.
 - .7 Minimize joint deflection after joint has been made to avoid joint damage.
 - .8 At rigid structures, install pipe joints not more than [1.2] m from side of structure.
 - .9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .11 When stoppage of Work occurs, block pipes as directed by Departmental Representative to prevent creep during down time.
- .12 Plug lifting holes with pre-fabricated plugs approved by Departmental Representative, set in shrinkage compensating grout.
- .13 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .14 Make watertight connections to manholes.

- .1 Use shrinkage compensating grout when suitable gaskets are not available.
- .15 Use prefabricated saddles or field connections approved by Departmental Representative, for connecting pipes to existing sewer pipes.
 - .1 Joints to be structurally sound and watertight.

3.7 PIPE SURROUND

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
 - .1 Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers not exceeding [150] mm compacted thickness as indicated.
 - .1 Do not dump material within [1.5] m of pipe.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to [mid height] of pipe to at least [98] % [corrected maximum dry density] [maximum density to ASTM D698].
- .6 Compact each layer from [mid height] of pipe to underside of backfill to at least [90] % [corrected maximum dry density] [maximum density to ASTM D698].
- .7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.8 BACKFILL

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround in uniform layers not exceeding [150] mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least [98] % [corrected maximum dry density] [maximum density to ASTM D698].
 - .1 In other areas, compact to at least [90] % [corrected maximum dry density] [maximum density to ASTM D698].
- .4 Place unshrinkable fill in accordance with Section [31 23 33.01 - Excavating, Trenching and Backfilling].

3.9 UNDERCROSSING

- .1 Excavate working pit [to dimensions indicated,] outside right-of-way to be crossed.
- .2 Excavate working pit to minimum of [0.5] m below lowest invert of encasing pit.
- .3 Dewater excavation.
- .4 Dewater area of undercrossing.
- .5 Install [heavy timber] [steel frame] backstop.

- .6 Place encasing pipe to exact line and grade as indicated.
 - .1 Encasing pipe: undercross obstruction at [_____]degrees.
- .7 Install encasing pipe by [jacking] [boring] [tunnelling].
- .8 Ensure encasing pipe is not in tension.
- .9 Use [mechanical] [welded] type joints for encasing pipe.
- .10 Place concrete grout levelling pad in encasing pipe.
 - .1 Control level of grout during placing.
- .11 Provide shop drawings showing proposed method of installation for sanitary sewer in undercrossing.
- .12 Insert sanitary sewer pipe into encasement pipe, in end with largest opening after placement of levelling pad.
- .13 Use approved blocking method to guide sanitary sewer pipe in true alignment.
- .14 Clearance between blocks and encasement pipe: maximum [12] mm when sanitary sewer pipe is in position.
- .15 Join sanitary sewer pipe one length at time outside encasement pipe.
 - .1 [Push] [Pull] sanitary sewer pipe into position.
- .16 Couplings of sanitary sewer pipe: not to rest on levelling pad when sanitary sewer pipe is in position.
- .17 Place [20] MPa concrete cradle around sanitary sewer pipe after it is positioned.
 - .1 Cradle to be minimum of [225] mm and maximum of [300] mm above levelling pad.
- .18 Pressure grout remaining void with grout consisting of 1 part Portland cement and 2 parts clean washed sand with only sufficient amount of water added to allow placement.
 - .1 Do not install pressure grout until sanitary sewer pipe is secure against flotation.
 - .2 Do not use additives.
- .19 Do field testing before placing concrete cradle and grouting.

3.10 SERVICE CONNECTIONS

- .1 Install pipe to [CSA B182.11] manufacturer's instructions and specifications.
- .2 Maintain grade for [100 and 125] mm diameter sewers at [1 vertical to 50 horizontal] unless directed otherwise by Departmental Representative.
- .3 Service connections to main sewer: [standard] [Tee] [Wye] [fittings] Departmental Representative approved saddles].
 - .1 Do not use break-in and mortar patch-type joints.
- .4 Service connection pipe: not to extend into interior of main sewer.

- .5 Make up required horizontal and vertical bends from 45 degrees bends or less, separated by straight section of pipe with minimum length of 4 pipe diameters.
 - .1 Use long sweep bends where applicable.
- .6 Plug service laterals with water tight caps or plugs as approved by Departmental Representative.
- .7 Place location marker at ends of plugged or capped unconnected sewer lines.
 - .1 Each marker: [38 x 89] mm stake extending from pipe end at pipe level to [0.6] m above grade.
 - .2 Paint exposed portion of stake red [with designation SAN SWR LINE in black].

3.11 FIELD TESTING

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 When directed by Departmental Representative, draw tapered wooden plug with diameter of [50] mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.

Use a plug that has diameter of 95% of inside diameter of pipe in PVC pipe test.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.
- .5 Do infiltration and exfiltration test to [ASTM C828]. Air testing permitted with approval of Department Representative.
- .6 Do infiltration, exfiltration or hydrostatic testing as specified herein and as directed by Departmental Representative.
 - .1 Perform tests in presence of Departmental Representative.
 - .2 Notify Departmental Representative 24 hours minimum in advance of proposed tests.
- .7 Carry out tests on each section of sewer between successive manholes including service connections.
- .8 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.
- .9 Exfiltration test:
 - .1 Fill test section with water to displace air in line. Maintain under nominal head for 24 hours to ensure absorption in pipe wall is complete before test measurements are begun.
 - .2 Immediately prior to test period add water to pipeline until there is head of [1] m over interior crown of pipe measured at highest point of test section or water in manhole is [1] m above static ground water level, whichever is greater.

- .3 Duration of exfiltration test: 2 hours.
- .4 Water loss at end of test period: not to exceed maximum allowable exfiltration over any section of pipe between manholes.
- .10 Infiltration test:
 - .1 Conduct infiltration test in lieu of exfiltration test where static ground water level is [750] mm or more above top of pipe measured at highest point in line to be used.
 - .2 Do not interpolate a head greater than [750] mm to obtain an increase in allowable infiltration rate.
 - .3 Install watertight plug at upstream end of pipeline test section.
 - .4 Discontinue pumping operations for at least 3 days before test measurements are to begin and during this time, keep thoroughly wet at least one third of pipe invert perimeter.
 - .5 Prevent damage to pipe and bedding material due to flotation and erosion.
 - .6 Place 90 degrees V-notch weir, or other measuring device approved by Departmental Representative in invert of sewer at each manhole.
 - .7 Measure rate of flow over minimum of 1 hour, with recorded flows for each 5 min interval.
- .11 Infiltration and exfiltration: not to exceed following limits in [L] per hour per [100] m of pipe, including service connections.

Nominal Pipe diameter in mm	Asbestos-Cement or Plastic pipe	Concrete or Vitrified Clay pipe
Values shown in columns 2 and 3 are in litres per hour per 100 metres of pipe.		
100	3.88	25.5
125	4.62	30.0
150	5.51	34.0
200	7.45	41.5
250	9.39	49.5
300	11.33	56.5
350	13.27	63.5
400	14.91	70.0
450	16.84	76.0
500	18.78	81.5
550	20.72	87.0
600	22.80	92.5
700	26.53	102.0
800	30.11	110.5
900	33.69	118.0
1000	37.56	124.5
1100	41.29	130.0
1200	45.01	135.0

- .12 Leakage: not to exceed following limits in [litres] per hour per [mm] of diameter per 100[m] of sewer including service connections:
 - .1 Exfiltration, based on [600] mm head: [0.175] L.
 - .2 Infiltration: [0.150] L.
- .13 Hydrostatic Testing
 - .1 Apply hydrostatic test pressure of 690 kPa based on the lowest point in line and corrected to elevation of test gauge for hydrostatic test and 345 kPa for leakage test.
 - .2 Apply pressures for 1 h for pressure test and 2 h for leakage test.
 - .3 Allowable leakage to be as defined in AWWA C600-10.
- .14 Repair and retest sewer line as required, until test results are within limits specified.
- .15 Repair visible leaks regardless of test results.
- .16 Television and photographic inspections:
 - .1 Carry out inspection of installed sewers by video camera, digital camera or by other related means.
 - .2 Provide means of access to permit Departmental Representative to do inspections.
 - .3 Payment for inspection services in accordance with Measurement and Payment in PART 1.

3.12 CLEANING

- .1 Progress Cleaning: clean in accordance with Section [01 74 11 - Cleaning].
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section [01 74 11 - Cleaning].
- .3 Waste Management: separate waste materials for [reuse] [recycling] in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal] [01 35 21 - LEED Requirements].
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

APPENDIX A

GEOTECHNICAL REPORT



**SOIL & MATERIALS ENGINEERING INC.
CONSULTING ENGINEERS**

Report on the

Geotechnical Investigation for
The Camp Henry Modifications
Point Pelee, Ontario

Report Issued to

LeMay Architects
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Montréal (qc) canada
H3C 0I8

Attention: stéphane kruschitz, mpm
skruschitz@lemay.com

Date of Report

Tuesday, October 18, 2016

Job No.

16G074

Distribution of Report

3 copies – LeMay Architects
1 e-copy – LeMay Architects
1 e-copy – Baird | AE

GEOTECHNICAL ENGINEERING AND CONSTRUCTION MATERIALS INSPECTION & TESTING

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1.0 INTRODUCTION

Stéphane Kruschitz, MPM of LeMay Architects on behalf of Public Works Canada authorized Soil & Materials Engineering Inc. to complete a geotechnical investigation for the planned Camp Henry Modifications, Point Pelee, Ontario. The development will include a:

- Camp Office
- Comfort Station
- Dining Hall Extension
- Dormitory
- Leaching Bed

The scope of this work is to carry out a geotechnical investigation and to prepare a geotechnical report based on soil borings and laboratory testing.

