



Conseil des
écoles publiques
de l'Est de l'Ontario

Specifications

École Le Prélude – Music Room

Conseil des Écoles Publiques de l'Est de l'Ontario
6025 Promenade Longleaf
Orléans, Ontario

Issued for Tender

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Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises general construction of
- .2 Work of this Contract comprises general construction of a single-storey elementary school building addition, located at École Le Prélude, 6025 Promenade Longleaf, Orléans, Ontario; and further identified as **Le Prelude Music Room**. Work generally includes, but is not limited to, the following:
 - .1 Selective demolition of existing roofing, insulation, flashings/cants, gravel ballast and other roofing components; in preparation for the installation of new mechanical units.
 - .2 The selective demolition and renovation of the existing Gymnasium Stage to access the music room addition. This includes minor architectural, mechanical and electrical work to connect building services to the addition.
 - .3 All excavation, backfill and making good for the building site,
 - .4 New concrete footings and foundations complete with slab-on-grade, stepped floor for music room.
 - .5 Structural steel structural columns, beams, joists and associated framing.
 - .6 Concrete block repairs, interior metal stud partitions and exterior metal stud load bearing walls.
 - .7 Building cladding including masonry veneer, metal composite panels, translucent panel system and roofing.
 - .8 Mechanical HVAC, fire protection, plumbing and underground services, including tie-in to existing services.
 - .9 Electrical power service, distribution, fixtures and related components including tie-in to existing services,
 - .10 Electrical lighting, devices and controls,
 - .11 Fire alarm controls and wiring including tie-in into existing systems,
 - .1 Acoustical tile ceilings and treatment,
 - .2 Doors, frames and associated hardware,
 - .3 Interior finishes, painting, flooring, wall finishes and trim,
 - .4 Interior folding partition system.
 - .5 Minor exterior landscaping, paving and planting,
 - .6 Final finish course of asphalt modifications.

1.2 CONTRACT METHOD

- .1 Construct Work under stipulated price contract, CCDC2-2008 and related Supplementary Conditions.

1.3 WORK SEQUENCE

- .1 Construct Work in stages to accommodate Owner's continued use of premises during construction. Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.

1.4 CONTRACTOR USE OF PREMISES

- .1 Limit use of premises for Work, storage, and for access to allow owner occupancy and Public usage.
- .2 Co-ordinate use of premises under direction of the CEPEO Project Manager.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .4 Remove or alter existing work to prevent injury or damage to portions of existing work which 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 Architect.
- .6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.5 OWNER OCCUPANCY

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with CEPEO Project Manager in scheduling operations to minimize conflict and to facilitate Owner usage.

1.6 OWNER FURNISHED ITEMS

- .1 Owner Responsibilities:
 - .1 Arrange and pay for removal and storage of all furnishings, equipment and material prior to the mobilization of the Contractor.
- .2 Contractor Responsibilities:
 - .1 Repair or replace items damaged by Contractor or subcontractor on site (under their control).

1.7 EXISTING SERVICES

- .1 Notify Consultant and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give CEPEO Project Manager 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 pedestrian and vehicular traffic.
- .3 Provide alternative routes for personnel, pedestrian and vehicular traffic.
- .4 Establish location and extent of service lines in area of work before starting Work. Notify Consultant of findings.
- .5 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.
- .6 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .7 Record locations of maintained, re-routed and abandoned service lines.

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

1.8 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Site Superintendent Logbook
 - .2 Contract Drawings.
 - .3 Specifications.
 - .4 Addenda.
 - .5 Reviewed Shop Drawings.
 - .6 List of Outstanding Shop Drawings.
 - .7 Change Orders.
 - .8 Other Modifications to Contract.
 - .9 Field Test Reports.
 - .10 Copy of Approved Work Schedule.
 - .11 Health and Safety Plan and Other Safety Related Documents.
 - .12 Other documents as specified.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

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Part 1 General

1.1 RELATED SECTIONS

- .1 Appendix 01- Geotechnical Report(s).

1.2 SITE CONDITIONS

- .1 Subsurface investigation reports have been prepared for this project as follows:
 - .1 Report No. G7458-1 dated July 22, 1999 on subsurface investigations for proposed two-storey school addition, by John D. Paterson and Associates Limited.
 - .2 A copy of this report is included in Appendix 01 in these specifications.
- .2 Bidders must fully read the attached reports and be informed of the reports details and findings, before providing a bid.
- .3 The soils investigation reports record properties of the soils and recommendations for the design of foundations, prepared primarily for the use of the original building Consultant. The recommendations given shall not be construed as a requirement of the Contract unless also contained in the Contract Documents.
- .4 This Report shall not form part of the Contract Documents.
- .5 The reports, by their nature, cannot reveal all conditions that exist or occur on the site. Should subsurface conditions be found to vary substantially from the Soil Investigation Report noted above, changes in the design and construction of foundations may be required. This may result in resulting credits or expenditures to the Contract price accruing to the Owner.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

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Part 1 General

1.1 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 CEPEO Project Manager to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 The CEPEO Project Manager will not assign existing building sanitary facilities for use by Contractor's personnel. Provide own temporary washroom(s) and keep facilities clean.
- .5 Use of existing building elevators, dumbwaiters, conveyors or escalators will not be allowed. Provide own conveying equipment; accept liability for damage, safety of equipment and overloading of equipment.
- .6 Closures: protect work temporarily until permanent enclosures are completed.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.4 EXISTING SERVICES

- .1 Notify CEPEO Project Manager and utility companies, where applicable, of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give CEPEO Project Manager minimum 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions to a minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for personnel, pedestrian and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.5 SPECIAL REQUIREMENTS

- .1 Due to the existing building use, security measures are critical and strictly enforced. Coordinate security requirements fully with the CEPEO Project Manager, building operations and security personnel.
- .2 Submit schedule in accordance with Section 01 32 17 - Construction Progress Schedule.
- .3 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

- .4 Keep within limits of work and avenues of ingress and egress.
- .5 Ingress and egress of Contractor vehicles at site is limited to areas as indicated on drawings.

1.6 WORK SCHEDULE REQUIREMENTS

- .1 During the operations of the Elementary school year, carry out noise generating Work Monday to Friday from 18:00 to 06:00 hours and on Saturdays, Sundays and statutory holidays only.
- .2 Carry out Work which does not emit noise, contaminants and disturbance to the building occupants/public may be allowed Monday to Friday from 06:00 to 18:00 hours. Coordinate fully with CEPEO Project Manager.
- .3 Deliver materials outside of peak traffic hours 17:00 to 07:00 and 13:00 to 15:00 unless otherwise approved by the CEPEO Project Manager.
- .4 Coordinate all schedule requirements with the CEPEO Project Manager and the building operator representatives.

1.7 SECURITY CLEARANCES

- .1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require entering premises. Coordinate all security requirements with the CEPEO Project Manager.

1.8 SECURITY ESCORT

- .1 Personnel employed on this project within the building interior must be escorted when executing work in non-public areas during normal working hours. Personnel must be escorted in all areas after normal working hours.
- .2 Submit an escort request to CEPEO Project Manager at least seven (7) days before service is needed.

1.9 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions. Smoking is not allowed in the building or public areas.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract.
- .2 Project Supplementary Conditions

1.2 CASH ALLOWANCES

- .1 Refer to CCDC 2, GC 4.1.
- .2 Include in Contract Price specified cash allowances.
- .3 Cash allowances, unless otherwise specified, cover net cost to Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage, installation and other authorized expenses incurred in performing Work.
- .4 Contract Price, and not cash allowance, includes Contractor's overhead and profit in connection with such cash allowance.
- .5 Contract Price will be adjusted by written order to provide for excess or deficit to each cash allowance.
- .6 Where costs under a cash allowance exceed amount of allowance, Contractor will be compensated for excess incurred and substantiated plus allowance for overhead and profit as set out in Contract Documents.
- .7 Include progress payments on accounts of work authorized under cash allowances in Consultant's monthly certificate for payment.
- .8 Prepare schedule jointly with Consultant to show when items called for under cash allowances must be authorized by Consultant for ordering purposes so that progress of Work will not be delayed.
- .9 Amount of each allowance, for Work specified in respective specification Sections is as follows:
 - .1 Section 01 29 83 to include allowance of \$10,000.00 for costs of Inspections and Testing.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 Owner/Contractor Agreement.
- .2 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-08, Stipulated Price Contract.

1.2 APPLICATIONS FOR PROGRESS PAYMENT

- .1 Make applications for payment on account as provided in Agreement as Work progresses.
- .2 Date applications for payment last day of agreed payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date.
- .3 Provide updated digital Progress Photographs as required in Section 01 33 00, Submittal Procedures, for each Progress Claim. Ensure the number of photographs are able to substantiate the Value of work claimed under the application for payment.
- .4 Provide updated digital Progress Deficiency Log as required in Section 01 33 00, Submittal Procedures, for each Progress Claim. Ensure the log accurately identifies all items related to the Value of work claimed under the application for payment.
- .5 Submit to Architect, at least five (5) days before first application for payment. Schedule of values for parts of Work, aggregating total amount of Contract Price, to facilitate evaluation of applications for payment. Refer to Schedule of Values requirement form in Division 00 – Bidding Documents.

1.3 SCHEDULE OF VALUES

- .1 Provide schedule of values supported by evidence as Architect may reasonably direct and when accepted by Architect, be used as basis for applications for payment.
- .2 Include statement based on schedule of values with each application for payment.
- .3 Support claims for products delivered to Place of Work but not yet incorporated into Work by such evidence as Architect may reasonably require, establishing value and delivery of products.

1.4 PROGRESS PAYMENT

- .1 Architect will issue to Owner, no later than five (5) days after receipt of an application for payment, Certificate for Payment in amount applied for or in such other amount as Architect determines to be due. If Architect amends application, Architect will give notification in writing giving reasons for amendment.

1.5 SUBSTANTIAL PERFORMANCE OF WORK

- .1 Refer to CCDC 2.
- .2 Prepare and submit to Architect comprehensive list of items to be completed or corrected and apply for a review by Architect to establish Substantial Performance of Work or substantial performance of designated portion of Work when Work is substantially performed if permitted by lien legislation applicable to Place of Work designated portion which Owner agrees to accept separately is substantially performed. Failure to include items on list does not alter responsibility to complete Contract.

- .3 Provide complete set of Progress Photographs as required in Section 01 33 00, Submittal Procedures, on USB storage devices for Substantial Completion Claim. Include a separate of photographs documenting all deficiency items from the Contractor's Deficiency List. Failure to do so may delay processing of Substantial Performance.
- .4 No later than 10 days after receipt of list and application, Architect will review Work to verify validity of application, and no later than seven (7) days after completing review, will notify Contractor if Work or designated portion of Work is substantially performed.
- .5 Architect: state date of Substantial Performance of Work or designated portion of Work in certificate.
- .6 Immediately following issuance of certificate of Substantial Performance of Work, in consultation with Architect, establish a reasonable date for finishing Work.

1.6 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF WORK

- .1 Refer to CCDC 2.
- .2 After issuance of certificate of Substantial Performance of Work:
 - .1 Submit application for payment of holdback amount.
 - .2 Submit sworn statement that accounts for labour, subcontracts, products, construction machinery and equipment, and other indebtedness which may have been incurred in Substantial Performance of Work and for which Owner might in be held responsible have been paid in full, except for amounts properly retained as holdback or as identified amount in dispute.
- .3 After receipt of application for payment and sworn statement, Architect will issue certificate for payment of holdback amount.
- .4 Where holdback amount has not been placed in a separate holdback account, Owner shall, 10 days prior to expiry of holdback period stipulated in lien legislation applicable to Place of Work, place holdback amount in bank account in joint names of Owner and Contractor.
- .5 Amount authorized by certificate for payment of holdback amount is due and payable on day following expiration of holdback period stipulated in lien legislation applicable to Place of Work. Where lien legislation does not exist or apply, holdback amount is due and payable in accordance with other legislation, industry practice, or provisions which may be agreed to between parties. Owner may retain out of holdback amount sums required by law to satisfy liens against Work or, if permitted by lien legislation applicable to Place of Work, other third party monetary claims against Contractor which are enforceable against Owner.

1.7 PROGRESSIVE RELEASE OF HOLDBACK

- .1 Refer to CCDC 2.
- .2 Where legislation permits, if Architect has certified that Work of subcontractor or supplier has been performed prior to Substantial Performance of Work, Owner shall pay holdback amount retained for such subcontract Work, or products supplied by such supplier, on day following expiration of holdback period for such Work stipulated in lien legislation applicable to Place of Work.
- .3 In addition to provisions of preceding paragraph, and certificate wording, ensure that such subcontract Work or products is protected pending issuance of final certificate for payment and be responsible for correction of defects or Work not performed regardless of whether or not such was apparent when such certificates were issued.

1.8 FINAL PAYMENT

- .1 Refer to CCDC 2, GC 5.7.
- .2 Submit application for final payment when Work is completed.
- .3 Architect will, no later than (ten) 10 days after receipt of application for final payment, review Work to verify validity of application. Architect will give notification that application is valid or give reasons why it is not valid, no later than seven (7) days after reviewing Work.
- .4 Architect will issue final certificate for payment when application for final payment is found valid.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

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Part 1 General

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- .1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Contractor are specified under various sections.
- .2 Refer to Section 01 21 00 - Cash Allowances for Owner-engaged Testing and Inspections,

1.2 APPOINTMENT AND PAYMENT

- .1 CEPEO Project Manager will appoint and pay for services of testing laboratory except as 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 the supervision of Consultant.
- .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 Consultant 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 Consultant 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 Consultant.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Schedule and administer project meetings throughout the progress of the work at the call of CEPEO Project Manager.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting four (4) days in advance of meeting date to CEPEO Project Manager.
- .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 meeting participants, affected parties not in attendance and the CEPEO Project Manager and Consultant.
- .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

- .1 Within 5 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities. Senior representatives of the Owner, building operations personnel, CEPEO Project Manager, Architect, engineering sub-consultants, Contractor, major Subcontractors, field inspectors, supervisors and any other project stakeholders will be in attendance.
- .2 Establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.
- .3 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .4 Agenda to include:
 - .1 Appointment of official representatives of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 17 - 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 Delivery schedule of specified equipment.
 - .6 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.

1.3 PROGRESS MEETINGS

- .1 During course of Work and one (1) week prior to project completion, schedule progress meetings every two (2) weeks. The meeting must be no longer than ninety (90) minutes in duration. Schedule agenda accordingly.
- .2 Contractor, major Subcontractors involved in Work, CEPEO Project Manager, Architect, sub-consultants (optional) and Owner (optional) are to be in attendance.
- .3 Notify parties minimum three (3) days prior to meetings. Clearly notify the Architect when the attendance of the structural, mechanical, electrical and/or other consultants is necessary. Schedule consultants and/or subtrade attendance (when necessary) at the beginning of the meetings for efficient use of their time.
- .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.
 - .5 Review of off-site fabrication delivery schedules.
 - .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.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

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Part 1 General

1.1 DEFINITIONS

- .1 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 Actual Finish Date (AF): point in time that Work actually ended on activity
- .3 Actual Start Date (AS): point in time that Work actually started on activity.
- .4 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.
- .5 Baseline: original approved plan (for Project, work package, or activity), plus or minus approved scope changes.
- .6 Completion Milestones: they are firstly Substantial Completion and secondly Final Certificate.
- .7 Constraint: applicable restriction that will affect performance of Project. Factors that affect activities can be scheduled.
- .8 Control: process of comparing actual performance with planned performance, analyzing variances, evaluating possible alternatives, and taking appropriate corrective action as needed.
- .9 Critical Activity: any activity on a critical path. Most commonly determined by using critical path method.
- .10 Critical Path: series of activities that determines duration of Project. In deterministic model, critical path is usually defined as those activities with float less than or equal to specified value, often zero. It is longest path through Project.
- .11 Critical Path Method (CPM): network analysis technique used to predict Project duration by analyzing which sequence of activities (which path) has least amount of scheduling flexibility (least amount of float).
- .12 Data Date (DD) : date at which, or up to which, Project's reporting system has provided actual status and accomplishments.
- .13 Duration (DU): number of work periods (not including holidays or other non-working periods) required to complete activity or other Project element. Usually expressed as workdays or work weeks.
- .14 Early Finish Date (EF): 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. Early finish dates can change as Project progresses and changes are made to Project plan.
- .15 Early Start Date (ES): 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. Early start dates can change as Project progresses and changes are made to Project Plan.

- .16 Finish Date: point in time associated with activity's completion. Usually qualified by one of following: actual, planned, estimated, scheduled, early, late, baseline, target, or current.
- .17 Float: amount of time that activity may be delayed from its early start without delaying Project finish date. Float is mathematical calculation, and can change as Project progresses and changes are made to Project plan. This resource is available to both Project Manager and Contractor.
- .18 Lag: modification of logical relationship that directs delay in successor task.
- .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 Plan: summary-level schedule that identifies major activities and key milestones.
- .24 Milestone: significant event in Project, usually completion of major deliverable.
- .25 Monitoring: capture, analysis, and reporting of Project performance, usually as compared to plan.
- .26 Near-Critical Activity: activity that has low total float.
- .27 Non-Critical Activities: activities which when delayed, do not affect specified Contract duration.
- .28 Project Control System: fully computerized system utilizing commercially available software packages.
- .29 Project Network Diagram: schematic display of logical relationships of Project activities. Always drawn from left to right to reflect Project chronology.
- .30 Project Plan: formal, approved document used to guide both Project execution and Project control. Primary uses of Project plan are to document planning assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines. Project plan may be summary or detailed.
- .31 Project Planning: development and maintenance of Project Plan.
- .32 Project Planning, Monitoring and Control System: overall system operated by Project Manager to enable monitoring of Project Work in relation to established milestones.
- .33 Project Schedule: planned dates for performing activities and 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.
- .34 Quantified days duration: working days based on 5 day work week, discounting statutory holidays.
- .35 Risk: uncertain event or condition that, if it occurs, has positive or negative effect on Project's objectives.