This report discusses the results of our investigation with respect to the redevelopment of the Camp Henry facility. The results of the fieldwork and laboratory testing programs were used to determine the relevant soil and groundwater parameters at this site. The recommendations contained in this report refer to the geotechnical aspect of the soil conditions encountered in the exploratory holes.

2.0 INVESTIGATIVE PROGRAM

The field work portion of the geotechnical investigation consisted of four augered and sampled testholes (Testholes 1 through 4) and three in situ percolation testholes (Testholes P1, P2, and P3) at approximate locations indicated on the Site Maps (Drawings 1, and 3). Four testholes were designated for the assessment of the subsurface conditions within the footprint of the new buildings, and three testholes were completed for the sewage leachate disposal system. The deep testholes were advanced to the depths of 5.0 m below existing grade. The percolation testholes were advanced to a depth of $0.6\pm$ m below grade. The advancement of the deep testholes was facilitated with a truck mounted power auger machine owned and operated by C.T. Soil & Materials Testing Inc. The drill unit is equipped with hollow as well as solid stem augers and conventional soil sampling tools. The testholes were completed on October 3, 2016 under the direction of a geotechnical engineer. The testhole information from the geotechnical investigation is presented in graphical forms in the Log of Testholes (Drawings 4 through 10).

Soil samples were retrieved at frequent intervals of depth using the Standard Penetration Test (SPT) Method (ASTM D1586). The retained soil samples were field logged, placed in suitable containers and transported to our laboratory for further detailed examination and testing. At the completion of each testhole, the presence of free standing groundwater was determined and, where present, noted on the respective Log of Testholes.

The laboratory testing included a detailed visual and tactile examination of the retrieved samples along with soil moisture content determinations and grain size distribution testing on selected soil samples. Soil moisture contents are presented on the Testhole Logs (Drawings 4 through 10). The grain size tests are attached to this report.

The ground surface elevations at the testhole locations were level surveyed in reference to a spot height interpolation from the Camp Henry Grading Plan (BAIRD | AE Drawing 16-004 Sheet 02). The elevations presented in this report were derived for the sole benefit of the geotechnical analysis and stratigraphic evaluation by the geotechnical engineer. The elevations presented in this report should not be used by others, for any other purpose.

3.0 SITE AND SUBSURFACE CONDITIONS

The approximate location of the four testholes drilled and three testholes hand-excavated during the investigation is plotted on the enclosed Site Maps (Drawings 1, 2, and 3). A detailed description of the subsurface conditions is presented on the Log of Testholes (Drawings 4 through 10). The site is pre-existing campground with new camper modules recently installed among the pre-existing network of paths and buildings. The following description is intended as a summary of the subsurface conditions encountered at the testhole locations.

3.1 Soil Condition

The stratigraphic and interpreted boundaries in the testholes were obtained from 38 mm diameter samples retrieved from 83 mm I.D. (165 mm O.D.) hollow stem auger holes. The soil shear strength consistency or relative compactness condition, as provided on the enclosed Testhole Logs (Drawings 4 through 7), are based on "N"-values determined from the Standard Penetration Test Method (ASTM D1586), as well as visual and tactile examination of the soil samples.

3.1.1 Topsoil

At ground surface, the testholes encountered topsoil or fill mixed with topsoil ranging in thickness from 0.2 m to 0.6 m. The topsoil is generally sand to silty sand with organics.

3.1.2 Fluvial Sand

The veneer of organic sand topsoil is underlain by a major deposit of fluvial or eolian deposited sand, sand with silt, medium to coarse sand with gravel, or fine to medium gravel. The water or wind-borne deposit of non-cohesive soil has a brown colour changing to grey below a depth of approximately 2.5 m. Based on in situ measured N-values, the non-cohesive soil generally has a "compact" to "dense" to "very dense" condition.

3.2 Groundwater

The groundwater level and the depth that the testhole remained open after the completion of drilling is presented on the Log of Testholes, where encountered. The measured water level upon completion of drilling varied between 1.37 m and 2.06 m below grade.

4.0 DISCUSSION AND RECOMMENDATIONS

Parks Canada is modifying the pre-existing Camp Henry facilities to include the construction of a camp office, a dormitory, an addition to the dining hall, and a comfort station. A treated sewage disposal leaching bed will also be constructed as part of the site modifications. The building constructions will be basementless and limited to one storey above grade.

4.1 Foundations

The exploratory testholes completed at this site reveal variable shallow subsurface conditions in terms of soil composition and compactness condition. Below the organic topsoil layer, the site is characterized by non-cohesive silty sand, fine sand, medium to coarse sand, and sand with fine gravel through to the limits of this geotechnical investigation, 5 metres below grade. The non-cohesive soil is generally in a “loose” to “compact” to “dense” to “very dense” condition. The water table was measured to be 1.37 m to 2.06 m below grade at the time of the field work portion of the geotechnical investigation.

The bearing capacity of shallow foundations was therefore calculated for this report based on the presence of a “loose” non-cohesive soil overlying “compact” to “dense” non-cohesive soil. (i.e. two layer soil model). The following subsections presents geotechnical resistance referenced to the ultimate limit states and the serviceability limit states for conventional shallow spread foundations at this site

4.1.1 Ultimate Limit States

The factored net geotechnical resistance at ultimate limit states (geotechnical resistance factor, Φ , of 0.5) that may be used for conventional spread footing foundations are presented below.

TABLE 1: U.L.S Factored Bearing Resistance

Elevation (m)	Factored Geotechnical Resistance, ΦR , at U.L.S. (kPa)*	
	Isolated Square	Continuous Strip
u/s fill/topsoil to El.175.0	180	150
El.175.0 to El.174.8*	260	180

* Use of this bearing zone will require dewatering prior to excavation

The above factored geotechnical resistance at ultimate limit states incorporates 0.50 as an applied resistance factor, Φ , to the ultimate geotechnical resistance. These values are net of the lowest surcharge pressure on the soil surrounding the footing.

4.1.2 Serviceability Limit States

For geotechnical calculation purposes, the gross bearing pressure at serviceability limit states has been taken for that pressure to generate 25 mm of total settlement beneath the footing, thereby generally assuring less than 20 mm differential settlement between any two foundation units. The composition of the unfactored loads to generate the calculated settlement will be dependent on the long-term sustained loading conditions which will include 100% of the dead loads and 100% of the live loads, including transient loads such as wind or earthquake.

Geotechnical resistance at serviceability limit states that may be used for conventional spread footing foundations less than 2.5 m (isolated square) and 1.5 m (continuous strip) are presented below.

TABLE 2: Geotechnical Resistance (Unfactored) at S.L.S.

Elevation (m)	Geotechnical Resistance at S.L.S. (kPa)	
	Isolated Square	Continuous Strip
u/s fill/topsoil to El. 175.2	120	100
El. 175.0 to El. 174.8*	175	125

* Use of this bearing zone will require dewatering prior to excavation

Foundations exceeding the above design chart or maximum footing width may be feasible; however, a detailed geo-structural interaction analysis must be completed for proper evaluation.

4.1.3 Foundation Design (General)

All the factored geotechnical resistance bearing pressures at ultimate limit states incorporate a factor, Φ , of 0.5 against shear failure of the underlying soil strata (in accordance with the Canadian Foundation Design Manual, 4th Edition and Ontario Building Code (2006)). The expected total and differential settlements for footings constructed as outlined previously will be 25 mm and 20 mm, respectively.

The settlement of such foundations is to be assessed in conjunction with the existing overburden pressure, foundation size and construction procedure.

Some continuous footings or isolated square footings may be designed to be constructed at different elevations in the soil. In this case, the footings should be stepped such that the soil slope is cut no steeper than 3H:1V with a maximum slope height of one metre. Successive sloped sections must have a crest-toe separation of greater than 1.5 m.

We recommend all soil bearing surfaces be inspected and approved by the Geotechnical Consultant to confirm that the soil exposed corresponds with the testhole observations and the design assumptions of the soil consistency. All exterior footings constructed adjacent to unheated areas must have a minimum of 1.2 m of soil cover, or synthetic insulation of equal thermal value for protection against frost heave.

The native silty clay at this site is sensitive and is subject to disturbance when exposed to construction traffic and adverse weather conditions. We therefore recommend placing the foundation concrete on the same day the excavation is completed and the subgrade has been inspected and approved by the Geotechnical Consultant. If this is not possible, then following subgrade approval, a thin mat of lean concrete (mud mat) should be placed on the bearing surface in order to preserve its integrity.

4.2 Floor Slab-on-Grade

The existing organic soil and fill materials must be removed from beneath the floor slab areas. Immediately following excavation to final subgrade level the approved granular fill should be placed to avoid deterioration of the soil surface caused by construction traffic and adverse weather conditions.

The exposed subgrade should be proof-rolled in the presence of the Geotechnical Consultant. Any "soft" areas encountered during proof-rolling and inspection must be subexcavated and replaced with approved fill such as Granular "B Type I" (O.P.S.S. 1010) or native, non-organic sand and compacted to at least 98% of its Standard Proctor maximum dry density. Fill used to raise the grade of the floor slab should be constructed similarly.

Presuming a service loading condition of less than 15 kPa, immediately beneath the floor slab, we recommend placing a minimum of 200 mm of Granular "A" (O.P.S.S. 1010) compacted to 98% of its Standard Proctor maximum dry density to provide uniform and adequate bearing surface. Floor slab construction lower than 100 mm above the surrounding exterior grade, if present, should incorporate a capillary break consisting of 100 mm of clearstone gravel (Granular "O", OPSS 1010). Heavier loaded floor slabs should be specifically reviewed by this office.

An appropriately placed vapour retarder is recommended beneath all slab on grade constructions that include moisture sensitive floorings or areas requiring humidity control.

4.3 Excavation and Construction

Excavations through the surficial fill materials and native sandy silt to the depth of the prevailing groundwater table at 1.37 m to 2.06 m below existing grades should have side walls safely sloped at a minimum gradient of 1H:1V in accordance with Ontario Provincial Regulations. Side slopes cut at a steeper rate than this will require field assessment by the Geotechnical Consultant.

Excavations below a depth of 1.2 metre will encounter fully saturated conditions and will require dewatering to ensure stable side slope and excavation base. Dewatering should be completed prior to excavation.

If vertical walls are intended, excavations below a depth of 1.2 m should be shored. The temporary shoring should be reviewed by the Geotechnical Consultant.

Due to past developments on site, we anticipate encounters of relict landscaping and foundation features at various locations across the site. We recommend all foundations, subgrades, and trench side walls to be inspected by this office at the time of excavation.

4.4 Seismic Site Classification

The Ontario Building Code allows the site to be classified on the basis of the weighted average shear strength or standard penetration resistance profile within the upper 30 m of the soil column. Based on investigations at testholes for this site investigation terminating at a depth of 5 metres, we recommend the site to receive a Class "D" classification for seismic site response resulting from the weighted average shear strength and standard penetration resistance profile of the cohesive and non-cohesive soils encountered below the testhole depths. Further investigation may suggest otherwise.

4.5 Percolation Testing

Field percolation testing was completed at three locations (P1, P2, and P3 on the attached Site Maps) in accordance with the procedures dictated by the Ontario Building Code Supplementary Standard SB-6. The results of the percolation testing are presented on the Log of Testholes P1 and P2 (Drawings 8 and 9) producing results of 0.2 min/cm, respectively. Laboratory grain size distribution tests were complete on representative samples taken from each percolation test (Drawing 11). These same grain size tests were also compared to the Ontario Building Code Chart 6 grain size classification (Drawing 11) for correlation to estimated T-Time (ranging between $T = 2$ min/cm and $T = 8$ min/cm).

Based on the results of the field percolation testing and the laboratory correlation testing, we recommend designing the effluent system with an inverse percolation rate, T , of 1 min/cm. A dosing chamber will be required in order to ensure relatively uniform distribution of effluent since there are areas of significantly faster percolation rates.

5.0 CLOSURE

This report presents our interpretation of factual information obtained from the investigation and is intended for the use of the design engineer. Where comments are made related to construction, they are provided only in order to highlight aspects of construction that could affect the design of the project.

The number of boreholes required to determine the localized underground conditions between testholes affecting construction would be much greater than has been carried out for design purposes.

Further examination and investigation should be carried out in order to verify the adequacy of the information for construction that may affect the contractor with regards to construction techniques, schedule, equipment capabilities, cost sequencing, etc. This report addresses the geotechnical aspects of the subsurface conditions pertinent to this site.

It is beyond the scope of this investigation and report to address any issues related to health or environmental aspects of the proposed works.

Should local site conditions differ materially from that contained in this report, contact our office immediately for guidance. Do not hesitate to contact us should questions arise concerning the contents of this report. We would be pleased to meet with you at your convenience.

Regards,
Soil & Materials Engineering Inc.

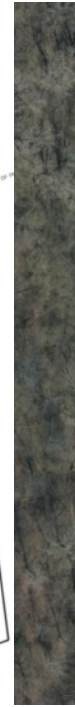
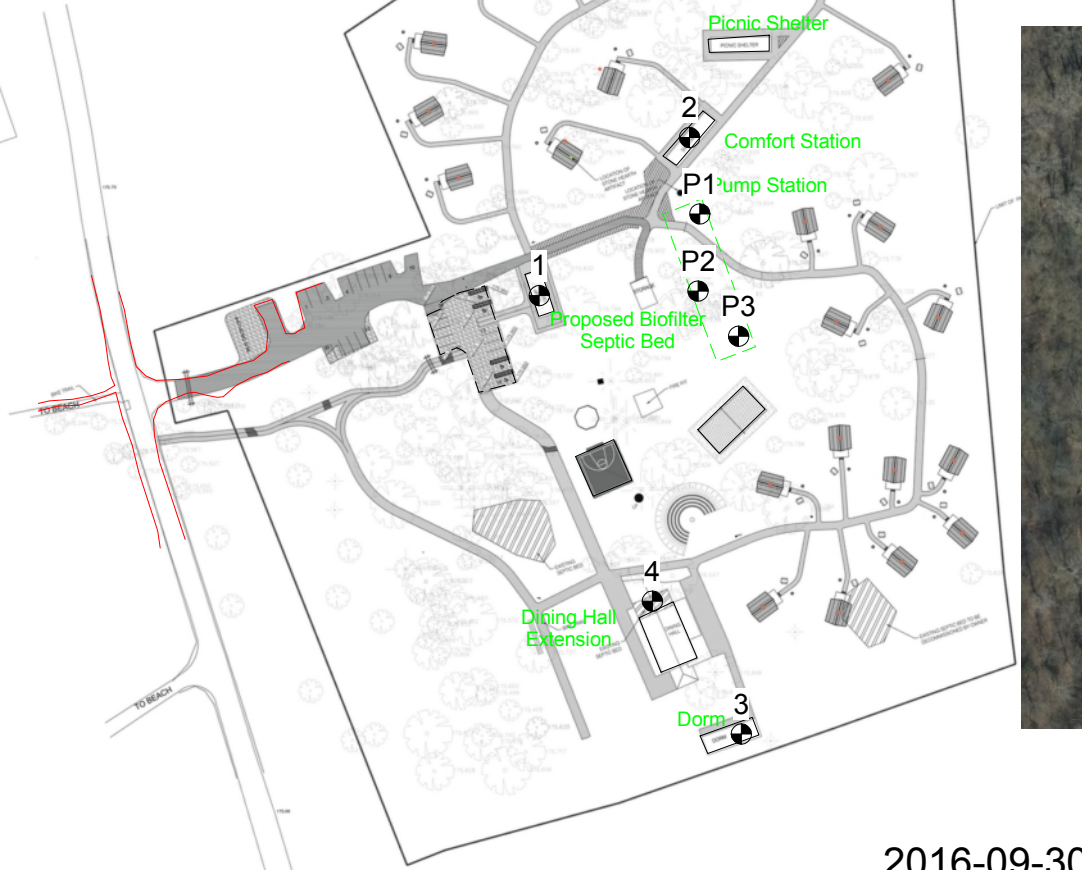


T. O'Dwyer, P.Eng.
Consulting Engineer



Drawings/Enclosures

SITE MAP



Revision: 01

2016-09-30

LEGEND:

- Test Hole
- ◆ Monitoring Well
- ⊕ Test Well
- ▣ DMT
- ▭ Inclinometer
- ▣ Test Pit



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Project: Camp Henry Modifications
 Location: Point Pelee National Park
 Number: 16G074

Notes:

Testhole Locations

Client:
Parks Canada c/o LeMay Architects

DRAWING

1

SITE MAP



Revision: 01

2016-09-30

LEGEND:

- ⊕ Test Hole
- ⊕ Monitoring Well
- ⊕ Test Well
- ⊕ DMT
- ⊕ Inclinometer
- ⊕ Test Pit



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Notes:

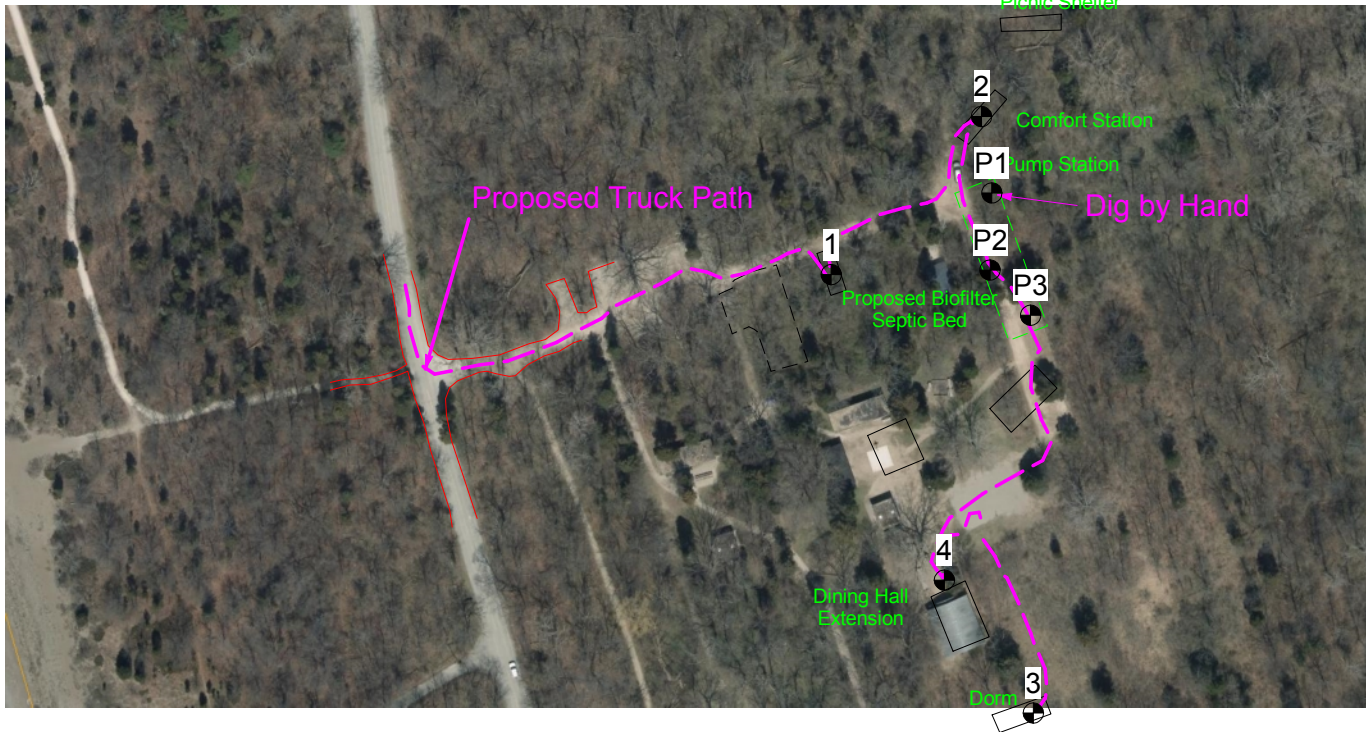
Testhole Locations

Client:
Parks Canada c/o LeMay Architects

DRAWING

2

SITE MAP



Revision: 01

2016-09-30

LEGEND:

- ⊕ Test Hole
- ⊕ Monitoring Well
- ⊕ Test Well
- ⊕ DMT
- ⊕ Inclinometer
- ⊕ Test Pit



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Number: 16G074

Notes:

Testhole Locations

Client:
Parks Canada c/o LeMay Architects

DRAWING

3



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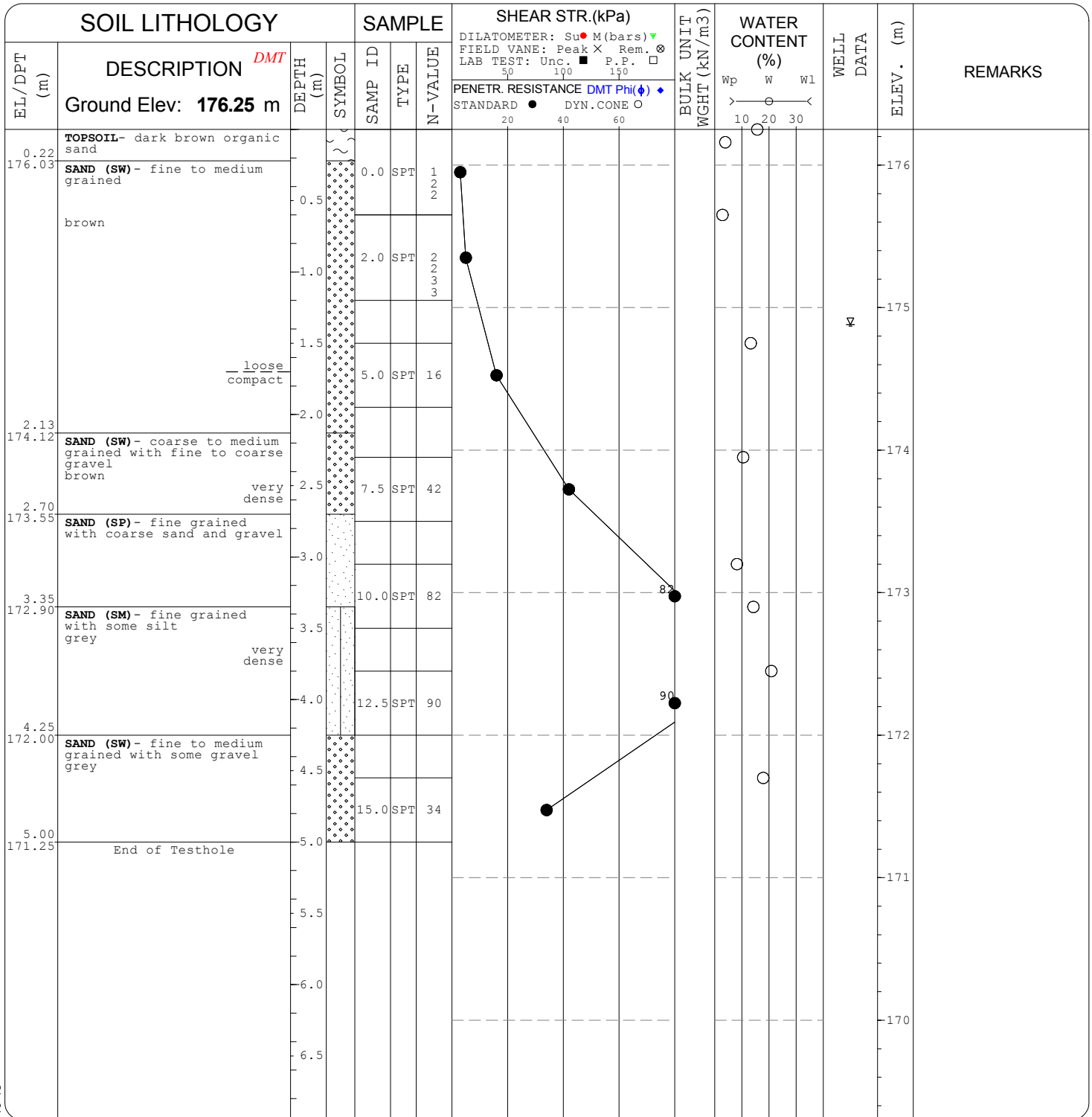
Client: Parks Canada c/o LeMay Architects

Project: Camp Henry Modifications

Location: Point Pelee National Park

EQUIPMENT DATA

Machine: Diedrich D50
Method: 83 mm I.D. H/S Auger
Size: 165 mm OD
Date: 2016-10-03 TO 2016-10-03



CTMET 16G074.GPJ 16-10-18

REVIEWING PROFESSIONAL:
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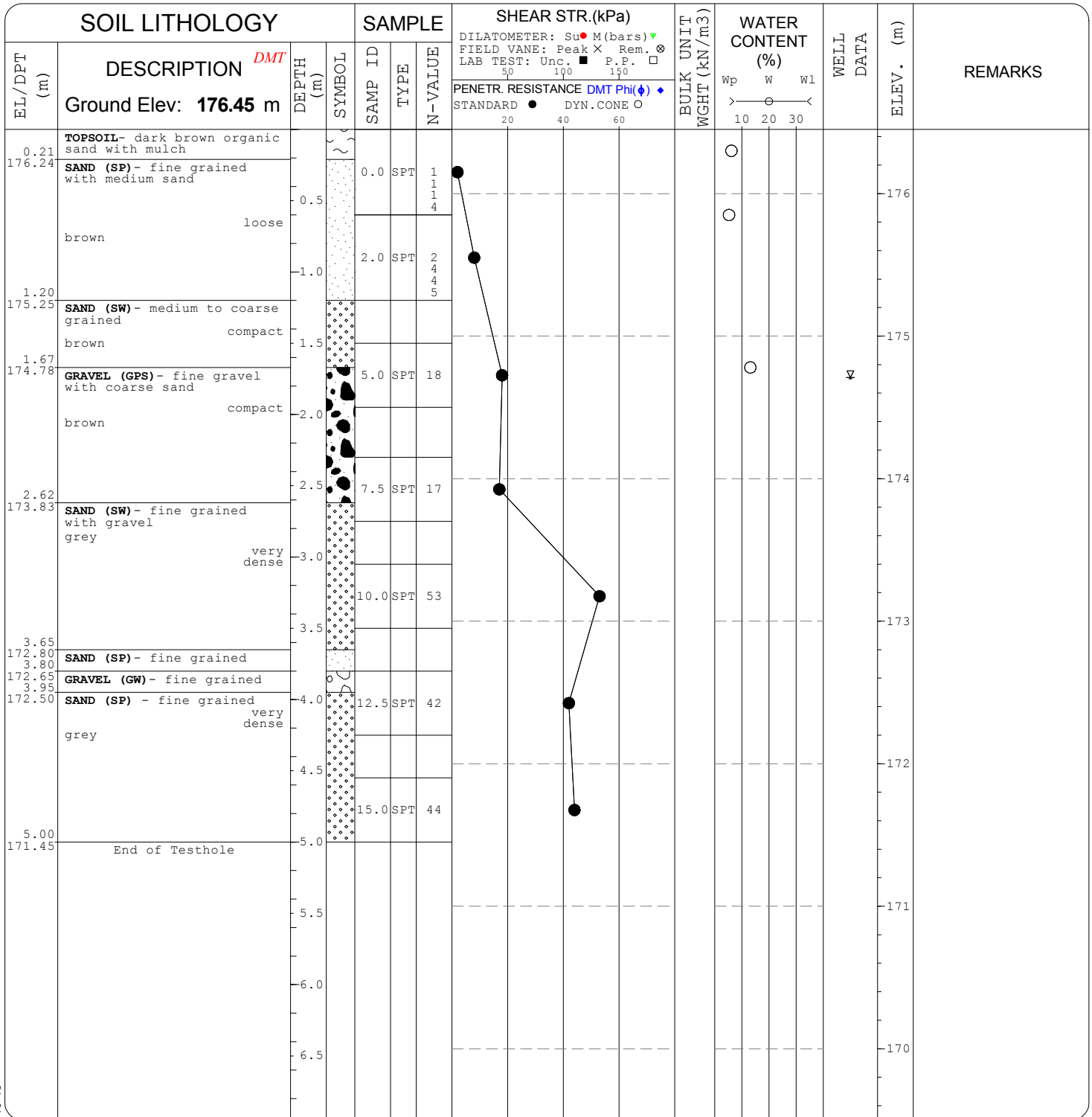
Client: Parks Canada c/o LeMay Architects