- .36 Scheduled Finish Date (SF): point in time that Work was scheduled to finish on activity. Scheduled finish date is normally within range of dates delimited by early finish date and late finish date.
- .37 Scheduled Start Date (SS): point in time that Work was scheduled to start on activity. Scheduled start date is normally within range of dates delimited by early start date and late start date.
- .38 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.
- .39 Work Breakdown Structure (WBS): deliverable-oriented grouping of project elements that organizes and defines total Work scope of Project. Each descending level represents increasingly detailed definition of Project Work.

1.2 SYSTEM DESCRIPTION

- .1 Construction Progress Schedule (Project Time Management): describes processes required to ensure timely completion of Project. These processes ensure that various elements of Project are properly co-ordinated. It consists of planning, time estimating, scheduling, progress monitoring and control.
- .2 Planning: this is most basic function of management, that of determining presentation of action and is essential.
 - .1 It involves focusing on objective consideration of future, and integrating forward thinking with analysis; therefore, in planning, implicit assumptions are made about future so that action can be taken today.
 - .2 Planning and scheduling facilitates accomplishment of objectives and should be considered continuous interactive process involving planning, review, scheduling, analysis, monitoring and reporting.
- .3 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. This implies progressively more reliability of scheduling data. Detail Project schedule is used for analysis and progress monitoring.
- .4 Ensure project schedule efficiencies through monitoring.
 - .1 When activities begin on time and are performed according to estimated durations without interruptions, original Critical Path will remain accurate. Changes and delays will however, create an essential need for continual monitoring of Project activities.
 - .2 Monitor progress 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 Monitoring should be done sufficiently often so that causes of delays are immediately identified and removed if possible.
- .5 Project monitoring and reporting: as Project progresses, keep team aware of changes to schedule, and possible consequences. In addition to Bar Charts and CPM networks, use narrative reports to provide advice on seriousness of difficulties and measures to overcome them.

- .1 Narrative reporting begins with statement on general status of Project followed by summarization of delays, potential problems, corrective measures and Project status criticality.

1.3 CPM REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Master Plan and Detail Schedule deemed impractical by CEPEO Project Manager are revised and resubmitted for approval.
- .3 Acceptance of Master Plan and Detail Schedule showing scheduled Contract duration shorter than specified Contract duration does not constitute change to Contract. Duration of Contract may only be changed through bilateral Agreement.
- .4 Consider Master Plan and Detail Schedule deemed practical by CEPEO Project Manager showing Work completed in less than specified Contract duration, to have float.
- .5 First Milestone on Master Plan 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. 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. Simultaneous use of multiple crews on multiple fronts on multiple critical paths may be required. Arrange participation on and off site of subcontractors and suppliers, as required by the CEPEO Project Manager, for purpose of network planning, scheduling, updating and progress monitoring. Approvals by the CEPEO Project Manager of original networks and revisions do not relieve Contractor from duties and responsibilities required by Contract.
- .13 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.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to CEPEO Project Manager Project Control System for planning, scheduling, monitoring and reporting of project progress.

- .3 Submit Project Control System to CEPEO Project Manager for approval, with copy to Consultant; failure to comply with each required submission, may result in progress payment being withheld.
- .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 Project planning, monitoring and control system data as part of initial schedule submission and monthly status reporting as required by CEPEO Project Manager in following form.
 - .1 USB storage media files, in original scheduling software, containing schedule and cash flow information, labelled with data date, specific update, and person responsible for update Master Plan Bar Chart. MS Project format is required.
 - .2 Construction Detail schedule Bar Chart.
 - .3 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.
 - .4 Criticality report listing activities and milestones with zero 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.
 - .5 Progress report in early start sequence, listing for each trade, activities due to start, underway, or finished within two 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.

1.5 QUALITY ASSURANCE

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

1.6 PROJECT MEETING

- .1 Meet with CEPEO Project Manager within two (2) working days of Award of Contract date, to establish Work requirements and approach to project construction operations.

1.7 WORK BREAKDOWN STRUCTURE (WBS)

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

1.8 PROJECT MILESTONES

- .1 Mandatory and recommended project milestones form targets for both Master Plan and Detail Schedule of CPM construction network system. The following, where applicable, are to be confirmed and/or determined at Project Start-up Meeting.

- .1 Mandatory/Recommended: excavation completed within number of working days of Award of Contract date.
- .2 Mandatory/Recommended: substructure completed within number working days of Award of Contract date.
- .3 Mandatory/Recommended: superstructure completed within number working days of Award of Contract date.
- .4 Mandatory/Recommended: building closed-in and weatherproofed within number working days of Award of Contract date.
- .5 Mandatory/Recommended: interior finishing and fitting, mechanical and electrical work completed within number working days of Award of Contract date.
- .6 Mandatory/Recommended: interim Certificate (substantial completion) within number working days of Award of Contract date.
- .7 Mandatory/Recommended: outside work completed within number working days of Award of Contract date.
- .8 Mandatory/Recommended: final Certificate completion within number working days of Award of Contract date.

1.9 MASTER PLAN

- .1 Structure and base CPM construction networks system on WBS coding in order to ensure consistency throughout Project.
- .2 Prepare comprehensive construction Master Plan (CPM logic diagram) and dependent Cash Flow Projection within five (5) working days of finalizing Agreement to confirm validity or alternates of identified milestones.
 - .1 Master Plan will be used as baseline.
 - .1 Revise baseline as conditions dictate and as required by the Project Manager.
 - .2 Project Manager will review and return revised baseline within five (5) working days.
- .3 Reconcile revisions to Master Plan and Cash Flow Projections with previous baseline to provide continuous audit trail.
- .4 Initial and subsequent Master Plans will include:
 - .1 CD-ROM containing schedule and cash flow information, clearly labelled 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 (logic), 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.

1.10 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 Award of Contract.
- .2 Sequence of Shop Drawings, Samples, Mockups.
- .3 Required Permits and Approvals.
- .4 Mobilization.
- .5 Selective Removals.
- .6 Site Preparation.
- .7 Concrete Formwork and Placing
- .8 Structural Steel.
- .9 Metal Fabrications/Handrails
- .10 Membrane Roofing System,
- .11 Exterior envelope,
- .12 Metal Stud framing,
- .13 Doors and Frames, Hardware,
- .14 Gypsumboard,
- .15 Flooring and finishes,
- .16 Specialties,
- .17 Plumbing,
- .18 Lighting.
- .19 Electrical.
- .20 Controls.
- .21 Heating, Ventilating, and Air Conditioning.
- .22 All Testing and Commissioning.
- .23 Supplied equipment long delivery items.
- .2 Detail CPM schedule to cover in detail minimum period of months beginning from Award of Contract date with each activity duration approximately 3 to 15 workdays.
 - .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 Plan.
- .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 CEPEO Project Manager for review effects created by insertion of new Change Order.

1.11 REVIEW OF THE CONSTRUCTION DETAIL SCHEDULE

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

1.12 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 CEPEO Project Manager.
- .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/or additional work shifts.
- .4 Submit to CEPEO Project Manager written 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 Project Manager.
 - .4 Do not assume approval of Contract extension prior to receipt of written approval from CEPEO Project Manager.
- .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 The CEPEO Project Manager 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.

1.13 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 the CEPEO Project Manager 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 CEPEO Project Manager four (4) 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/approvals, shop drawings, Change Orders, 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.

1.14 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site 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.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2 ADMINISTRATIVE

- .1 All submissions to be provided in PDF format, unless otherwise noted, by email. Subject line must be identified as: "[1553] Le Prelude Music Room: (TOPIC)".
- .2 Submit to Consultant 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 or Contract Cost and no claim for extension by reason of such default will be allowed.**
- .3 Do not proceed with Work affected by submittal until review is complete.
- .4 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .5 Where items or information is not produced in SI Metric units converted values are acceptable. The General Contractor MUST review all submittals prior to submission to Consultant. **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 BY THE General Contractor.** Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Consultant, 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 is co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
- .10 Keep one reviewed copy of each submission on site.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.
- .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 Ten (10) days for the Consultants to review of submission.

- .5 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .6 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, 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 Consultant's review, distribute copies.
- .10 Submit electronic copy (in .pdf format) of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.
- .11 Submit electronic copy (in .pdf format) of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic copy (in .pdf format) of test reports for requirements requested in specification Sections and as requested by Consultant.

- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit electronic copy (in .pdf format) of certificates for requirements requested in specification Sections and as requested by Consultant.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic copy (in .pdf format) of manufacturer's instructions for requirements requested in specification Sections and as requested by Consultant.
 - .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.
- .15 Submit electronic copy (in .pdf format) of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Consultant.
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .16 Submit 3 copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Consultant.
- .17 When submitting electronic documents, the documents must be marked up or annotated to detail the specific requirements of the project. Delete information not applicable to project.
- .18 Supplement standard information to provide details applicable to project.
- .19 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, electronic 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.
- .20 The review of shop drawings by Consultant is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that the Consultant 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.
- .21 Arrange and pay for all deliveries and pick-up, to and from, the Consultant's offices.

1.4 SAMPLES

- .1 Submit for review samples in triplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Consultant's business address.
- .3 Notify Consultant 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 Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .6 Make changes in samples which Consultant 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.
- .8 Arrange and pay for all deliveries and pick-up, to and from, the Consultant's offices.

1.5 MOCK-UPS

- .1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

1.6 PROGRESS PHOTOGRAPHS

- .1 Submit progress photographs in accordance with this Section. These are required to accompany the application for payment documentation to substantiate the value of work provided to date.
- .2 Contractor to provide digital photographs for the interior and exterior of the building for all areas affected by the work of this Contract. This will form the basis for recording of all existing conditions before the work proceeds. Review with Consultant before commencing construction.
- .3 Provide detailed photographs throughout the extents of the scope of work to document existing conditions before any work is conducted.
- .4 Submit digital photograph files in .JPEG or .TIFF formats, by email, Architect cloud filing sharing site or on USB storage device to the Consultant, all Sub-consultants and the Owner. Provide room number/location identification, view orientation and date of photograph.
- .5 Provide progress photographs at monthly intervals, as a minimum. Provide additional photographs prior to concealment of services and building elements, at significant stages of the project and at final completion.
- .6 Viewpoints to be as a minimum each side of building exterior and roof, all elevations of all interior rooms and other locations determined by the Consultant. Include all exterior site and landscaping work.
- .7 Submittal of photographs is a requirement for monthly progress payments to the Contractor.

1.7 PROGRESS DEFICIENCY LOG

- .1 Submit progress deficiency log in accordance with this Section. This log is required to accompany the application for payment documentation to substantiate the value of work provided to date and the relation of deficiencies to date.
- .2 The deficiency log is to be provided in MS Excel spreadsheet, in digital format to the Architect, separated by each Division.
- .3 Provide information in the following columns:
 - .1 Deficiency reference number by Division. (i.e. 06.01 (Wood and Plastics, deficiency number 1).
 - .2 Room or area location in the project, and gridline,
 - .3 Description of deficiency,
 - .4 Status of deficiency, in progress, completed, etc.
 - .5 Cost of deficiency. This figure must represent the cost of rectification if the Owner was required to engage a separate Contractor to complete the work of the item. Ensure the costs of current deficiencies are totalled.

1.8 CERTIFICATES AND TRANSCRIPTS

- .1 Submit transcription of insurance immediately after award of Contract.
- .2 Immediately after award of Contract, submit Workers' Compensation Board Status.
- .3 Provide certificates and transcripts in PDF format.

1.9 SUBMITTAL SCHEDULE

- .1 Shop Drawings, Inspections/Testing Reports and Certificates:
 - .1 Submit electronic transmittal and shop drawing submittal files, all in PDF format by email, for each individual Specification Section to parties as follows:
 - .1 All specification Divisions 01, 02, 04, 06 to 14: Architect only.
 - .2 All specification Divisions 03, 05: Structural Engineering Sub-consultant directly, with circulation copy to Architect.
 - .3 All specification Divisions 21 to 29: Mechanical/Electrical Engineering Sub-consultant directly, with circulation copy to Architect.
 - .4 All specification Divisions 21 to 29: Civil Engineering Sub-consultant (where applicable) directly, with circulation copy to Architect.
 - .2 Submit all submittals accompanied by Shop Drawing Submission form of the Architect, duly completed.
- .2 Construction Progress Meeting:
 - .1 Submit the following mandatory submittal files, in electronic PDF format, and Three (3) hard copies of each. Failure to do so will delay the coordination with the Owner and Consultants.
 - .1 Current Deficiency Log, identifying all deviancies from all subtrades in progress. Submit in MS Excel format.

- .2 Current Shop Drawing Log, identifying all detailed shop drawing reviews and approvals in progress. Submit in MS Excel format.
 - .3 Current Request for Information (RFI) Log, identifying all RFI's, outstanding RFI's, Priorities of Outstanding RFI's, dates and detailed subject. Submit in MS Excel format.
 - .4 Current Critical Path Schedule, identifying all updates to current progress to the Approved Construction Schedule. Submit in MS Project format.
 - .5 Current Request for Information (RFI) Log, identifying all RFI's, outstanding RFI's, Priorities of Outstanding RFI's, dates and detailed subject. Submit in MS Excel format.
 - .6 Current Change (CCC/CO) Log, identifying all changes, dates and detailed subject, their status and the party actioning the item. Submit in MS Excel format.
- .3 Monthly Progress Claims:
- .1 Submit the following mandatory submittal files, in electronic format, with each monthly Progress Claim. Failure to do so will delay processing of the Certificate for Payment.
 - .1 Progress Photographs, evidencing all work progress in detail,
 - .2 Current Deficiency Log, identifying all deviancies from all subtrades in progress. Submit in MS Excel format.
 - .3 Current Shop Drawing Log, identifying all detailed shop drawing reviews and approvals in progress. Submit in MS Excel format.
 - .4 Current Request for Information (RFI) Log, identifying all RFI's, outstanding RFI's, Priorities of Outstanding RFI's, dates and detailed subject. Submit in MS Excel format.
 - .5 Current Critical Path Schedule, identifying all updates to current progress to the Approved Construction Schedule. Submit in MS Project format.
 - .6 WSIB Statutory Declaration,
 - .7 Statutory Declaration, verifying all subtrades have been paid for work to date.
- .4 Application for Substantial Performance:
- .1 Submit the following mandatory submittal files, in electronic PDF format, for application of Substantial Performance. Failure to do so will delay processing of Substantial Performance Certificate.
 - .1 Progress Photographs, evidencing all work in detail,
 - .2 Include a separate series of photographs documenting all deficiency items from the Contractor's Deficiency Log.
 - .3 WSIB Statutory Declaration,
 - .4 Detailed construction Deficiency Log, with the cost breakdown for each deficiency and totals for each subtrade division. Completed deficiencies must have the approvals of the Owner, Architect and consultants that all rectified deficiencies have been completed
 - .5 Final Electrical Certificate from the authorities having jurisdiction.
 - .6 Final Fire Alarm Verification Certificate.
 - .7 Final Fire suppression testing and approvals.
 - .8 Final HVAC testing and balancing report,
 - .9 Final Inspection Report from the authorities having jurisdiction,

- .10 Final copies of all testing and inspection reports.
- .11 Any other reports as required by agencies.
- .5 Application for Total Performance:
 - .1 Submit the following mandatory submittal files, in electronic PDF format, for application of Total Performance. Failure to do so will delay processing of Total Performance Certificate.
 - .1 Progress Photographs, evidencing all work in detail,
 - .2 WSIB Statutory Declaration,
 - .3 Final Deficiency Log, with the approvals of the Owner, Architect, consultants that all deficiencies have been completed and no costs remain for deficiencies.
- .6 Contractor Requests for Information (RFI)
 - .1 Submit the written Requests for Information, in electronic PDF format and immediately upon the need for information. Failure to do so will delay processing of the responses.
 - .1 Progress Photographs, evidencing all work progress in detail,
 - .2 Current Deficiency Log, identifying all deviancies from all subtrades in progress. Submit in MS Excel format.
 - .3 Current Shop Drawing Log, identifying all detailed shop drawing reviews and approvals in progress. Submit in MS Excel format.
 - .4 Current Request for Information (RFI) Log, identifying all RFI's, outstanding RFI's, Priorities of Outstanding RFI's, dates and detailed subject. Submit in MS Excel format.
 - .5 Current Critical Path Schedule, identifying all updates to current progress to the Approved Construction Schedule. Submit in MS Project format.
 - .2 Ensure all required information is provided to allow the consultants to properly respond to the requests. Failure to do so will delay processing of the responses.
 - .3 Ensure all Contract Documents, site conditions, related reports, shop drawings and other contract documentation is reviewed before issuance.
 - .4 Requests for Information will never be responded to verbally. Improper Request for Information processes

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 Manual of Uniform Traffic Control Devices for Streets and Highways (UTCD) - 2002.

1.2 PROTECTION OF PUBLIC TRAFFIC

- .1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.
- .2 When working on travelled way:
 - .1 Place equipment in position to present minimum of interference and hazard to travelling public.
 - .2 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.
 - .3 Do not leave equipment on travelled way overnight.
- .3 Do not close any lanes of road without approval of CEPEO Project Manager. Before re-routing traffic erect suitable signs and devices in accordance with instructions contained in Part D of UTCD.
- .4 As directed by CEPEO Project Manager, provide detours or temporary roads to facilitate passage of traffic around restricted construction area:
- .5 Provide and maintain road access and egress to property fronting along Work under Contract and in other areas as indicated, unless other means of road access exist that meet approval of CEPEO Project Manager.

1.3 INFORMATIONAL AND WARNING DEVICES

- .1 Provide and maintain signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.
- .2 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in Part D, Temporary Conditions Signs and Devices, of UTCD manual.
- .3 Place signs and other devices in locations recommended in UTCD manual.
- .4 Meet with CEPEO Project Manager prior to commencement of Work to prepare list of signs and other devices required for project. If situation on site changes, revise list to approval of Project Manager.
- .5 Continually maintain traffic control devices in use by:
 - .1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
 - .2 Removing or covering signs which do not apply to conditions existing from day to day.

1.4 CONTROL OF PUBLIC TRAFFIC

- .1 Provide competent flag persons, trained in accordance with, and properly equipped as specified in, UTCD manual in following situations:

- .1 When public traffic is required to pass working vehicles or equipment that block all or part of travelled roadway.
- .2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.
- .3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.
- .4 Where temporary protection is required while other traffic control devices are being erected or taken down.
- .5 For emergency protection when other traffic control devices are not readily available.
- .6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.
- .7 Delays to public traffic due to contractor's operators: maximum 5 minutes.