Project: Camp Henry Modifications

Location: Point Pelee National Park

EQUIPMENT DATA

Machine: Diedrich D50
Method: 83 mm I.D. H/S Auger
Size: 165 mm OD
Date: 2016-10-03 TO 2016-10-03



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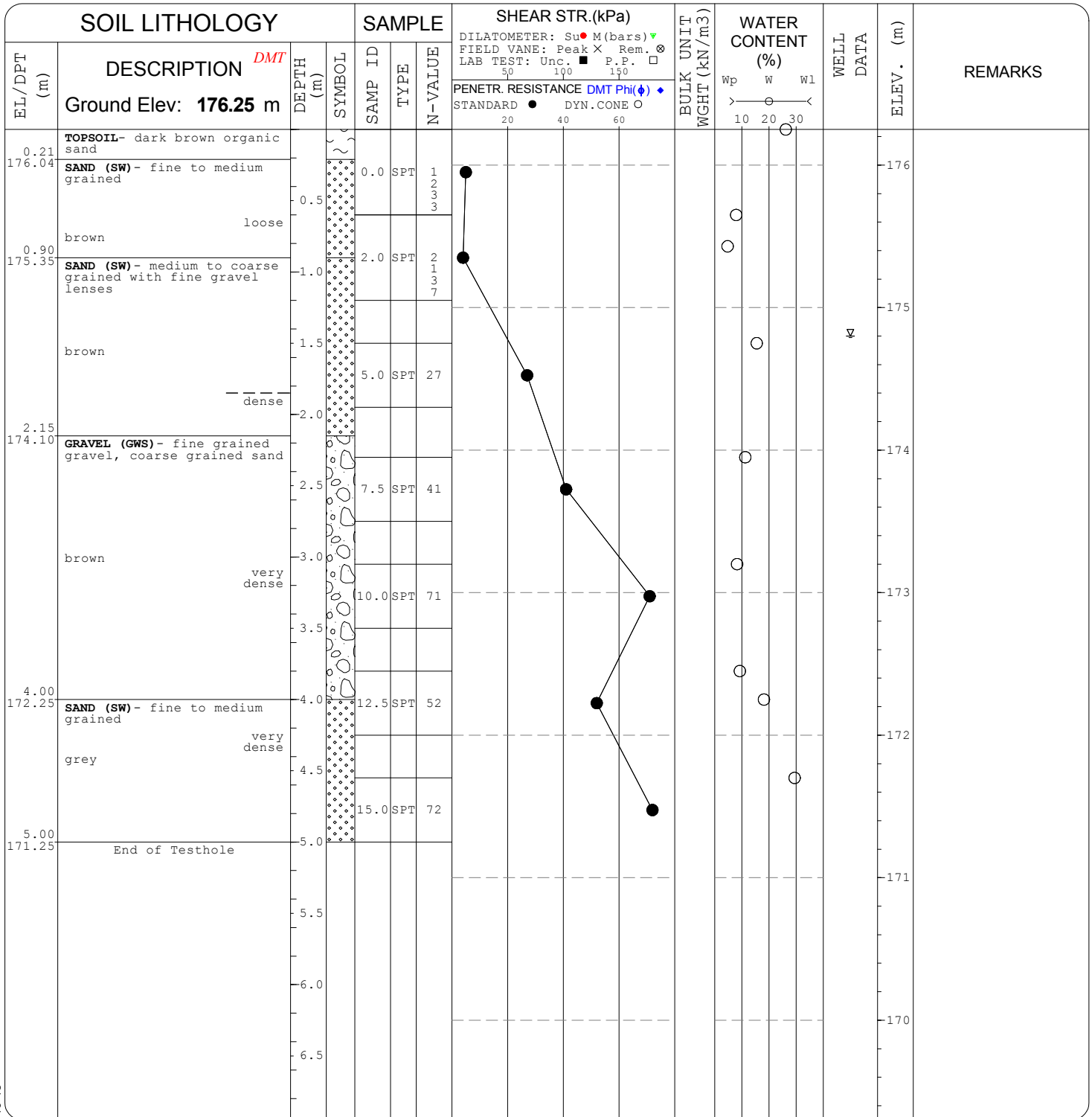
Client: **Parks Canada c/o LeMay Architects**

Project: **Camp Henry Modifications**

Location: **Point Pelee National Park**

EQUIPMENT DATA

Machine: **Diedrich D50**
Method: **83 mm I.D. H/S Auger**
Size: **165 mm OD**
Date: **2016-10-03 TO 2016-10-03**



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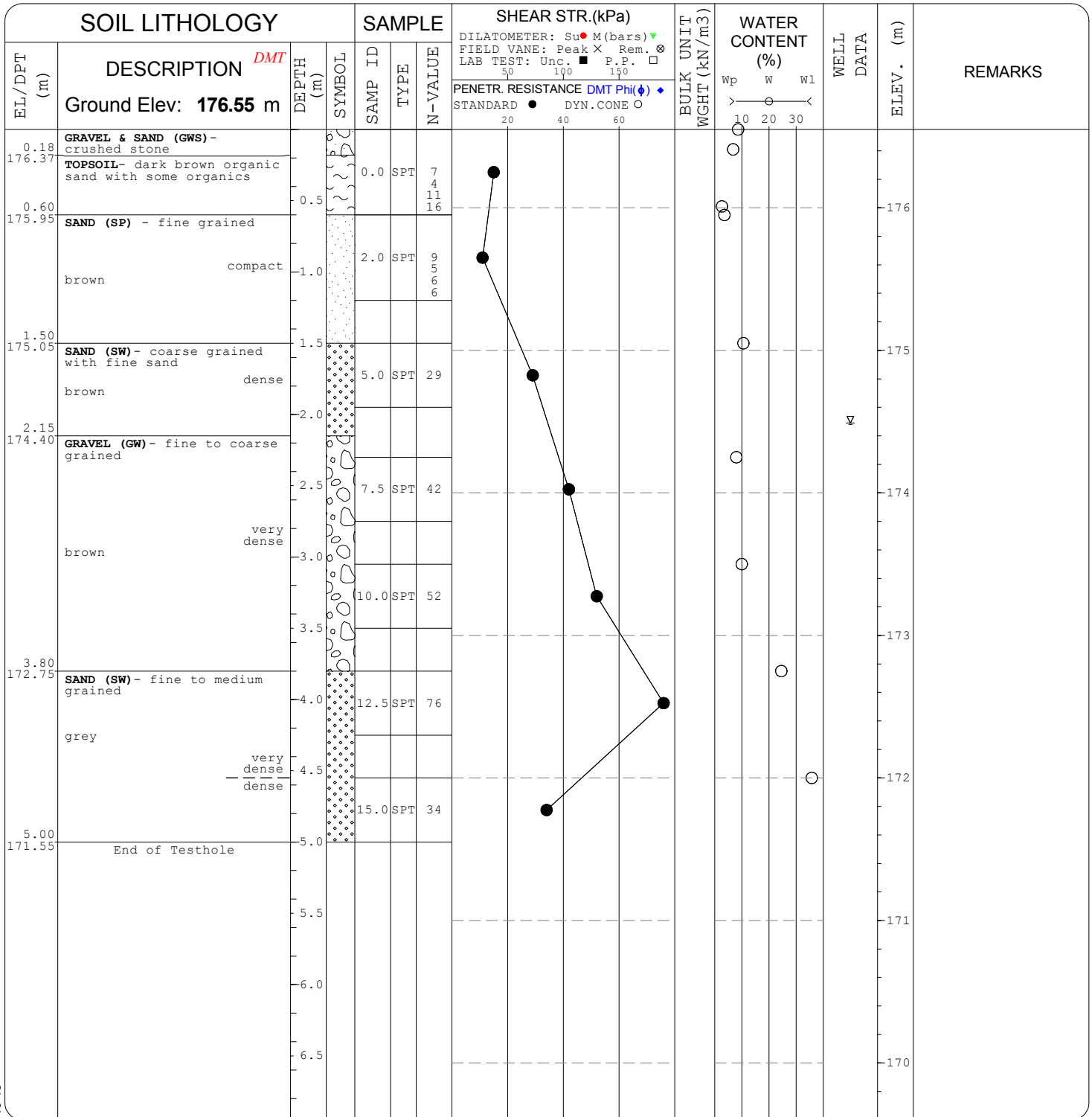
Client: **Parks Canada c/o LeMay Architects**

Project: **Camp Henry Modifications**

Location: **Point Pelee National Park**

EQUIPMENT DATA

Machine: **Diedrich D50**
Method: **83 mm I.D. H/S Auger**
Size: **165 mm OD**
Date: **2016-10-03 TO 2016-10-03**



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Client: **Parks Canada c/o LeMay Architects**