1.5 OPERATIONAL REQUIREMENTS

- .1 Maintain existing conditions for traffic throughout period of contract except that, when required for construction under contract and when measures have been taken as specified and approved by CEPEO Project Manager to protect and control public traffic.
- .2 Maintain existing conditions for traffic crossing right-of-way.
- .3 Be responsible for any damage, caused by the work under this Contract, to existing hard and soft landscaping, asphalt paving and site elements not within the scope of work. All damages are to be repaired, patched and/or make good to match existing conditions.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Ontario
 - .1 Occupational Health and Safety Act, R.S.O. 1990 Updated 2007.

1.3 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan to the CEPEO Project Manager, 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.
- .3 Submit electronic copy of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .4 Submit electronic copy of incident and accident reports.
- .5 CEPEO Project Manager will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within five (5) days after receipt of plan. Revise plan as appropriate and resubmit plan to CEPEO Project Manager within three (3) days after receipt of comments from CEPEO Project Manager.
- .6 CEPEO Project Manager'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.
- .7 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to CEPEO Project Manager.
- .8 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.4 FILING OF NOTICE

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

1.5 SAFETY ASSESSMENT

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

1.6 REGULATORY REQUIREMENTS

- .1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

1.7 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 CEPEO Project Manager may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

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

1.9 COMPLIANCE REQUIREMENTS

- .1 Comply with Ontario Health and Safety Act, R.S.O.
- .2 Comply with Occupational Health and Safety Regulations, 1996.
- .3 Comply with Occupational Health and Safety Act, General Safety Regulations, O.I.C.
- .4 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.10 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Consultant verbally and in writing.

1.11 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have site-related working experience specific to activities associated with the project.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 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.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.12 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 Province having jurisdiction, and in consultation with Consultant.

1.13 CORRECTION OF NON-COMPLIANCE

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

1.14 POWDER ACTUATED DEVICES

- .1 Use powder actuated devices only after receipt of written permission from CEPEO Project Manager.

1.15 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.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

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Part 1 General

1.1 CODES

- .1 Perform Work in accordance with Ontario Building Code of Canada (OBC) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Architect.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Architect.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Architect.

1.3 BUILDING SMOKING ENVIRONMENT

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

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Part 1 General

1.1 INSPECTION

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

1.2 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies may be engaged by Owner for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Owner.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 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 Consultant at no cost to Owner. 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 and Consultant 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 Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Consultant.

1.6 REPORTS

- .1 Submit on-going, detailed and quantified Deficiency Log, throughout all stages of the project and until Total Performance is achieved. Refer to Section 01 33 00 Submittal Procedures.
- .2 Submit electronic copy (in .pdf format) of inspection and test reports to Consultant.
- .3 Provide copies to subcontractor of work being inspected or tested and/or manufacturer or fabricator of material being inspected or tested.

1.7 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Consultant and may be authorized as recoverable.

1.8 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to Consultant as specified in specific Section.
- .3 Prepare mock-ups for Consultant review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 Mock-ups may remain as part of Work when acceptable to Consultant.

1.9 MILL TESTS

- .1 Submit mill test certificates as requested or required of specification Sections.

1.10 EQUIPMENT AND SYSTEMS

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

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Part 1 General

1.1 SUBMITTALS

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

1.2 INSTALLATION AND REMOVAL

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

1.3 DEWATERING

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

1.4 WATER SUPPLY

- .1 The Owner will provide continuous supply of potable water for construction use.
- .2 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.
- .3 The Owner will pay for utility charges at prevailing rates.

1.5 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. Protect Work and products against dampness and cold.
 - .2 Prevent moisture condensation on surfaces.
 - .3 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .4 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
- .5 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.

- .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Permanent heating system of building, may be used when available. Be responsible for damage to heating system if use is permitted.
- .7 On completion of Work for which permanent heating system is used, replace filters.
- .8 Pay costs for maintaining temporary heat, when using permanent heating system.
- .9 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform to 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.
- .10 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.6 TEMPORARY POWER AND LIGHT

- .1 The Owner will pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 230 volts 30 amps.
- .2 Arrange for connection with appropriate utility company where applicable. Pay 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 floors 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 Consultant 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 3 months.

1.7 TEMPORARY COMMUNICATION FACILITIES

- .1 Provide and pay for temporary telephone, fax, data hook up, lines, equipment necessary for own use.

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

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Part 1 General

1.1 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.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.
 - .2 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

1.2 SUBMITTALS

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

1.3 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 gravelled 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.

1.4 SCAFFOLDING

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

1.5 HOISTING

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

1.6 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.

1.7 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.

1.8 SECURITY

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

1.9 OFFICES

- .1 Provide office heated to 22 degrees C, lighted 750 lux and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.

1.10 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.

1.11 SANITARY FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Consultant.

1.12 CONSTRUCTION SIGNAGE

- .1 Provide and erect project sign, within three weeks of signing Contract, in a location designated by Consultant.
- .2 Construction sign of wood frame and plywood construction painted with exhibit lettering produced by a professional sign painter.
- .3 No other signs or advertisements, other than warning signs, are permitted on site.
- .4 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .5 Maintain approved signs and notices in good condition for duration of project, and dispose of offsite on completion of project or earlier if directed by Consultant.

1.13 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 Consultant.
- .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 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .8 Dust control: adequate to ensure safe operation at all times.
- .9 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Consultant.
- .10 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .11 Provide snow removal during period of Work if required.

1.14 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.

Part 2 Products

2.1 Not Used

- .1 Not Used.

Part 3 Execution

3.1 Not Used

- .1 Not Used.

END OF SECTION

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Part 1 General

1.1 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.

1.2 INSTALLATION AND REMOVAL

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

1.3 HOARDING

- .1 Protect building interior and exterior from damage by equipment and construction procedures.
- .2 The following hoarding types are to be used on the project:
 - .1 Hoarding Type **HT-01**: Interior public areas, entrances and stairs for pedestrian access control, to underside of ceilings (2400mm +/-), continuous.
 - .1 Erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA O121.
 - .2 Apply plywood panels vertically flush and butt jointed.
 - .3 Provide pedestrian doors as directed. Equip gates with locks and keys.
 - .4 Paint public side of site enclosure in selected colours with one coat primer to CAN/CGSB 1.189 and one coat exterior paint to CGSB 1.59. Maintain public side of enclosure in clean condition
 - .5 Colour to be selected by Owner.
 - .2 Hoarding Type **HT-02**: exterior project site enclosure, Minimum 2100mm high, continuous.
 - .1 Erect temporary site enclosure using new prefinished prefabricated heavy gage wire mesh 'modulock' fencing systems. Provide one lockable truck gate. Maintain fence in good repair.
 - .3 Hoarding Type **HT-03**: temporary exterior area enclosure, Minimum 1200mm high, continuous. For protection of pedestrians from traffic or other hazards.
 - .1 Erect temporary site enclosure using snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 m on centre. Maintain fence as work progresses.
- .3 Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.

1.4 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.
- .2 Provide as required by governing authorities

1.5 WEATHER ENCLOSURES

- .1 Provide weather tight closures to unfinished door and window openings, tops of shafts 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.

1.6 DUST TIGHT SCREENS

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

1.7 ACCESS TO SITE

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

1.8 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.

1.9 FIRE ROUTES

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

1.10 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.

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 Within text of each specifications section, reference may be made to reference standards. List of standards reference writing organizations.
- .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, Consultant reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be borne by Owner in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.2 QUALITY

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials in execution of work.
- .3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection. Should disputes arise as to quality or fitness of products, decision rests strictly with Consultant 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.

1.3 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Consultant 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 Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

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

- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber and panel materials 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 Consultant.
- .9 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 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 Owner. Unload, handle and store such products.

1.6 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 Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Consultant to require removal and re-installation at no increase in Contract Price or Contract Time.
- .4 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.
- .5 Do not employ anyone unskilled in their required duties. Consultant reserves right to require dismissal from site, workers deemed incompetent or careless.
- .6 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Consultant, whose decision is final.

1.7 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.

1.8 CONCEALMENT

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform Consultant if there is interference. Install as directed by Consultant.

1.9 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.

1.10 LOCATION OF FIXTURES

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

1.11 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.

1.12 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.

1.13 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 Consultant.

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

- .1 'Acceptable' Materials: Products, materials, finishes, sources and components which form the basis of the Contract Documents in material quality, technical performance and meeting the requirements for the building and/or site design.
- .2 'Equivalent' Materials: Products, materials, finishes, sources and components which are considered equivalent in all aspects and accepted as substitutes for 'acceptable' materials defined above.
- .3 'Design Appearance': Products, materials, finishes, sources and components which form the basis of the Contract Documents to match in aesthetic finish, pattern and/or colours, usually in the case of interior finishes.

1.2 ACCEPTABILITY OF MATERIALS

- .1 'Acceptable' materials specified in the Contract Documents are products, materials, components and finishes which have been researched and 'accepted' for use on this project.
- .2 Notify Consultant in writing, of conflicts between specifications and manufacturer's product data, so the Consultant will establish course of action.
- .3 Do not order, deliver/install any products or materials not 'accepted', in writing, by the Consultant. Improper installation or erection of products, due to failure in complying with these requirements, authorizes Consultant to require removal and re-installation of approved materials at no increase in Contract Price or Contract Time.
- .4 Decisions as to standard/fitness of products or materials, in cases of dispute, rest solely with Consultant, whose decision is final.

1.3 REQUESTS FOR ACCEPTANCE

- .1 Requests for 'acceptance' of materials, on the basis of 'equivalency' in addition to those presently established as 'acceptable' by the Contract Documents shall be submitted in writing (email) to the CEPEO Project Manager procurement offices.
- .2 Manufacturers who consider their product as 'equivalent' to those specified as 'acceptable' may make written application to the Consultant during the tendering period only. No substitutions will be accepted by the Consultant after the tender closing date.
- .3 Make application as early as possible in the tendering period; no later than nine (9) working days before the closing of tenders. If the product or material is approved as 'equivalent' to that specified during tender, an addendum will be issued to identify the approved product.

1.4 PRODUCT DATA/INFORMATION: REQUESTS FOR ACCEPTANCE

- .1 Applications for 'Equivalents' must include the following, as a minimum:
 - .1 Accompany submissions with transmittal letter, in PDF Format, 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.
- .2 Product Data/Information Submissions, in PDF Format, are to include:
 - .1 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .2 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.
 - .11 Colours, finishes.
 - .3 Other optional pertinent information may be included as follows:
 - .1 Technical data that is available, such as product technical literature, test results, acceptance or evaluations by other organizations in Canada and elsewhere, site monitoring and past experiences.
 - .2 A copy of the installation manual provided to contractors who install the product.
 - .3 A copy of the quality control manual used in the manufacturing plant.

1.5 SAMPLES: REQUESTS FOR ACCEPTANCE

- .1 Submit for review samples in triplicate, as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Consultant.
- .3 Notify Consultant 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.

1.6 PRODUCT DATA/INFORMATION: REQUESTS FOR ACCEPTANCE

- .1 The Applicant is responsible for providing all relevant information related to this specific project and the content which would allow the Consultant to properly review the request. Incomplete, unclear or submissions with lack of details may result in rejection.
- .2 Requests for Equivalents submission are to be directed by email to the CEPEO Procurement Offices.
- .3 Provide submittals for Requests for Equivalents in accordance with Section 01 33 00 - Submittal Procedures.

- .4 Final decisions for requests of equivalents rests solely with the Consultant and these decisions are to be considered final.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 Canadian Roofing Contractors Association (CRCA): CRCA Roofing Specifications Manual-1997.
- .2 Canadian Nursery Landscape Association (CNLA): Canadian Standards for Nursery Stock 8th Edition, 2006.

1.2 WARRANTY CO-ORDINATION

- .1 Coordinate Work as it proceeds in accordance with Section 01 32 17 - Construction Progress Schedules, to ensure warranty responsibilities are maintained.
- .2 All Warranties identified in this Section shall commence from the date of Substantial Completion for the entire Project.

1.3 WARRANTIES: PROTECTED MEMBRANE SYSTEM

- .1 The following Warranty provisions are required of this project for the EPDM Protected Membrane Sub-System of the green roof assembly.
 - .1 **Manufacturer's Membrane Roofing Extended Warranty:** a written guarantee that the manufacturer will replace, at no cost to the Owner, any portion of the roofing membrane which experiences actual leaks resulting from defects in the manufacture of the membrane for a period of:
 - .1 **Ten (10) year** warranty shall be provided commencing from the date of Substantial Performance of the Project.
 - .2 **Roofing Sub-contractor Elastomeric Protected Membrane Roofing Installation Warranty:** The Standard Canadian Roofing Contractors' Association (CRCA):
 - .1 **Two (2) year** warranty shall be provided, commencing from the date of Substantial Performance of the project.
 - .2 The Standard Form of Warranty document from the CRCA shall be used.
- .1 **Manufacturer's Translucent Panel System Extended Warranty:** a written guarantee that the manufacturer will replace or repair, at no cost to the Owner, any portion of the translucent panel system work, which fails in materials or workmanship. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects in accessories, insulated translucent sandwich panels and other components of the work. This warranty is for a period of:
 - .1 **Ten (10) year** warranty shall be provided commencing from the date of Substantial Performance of the Project.
- .2 **Sheet Metal Flashing and Trim Sub-contractor Warranty:** The prescribed One (1) year warranty period prescribed in CCDC GC 12.3 shall be extended to:
 - .1 **Three (3) year** warranty shall be provided, commencing from the date of Substantial Performance of the project.
 - .2 The sub-contractor warrants that all metalwork will stay in place and remain leakproof for this warranty period. The Standard Form of Warranty document from the CRCA is not acceptable.

- .3 **Sealants Sub-contractor Warranty:** The prescribed One (1) year warranty period prescribed in CCDC GC 12.3 shall be extended to:
 - .1 **Five (5) year** warranty shall be provided, commencing from the date of Substantial Performance of the project.
 - .2 The sub-contractor warrants that all sealants work will not leak, crack, crumble, melt, shrink, run, lose adhesion or stain adjacent surfaces.

1.4 WARRANTIES: GROUND LEVEL - TREES, SHRUBS AND GROUND COVERS

- .1 The Landscaping sub-contractor hereby warrants that plant material as itemized on plant list will remain free of defects in accordance with CCDC GC 12.3 after acceptance, for:
 - .1 **Two (2) full growing seasons.**
- .2 End-of-warranty inspection will be conducted by Landscape Architect.
- .3 Landscape Architect reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract.
- .2 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 Consultant.

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 Consultant.
- .4 Report to Consultant 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 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, fill and topsoil placement and landscaping features.
- .4 Stake slopes and berms.
- .5 Establish pipe invert elevations.
- .6 Stake batter boards for foundations.
- .7 Establish foundation 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 Consultant of findings.

- .2 Remove abandoned service lines within 2.0 m of structures. Cap or otherwise seal lines at cut-off points as directed by Consultant.

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 Consultant 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 Consultant.

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 Consultant.
- .2 On request of Consultant, 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 Consultant 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 Consultant determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

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Part 1 General

1.1 RELATED SECTIONS

- .1 This section describes requirements applicable to all Sections within Divisions 02 to 49.

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 61 10 – Specific Materials.

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 firestopping material in accordance with Section 07 84 00 - Firestopping, 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.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2 GENERAL REQUIREMENTS

- .1 This Section provides guidelines to the existing building material refurbishment, as indicated on the Drawings, as specified herein and as required for a complete project, as well as requirements and limitations for cutting and patching the Work.
 - .1 Where indicated and required, patch and make good and/or reinstate finishes and assemblies with like materials to match existing finishes which are to remain, or new finishes to be provided.
 - .2 Complete work to extent required using appropriate transition points between existing or between existing and new assemblies to ensure neat consistent, finished appearance over entire surface.
 - .3 Where a smooth transition cannot be achieved in close proximity to the effected work, finish to appropriate transition points including:
 - .1 Intersection of ceiling or floor and wall plane
 - .2 Intersection of wall planes
 - .3 Intersection of other horizontal or vertical surfaces such as bulkheads
 - .4 Inside or outside corner at changes in surface plane.
- .2 Review construction documents and existing conditions at site assessment to ascertain extent of alterations required to meet the requirements described herein.

1.3 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.

1.4 ALTERATIONS, CUTTING AND PROTECTION

- .1 Extent:
 - .1 Perform cutting and removal work so as not to cut or remove more than is necessary and so as not to damage adjacent work.
- .2 Shoring, Bracing and Capping:
 - .1 Provide shoring, needling and bracing as needed to keep the building structurally secure and free of deflection in all its parts and as needed for the installation of new work.
- .3 Responsibility and Assignment to Trades:

- .1 The Contractor shall assign the work of moving, removal, cutting, patching and repair to trades under his supervision so as to cause the least damage to each type of work encountered, and so as to return the building as much as possible to the appearance of the new work.
- .2 Assign patching of finish materials to tradesmen skilled in the work of the finish trade involved.
- .4 Protection:
 - .1 Protect remaining finishes, equipment and adjacent work from damage caused by cutting, moving, removal and patching operations. Protect surfaces which will remain a part of the finished work.

1.5 PATCHING, EXTENDING AND MATCHING

- .1 Skill:
 - .1 Patch and extend existing work using skilled tradesmen who are capable of matching the existing quality of workmanship. The quality of patched or extended work shall not be less than that specified in the applicable Sections of the Contract Specifications.
- .2 Patching:
 - .1 In areas where any portion of an existing finished surface is damaged, lifted, stained or otherwise found to be imperfect, patch or replace the imperfect portion of the surface with matching material.
 - .2 Do not incorporate salvaged or used material in new construction, except where small quantities of finish material which are difficult to match or duplicate are approved for patching or extending purposes by the Consultant.
 - .3 Provide adequate support or substrate for patching of finishes.
 - .4 If the imperfect surface is a painted or coated one, repaint or recoat the patched portion in such a way that uniform colour and texture over the entire surface results.
 - .5 If the surrounding surface cannot be matched, repaint or recoat the entire surface to nearest natural break.
- .3 Quality:
 - .1 In the Sections of the Specifications to which these alteration procedures are applicable, products required for patching, matching, extending or replacing existing work have not necessarily been described. Obtain all required products in time to complete the Work on schedule. Provide products of quality equal to or better than the existing products.
- .4 Transitions:
 - .1 Where new work abuts or finishes flush with existing work, make the transition as smooth and workmanlike as possible. Patched work shall match existing adjacent work in texture and appearance, so as to make the patch or transition invisible to the eye at a distance of one metre.
 - .2 Where concrete, drywall, wood, metal or other finished surface is cut in such a way that a smooth transition with new work is not possible, terminate the existing surface in a neat fashion along a straight line at a natural line of division and provide trim appropriate to the finished surface.

- .5 Matching:
 - .1 Where not otherwise specified or indicated, restore existing work that is damaged during construction to a condition equal to its condition at the time of the start of the Work. At locations in existing areas where partitions are removed, patch the floors, walls and ceilings with finish materials to match adjacent finishes.
 - .2 At locations in existing areas where partitions are removed, patch the floors, walls and ceilings with finish materials to match adjacent finishes.

1.6 EXECUTION

- .1 Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.
- .2 Use material to match existing.
- .3 Cut rigid materials using a masonry saw or core drill. Pneumatic or impact tools not allowed without prior approval.
- .4 Restore work with new products in accordance with requirements of Contract Documents.
- .5 Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .6 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with fire rated materials and firestopping material, full thickness of the construction element in accordance with Section 07 84 00 - Firestopping, full thickness of the construction element.
- .7 Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
- .8 Reinstall work in accordance with the conditions of the surface prior to cutting and patching.
- .9 Reconnect any services damaged due to cutting as part of patching and repairing of the damage area.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

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Part 1 General

1.1 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, 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 Consultant. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only. Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers for collection of waste materials and debris.
- .5 Provide and use marked separate bins for recycling.
- .6 Dispose of waste materials and debris off site.
- .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.

1.2 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 other than that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.
- .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, furniture fitments, millwork, walls, floors and ceilings.

- .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, gutters, areaways, and sunken wells.
- .16 Sweep and wash clean paved areas. Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .17 Clean roofs, downspouts, and drainage systems.
- .18 Remove debris and surplus materials from crawl spaces and plenum areas and other accessible concealed spaces.
- .19 Remove snow and ice from access to building.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT GOALS

- .1 Waste Management Goal: 75% percent of total Project Waste to be diverted from landfill sites. Provide Consultant documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .2 Accomplish maximum control of solid construction waste.
- .3 Preserve environment and prevent pollution and environment damage.

1.2 DEFINITIONS

- .1 Class III: non-hazardous waste - construction renovation and demolition waste.
- .2 Inert Fill: inert waste - exclusively asphalt and concrete.
- .3 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .4 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .5 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .6 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .7 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
- .8 Separate Condition: refers to waste sorted into individual types.
- .9 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.

1.3 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged.
- .2 Unless specified otherwise, materials for removal do not become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect surface drainage, mechanical and electrical from damage and blockage.
- .6 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off-site processing facility for separation.

1.4 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
 - .1 Number and size of bins.
 - .2 Waste type of each bin.
 - .3 Total tonnage generated.
 - .4 Tonnage reused or recycled.
 - .5 Reused or recycled waste destination.
- .4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 INSPECTION AND DECLARATION PROCEDURES

- .1 Contractor's Inspection: The Contractor and all Subcontractors shall:
 - .1 Conduct an inspection of the Work and identify deficiencies and defects;
 - .2 Submit type-written list of these items.
 - .3 Repair as required to conform to the Contract Documents.
 - .4 Notify The Consultant in writing of satisfactory completion of the Contractor's Inspection and that corrections have been made, and
 - .5 Request The Consultant's Inspection.
- .2 Consultant's Inspection: Consultant and Contractor shall:
 - .1 Perform inspection of Work to identify obvious defects or deficiencies.
 - .2 The consultant shall submit a list of these items.
 - .3 The Contractor shall correct Work accordingly.
- .3 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - .4 Certificates required by Boiler Inspection Branch, Fire Commissioner, Utility companies have been submitted.
 - .5 Operation of systems have been demonstrated to Owner's personnel.
 - .6 Work is complete and ready for final inspection.
- .4 Final Inspection: when items noted above are completed, request final inspection of Work by Owner and Consultant. If Work is deemed incomplete by Owner or Consultant, complete outstanding items and request re-inspection.
- .5 Declaration of Substantial Performance: when Owner and Consultant consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Substantial Performance.
- .6 Final submission of complete, integrated and comprehensive Operations and Maintenance Manuals, in accordance with Section 01 78 00 – Closeout Submittals, including warranties, maintenance information and as-built drawings shall be a Mandatory requirement of substantial performance.
- .7 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance shall be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .8 Payment of Holdback: after issuance of certificate of Substantial Performance of Work, submit an application for payment of holdback amount in accordance with CCDC.

- .9 Declaration of Total Performance: When the Owner and the Consultant consider final deficiencies and defects have been corrected and it appears that the requirements of the Contract have been totally performed, the Contractor shall make application for a certificate of Total Performance.
- .10 If the Work is deemed incomplete by the Owner and the Consultant, complete the outstanding items and request re-inspection.
- .11 Final Payment: when Owner and Consultant consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment in accordance with the general conditions of the contract.

1.2 REINSPECTION

- .1 Should the status of the Work require re-inspection by the Consultant due to failure of the Work to comply with the Contract Documents, the Owner will deduct the costs of re-inspection services from payment to the Contractor.

1.3 CLEANING

- .1 In accordance with Section 01 74 11 - Cleaning.
- .2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 At Substantial Performance of the Work, submit to the Consultant copies of operating and maintenance manuals in English and French (1 (One) copy each).
- .4 Copies will be returned after inspection, with Consultant's comments.
- .5 Revise content of documents as required prior to final submittal.
- .6 Submit to the Consultant, 4 (Four) final copies of operating and maintenance manuals in English and French (2 (Two) copies each). One English copy is reserved for the Architect's records.
 - .1 If previous comments have not been addressed or subsequent concerns are observed, copies will be returned after inspection with Consultant comments.
 - .2 Final copies, with no outstanding issues, shall be a requirement prior to consideration of substantial performance of the work
- .7 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
 - .1 Deliver and store as directed by Owner.
 - .2 Provide itemized inventory listing complete with acknowledgment endorsed by consultant or owner representative taking delivery of same, including:
 - .1 Date
 - .2 Specification Section
 - .3 Item
 - .4 Quantity
 - .5 Condition
- .8 Furnish evidence, if requested, for type, source and quality of products provided.
- .9 Defective products will be rejected, regardless of previous inspections. Replace deficient products at own expense.
- .10 Pay costs of transportation.

1.2 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. 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 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.3 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project; Date of submission; names.
 - .1 Addresses and telephone numbers of Consultants and Contractor with name of responsible parties.
 - .2 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. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.4 AS-BUILTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, 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. Field test records.
 - .6 Inspection certificates.
 - .7 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Consultant.

1.5 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of red line opaque drawings, and in copy of Project Manual/Specifications, provided by Consultant.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. 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 and field test records, required by individual specifications sections.

1.6 FINAL SURVEY

- .1 Submit final site survey certificate, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.7 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. 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. Include regulation, control, stopping, shut-down, and emergency instructions. 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 and lubrication schedule, and list of lubricants required.

- .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.

1.8 MATERIALS AND FINISHES

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. 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.

1.9 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 site; place and store.
- .4 Receive and catalogue items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.10 MAINTENANCE 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 site; place and store.
- .4 Receive and catalogue items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.11 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 site; place and store. Receive and catalogue items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

1.12 STORAGE, HANDLING AND PROTECTION

- .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 to satisfaction of Consultant.

1.13 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.
- .3 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .4 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:
 - .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 (10) days after completion of 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.
- .5 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .6 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and

- commissioned systems such as fire protection, alarm systems, sprinkler systems, lightning protection systems.
- .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty; include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .8 Starting point and duration of warranty period.
 - .9 Summary of maintenance procedures required to continue warranty in force.
 - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
 - .11 Organization, names and phone numbers of persons to call for warranty service.
 - .12 Typical response time and repair time expected for various warranted equipment.
- .4 Procedure and status of tagging of equipment covered by extended warranties.
- .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .7 Respond in a timely manner to oral or written notification of required construction warranty repair work.

1.14 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Consultant.
- .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.Warranty period.
 - .5 Inspector's signature.
 - .6 Construction Contractor.

Part 2 **Products**

2.1 **NOT USED**

.1 Not Used.

Part 3 **Execution**

3.1 **NOT USED**

.1 Not Used.

END OF SECTION

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Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 91 41 – Commissioning Training.

1.2 DESCRIPTION

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of substantial performance.
- .2 Owner will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.

1.3 QUALITY CONTROL

- .1 When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

1.4 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for CEPEO Project Manager approval. Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .3 Give time and date of each demonstration, with list of persons present.

1.5 CONDITIONS FOR DEMONSTRATIONS

- .1 Equipment has been inspected and put into operation in accordance with Section 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.
- .3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.6 PREPARATION

- .1 Verify that conditions for demonstration and instructions comply with requirements.
- .2 Verify that designated personnel are present.

1.7 DEMONSTRATION AND INSTRUCTIONS

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the equipment location.

- .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
- .3 Review contents of manual in detail to explain aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

1.8 TIME ALLOCATED FOR INSTRUCTIONS

- .1 Ensure amount of time required for instruction of each item of equipment or system as follows:
 - .1 Section 23 20 90- Heating: 0.5 hour(s) of instruction.
 - .2 Section 20 30 00- Cooling and Ventilation System: 1 hour(s) of instruction.
 - .3 Section 25 10 00- Control System: 1 hour(s) of instruction.
 - .4 Section 26 00 10- Electrical System: 1 hour(s) of instruction.
 - .5 Section 10 22 26- Operable Partitions: 1 hour(s) of instruction.

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 REFERENCE

- .1 Acronyms:
 - .1 AFD - Alternate Forms of Delivery, service provider.
 - .2 BMM - Building Management Manual.
 - .3 Cx - Commissioning.
 - .4 EMCS - Energy Monitoring and Control Systems.
 - .5 O&M - Operation and Maintenance.
 - .6 PI - Product Information.
 - .7 PV - Performance Verification.
 - .8 TAB - Testing, Adjusting and Balancing.

1.2 GENERAL

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved.
Objectives:
 - .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
 - .2 Ensure appropriate documentation is compiled into the BMM.
 - .3 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
 - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
 - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.3 COMMISSIONING OVERVIEW

- .1 Cx to be a line item of Contractor's cost breakdown.
- .2 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .3 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities include transfer of critical knowledge to facility operational personnel.

- .4 Architect will issue Certificate of Substantial Performance when:
 - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Engineering Consultants and Owner Engaged Commissioning Agent.
 - .2 Equipment, components and systems have been commissioned.
 - .3 O&M training has been completed.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the un-functional system, including related systems as deemed required by Architect, to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.5 PRE-CX REVIEW

- .1 Before Construction:
 - .1 Review contract documents, confirm by writing to Owner-Engaged Commissioning Agent:
 - .1 Adequacy of provisions for Cx.
 - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
 - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
 - .1 Have completed Cx Plan up-to-date.
 - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
 - .3 Fully understand Cx requirements and procedures.
 - .4 Have Cx documentation shelf-ready.
 - .5 Understand completely design criteria and intent and special features.
 - .6 Submit complete start-up documentation to Owner-Engaged Commissioning Agent.
 - .7 Have Cx schedules up-to-date.
 - .8 Ensure systems have been cleaned thoroughly.
 - .9 Complete TAB procedures on systems, submit TAB reports to Owner-Engaged Commissioning Agent for review and approval.
 - .10 Ensure "As-Built" system schematics are available.
- .4 Inform Owner-Engaged Commissioning Agent in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

- .1 Report conflicts between requirements of this section and other sections to Owner-Engaged Commissioning Agent before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.7 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit no later than 4 weeks after award of Contract:
 - .1 Name of Contractor's Cx agent.
 - .2 Draft Cx documentation.
 - .3 Preliminary Cx schedule.
 - .2 Request in writing to Owner-Engaged Commissioning Agent for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
 - .3 Submit proposed Cx procedures to Owner-Engaged Commissioning Agent where not specified and obtain written approval at least 8 weeks prior to start of Cx.
 - .4 Provide additional documentation relating to Cx process required by Owner-Engaged Commissioning Agent.

1.8 COMMISSIONING DOCUMENTATION

- .1 Owner-Engaged Commissioning Agent to review and approve Cx documentation.
- .2 Provide completed and approved Cx documentation to Owner-Engaged Commissioning Agent.

1.9 COMMISSIONING SCHEDULE

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 17 - Construction Progress Schedule - Critical Path Method (CPM).
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
 - .1 Approval of Cx reports.
 - .2 Verification of reported results.
 - .3 Repairs, retesting, re-commissioning, re-verification.
 - .4 Training.

1.10 COMMISSIONING MEETINGS

- .1 Convene Cx meetings following project meetings: Section 01 32 17 - Construction Progress Schedule - Critical Path Method (CPM) and as specified herein.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60% construction completion stage, Section 01 32 17 - Construction Progress Schedule - Critical Path Method (CPM), Owner-Engaged Commissioning Agent to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:

- .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
- .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by Owner-Engaged Commissioning Agent who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.11 STARTING AND TESTING

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

1.12 WITNESSING OF STARTING AND TESTING

- .1 Provide 14 days notice prior to commencement.
- .2 Owner-Engaged Commissioning Agent to witness of start-up and testing.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

- .1 Factory testing: manufacturer to:
 - .1 Coordinate time and location of testing.
 - .2 Provide testing documentation for approval by Owner-Engaged Commissioning Agent.
 - .3 Arrange for Owner-Engaged Commissioning Agent to witness tests.
 - .4 Obtain written approval of test results and documentation from Owner-Engaged Commissioning Agent before delivery to site.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Owner-Engaged Commissioning Agent.
 - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
 - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .3 Integrity of warranties:
 - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
 - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 To report results in clear, concise, logical manner.

1.14 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
 - .3 Operational testing: document equipment performance.
 - .4 System PV: include repetition of tests after correcting deficiencies.
 - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Owner-Engaged Commissioning Agent after distinct phases have been completed and before commencing next phase.
- .4 Document required tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Owner-Engaged Commissioning Agent. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - .1 Minor equipment/systems: implement corrective measures approved by Owner-Engaged Commissioning Agent.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Owner-Engaged Commissioning Agent.
 - .3 If evaluation report concludes that major damage has occurred, Owner-Engaged Commissioning Agent shall reject equipment.
 - .1 Rejected equipment to be remove from site and replace with new.
 - .2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

- .1 Assemble start-up documentation and submit to Owner-Engaged Commissioning Agent for approval before commencement of commissioning.
- .2 Start-up documentation to include:
 - .1 Factory and on-site test certificates for specified equipment.
 - .2 Pre-start-up inspection reports.
 - .3 Signed installation/start-up check lists.
 - .4 Start-up reports,
 - .5 Step-by-step description of complete start-up procedures, to permit Owner-Engaged Commissioning Agent to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

- .2 With assistance of manufacturer develop written maintenance program and submit Owner-Engaged Commissioning Agent for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.17 TEST RESULTS

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

1.18 START OF COMMISSIONING

- .1 Notify Owner-Engaged Commissioning Agent and Architect at least 21 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.19 INSTRUMENTS / EQUIPMENT

- .1 Submit to Owner-Engaged Commissioning Agent for review and approval:
 - .1 Complete list of instruments proposed to be used.
 - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.
- .2 Provide the following equipment as required:
 - .1 2-way radios.
 - .2 Ladders.
 - .3 Equipment as required to complete work.

1.20 COMMISSIONING PERFORMANCE VERIFICATION

- .1 Carry out Cx:
 - .1 Under accepted simulated operating conditions, over entire operating range, in all modes.
 - .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

1.21 WITNESSING COMMISSIONING

- .1 Owner-Engaged Commissioning Agent to witness activities and verify results.

1.22 AUTHORITIES HAVING JURISDICTION

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Owner-Engaged Commissioning Agent and Architect within 5 days of test and with Cx report.

1.23 EXTRAPOLATION OF RESULTS

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Owner-Engaged Commissioning Agent in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.24 EXTENT OF VERIFICATION

- .1 Laboratory areas:
 - .1 Provide manpower and instrumentation to verify up to 100% of reported results.
- .2 Elsewhere:
 - .1 Provide manpower and instrumentation to verify up to 30% of reported results, unless specified otherwise in other sections.
- .3 Number and location to be at discretion of Owner-Engaged Commissioning Agent.
- .4 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .5 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.
- .6 Perform additional commissioning until results are acceptable to Owner-Engaged Commissioning Agent.

1.25 REPEAT VERIFICATIONS

- .1 Assume costs incurred by Owner-Engaged Commissioning Agent, Engineering Consultant's and Architect for third and subsequent verifications where:
 - .1 Verification of reported results fail to receive Owner-Engaged Commissioning Agent approval.
 - .2 Repetition of second verification again fails to receive approval.
 - .3 Owner-Engaged Commissioning Agent deems Contractor's request for second verification was premature.

1.26 SUNDRY CHECKS AND ADJUSTMENTS

- .1 Make adjustments and changes which become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

1.27 DEFICIENCIES, FAULTS, DEFECTS

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Owner-Engaged Commissioning Agent.

- .2 Report problems, faults or defects affecting Cx to Owner-Engaged Commissioning Agent in writing. Stop Cx until problems are rectified. Proceed with written approval from Owner-Engaged Commissioning Agent.

1.28 COMPLETION OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Owner-Engaged Commissioning Agent and Architect.

1.29 ACTIVITIES UPON COMPLETION OF COMMISSIONING

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.30 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

1.31 OCCUPANCY

- .1 Cooperate fully with Owner-Engaged Commissioning Agent and Architect during stages of acceptance and occupancy of facility.