Project: **Camp Henry Modifications**

Location: **Point Pelee National Park**

EQUIPMENT DATA

Machine: **Hand**

Method: **Shovel**

Size: **305 mm**

Date: **2016-10-03 TO 2016-10-03**

SOIL LITHOLOGY		SAMPLE			SHEAR STR.(kPa)			BULK UNIT WGHT (kN/m ³)	WATER CONTENT (%)			WELL DATA	ELEV. (m)	REMARKS
EL/DPT (m)	DESCRIPTION <i>DMT</i>	DEPTH (m)	SYMBOL	SAMP ID	TYPE	N-VALUE	DILATOMETER: Su M (bars) ▼ FIELD VANE: Peak X Rem. ⊗ LAB TEST: Unc. ■ P.P. □ 50 100 150		Wp	W	Wl			
0.23 176.12	TOPSOIL - dark brown organic sand	0.5		0.3	GRAB		PENETR. RESISTANCE DMT Phi(φ) ◆ STANDARD ● DYN. CONE ○ 20 40 60						176	Field Percolation Test, T-Time = 0.2 min/cm grain size testing resthole open and dry prior to percolation testing
0.60 175.75	SAND (SP) - light brown, fine grained													
	End of Testhole	1.0												
		1.5												
		2.0												
		2.5												
		3.0												
		3.5												
		4.0												
		4.5												
		5.0												
		5.5												
		6.0												
		6.5												

CTMET 16G074.GPJ 16-10-18

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Location: **Point Pelee National Park**

EQUIPMENT DATA

Machine: **Hand**
Method: **Shovel**
Size: **305 mm**
Date: **2016-10-03 TO 2016-10-03**

SOIL LITHOLOGY		SAMPLE			SHEAR STR.(kPa)			BULK UNIT WGHT (kN/m ³)	WATER CONTENT (%)			WELL DATA	ELEV. (m)	REMARKS
EL/DPT (m)	DESCRIPTION <i>DMT</i>	DEPTH (m)	SYMBOL	SAMP ID	TYPE	N-VALUE	DILATOMETER: Su M (bars) ▼ FIELD VANE: Peak X Rem. ⊗ LAB TEST: Unc. ■ P.P. □ 50 100 150		Wp	W	Wl			
	Ground Elev: 176.25 m						PENETR. RESISTANCE <i>DMT Phi(φ)</i> ◆ STANDARD ● DYN. CONE ○ 20 40 60							
0.40	TOPSOIL - dark brown organic sand												176	Field Percolation Test, T-Time = 0.2 min/cm grain size testing resthole open and dry prior to percolation testing
175.85	SAND (SP) - light brown, fine grained	0.5		0.4 GRAB										
0.75	End of Testhole	1.0												
175.50		1.5											175	
		2.0											174	
		2.5											173	
		3.0											172	
		3.5											171	
		4.0											170	
		4.5												
		5.0												
		5.5												
		6.0												
		6.5												

CTMET 16G074.GPJ 16-10-18

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Project: **Camp Henry Modifications**

Location: **Point Pelee National Park**

EQUIPMENT DATA

Machine: **Hand**
Method: **Shovel**
Size: **305 mm**
Date: **2016-10-03 TO 2016-10-03**

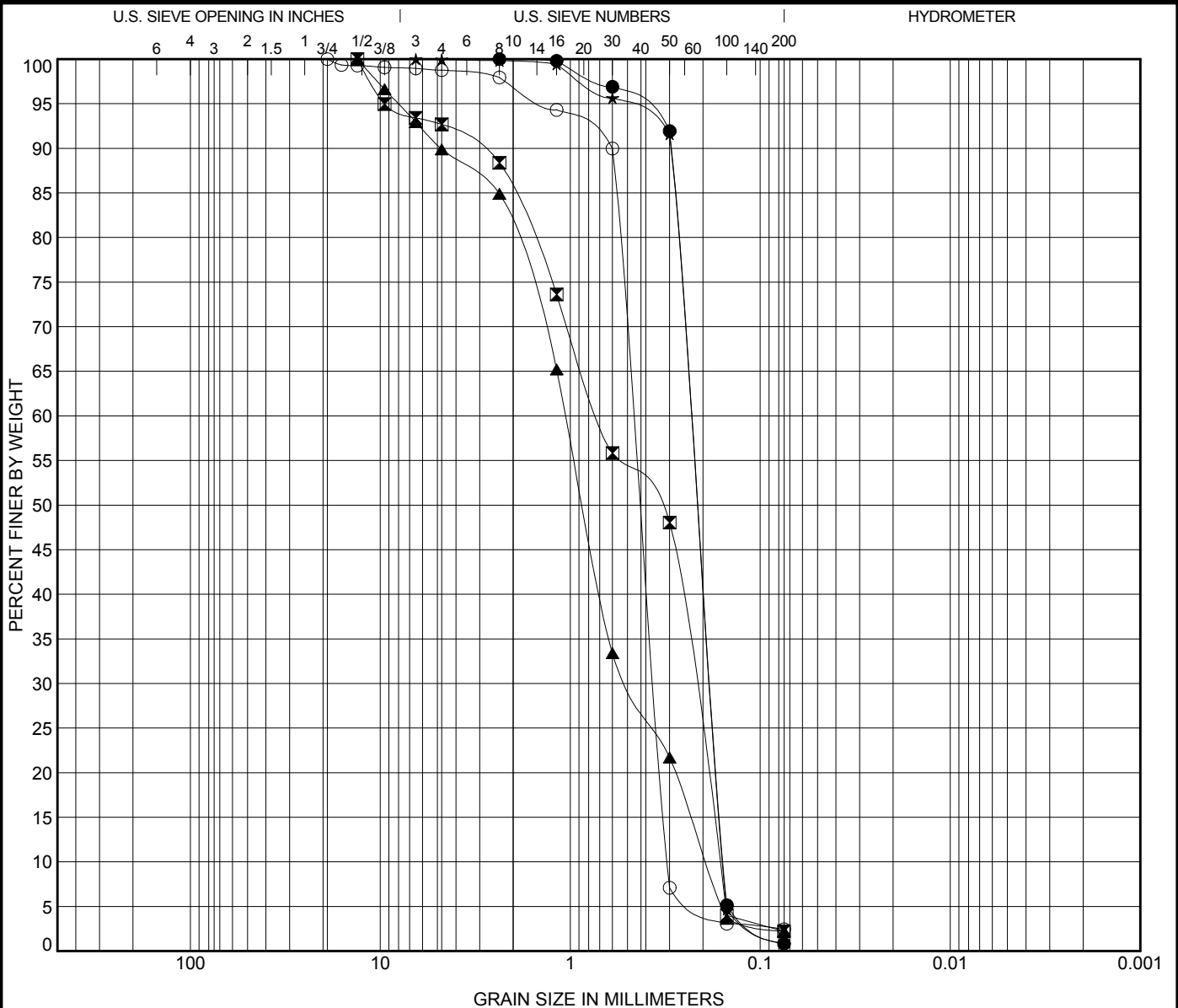
SOIL LITHOLOGY		SAMPLE			SHEAR STR.(kPa)			BULK UNIT WGHT (kN/m ³)	WATER CONTENT (%)			WELL DATA	ELEV. (m)	REMARKS	
EL/DPT (m)	DESCRIPTION <i>DMT</i>	DEPTH (m)	SYMBOL	SAMP ID	TYPE	N-VALUE	DILATOMETER: Su (Mbars) ▼ FIELD VANE: Peak X Rem. ⊗ LAB TEST: Unc. ■ P.P. □ 50 100 150		Wp	w	wl				
0.08	Ground Elev: 176.20 m GRAVEL & SAND (GWS) - crushed stone TOPSOIL - dark brown organic sand SAND (SP) - light brown, fine grained	0.08	[Symbol]	0.3 GRAB			PENETR. RESISTANCE DMT Phi(φ) ◆ STANDARD ● DYN. CONE ○ 20 40 60	○					176	Field Percolation Test, T-Time = 0.2 min/cm grain size testing resthole open and dry prior to percolation testing	
176.12		0.30													
175.90		0.60													
175.60	End of Testhole	1.0													
		1.5													
		2.0													
		2.5													
		3.0													
		3.5													
		4.0													
		4.5													
		5.0													
		5.5													
		6.0													
		6.5													

CTMET 16G074.GPJ 16-10-18

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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