1.32 INSTALLED INSTRUMENTATION

- .1 Use instruments installed under Contract for TAB and PV if:
 - .1 Accuracy complies with these specifications.
 - .2 Calibration certificates have been deposited with Owner-Engaged Commissioning Agent.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.33 PERFORMANCE VERIFICATION TOLERANCES

- .1 Application tolerances:
 - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/-10% of specified values.
- .2 Instrument accuracy tolerances:
 - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
 - .1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

1.34 OWNER'S PERFORMANCE TESTING

- .1 Performance testing of equipment or system by Owner-Engaged Commissioning Agent will not relieve Contractor from compliance with specified start-up and testing procedures.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

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PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit demolition drawings:
 - .1 Submit for review and approval by Consultant shoring and underpinning drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario Canada, showing proposed method.

1.2 SITE CONDITIONS

- .1 Review "Designated Substance Report" and take precautions to protect environment.
- .2 Should material resembling spray or trowel-applied asbestos or other designated substance be encountered, stop work, take preventative measures, and notify Consultant immediately.
 - .1 Do not proceed until written instructions have been received from Consultant.
- .3 Notify Consultant before disrupting building access or services.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Inspect building with 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, 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 Consultant and utility company concerned in case of damage to any utility or service, designated to remain in place.
 - .2 Immediately notify the Consultant 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: 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, landscaping features, and parts of building to remain in place. Provide bracing and shoring required.
 - .2 Keep noise, dust, and inconvenience to occupants to minimum.
 - .3 Protect building systems, services and equipment.
 - .4 Provide temporary dust screens, covers, railings, supports and other protection as required.
 - .5 Do Work in accordance with Section 01 35 29 - Health and Safety Requirements.
- .3 Demolition/Removal:
 - .1 Remove items as indicated.
 - .2 Removal of Pavements, Curbs and Gutters:
 - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Consultant.
 - .2 Protect adjacent joints and load transfer devices.
 - .3 Protect underlying and adjacent granular materials.
 - .3 Remove parts of existing building to permit new construction.
 - .4 Trim edges of partially demolished building elements to tolerances as defined by Consultant 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.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 Definitions:
 - .1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
 - .2 Hazardous Material: product, substance, or organism used for its original purpose; and is either dangerous goods or material that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
 - .3 Hazardous Waste: hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .2 Reference Standards:
 - .1 Canadian Environmental Protection Act, 1999 (CEPA 1999)
 - .1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).
 - .2 Department of Justice Canada (Jus)
 - .1 Transportation of Dangerous Goods Act, 1992, (TDG Act-92, c. 34).
 - .2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001-286).
 - .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .4 National Research Council Canada Institute for Research in Construction (NRC-IRC)
 - .1 National Fire Code of Canada-2005.

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 hazardous materials and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS MSDS in accordance with Section 01 35 29 - Health and Safety Requirements to Consultant for each hazardous material required prior to bringing hazardous material on site.
 - .3 Submit hazardous materials management plan to Consultant that identifies hazardous materials, usage, location, personal protective equipment requirements, and disposal arrangements.

1.3 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 Transport hazardous materials and wastes in accordance with Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
 - .1 When exporting hazardous waste to another country, ensure compliance with Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulations.

- .4 Storage and Handling Requirements:
 - .1 Co-ordinate storage of hazardous materials with Consultant and abide by internal requirements for labelling and storage of materials and wastes.
 - .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
 - .3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada requirements.
 - .4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.
 - .1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.
 - .2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Consultant.
 - .5 Transfer of flammable and combustible liquids is prohibited within buildings.
 - .6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.
 - .7 Solvents or cleaning agents must be non-flammable or have flash point above 38 degrees C.
 - .8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.
 - .9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.
 - .10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:
 - .1 Store hazardous materials and wastes in closed and sealed containers.
 - .2 Label containers of hazardous materials and wastes in accordance with WHMIS.
 - .3 Store hazardous materials and wastes in containers compatible with that material or waste.
 - .4 Segregate incompatible materials and wastes.
 - .5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.
 - .6 Store hazardous materials and wastes in secure storage area with controlled access.
 - .7 Maintain clear egress from storage area.
 - .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.
 - .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
 - .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
 - .11 When hazardous waste is generated on site:
 - .1 Co-ordinate transportation and disposal with Consultant.
 - .2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.
 - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
 - .4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material and it is licensed to accept this material.
 - .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.

- .6 Only trained personnel handle, offer for transport, or transport dangerous goods.
- .7 Provide photocopy of shipping documents and waste manifests to Consultant.
- .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to Consultant.
- .9 Report discharge, emission, or escape of hazardous materials immediately to Consultant and appropriate provincial authority. Take reasonable measures to control release.
- .12 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
- .13 Report spills or accidents immediately to Consultant. Submit a written spill report to Consultant within 24 hours of incident.
- .5 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding, and packaging materials.

1.4 MATERIALS

- .1 Description:
 - .1 Bring on site only quantities hazardous material required to perform Work.
 - .2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.
 - .3 Sustainability Characteristics:
 - .1 Adhesives and Sealants in accordance with Section 07 92 00 - Joint Sealants.
 - .1 Adhesives and Sealants: maximum VOC limit 50 g/L to SCAQMD Rule 1168.
 - .2 Primers, Paints, and Coatings in accordance with manufacturer's recommendations for surface conditions and Section 09 91 23 - Interior Painting.

PART 2 EXECUTION

2.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 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 recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
 - .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
 - .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
 - .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
 - .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
 - .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.

- .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials:
 - .1 ASTM-C779, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
 - .2 ASTM G23-81, Ultraviolet Light & Water Spray.
 - .3 ASTM C805, Impact Strength.
- .2 American Concrete Institute
 - .1 ACI 302. 1R-89, Guide for concrete Floor and Slab Construction.
- .3 Other Tests: Reflectivity

1.2 SUBMITTALS

- .1 Product Data.
 - .1 Submit special concrete finishes manufacturers specifications and test data.
 - .2 Submit special concrete finishes describing product to be provided, giving manufacturer's name and product name for the specified material proposed to be provided under this section.
 - .3 Submit special concrete finishes manufacturer's recommended installation procedures; which when approved by the architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
 - .4 Submit special concrete finishes technical data sheet giving descriptive data, curing time and application requirements.
 - .5 Submit special concrete finishes manufacturer's material safety data sheet (MSDS) and other safety requirements.
 - .6 Follow all special concrete finishes published manufacturer's installation instructions.
- .2 Test report:
 - Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria.

1.3 QUALITY ASSURANCE

- .1 Installer qualifications:
 - .1 Use an experienced installer and adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft.
 - .2 The special concrete finish manufacturer shall certify applicator.
 - .3 Applicator shall be familiar with the specified requirements and the methods needed for proper performance of work of this section.
- .2 Mock-ups:
 - .1 Build 2 m2 mock-up in a location as directed by the architect.
 - .2 Obtain from the architect approval of mock-ups before proceeding with work under this section.
 - .3 Approved mock-ups may become part of the completed work.

- .3 Protection:
 - .1 All hydraulic powered equipment must be diapered to avoid staining of the concrete.
 - .2 No trade will park vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.
 - .3 No pipe cutting machine will be used on the inside floor slab.
 - .4 Steel will not be placed on interior slab to avoid rust staining.
 - .5 Acids and acidic detergents will not come into contact with slab.
 - .6 All trades informed that the slab must be protected at all times.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials in original containers, with seal's unbroken, bearing manufacturer labels indicating brand name and directions for storage.
- .2 Dispense special concrete finish material from factory numbered and sealed containers. Maintain record of container numbers.

1.5 SITE CONDITIONS

- .1 Environmental limitations:
 - .1 Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation and other conditions affecting topping performance
 - .2 Concrete floor flatness rating recommended at least 40.
 - .3 Concrete floor levelness rating recommended at least 30.
 - .4 Concrete must be cured a minimum of 45 days or as directed by the manufacturer before application.
 - .5 Application shall take place 10 days prior to installation of equipment and substantial completion, thus providing a complete, uninhibited concrete slab for application.
 - .6 Close areas to traffic during floor application and after application, for time period recommended in writing by manufacturer.

Part 2 Products

2.1 MATERIALS

- .1 Hardening sealing agent:
 - .1 Abrasion resistance: ASTM C779 – up to 400% increase in abrasion resistance.
 - .2 Impact strength: ASTM C805 – up to 21% increase impact strength.
 - .3 Ultra violet light and water spray: ASTM G23-81 -no adverse effect to ultra violet and water spray.
 - .4 Reflectivity: up to 30% increase in reflectivity.
 - .5 Standard of Acceptance: Retro-plate 99 or approved equivalent.

2.2 RELATED MATERIALS

- .1 Neutralizing agent:
 - .1 Tri-sodium phosphate
 - .2 Potable water.

Part 3 Execution

3.1 SURFACE CONDITIONS:

- .1 Examine surface with installer present, for conditions affecting performance of finish. Correct conditions determined to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.
- .2 Prior to application, verify that the floor surfaces are free of construction latents.

3.2 INSTALLATION

- .1 Start any of the floor finish applications in presence of manufacturer's technical representative.
- .2 Achieve waterproofing, hardening, dust proofing and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the sheen.
- .3 Polish to a level 3, light reflective mirror finish.

3.3 CLEANING

- .1 The premises shall be kept clean and free of debris at all times.
- .2 Remove spatter from adjoining surfaces, as necessary.
- .3 Repair damages to surface caused by cleaning operations.
- .4 Remove debris from jobsite

3.4 PROTECTION

- .1 Protect finished work until fully cured in accordance with manufacturer's recommendations.

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 CSA Group
 - .1 CAN/CSA-A165 Series-04(R2009), CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
 - .2 CAN/CSA-A179-04(R2009), Mortar and Grout for Unit Masonry.
 - .3 CAN/CSA-A371-04(R2009), Masonry Construction for Buildings.
- .2 International Masonry Industry All-Weather Council (IMIAC)
 - .1 Recommended Practices and Guide Specification for Cold Weather Masonry 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 masonry and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 30 - Health and Safety Requirements.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Submit shop drawings detailing temporary bracing required, designed to resist wind pressure and lateral forces during installation.
- .4 Certificates: submit manufacturer's product certificates certifying materials comply with specified requirements.
- .5 Test and Evaluation Reports:
 - .1 Test reports to certify compliance of masonry units and mortar ingredients with specified performance characteristics and physical properties.
 - .2 Submit data for masonry units, in addition to requirements set out in referenced CSA and ASTM Standards, indicating initial rates of absorption.
- .6 Installer Instructions: provide manufacturer's installation instructions, including storage, handling, safety and cleaning.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit manufacturer's instructions for care, cleaning and maintenance of prefaced masonry units for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 EXTRA MATERIALS

- .1 Submit manufacturer's instructions in accordance with Section 01 78 00 - Closeout Submittals covering maintenance requirements and parts catalogue, with cuts and identifying numbers.

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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect material from nicks, scratches, and blemishes.
 - .3 Keep materials dry until use.
 - .4 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.
 - .5 Replace defective or damaged materials with new.

1.6 SITE CONDITIONS

- .1 Ambient Conditions: assemble and erect components when temperatures are above 4 degrees C.
- .2 Weather Requirements: to CAN/CSA-A371.
- .3 Cold weather requirements:
 - .1 To CAN/CSA-A371 with following requirements.
 - .1 Maintain temperature of mortar between 5 degrees C and 50 degrees C until batch is used or becomes stable.
 - .2 Maintain ambient temperature of masonry work and it's constituent materials between 5 degrees C and 50 degrees C and protect site from windchill.
 - .3 Maintain temperature of masonry above 0 degrees C for minimum of 7 days, after mortar is installed.
 - .4 Preheat unheated wall sections in enclosure for minimum 72 hours above 10 degrees C, before applying mortar.
 - .2 Hot weather requirements:

- .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
- .2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.
- .3 Spray mortar surface at intervals and keep moist for maximum of 3 days after installation.

Part 2 Products

2.1 MATERIALS

- .1 Masonry materials are specified elsewhere in related Sections:
 - .1 Section 04 05 12 - Masonry Mortar And Grout.
 - .2 Section 04 05 19 - Masonry Anchorage And Reinforcing.
 - .3 Section 04 05 23 - Masonry Accessories.
 - .4 Section 04 22 00 - Concrete Unit Masonry.

Part 3 Execution

3.1 INSTALLERS

- .1 Experienced and qualified masons to carry out erection, assembly and installation of masonry work.

3.2 EXAMINATION

- .1 Examine conditions, substrates and work to receive work of this Section. Co-ordinate with Section 01 71 00 - Examination and Preparation.
- .2 Examine openings to receive masonry units. Verify opening size, location, and that opening is square and plumb, and ready to receive work of this Section.
 - .1 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation after unacceptable conditions have been remedied.
- .3 Verification of Conditions:
 - .1 Verify that:
 - .1 Substrate conditions which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of concrete block.
 - .2 Field conditions are acceptable and are ready to receive work.

.3 Built-in items are in proper location, and ready for roughing into masonry work.

.2 Commencing installation means acceptance of existing substrates.

3.3 PREPARATION

- .1 Surface Preparation: prepare surface in accordance with manufacturer's written recommendations and co-ordinate with Section 01 71 00 - Examination and Preparation.
- .2 Establish and protect lines, levels, and coursing.
- .3 Protect adjacent materials from damage and disfiguration.

3.4 INSTALLATION

- .1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment, respecting construction tolerances permitted by CAN/CSA-A371.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.5 CONSTRUCTION

- .1 Exposed masonry:
 - .1 Remove chipped, cracked, and otherwise damaged units, in accordance with CAN/CSA-A165, in exposed masonry and replace with undamaged units.
- .2 Jointing:
 - .1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints where concave joints are indicated.
 - .2 Allow joints to set just enough to remove excess water, then rake joints uniformly to 6 mm depth and compress with square tool to provide smooth, compressed, raked joints of uniform depth where raked joints are indicated.
 - .3 Strike flush joints concealed in walls and joints in walls to receive plaster, tile, insulation, or other applied material except paint or similar thin finish coating.
- .3 Cutting:
 - .1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.
 - .2 Make cuts straight, clean, and free from uneven edges.
- .4 Building-In:

- .1 Build in items required to be built into masonry.
- .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
- .3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
- .5 Wetting of bricks:
 - .1 Except in cold weather, wet bricks having initial rate of absorption exceeding 1 g/minute/1000 mm²: wet to uniform degree of saturation, 3 to 24 hours before laying, and do not lay until surface dry.
 - .2 Wet tops of walls built of bricks qualifying for wetting, when recommencing work on such walls.
- .6 Support of loads:
 - .1 Use concrete to Section 03 30 00 - Cast-in-Place Concrete, where concrete fill is used in lieu of solid units.
 - .2 Use grout to CAN/CSA-A179 where grout is used in lieu of solid units.
 - .3 Install building paper below voids to be filled with concrete or grout; keep paper 25 mm back from faces of units.
- .7 Provision for movement:
 - .1 Leave 3 mm space below shelf angles.
 - .2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
 - .3 Built masonry to tie in with stabilizers, with provision for vertical movement.
- .8 Loose steel lintels:
 - .1 Install loose steel lintels. Center over opening width.
- .9 Control joints:
 - .1 Construct continuous control joints.
- .10 Movement joints:
 - .1 Build-in continuous movement joints as indicated.
- .11 Interface with other work:
 - .1 Cut openings in existing work as indicated.
 - .2 Openings in walls: reviewed by Consultant.
 - .3 Make good existing work. Use materials to match existing.

3.6 SITE TOLERANCES

- .1 Tolerances in notes to CAN/CSA-A371 apply.

3.7 FIELD QUALITY CONTROL

- .1 Site Tests, Inspection:

- .1 Perform field inspection and testing in accordance with Section 01 45 00 - Quality Control.
- .2 Notify inspection agency minimum of 24 hours in advance of requirement for tests.

3.8 CLEANING

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

3.9 PROTECTION

- .1 Temporary Bracing:
 - .1 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.
 - .2 Bracing approved by Consultant.
 - .3 Brace masonry walls as necessary to resist wind pressure and lateral forces during construction.
- .2 Moisture Protection:
 - .1 Keep masonry dry using waterproof, non staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until completed and protected by flashing or other permanent construction.
 - .2 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each work day. Anchor securely in position.
 - .3 Air Temperature Protection: protect completed masonry as recommended in.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA A179-04, Mortar and Grout for Unit Masonry.
 - .3 CAN/CSA A371-04, Masonry Construction for Buildings.
 - .4 CAN/CSA-A3000-03, Cementitious Materials Compendium; CAN/CSA-A3002-03, Masonry and Mortar Cement.

1.2 SUBMITTALS

- .1 Product Data.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Samples.
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit two samples of mortar and coloured mortar.
- .3 Manufacturer's Instructions.
 - .1 Submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

Part 2 Products

2.1 MATERIALS

- .1 Use same brands of materials and source of aggregate for entire project.
- .2 Mortar and grout: CSA A179.
- .3 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
- .4 Colour: ground coloured natural aggregates or metallic oxide pigments.
- .5 Mortar for exterior masonry above grade:
 - .1 Loadbearing: type S based on Proportion specifications.
 - .2 Non-Loadbearing: type N based on Proportion specifications.
- .6 Mortar for interior masonry.
 - .1 Loadbearing: type S based on Proportion specifications.
 - .2 Non-Loadbearing: type N based on Proportion specifications.
- .7 Following applies regardless of mortar types and uses specified above:

- .1 Mortar for grouted reinforced masonry: type S based on Proportion specifications.
- .2 Mortar for pointing: type S based on Proportion specifications.
- .8 White mortar: use white Portland cement, and lime to produce mortar type specified.
- .9 Coloured mortar: use colouring admixture not exceeding 10% of cement content by mass, or integrally coloured masonry cement, to produce coloured mortar to match approved sample.
- .10 Non-Staining mortar: use non-staining masonry cement for cementitious portion of specified mortar type.
- .11 Grout: to CSA A179, Table 3.
- .12 Parging mortar: type S to CSA A179.
- .13 Colours based on Interstar Grouts:
 - .1 **MG-02: Ebony, CM-005 for Masonry Veneer (MV-02).**

2.2 MIXES

- .1 Pointing mortar: prehydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into ball. Allow to stand for not less than 1 hour not more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.
- .2 Colour: mix grout to semi-fluid consistency.
- .3 Coloured mortars: incorporate colour into mixes in accordance with manufacturer's instructions. Use clean mixer for coloured mortar.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 CONSTRUCTION

- .1 Do masonry mortar and grout work in accordance with CSA A179 except where specified otherwise.
- .2 Apply parging in uniform coating not less than total 10 mm thick, where indicated.

3.3 CLEANING

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

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A23.1/A23.2-4044, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA A179-04, Mortar and Grout for Unit Masonry.
 - .3 CAN/CSA A370-04, Connectors for Masonry.
 - .4 CAN/CSA A371-04, Masonry Construction for Buildings.
 - .5 CAN/CSA G30.18-M92(R2007), Billet-Steel Bars for Concrete Reinforcement.
 - .6 CSA-S304.1-04, Design of Masonry Structures.
 - .7 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Shop drawings consist of bar bending details, lists and placing drawings.
 - .3 On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .3 Divert unused metal materials from landfill to metal recycling facility approved by Consultant.

Part 2 Products

2.1 MATERIALS

- .1 Bar reinforcement: to CSA-A371 and CAN/CSA G30.18, Grade 400.
- .2 Wire reinforcement: to CSA-A371 and CSA G30.14, ladder type.
- .3 Connectors: to CSA-A370 and CSA-S304.
- .4 Corrosion protection: to CSA-S304, galvanized to CSA-S304 and CSA-A370.

- .5 Brick Ties: to CAN/CSA A370.
- .1 Acceptable Product: Bailey ESS-3 Series, stainless steel ties or equal.

2.2 FABRICATION

- .1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Ontario.
- .2 Fabricate connectors in accordance with CSA-A370.
- .3 Obtain Consultant approval for locations of reinforcement splices other than shown on placing drawings.
- .4 Upon approval of Consultant, weld reinforcement in accordance with CSA W186.
- .5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 GENERAL

- .1 Supply and install masonry connectors and reinforcement in accordance with CSA-A370, CSA-A371, CAN/CSA-A23.1 and CSA-S304.1 unless indicated otherwise.
- .2 Prior to placing mortar and grout, obtain Consultant's approval of placement of reinforcement and connectors.
- .3 Supply and install additional reinforcement to masonry as indicated.

3.3 BONDING AND TYING

- .1 Bond walls of two or more wythes using metal connectors in accordance with CSA-S304, CSA-A371 and as indicated.
- .2 Tie masonry veneer to backing in accordance with NBC, CSA-S304.1, CSA-A371 and as indicated.

3.4 REINFORCED LINTELS AND BOND BEAMS

- .1 Reinforce masonry lintels and bond beams as indicated.
- .2 Place and grout reinforcement in accordance with CSA-S304.1, CSA-A371, and CSA-A179.

3.5 GROUTING

- .1 Grout masonry in accordance with CSA-S304.1, CSA-A371 and CSA-A179 and as indicated.

3.6 ANCHORS

- .1 Supply and install metal anchors as indicated.

3.7 LATERAL SUPPORT AND ANCHORAGE

- .1 Supply and install lateral support and anchorage in accordance with CSA-S304.1 and as indicated.

3.8 MOVEMENT JOINTS

- .1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

3.9 FIELD BENDING

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

3.10 FIELD TOUCH-UP

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcement steel and connectors with compatible finish to provide continuous coating.

3.11 CLEANING

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

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM D 2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA A371-04, Masonry Construction for Buildings.
 - .2 CAN/CSA-ISO 14021-00(R2204), Environmental Labels and Declarations - Self Declared Environmental Claims (Type II Environmental Labelling).

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling.

Part 2 Products

2.1 MATERIALS

- .1 Control joint filler: purpose-made elastomer durometer hardness to ASTM D2240 of size and shape indicated.
- .2 Lap adhesive: recommended by masonry flashing manufacturer.
- .3 Weep hole vents: purpose-made polypropylene fibre filter, colour to match brick veneer.
- .4 Polyethylene flashings: In accordance with Section 07 27 10 – Air Barriers-Descriptive or Proprietary.
- .5 Aluminum flashings: In accordance with Section 07 62 00 – Sheet Metal Flashing and Trim.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install continuous control joint fillers in control joints at locations indicated on drawings.
- .2 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre.

3.3 CONSTRUCTION

- .1 Build in flashings in masonry in accordance with CSA-A371.
 - .1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses and as indicated.
 - .2 In cavity walls and veneered walls, carry flashings from front edge of masonry, under outer wythe, then up backing not less than 150 mm, and as follows:
 - .1 For masonry backing embed flashing 25 mm in joint.
 - .2 For concrete backing, insert flashing into reglets.
 - .3 For gypsum board backing, bond to wall using manufacturer's recommended adhesive.
 - .3 Lap joints 150 mm and seal with adhesive.

3.4 CLEANING

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM C 73-05, Standard Specification for Calcium Silicate Brick (Sand-Lime Brick).
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A165 Series-2004, CSA Standards on Concrete Masonry Units.
 - .2 CAN/CSA A371-04, Masonry Construction for Buildings.

1.2 SUBMITTALS

- .1 Product Data.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's Instructions.
 - .1 Submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling.

Part 2 Products

2.1 MANUFACTURED UNITS

- .1 Concrete brick: to CAN/CSA-A165 Series.
 - .1 Grade: I.
 - .2 Acceptable Manufacturer: Shouldice.
 - .3 Size: 90 x190 x 390 mm
 - .4 Texture: Tapestry.
 - .5 Colours:
 - .1 **MV-01**: Colby, Stack bond.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Construction to conform to CAN/CSA A371.
- .2 Bond: Stack.
- .3 Coursing height: 200mm for one masonry unit and one joint.
- .4 Jointing: Weathered.
- .5 Mixing and blending: mix units within each pallet and with other pallets to ensure uniform blend of colour and texture.
- .6 Clean unglazed clay masonry as work progresses.
- .7 Reinforcement: Install reinforcing in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.
- .8 Connectors: Install connectors in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.
- .9 Mortar Placement: Place mortar in accordance with Section 04 05 12 - Masonry Mortar and Grout.
- .10 Grout Placement: Place grout in accordance with Section 04 05 12 - Masonry Mortar and Grout.
- .11 Repair/Restoration: Upon completion of masonry, fill holes and cracks, remove loose mortar and repair defective work.
- .12 Field Quality Control:
 - .1 Site Tests, Inspection: in accordance with Section 04 05 00 - Common Work Results for Masonry supplemented as follows:
 - .2 Manufacturer's Field Services: in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .13 Tolerances: To CAN/CSA A371 unless noted below.

3.3 CLEANING

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .2 Clean masonry in accordance to the manufacturers cleaning instructions.
- .3 Do not use muriatic acid on brick.
- .4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM C 73-05, Standard Specification for Calcium Silicate Brick (Sand-Lime Brick).
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A165 Series-2004, CSA Standards on Concrete Masonry Units.
 - .2 CAN/CSA A371-04, Masonry Construction for Buildings.

1.2 SUBMITTALS

- .1 Product Data.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's Instructions.
 - .1 Submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling.

Part 2 Products

2.1 MANUFACTURED UNITS

- .1 Concrete brick: to CAN/CSA-A165 Series.
 - .1 Grade: I.
 - .2 Acceptable Manufacturer: Shouldice, or approved equivalent.
 - .3 Size: 90 x190 x 390 mm
 - .4 Texture: Tapestry.
 - .5 Colours:
 - .1 **MV-01**: Colby, Stack bond.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Construction to conform to CAN/CSA A371.
- .2 Bond: Stack.
- .3 Coursing height: 200mm for one masonry unit and one joint.
- .4 Jointing: Weathered.
- .5 Mixing and blending: mix units within each pallet and with other pallets to ensure uniform blend of colour and texture.
- .6 Clean unglazed clay masonry as work progresses.
- .7 Reinforcement: Install reinforcing in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.
- .8 Connectors: Install connectors in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.
- .9 Mortar Placement: Place mortar in accordance with Section 04 05 12 - Masonry Mortar and Grout.
- .10 Grout Placement: Place grout in accordance with Section 04 05 12 - Masonry Mortar and Grout.
- .11 Repair/Restoration: Upon completion of masonry, fill holes and cracks, remove loose mortar and repair defective work.
- .12 Field Quality Control:
 - .1 Site Tests, Inspection: in accordance with Section 04 05 00 - Common Work Results for Masonry supplemented as follows:
 - .2 Manufacturer's Field Services: in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .13 Tolerances: To CAN/CSA A371 unless noted below.

3.3 CLEANING

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .2 Clean masonry in accordance to the manufacturers cleaning instructions.
- .3 Do not use muriatic acid on brick.
- .4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM E 336-07, Standard Test Method for Measurement of Airborne Sound Attenuation Between Rooms in Buildings.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A165 Series-2004, CSA Standards on Concrete Masonry Units covers: A165.1, A165.2, A165.3.
 - .2 CAN/CSA A371-04, Masonry Construction for Buildings.
 - .3 CSA S304.1-04, Design of Masonry Structures.
- .3 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101-07, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Product Data: provide product data, including manufacturer's printed data sheets and catalog pages illustrating products to be incorporated into project for specified products.
- .3 Samples:
 - .1 Provide unit samples in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .4 Manufacturer's Written Instructions: provide in accordance with Section 04 05 00 - Common Work Results for Masonry.

1.3 QUALITY ASSURANCE SUBMITTALS

- .1 Certificates: provide in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .2 Test and Evaluation Reports: provide certified test reports in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .3 Pre-Installation Meetings: conduct pre-installation meeting in accordance with Section 04 05 00 - Common Work Results for Masonry to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.
- .4 Mock-ups:
 - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control and requirements of Section 04 05 00 - Common Work Results for Masonry.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle concrete unit masonry in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .2 Packaging Waste Management:
 - .1 Separate and recycle waste materials.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Standard concrete block units to CAN/CSA-A165 Series (CAN/CSA-A165.1).
 - .1 Classification: H/10/A/M
- .2 Dimensions - Nominal:
 - .1 90mm wide x 190 mm high x 390 mm long.
 - .2 140mm wide x 190 mm high x 390 mm long.
 - .3 190mm wide x 190 mm high x 390 mm long.
 - .4 290mm wide x 190 mm high x 390 mm long.
- .3 Special shapes; provide bull-nosed units for exposed corners. Provide purpose-made shapes for lintels, beams and bond beams. Provide additional special shapes as indicated.
- .4 Colour:
 - .1 Integrally coloured pre-finished architectural concrete block with one or more faces ground to expose variegated colours of natural aggregates; with factory-applied clear satin gloss acrylic finish.
 - .2 Unit faces filled with cementitious grout, polished with factory applied clear satin gloss acrylic finish.

2.2 REINFORCEMENT

- .1 Reinforcement in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

2.3 CONNECTORS

- .1 Connectors in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

2.4 FLASHING

- .1 Flashing; in accordance with Section 07 62 00 – Sheet Metal Flashing and Trim.

2.5 MORTAR MIXES

- .1 Mortar and mortar mixes in accordance with Section 04 05 12 - Masonry Mortar and Grout.

2.6 GROUT MIXES

- .1 Grout and grout mixes in accordance with Section 04 05 12 - Masonry Mortar and Grout.

2.7 CLEANING COMPOUNDS

- .1 Use low VOC products.
- .2 Compatible with substrate and acceptable to masonry manufacturer for use on products.
- .3 Cleaning compounds compatible with concrete unit masonry and in accordance with manufacturer's written recommendations and instructions.

2.8 TOLERANCES

- .1 Tolerances for standard concrete unit masonry tolerances in accordance with CAN/CSA A165.1, supplemented as follows:
 - .1 Maximum variation between units within specific job lot not to exceed 2 mm.
 - .2 No parallel edge length, width or height dimension for individual unit to differ by more than 2 mm.
 - .3 Out of square tolerance not to exceed 2 mm.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verify surfaces and conditions are ready to accept work of this Section.
- .2 Commencing installation means acceptance of existing substrates.

3.2 PREPARATION

- .1 Protect adjacent finished materials from damage due to masonry work.

3.3 INSTALLATION

- .1 Concrete block units:
 - .1 Bond: running.
 - .2 Coursing height: 200mm for one block and one joint.
 - .3 Jointing: concave where exposed or where paint or other finish coating is specified.
- .2 Special Shapes:
 - .1 Install special units to form corners, returns, offsets, reveals and indents without cut ends being exposed and without losing bond or module.
 - .2 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.
 - .3 End bearing: not less than 200mm.
 - .4 Install special site cut shaped units.

3.4 REINFORCEMENT

- .1 Install reinforcing in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

3.5 CONNECTORS

- .1 Install connectors in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

3.6 FLASHING

- .1 Install flashings: in accordance with Section 07 62 00 – Sheet Metal Flashing and Trim

3.7 MORTAR PLACEMENT

- .1 Place mortar in accordance with Section 04 05 12 - Masonry Mortar and Grout.

3.8 GROUT PLACEMENT

- .1 Place grout in accordance with Section 04 05 12 - Masonry Mortar and Grout.

3.9 CONSTRUCTION

- .1 Cull out masonry units, in accordance with CAN/CSA A165 and reviewed range of colour samples, with chips, cracks, broken corners, excessive colour and texture variation.
- .2 Build in miscellaneous items such as bearing plates, steel angles, bolts, anchors, inserts, sleeves and conduits.
- .3 Construct masonry walls using runningbond unless otherwise noted.

- .4 Build around frames previously set and braced. Fill behind hollow frames within masonry walls with mortar or grout and embed anchors.
- .5 Fit masonry closely against electrical and plumbing outlets so collars, plates and covers overlap and conceal cuts.
- .6 Install movement joints and keep free of mortar where indicated.
- .7 Hollow Units: spread mortar setting bed from outside edge of face shells. Gauge amount of mortar on top and end of unit to create full joints, equivalent to shell thickness. Avoid excess mortar.
- .8 Solid Units: apply mortar over entire vertical and horizontal surfaces. Avoid bridging of airspace between brick veneer and backup wall with mortar.
- .9 Ensure compacted head joints. Use full or face-shell joint as indicated.
- .10 Tamp units firmly into place.
- .11 Do not adjust masonry units after mortar has set. Where resetting of masonry is required, remove, clean and reset units in new mortar.
- .12 Tool exposed joints concaveweathered/raked for interior work; strike concealed joints flush.
- .13 After mortar has achieved initial set up, tool joints.
- .14 Do not interrupt bond below or above openings.

3.10 REPAIR/RESTORATION

- .1 Upon completion of masonry, fill holes and cracks, remove loose mortar and repair defective work.

3.11 FIELD QUALITY CONTROL

- .1 Site Tests, Inspection: in accordance with Section 04 05 00 - Common Work Results for Masonry supplemented as follows:
 - .1 Concrete masonry units will be sampled and tested by independent testing agency appointed and paid by Owner in accordance with CSA S304.1.
 - .2 Noise reduction between two rooms will be tested by independent testing agency appointed and paid by Owner in accordance with ASTM E 336.
 - .3 Notify inspection agency minimum of 24 hours in advance of requirement for tests.
- .2 Manufacturer's Field Services: in accordance with Section 04 05 00 - Common Work Results for Masonry.

3.12 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning, supplemented as follows.
 - .1 Progress Cleaning:
 - .1 Standard Concrete Unit Masonry:
 - .1 Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block. Clean wall surface with suitable brush or burlap.
 - .2 Architectural Concrete Unit Masonry:
 - .1 Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block. Clean wall surface with suitable brush or burlap.

3.13 PROTECTION

- .1 Brace and protect concrete unit masonry in accordance with Section 04 05 00 - Common Work Results for Masonry.

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-04a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A792/A792M-03, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .2 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel.
 - .3 CSA W55.3-1965(R2003), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .4 CSA W59-03, Welded Steel Construction (Metal Arc Welding) (Metric Version).
 - .5 CAN/CSA S136-01), North American Specification for the Design of Cold-Formed Steel Structural Members.
- .4 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 CSSBI 50M-87, Lightweight Steel Framing Manual.
 - .2 CSSBI 52M-91, Lightweight Steel Framing Binder.
 - .3 CSSBI Fact Sheet #3 June 1994, Care and Maintenance of Prefinished Sheet Steel Building Products.
 - .4 CSSBI Technical Bulletin Vol. 7, No. 2 February 2004, Changing Standard Thicknesses for Canadian Lightweight Steel Framing Applications.
 - .5 CSSBI S5-04, Guide Specification for Wind Bearing Steel Studs.
- .5 The Master Painters Institute (MPI) / Architectural Painting Specification Manual - February 2004
 - .1 MPI # 18, Organic Zinc Rich Primer.

1.2 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Items where structural failure could represent a safety hazard, including all related connections and fastenings, shall be designed by a structural engineer permanently licensed to practice in the Province of Ontario. Each shop drawing submitted shall bear the stamp and signature of the aforesaid structural engineer.
 - .2 Indicate design loads, member sizes, materials, design thickness exclusive of coatings, coating specifications, connection and bracing details, screw sizes and spacing, and anchors.
 - .3 Indicate locations, dimensions, openings and requirements of related work.
 - .4 Indicate welds by welding symbols as defined in CSA W59.

- .3 Submit samples of framing components and fasteners to Architect.
- .4 Prior to beginning Work, submit two certified copies of mill reports covering material properties.

1.3 QUALITY ASSURANCE

- .1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Site Meetings: as part of Manufacturer's Services as described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 100% complete.
 - .3 Upon completion of Work, after cleaning is carried out.
- .4 Post-installation certification: After installation, provide written certification, signed by the structural engineer responsible for the shop drawings, that all items have been installed in accordance with the shop drawings.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Protect steel studs during transportation, site storage and installation in accordance with CSSBI Sheet Steel Facts #3.
- .2 Handle and protect galvanized materials from damage to zinc coating.
- .3 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 and corrugated cardboard packaging material for recycling.
 - .4 Ensure emptied containers are sealed and stored safely.
 - .5 Divert unused metal materials from landfill to recycling facility as approved by Architect.
 - .6 Fold up metal and plastic banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

- .1 Steel: to CSA S136, fabricated from ASTM A446M, Grade A to D steel.
- .2 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W.
- .3 Zinc coated steel sheet: quality to ASTM A653/A653M, with Z275 designation coating.
- .4 Aluminum-zinc alloy coated steel sheet: to ASTM A792/A792M, commercial quality, grade 33 with AZ150 designation coating, regular spangle surface, chemically treated for unpainted finish.