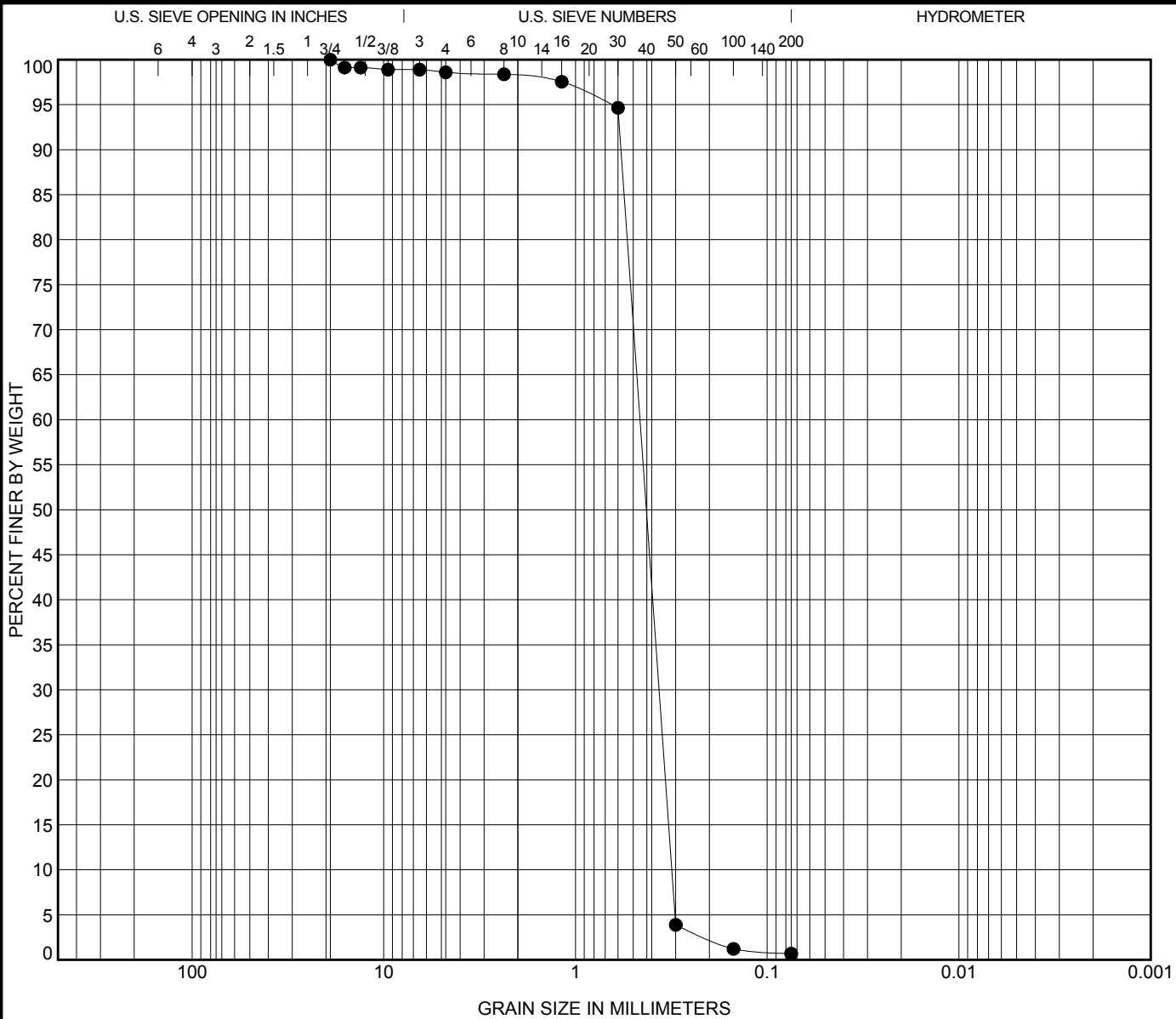
Specimen Identification	Classification	LL	PL	PI	Cc	Cu		
● 2 0.15	POORLY GRADED SAND(SP)				0.92	1.49		
☒ 2 0.60	POORLY GRADED SAND(SP)				0.44	4.27		
▲ 2 1.70	POORLY GRADED SAND(SP)				1.19	5.51		
★ P1 0.60	POORLY GRADED SAND(SP)				0.92	1.49		
○ P2 0.60	POORLY GRADED SAND(SP)				0.92	1.52		
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 2 0.15	2.36	0.232	0.183	0.156	0.0	99.2	0.8	
☒ 2 0.60	13.2	0.703	0.226	0.165	7.3	90.5	2.2	
▲ 2 1.70	13.2	1.056	0.491	0.192	10.1	87.7	2.2	
★ P1 0.60	6.5	0.233	0.184	0.156	0.0	99.1	0.9	
○ P2 0.60	19	0.467	0.363	0.307	1.2	96.3	2.4	



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GRAIN SIZE DISTRIBUTION

Project: Camp Henry Modifications
 Location: Point Pelee National Park
 Number: 16G074



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● P3 0.60	POORLY GRADED SAND(SP)				0.93	1.46

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● P3 0.60	19	0.46	0.366	0.314	1.4	97.9	0.7	

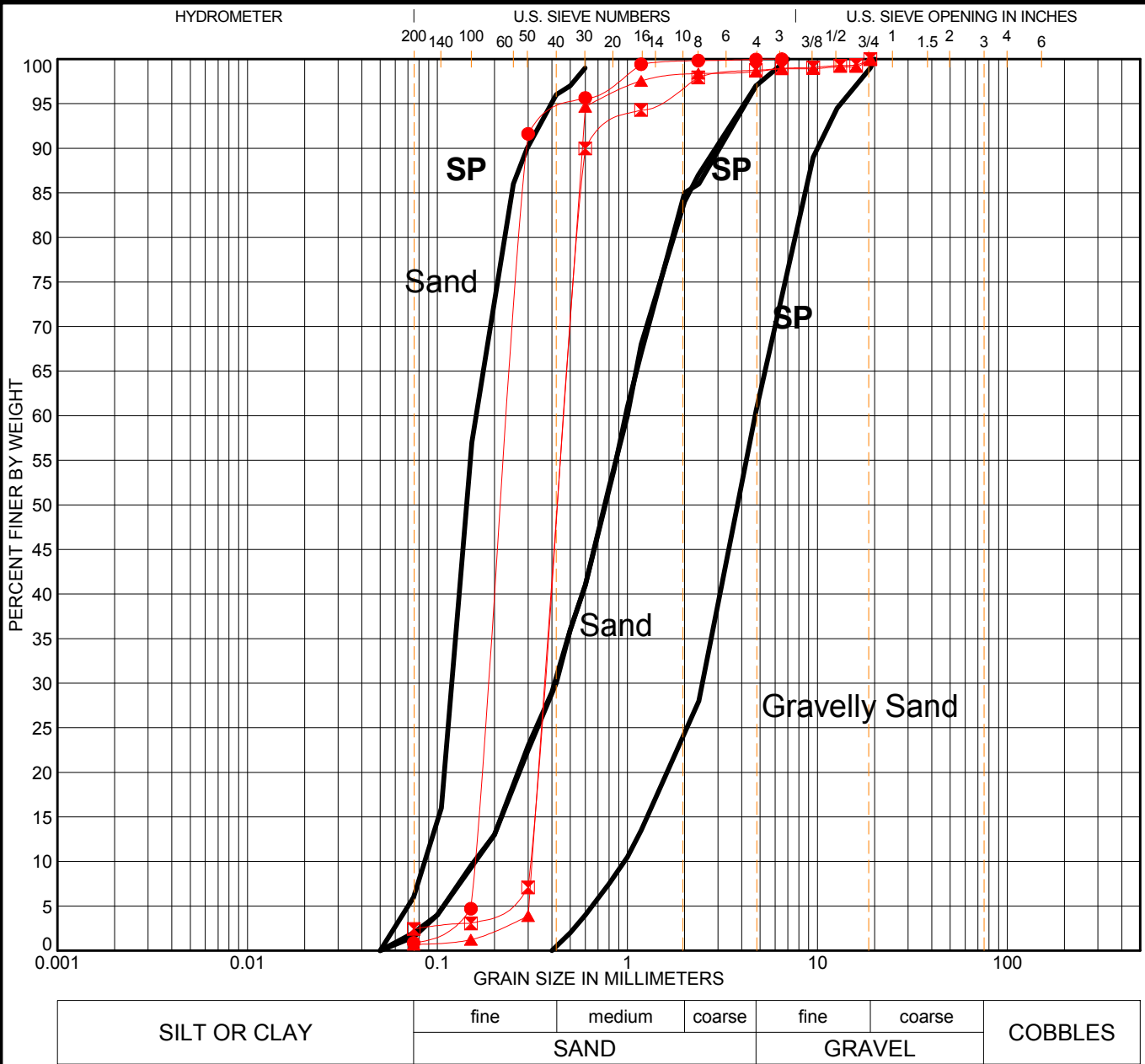


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GRAIN SIZE DISTRIBUTION

Project: Camp Henry Modifications
 Location: Point Pelee National Park
 Number: 16G074

CAN. GRAIN SIZE 16G074.GPJ CAN LAB.GDT 16-10-18



Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● P1 0.60	POORLY GRADED SAND(SP)				0.92	1.49
☒ P2 0.60	POORLY GRADED SAND(SP)				0.92	1.52
▲ P3 0.60	POORLY GRADED SAND(SP)				0.93	1.46

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● P1 0.60	6.5	0.233	0.184	0.156	0.0	99.1	0.9	
☒ P2 0.60	19	0.467	0.363	0.307	1.2	96.3	2.4	
▲ P3 0.60	19	0.46	0.366	0.314	1.4	97.9	0.7	

Chart 6 - SP
 Poorly-graded sands & gravelly-sands
 Little or no fines (< 5% passing 0.074 mm)
 Uniformity coefficient, Cu, < 6