- .5 Electrolytic zinc coated, chromate treated, steel sheet: to A591, commercial quality, Grade 33, with proprietary coating comprised of 31.1 g/mzinc total mass both sides, unpainted finish.
- .6 Welding materials: to CSAW59 and certified by Canadian Welding Bureau.
- .7 Screws: pan head, self-drilling, self-tapping sheet metal screws, corrosion protected to minimum requirements of CSSBI, length as required.
- .8 Anchors: concrete expansion anchors or other suitable drilled type fasteners.
- .9 Bolts, nuts, washers: hot dipped galvanized to CAN/CSA-G164, 380g/m2 zinc coating.
- .10 Touch up primer: zinc rich, to CAN/CGSB 1-GP-181M.

2.2 STEEL STUD DESIGNATIONS

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

2.3 METAL FRAMING

- .1 Steel studs: to CAN/CSA S136, fabricated from zinc coated steel, depth as indicated.
 - .1 Minimum steel thickness of 1.37 mm.
- .2 Stud tracks: fabricated from same material and finish as steel studs, depth to suit.
 - .1 Bottom track: single piece.
 - .2 Top track: two piece telescoping.
- .3 Separator: neoprene, sized to suit.
- .4 Bridging: fabricated from same material and finish as studs, 38 x 12 x 1.09 mm minimum thickness.
- .5 Angle clips: fabricated from same material and finish as studs, 38 x 38 mm x depth of steel stud, 1.37 mm minimum thickness.
- .6 Tension straps and accessories: as recommended by manufacturer.

2.4 SOURCE QUALITY CONTROL

- .1 Prior to commencement of work, submit 2 certified copies of mill reports covering material properties.

Part 3 Execution

3.1 GENERAL

- .1 Do welding in accordance with CSA W59.
- .2 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CAS W55.3 for resistance welding of structural components.
- .3 Do work in accordance with CSSBI S5.

3.2 ERECTION

- .1 Erect components to requirements of reviewed shop drawings.
- .2 Anchor tracks securely to structure at 800 mm on centre maximum, unless lesser spacing prescribed on shop drawings.
- .3 Erect studs plumb, aligned and securely attached with two screws minimum, or welded in accordance with manufacturer's recommendations.

- .4 Seat studs into bottom tracks and two piece telescoping top track.
- .5 Install 50.0 mm minimum telescoping track at top of walls where required to accommodate vertical deflection. Nest top track into deflection channel a minimum of 30.0 mm and a maximum of 40.0 mm. Do not fasten tracks together. Stagger joints and install neoprene separator.
- .6 Install studs at not more than 50.0 mm from abutting walls, openings, and each side of corners and terminations with dissimilar materials.
- .7 Brace steel studs with horizontal internal bridging. Fasten bridging to steel clips fastened to steel studs with screws or by welding.
- .8 Frame openings in stud walls to adequately carry loads by use of additional framing members and bracing as detailed on shop drawings.
- .9 Touch up welds with coat of zinc rich primer.

3.3 ERECTION TOLERANCES

- .1 Plumb: not to exceed 1/500th of member length.
- .2 Camber: not to exceed 1/1000th of member length.
- .3 Spacing: not more than 3.0 mm from design spacing.
- .4 Gap between end of stud and track web: not more than 4.0 mm.

3.4 CUTOUTS

- .1 Maximum size of cutouts for services as follows:

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

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

3.5 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer's 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.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A 53/A 53M-02, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A 269-02, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A 307-02, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-92, Ready-Mixed, Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16.1-01, Limit States Design of Steel Structures.
 - .4 CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-1989(R2001), Welded Steel Construction (Metal Arc Welding) (Imperial Version).
- .4 The Environmental Choice Program
 - .1 CCD-047a-98, Paints, Surface Coatings.
 - .2 CCD-048-98, Surface Coatings - Recycled Water-borne.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:
 - .1 For finishes, coatings, primers and paints.
- .2 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.3 QUALITY ASSURANCE

- .1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01 31 19 - Project Meetings.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Storage and Protection:
 - .1 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.
 - .2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Architect.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W.
- .2 Steel pipe: to ASTM A 53/A 53M standard weight, 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 tubing: to ASTM A 269, Type 302 Commercial grade, galvanized finish.
- .7 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 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 Anchoring Gel: non-sag, two component epoxy adhesive.
 - .1 Colour: Component B – Grey.
 - .2 Bond strength at 2 days to ASTM C882: 20 MPa.
 - .3 Bond strength at 14 days to ASTM C882: 21 MPa.
 - .4 Absorption to ASTM D570: 0.47%.
 - .5 Compressive Strength to ASTM D695: 75 MPa.
 - .6 Acceptable Product: Sika, AnchorFix-3ca, or approved equivalent.

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CAN/CSA-G164.
- .2 Prefinished Steel: Barrier coating thickness shall be 152.4 micrometers on exterior exposed surface of the finished profile and 101.6 micrometers on the reverse.
 - .1 Siliconized Polyester - SMP: will not change colour more than eight 8.0 Hunter units as determined by ASTM D 2244.
- .3 Gloss: low.

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 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .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 degrees C.
- .3 Clean surfaces to be field welded; do not paint.

2.6 ANGLE LINTELS

- .1 Steel angles: prime painted, sizes indicated for openings. Provide 150 mm minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated.
- .3 Finish: shop painted.

2.7 PIPE RAILINGS

- .1 Steel pipe: 40 mm nominal outside diameter, formed to shapes and sizes as indicated.
- .2 Galvanize interior pipe railings after fabrication.

2.8 CHANNEL FRAMES

- .1 Fabricate frames from steel, sizes of channel and opening as indicated.
- .2 Weld channels together to form continuous frame for jambs and head of openings, sizes as indicated.
- .3 Finish: prime coat painted.

PART 3 EXECUTION

3.1 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 Architect 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 Provide components for building by other sections in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CAN/CSA-S16.1, or weld.
- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .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.

3.2 PIPE RAILINGS

- .1 Install pipe railings to stairs.
- .2 Set railing standards in concrete. Grout to fill hole. Trowel surface smooth and flush with adjacent surfaces.

3.3 CHANNEL FRAMES

- .1 Install steel channel frames to openings as indicated.

3.4 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.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 American National Standards Institute/National Association of Architectural Metal Manufacturers (ANSI/NAAMM)
 - .1 ANSI/NAAMM MBG531-00, Metal Bar Grating Manual.
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A 53/A 53M-02, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A 307-02, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A 325M-02, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
 - .3 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel.
 - .4 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA W59-1989(R2001), Welded Steel Construction (Metal Arc Welding/Imperial Version).
- .5 National Association of Architectural Metal Manufacturers (NAAMM)
 - .1 AMP 510-92, Metal Stair Manual.
- .6 Steel Structures Painting Council (SSPC), Systems and Specifications Manual, Volume 2.

1.2 SYSTEM DESCRIPTION

- .1 Design Requirements:
 - .1 Design metal stair, balustrade and landing construction and connections to OBC vertical and horizontal live load requirements.
 - .2 Detail and fabricate stairs to NAAMM Metal Stairs Manual.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's for finishes, coatings, primers and paints.
- .2 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate construction details, sizes of steel sections and thickness of steel sheet.
 - .3 Submit shop drawing bearing stamp of a qualified professional engineer registered in Province of Ontario, Canada.

1.4 QUALITY ASSURANCE

- .1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01 31 19 - Project Meetings.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Architect.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Steel sections: to CAN/CSA-G40.20/G40.21 Grade 300 W.
- .2 Steel plate: to CAN/CSA-G40.20/G40.21, Grade 260 W.
- .3 Floor plate: to CAN/CSA-G40.20/G40.21, Grade 300 W.
- .4 Steel pipe: to ASTM A 53/A 53M, standard weight, galvanized finish.
- .5 Steel tubing: to CAN/CSA-G40.20/G40.21, Grade 300W, sizes and dimensions as indicated.
- .6 Metal bar grating: to ANSI/NAAMM MBG 531, steel, Type W-19-4, with checkered plate nosings.
- .7 Welding materials: to CSA W59.
- .8 Bolts: to ASTM A 307.
- .9 High strength bolts: to ASTM A 325M.

2.2 FABRICATION

- .1 Fabricate to NAAMM, Metal Stair Manual.
- .2 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.
- .3 Accurately form connections with exposed faces flush; mitres and joints tight. Make risers of equal height.
- .4 Grind or file exposed welds and steel sections smooth.
- .5 Shop fabricate stairs in sections as large and complete as practicable.

2.3 STEEL PAN STAIRS

- .1 Fabricate stairs with closed riser steel pan construction.

- .2 Form treads and risers from 3 mm thick steel plate. Secure treads and risers to L 35 x 35 x 5 horizontal and vertical welded to stringers.
- .3 Form wall stringers from MC 305 x 15.8.
- .4 Form outer stringers from MC 305 x 15.8 with 5 mm thick plate fascia welded on.
- .5 Form landings from 3 mm thick steel plate, reinforced by L 76 x 76 x 6 mm spaced at 400 mm on centre.
- .6 Provide clip angles for fastening of furring channels, where applied finish is indicated for underside of stairs and landings.
- .7 Extend stringers around mid landings to form steel base.
- .8 Close ends of stringers where exposed.

2.4 PIPE/TUBING BALUSTRADES

- .1 Construct balusters and handrails from steel tubing as follows:
 - .1 Balusters: 40mm DIA. Tube.
 - .2 Top rail: 40mm DIA. Tube.
 - .3 Bottom rail: 40mm DIA. Tube.
 - .4 Pickets: 13mm DIA. Tube, 100 mm on centre.
- .2 Cap and weld exposed ends of balusters and handrails.
- .3 Terminate at abutting wall with end flange.
- .4 Weld balustrades to stringers as indicated.

2.5 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CAN/CSA-G164.
- .2 Shop coat primer: to CAN/CGSB-1.40.

2.6 SHOP PAINTING

- .1 Clean surfaces in accordance with Steel Structures Painting Council Manual Volume 2.
- .2 Apply one coat of shop primer except interior surfaces of pans.
- .3 Apply two coats of primer of different colours to parts inaccessible after final assembly.
- .4 Use primer as prepared by manufacturer without thinning or adding admixtures. Paint on dry surfaces, free from rust, scale, grease; do not paint when temperature is below 7 degrees C.
- .5 Do not paint surfaces to be field welded.

PART 3 EXECUTION

3.1 INSTALLATION OF STAIRS

- .1 Install in accordance with NAAMM, Metal Stair Manual.
- .2 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting stairs to structure.

- .3 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .4 Do welding work in accordance with CSA W59 unless specified otherwise.
- .5 Touch up shop primer to bolts, welds, and burned or scratched surfaces at completion of erection.

3.2 CLEANING

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2010.

1.2 QUALITY ASSURANCE

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by grade mark in accordance with applicable CSA standards.
- .3 Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling.
- .4 Divert unused wood materials from landfill to recycling, reuse and composting facility approved by Architect.
- .5 Do not dispose of preservative treated wood through incineration.
- .6 Do not dispose of preservative treated wood with materials destined for recycling or reuse.
- .7 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Architect.
- .8 Dispose of unused wood preservative material at official hazardous material collections site approved by Architect.
- .9 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other locations where they will pose health or environmental hazard.

Part 2 Products

2.1 LUMBER MATERIAL

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
 - .1 CAN/CSA-O141.

- .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:
 - .1 S2S is acceptable for strapping.
 - .2 Board sizes: "Standard" or better grade.
 - .3 Dimension sizes: "Standard" light framing or better grade.
 - .4 Post and timbers sizes: "Standard" or better grade.

2.2 PANEL MATERIALS

- .1 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .3 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.

2.3 ACCESSORIES

- .1 Nails, spikes and staples: to CSA B111.
- .2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .3 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.

2.4 FINISHES

- .1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work, interior highly humid areas, pressure preservative, fire retardant and treated lumber.
- .2 Stainless steel: use stainless steel 304 alloy for exposed fasteners and grommets or eyelets.

2.5 WOOD PRESERVATIVE

- .1 Pressure impregnation wood preservative (PT): All wood associated with the roof, all wood installed on the exterior of the building, including plywood and concealed blocking, and wood in all other locations likely to be subjected to damp and/or humid conditions. Except in locations where run-off could stain other surfaces.
- .2 Vacuum pressure impregnate wood for rot resistance, in accordance with CAN/CSA-O80:
 - .1 Pressure Treated wood Furring, blocking, nailing strips: to CAN/CSA-080.1-97
 - .2 Pressure Treated Plywood: to CAN/CSA-080.9-97
- .3 Impregnate at a rate of 8.8 lbs (above ground) and 14 lbs (ground contact) chemical per m³ wood.
- .4 Minimum penetration depth to be 3/8" with no less than 80% of sapwood treated.

Part 3 Execution

3.1 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 where indicated as follows:
 - .1 Wood fascia backing, curbs, nailers, sleepers on roof deck.

3.2 INSTALLATION

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

3.3 ERECTION

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 Countersink bolts where necessary to provide clearance for other work.

3.4 SCHEDULES

- .1 Provide electrical equipment backboards for mounting electrical equipment as indicated. Use 19 mm thick plywood on 19 x 38 mm furring around spacing, perimeter and at maximum 300 mm intermediate.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 37.3-M89, Application of Emulsified Asphalts for Dampproofing or Waterproofing.
 - .2 CAN/CGSB 37.5-M89, Cutback Asphalt Plastic Cement.
 - .3 CGSB 37-GP-6Ma-83, Asphalt, Cutback, Unfilled, for Dampproofing.
 - .4 CGSB 37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
 - .5 CGSB 37-GP-11M-76(R1984), Application of Cutback Asphalt Plastic Cement.
 - .6 CGSB 37-GP-12Ma-84, Application of Unfilled Cutback Asphalt for Dampproofing.
 - .7 CGSB 37-GP-15M-76(R1984), Application of Asphalt Primer for Asphalt Roofing, Dampproofing and Waterproofing.
 - .8 CAN/CGSB 37.16-M89, Filled, Cutback, Asphalt for Dampproofing and Waterproofing.
 - .9 CGSB 37-GP-36M-76, Application of Filled Cutback Asphalts for Dampproofing and Waterproofing.
 - .10 CGSB 37-GP-37M-77, Application of Hot Asphalt for Dampproofing or Waterproofing.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA A123.4-98, Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data sheets for bituminous dampproofing products. Including:
 - .1 Product characteristics.
 - .2 Performance criteria.
 - .3 Application methods.
 - .4 Limitations.
- .3 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence and cleaning procedures.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Provide and maintain dry, off-ground weatherproof storage.
- .3 Store materials on supports to prevent deformation.
- .4 Remove only in quantities required for same day use.
- .5 Store materials in accordance with manufacturer's written instructions.

1.4 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.
- .4 Ensure emptied containers are sealed and stored safely.
- .5 Fold up metal banding, flatten and place in designated area for recycling.
- .6 Divert unused bituminous dampproofing sealing compounds and asphalt primer materials from landfill to recycling facility approved by Consultant.

1.5 PROJECT/SITE ENVIRONMENTAL REQUIREMENTS

- .1 Temperature, relative humidity, moisture content.
 - .1 Apply dampproofing materials only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
 - .2 Do not proceed with Work when wind chill effect would tend to set bitumen before proper curing takes place.
 - .3 Maintain air temperature and substrate temperature at dampproofing installation area above 5 degrees C for 24 hours before, during and 24 hours after installation.
 - .4 Do not apply dampproofing in wet weather.
- .2 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.
- .3 Ventilation:
 - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
 - .2 Provide continuous ventilation during and after dampproofing application. Run ventilation system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of dampproofing installation.

Part 2 Products

2.1 MATERIALS

- .1 Asphalt:
 - .1 For application and curing at temperatures above 5 degrees C: to CGSB 37-GP-6Ma.
Package label or bill of lading for bulk hot liquid asphalt must indicate type, flash point, equiviscous temperature range and final blowing temperature.
Recycled material content: 50%.
 - .2 For application and curing at temperatures above 0 degrees C but below 5 degrees C: to CGSB 37-GP-6Ma.
Package label or bill of lading for bulk hot liquid asphalt must indicate type, flash point, equiviscous temperature range and final blowing temperature.

Recycled material content: 50%.

- .2 Sealing compound: plastic cutback asphalt cement to CAN/CGSB-37.5.
- .3 Asphalt primer: to CAN/CGSB-37.2.

Part 3 Execution

3.1 WORKMANSHIP

- .1 Keep hot asphalt:
 - .1 Below its flash point.
 - .2 At or below its final blowing temperature.
 - .3 Within its equiviscous temperature range at place of application.

3.2 PREPARATION

- .1 Before applying dampproofing:
 - .1 Seal exterior joints between foundation walls and footings, joints between concrete floor slab and foundation and around penetrations through dampproofing with sealing compound.

3.3 APPLICATION

- .1 Do dampproofing in accordance with CAN/CGSB-37.3 except where specified otherwise.
- .2 Do sealing work in accordance with CGSB 37-GP-11M except where specified otherwise.
- .3 Do priming of surface in accordance with CGSB 37-GP-15M except where specified otherwise.
- .4 Apply primer.
- .5 Apply dampproofing in accordance with applicable CGSB application standard.

Material		Application
CAN/CGSB-37.2	use	CAN/CGSB-37.3
CGSB 37-GP-6Ma	use	CGSB 37-GP-12M
CAN/CGSB-37.16	use	CGSB 37-GP-36M
CAN/CGSB-37.28	use	CAN/CGSB-37.3
CSA A123.4	use	CGSB 37-GP-37M

3.4 SCHEDULE

- .1 Apply continuous, uniform coating to entire exterior faces of foundation walls from 50 mm below finished grade level to and including tops of foundation wall footings.
- .2 Apply continuous, uniform coating to exterior side of foundation walls enclosing rooms below finished grade. Include exterior portion of interior walls where floors in adjacent rooms are at different elevations.
- .3 Apply two additional coats of dampproofing to vertical corners and construction joints for a minimum width of 230 mm on each side, and all around and for 230 mm along pipes passing through walls.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C 591-01, Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 - .2 ASTM E 96/E 96M-05, Standard Test Methods for Water Vapour Transmission of Materials.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 71-GP-24M-77(R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.4 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 and corrugated cardboard packaging material for recycling.