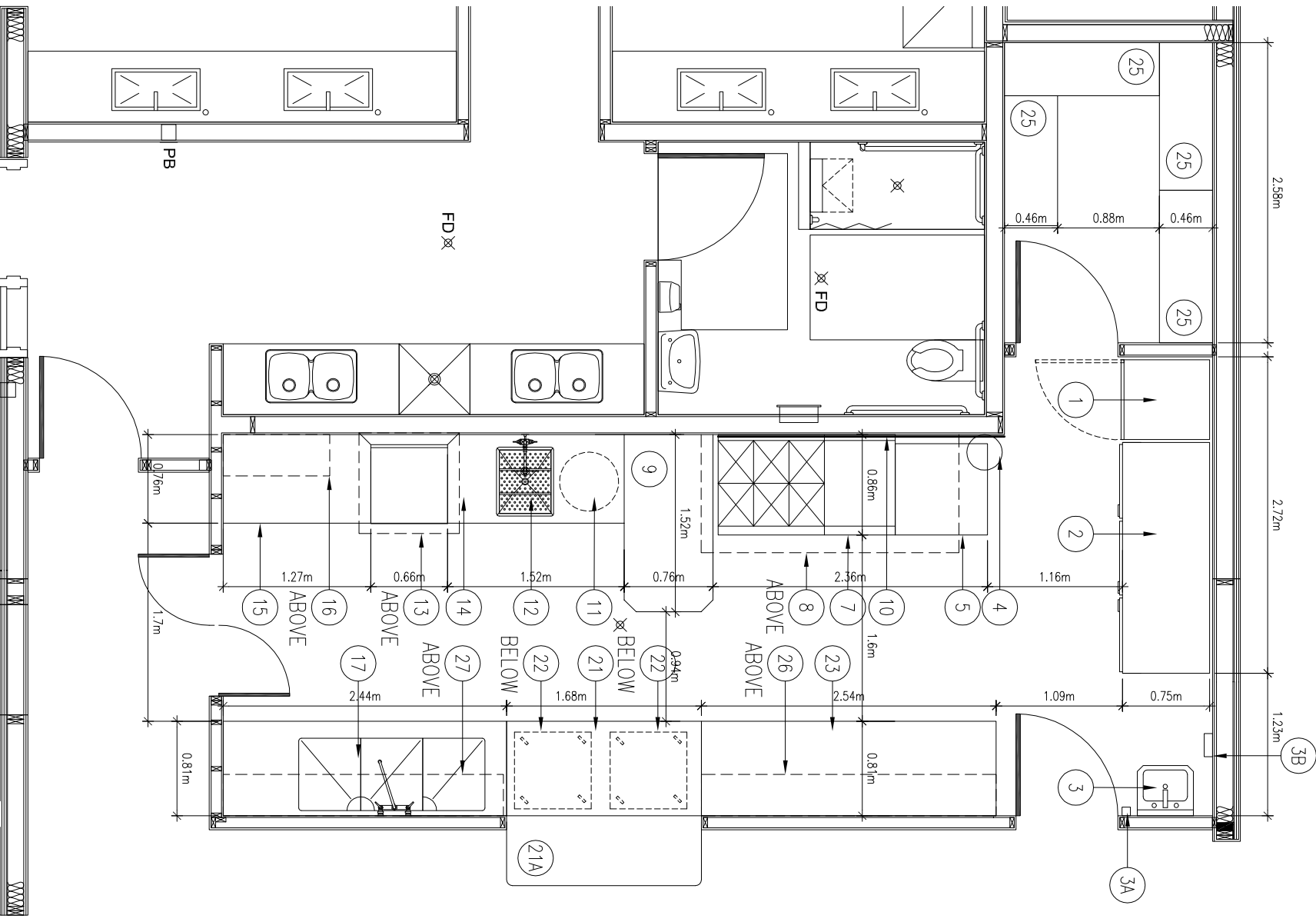
Soil & Materials Engineering Inc.
 2000 Legacy Park Drive
 Windsor, ON N8W 5S6
 Telephone: (519) 966-8863
 Fax: (519)966-8870

GRAIN SIZE DISTRIBUTION

Project: Camp Henry Modifications
 Location: Point Pelee National Park
 Number: 16G074

APPENDIX B

KITCHEN EQUIPMENT LAYOUT



KITCHEN PLAN

SCALE : 1 : 50

EQUIP. NO.	EQUIP. DESCRIPTION	QTY.	MFG
1	SINGLE DOOR FREEZER	1	TRUE - T-23F
2	THREE DOOR COOLER	1	TRUE - T-72
3	HAND SINK	1	TARRISON - HS-14
3A	SOAP DISPENSER - BY OWNER	1	
3B	PAPER TOWEL DISPENSER	1	
4	FIRE SUPPRESSION SYSTEM	1	ANSUL
5	SPREADER TABLE	1	CUSTOM
6	SPARE	1	
7	SIX BURNER / 24" GRIDDLE RANGE	1	GARLAND - G60-6G24RR
8	EXHAUST HOOD	1	SPRING AIR FN-B-7.50/3.92
9	S.S. WORK TABLE	1	CUSTOM
10	S.S. WALL PANELLING		CUSTOM
11	GARBAGE CAN W/ DOLLY	1	RUBBERMAID
12	SOLID TABLE W/ PRE RINSE SINK	1	CUSTOM
13	CONDENSATE HOOD	1	SPRING AIR
14	DISHWASHER / DOOR TYPE	1	HOBERT AM SELECT
15	CLEAN DISHABLE W/ UNDERSHELF	1	CUSTOM
16	S.S. WALL SHELF	1	CUSTOM
17	3 COMPARTMENT POT SINK	1	CUSTOM
18	SPARE		
19	SPARE		
20	SPARE		
21	S.S. CABINET W/ OPEN BASE SHELF	1	CUSTOM
21A	PASS THRU / PICK UP SHELF		SHELF
22	POKER CHIP DOLLIES	2	METRO - PC11A
23	S.S. CABINET W/ ADJUSTABLE SHELVES	1	CUSTOM
24	SPARE		
25	DRY STORAGE SHELVING	LOT	METRO CHROME
26	TWO TIER ADJUSTABLE WALL SHELF	LOT	METRO
27	TWO TIER ADJUSTABLE WALL SHELF	LOT	METRO

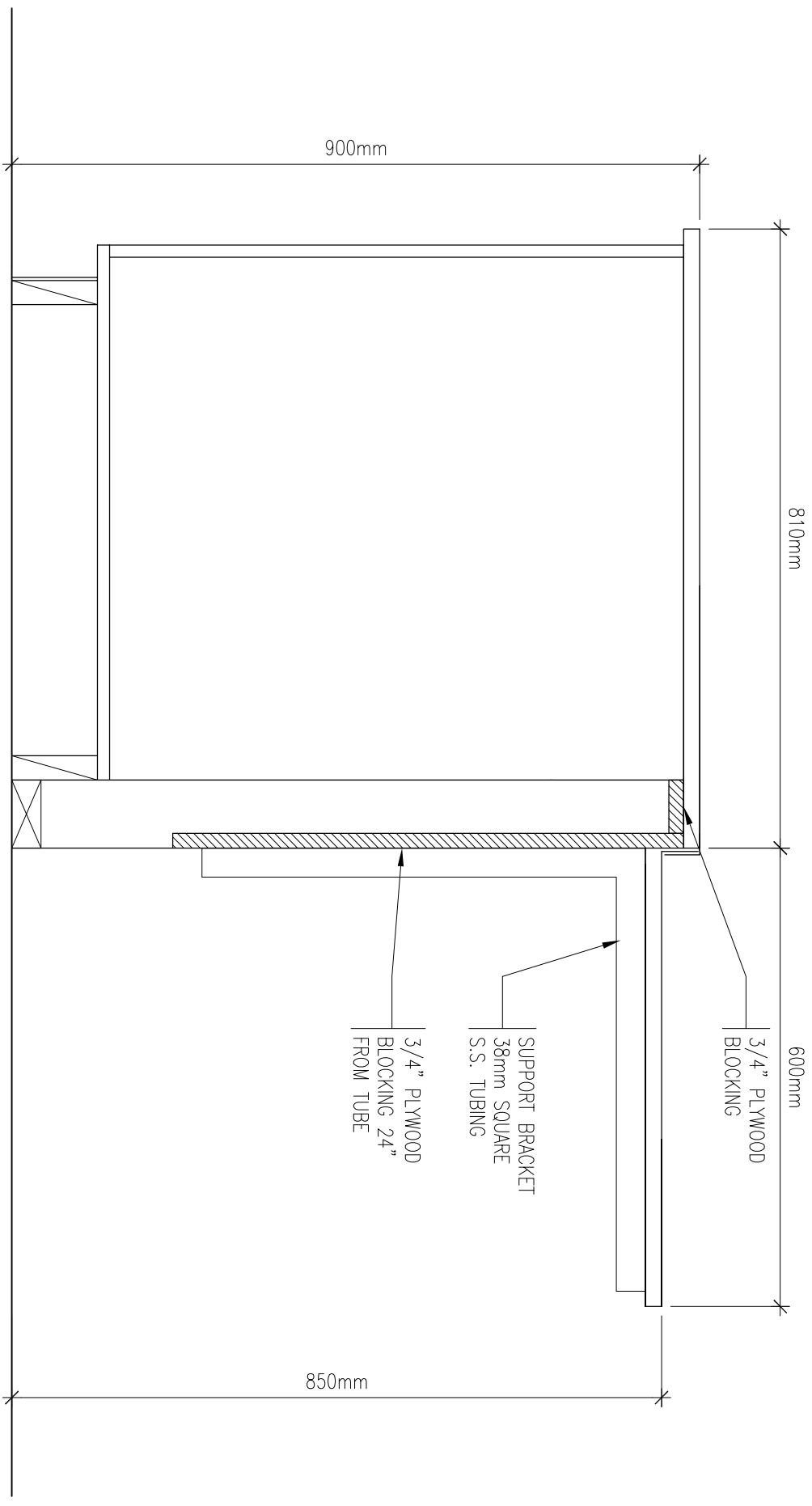
JOB No: 2013-038
 SHEET No: K1.1

PROJECT :
 CAMP HENRY
 POINT PEELE, ONTARIO
 DRAWING TITLE :
 KITCHEN PLAN

DATE : OCT 2016
 DRAWN BY : SAC
 CHECKED BY : R.W.
 SCALE : AS SHOWN

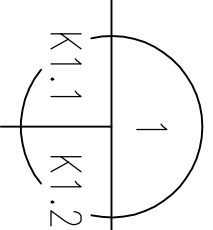
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 2-14-12 REVIEW

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SECTION

SCALE : 1 : 10



JOB No: 2013-038
SHEET No: **K1.2**

PROJECT :
**CAMP HENRY
POINT PELEE, ONTARIO**
DRAWING TITLE :
SECTION

DATE : OCT 2016
DRAWN BY : SAC
CHECKED BY : R.W.
SCALE : AS SHOWN

ITEM 21

ISSUED FOR :	REVIEW
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