Part 2 Products

2.1 INSULATION

- .1 Foundation Wall Perimeter Insulation (**RI-01**): Extruded polystyrene(XPS) c/w vertical dovetail grooves for water drainage to weeping tile: to CAN/ULC-S701.
 - .1 Type: 4.

- .2 Thermal Resistance: Long term aged RSI value of 0.87/25 mm, to ASTM C518.
 - .3 Compressive strength: to ASTM D1621, minimum 210kPa.
 - .4 Thickness: 52mm.
 - .5 Size: 610 x 2440mm.
 - .6 Edges: shiplapped.
 - .7 Drainage capacity: >0.72 m3/hr/m, CCMC Class A, Type 2
 - .8 Water Vapour Permeance: to ASTM E96, 50 ng/Pas m2 max.
 - .9 Acceptable Product: Dow Chemical Canada, Styrofoam Brand, Perimate Insulation, or approved equivalent.
- .2 Foundation Wall Perimeter Finish Insulation (**FI-02**): Concrete faced insulated wall panels with extruded polystyrene (XPS) c/w vertical dovetail grooves for water drainage to weeping tile: to CAN/ULC-S701.
- .1 Type: 4.
 - .2 Thermal Resistance: Long term aged RSI value of 0.87/25 mm, to ASTM C518.
 - .3 Compressive strength: to ASTM D1621, minimum 210kPa.
 - .4 Thickness: 52mm.
 - .5 Size: 610 x 2440mm.
 - .6 Edges: shiplapped.
 - .7 Drainage capacity: >0.72 m3/hr/m, CCMC Class A, Type 2
 - .8 Water Vapour Permeance: to ASTM E96, 50 ng/Pas m2 max.
 - .9 Acceptable Product: CFI Insulation, or approved equivalent.
 - .10

2.2 ADHESIVE

- .1 Adhesive (for polystyrene): to CGSB 71-GP-2M.
 - .1 Adhesive: mastic type recommended by insulating drainage panel manufacturer as compatible with drainage panel and the waterproofing.
 - .2 Acceptable Product: ChemRex, Inc., Contech Brand PL300 Foam Board Adhesive.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 WORKMANSHIP

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 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 and CAN/CGA-B149.1 and CAN/CGA-B149.2 type B and L vents.

- .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 Do not enclose insulation until it has been inspected and approved by Consultant.

3.3 EXAMINATION

- .1 Examine substrates and immediately inform Consultant in writing of defects.
- .2 Prior to commencement of work ensure:
 - .1 Verify that the insulation boards and adjacent materials are compatible.
 - .2 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.4 PERIMETER FOUNDATION INSULATION

- .1 Apply adhesive in continuous 6 mm beads in a grid pattern to prevent potential air movement behind the insulation boards. Apply adhesive fully around protrusions.
- .2 Install boards on exterior face of foundation wall perimeter, vertically. Extend boards to top of footing.
- .3 Place boards in a method to maximize contact with bedding. Stagger side and end joints. Butt edges and ends tight to adjacent boards.
- .4 Extend boards across control and expansion joints, unbonded to foundation 75 mm on one side of joint.
- .5 Cut and fit insulation tight to protrusions or interruptions to insulation plane.

3.5 CLEANING

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

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C208-95(2001), Specification for Cellulosic Fiber Insulating Board.
 - .2 ASTM C591-01, Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 - .3 ASTM C612-04, Standard Specification for Mineral Fibre Block and Board Thermal Insulation.
 - .4 ASTM C726-05, Standard Specification for Mineral Fiber Roof Insulation Board.
 - .5 ASTM C728-05, Standard Specification for Perlite Thermal Insulation Board.
 - .6 ASTM C1126-04, Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
 - .7 ASTM C1289-05a, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - .8 ASTM E96/E96M-05, Standard Test Methods for Water Vapour Transmission of Materials.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 71-GP-24M-77(R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
 - .2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .3 CAN/ULC-S704-03, Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.4 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 and corrugated cardboard packaging material for recycling.

Part 2 Products

2.1 INSULATION

- .1 Wall Board Insulation (**RI-02**): Extruded polystyrene insulation to CAN/ULC-S701.
 - .1 Type:3.
 - .2 Size: 400 x 2400 mm.
 - .3 Thickness: As indicated on drawings.
 - .4 Edges: Butt Edge.
 - .5 Compressive Strength to ASTM D1621: 15 PSI minimum.
 - .6 Thermal Resistance to ASTM C518: 0.87 RSI / 25.4 mm minimum.
 - .7 Water Absorption to ASTM D2842: 0.3% maximum.
 - .8 Water Vapour Permeance to ASTM E96: 1.5 max per 25mm.
 - .9 Standard of Acceptance: Dow Chemical Canada, Styrofoam, Cavitymate.

2.2 ADHESIVE

- .1 Adhesive for roof board insulation to CGSB 71-GP-24, in accordance with manufacturer's recommendations.

2.3 ACCESSORIES

- .1 Typical Insulation Clips: impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.
- .2 Canopy Clips: impale type, perforated 100 x 100 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 WORKMANSHIP

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 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, and minimum 50 mm from CAN/CGA-B149.1 and CAN/CGA-B149.2 type B and L vents.

- .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 Consultant.

3.3 EXAMINATION

- .1 Examine substrates and immediately inform Consultant in writing of defects.
- .2 Prior to commencement of work ensure:
 - .1 Verify that the insulation boards and adjacent materials are compatible.
 - .2 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.4 RIGID INSULATION INSTALLATION

- .1 Apply full bed of adhesive in accordance with manufacturer's recommendations. Spread only enough adhesive to install four (4) boards at a time. Press boards in place to ensure complete bond with substrate. Apply adhesive fully around protrusions.
- .2 In addition to adhesive, install mineral fibre insulation boards with insulation clips and disk, 2 per 600 x 1200 mm board minimum, fit boards tight, cut off fastener spindle 3 mm beyond disk.
- .3 Leave insulation board joints unbonded over line of expansion and control joints. Bond a continuous 150 mm wide 0.15 mm modified bituminous membrane over expansion and control joints using compatible adhesive and primer before application of insulation.

3.5 CAVITY WALL INSTALLATION

- .1 Install polystyrene insulation boards over air/vapour barrier membrane to outer surface of inner wythe of wall cavity over impaling clips.
- .2 Place boards in a method to maximize contact with bedding. Stagger end joints. Butt edges and ends tight to adjacent boards and to protrusions.
- .3 Fit insulation boards neatly around wall ties.

3.6 ROOF INSTALLATION

- .1 Apply flat fill and sloped roof insulation boards in accordance with layout indicated on Shop Drawings.
- .2 Apply insulation boards parallel to roof perimeter long edges. Stagger end joints.
- .3 Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- .4 Lay second layer of insulation with joints staggered from first layer.
- .5 Cut boards to slope for a distance of 610 mm back from roof drains for positive drainage.
- .6 Apply no more insulation than can be covered with roofing membrane in same day.
- .7 Install single layer of overlay board, with joints staggered over insulation joints.

3.7 CLEANING

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C 553-02, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .2 ASTM C 665-01e1, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .3 ASTM C 1320-05, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- .2 Canadian Gas Association (CGA)
 - .1 CAN/CGA-B149.1-05, Natural Gas and Propane Installation Code Handbook.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .4 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S604-M1991, Type A Chimneys.
 - .2 CAN/ULC-S702-1997, Standard for Mineral Fibre Insulation.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

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

1.4 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 and corrugated cardboard packaging material in appropriate on-site for recycling.

Part 2 Products

2.1 INSULATION

.1 Thermal Insulation **(BI-01)**: Mineral fibre to CAN/ULC-S702-97.

- .1 Type: 1.
- .2 Size: To suit stud spacing.
- .3 Thickness: As indicated on drawings.
- .4 Combustibility to CAN4-S114: Non-combustible.
- .5 Surface Burning Characteristics to CAN/ULC-S102:
 - .1 Flame Spread: 0
 - .2 Smoke Developed: 0
- .6 Density: 32 kg/m³.
- .7 Thermal Resistance:

Thickness	RSI
63.5 mm	1.68
88.9 mm	2.30
152.4 mm	3.96

- .8 Standard of Acceptance: Roxul ComfortBatt, or approved equivalent.

.2 Fire-rated or Acoustical Insulation **(BI-02)**: Mineral fibre to CAN/ULC-S702-97.

- .1 Type: 1.
- .2 Size: To suit stud spacing.
- .3 Thickness: As indicated on drawings.
- .4 Combustibility to CAN4-S114: Non-combustible.
- .5 Surface Burning Characteristics to CAN/ULC-S102:
 - .1 Flame Spread: 0
 - .2 Smoke Developed: 0
- .6 Smoulder Resistance to CAN/ULC S129: 0.09%
- .7 Density: 45 kg/m³.
- .8 Acoustical Performance to ASTM C423:

Thickness	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	NRC
25.4 mm	0.14	0.25	0.65	0.90	1.01	1.01	0.70
38.1 mm	0.18	0.44	0.94	1.04	1.02	1.03	0.85
50.8 mm	0.28	0.60	1.09	1.09	1.05	1.07	0.95
76.2 mm	0.52	0.96	1.18	1.07	1.05	1.05	1.05
101.6 mm	0.86	1.11	1.20	1.07	1.08	1.07	1.10

- .9 Standard of Acceptance: Roxul Safe and Sound, or approved equivalent.

- .3 Firestopping Insulation **(BI-03)**: Mineral fibre to ASTM C 612.
- .1 Type: IVA.
 - .2 Size: To suit opening.
 - .3 Thickness: As required for ULC rating.
 - .4 Combustibility to CAN4-S114: Non-combustible.
 - .5 Surface Burning Characteristics to CAN/ULC-S102:
 - .1 Flame Spread: 0
 - .2 Smoke Developed: 0
 - .6 Smoulder Resistance to CAN/ULC S129: 0.01%
 - .7 Density: 72 kg/m³.
 - .8 Compressive Strength to ASTM C 165 (at 10%): 6.9 kPa
 - .9 Acoustical Performance to ASTM C423:

Thickness	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	NRC
50.8 mm	0.26	0.68	1.12	1.10	1.03	1.04	1.00
76.2 mm	0.63	0.95	1.14	1.01	1.03	1.04	1.05
101.6 mm	1.03	1.07	1.12	1.04	1.07	1.08	1.10

- .10 Acceptable Product: RoxulSafe or approved equivalent.

2.2 ACCESSORIES

- .1 Insulation clips:
 - .1 Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self-locking type.
- .2 Nails: galvanized steel, length to suit insulation plus 25 mm, to CSA B111.
- .3 Staples: 12 mm minimum leg.
- .4 Tape: as recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .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.

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

3.3 **CLEANING**

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Urethane Foam Contractors' Association Inc. (CUFCA)
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101-1989, Fire Endurance Tests of Building Construction and Materials.
 - .2 CAN/ULC-S102-1988(R2000), Surface Burning Characteristics of Building Materials and Assemblies.
 - .3 CAN/ULC-S705.1-01, Standard for Thermal Insulation Spray Applied Rigid Foam, Medium Density, Material Specification.
 - .4 CAN/ULC-S705.2-02, Standard for Thermal Insulation Spray Applied Rigid Foam, Medium Density, Installer's Responsibilities-Specification.

1.2 TEST REPORTS

- .1 Submit test reports, verifying qualities of insulation meet or exceed requirements of this specification, in accordance with Section 01 45 00 - Quality Control.
- .2 Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.

1.3 QUALITY ASSURANCE

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

1.4 SAFETY REQUIREMENTS

- .1 Protect workers as recommended by CAN/ULC-S705.2 and manufacturer's recommendations:
 - .1 Workers must wear gloves, respirators, dust masks, long sleeved clothing, eye protection and protective clothing when applying foam insulation.
 - .2 Workers must not eat, drink or smoke while applying foam insulation.

1.5 PROTECTION

- .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.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling.
- .4 Fold up metal banding, flatten and place in designated area for recycling.
- .5 Dispose of waste foam daily in location designated by Architect and decontaminate empty drums in accordance with foam manufacturer's instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

Part 2 Products

2.1 MATERIALS

- .1 Foamed-In-Place Insulation: Two component, low VOC, spray applied polyurethane to CAN/ULC-S705.1.
 - .1 Thermal Resistance: RSI 1.16 / 25.4 mm.
 - .2 Density: 35 kg/m³.
 - .3 Compressive Strength: 193 kPa.
 - .4 Recycled Content: Minimum 30%.
 - .5 Standard of Acceptance: Demilec, HeatLoc Soy Insulation, or approved equivalent.
- .2 Foamed-In-Place Insulation: One component, low VOC, spray applied polyurethane to CAN/ULC-S705.1.
 - .1 Thermal Resistance: RSI 1.16 / 25.4 mm.
 - .2 Density: 35 kg/m³.
 - .3 Compressive Strength: 193 kPa.
 - .4 Recycled Content: Minimum 30%.
 - .5 Standard of Acceptance: Demilec, R-Seal Insulation, or approved equivalent.
- .3 Primers: in accordance with manufacturer's recommendations for surface conditions.

Part 3 Execution

3.1 APPLICATION

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

END OF SECTION

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Part 1 General

1.1 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.

1.2 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.
 - .1 Performance criteria.
 - .2 Limitations.
- .3 Quality assurance submittals:
 - .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 and comply with written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

1.3 QUALITY ASSURANCE

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling.

Part 2 Products

2.1 SHEET VAPOUR BARRIER

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

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.
- .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.

Part 3 Execution

3.1 INSTALLATION

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

3.2 EXTERIOR SURFACE OPENINGS

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

3.3 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.

3.4 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.

3.5 ELECTRICAL BOXES

- .1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
 - .1 Install factory-moulded polyethylene boxes. 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.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

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PART 1 GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
 - .2 ASTM D570-98(2010)e1, Standard Test Method for Water Absorption of Plastics.
 - .3 ASTM D1004-09, Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
 - .4 ASTM D1876-08, Standard Test Method for Peel Resistance of Adhesives (T-Peel Test).
 - .5 ASTM D1938-08, Standard Test Method for Tear-Propagation Resistance (Trouser Tear) of Plastic Film and Thin Sheeting by a Single-Tear Method.
 - .6 ASTM D1970-09, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - .7 ASTM D3767-03(2008), Standard Practice for Rubber - Measurement of Dimensions.
 - .8 ASTM E96 / E96M-10, Standard Test Methods for Water Vapour Transmission of Materials.
 - .9 ASTM E154-08a, Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - .10 ASTM E2178-03, Standard Test Method for Air Permeance of Building Materials.
 - .11 ASTM E2357-05, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
- .2 Canadian Urethane Foam Contractor's Association - Professional Contractor Quality Assurance Program.
- .3 National Air Barrier Association - Professional Contractor Quality Assurance Program.
- .4 Sealant and Waterproofers Institute - Sealant and Caulking Guide Specification.

1.2 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 WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
- .3 Quality Assurance Submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Existing Substrate Condition: report deviations, as described in PART 3 -EXAMINATION in writing to Architect.
 - .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.
 - .4 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Applicator: company specializing in performing work of this section with minimum 5 years documented experience with installation of air/vapour barrier systems.
 - .1 Completed installation must be approved by the material manufacturer.
- .2 Mock-Up:
 - .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
 - .2 Construct typical exterior wall panel, 3 m long by 9m wide, incorporating; insulation, building corner condition, junction with roof system; illustrating materials interface and seals.
 - .3 Locate where directed by Architect.
 - .4 Mock-up may remain as part of finished work.
 - .5 Allow 48 hours for inspection of mock-up by Architect before proceeding with air/vapour barrier Work.
- .3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.

1.4 DELIVERY, STORAGE AND HANDLING

- .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 Avoid spillage: immediately notify Architect if spillage occurs and start clean up procedures.
- .4 Clean spills and leave area as it was prior to spill.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.
- .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.

1.6 AMBIENT CONDITIONS

- .1 Install solvent curing sealants and vapour release adhesive materials in open spaces with ventilation.
- .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
- .3 Maintain temperature and humidity recommended by materials manufactures before, during and after installation.

1.7 SEQUENCING

- .1 Sequence work in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Charts.
- .2 Sequence work to permit installation of materials in conjunction with related materials and seals.

1.8 WARRANTY

- .1 Provide three year warranty under provisions of Section 01 78 00 - Closeout Submittals and in accordance with General Conditions (GC) CCDC 2, GC 12.3.
- .2 Warranty: include coverage of installed sealant and sheet materials which:
 - .1 Fail to achieve air tight and watertight seal.
 - .2 Exhibit loss of adhesion or cohesion.
 - .3 Do not cure.

PART 2 PRODUCTS

2.1 GENERAL

- .1 For each type of material required for the work of this section, provide primary materials that are the products of one manufacturer.

2.2 SHEET MATERIALS

- .1 SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film, **(AB-01)**:
 - .1 Air leakage: <0.0001 CFM/ft² @1.6 lbs/ft² to ASTM E 2178 and ASTM E 283 and have no increased air leakage when subjected to a sustained wind load of 10.5 lbs/ft² for 1 hour and gust wind load pressure of 62.8 lbs/ft² for 10 seconds when tested at 1.6 lbs/ft² to ASTM E331.
 - .2 Tested to ASTM E 2357 for the air barrier assembly.
 - .3 Vapor permeance: 0.05 perms to ASTM E96.
 - .4 Membrane Thickness: 0.0394" (40 mils).
 - .5 Low temperature flexibility: -22 degrees F to CGSB 37-GP-56M.
 - .6 Elongation: 200% to ASTM D412-modified.
 - .7 Meets CAN/CGSB-51-33 Type I Water Vapor Permeance requirements.
 - .8 Acceptable Product: Blueskin SA, by Henry, or approved equivalent.

2.3 SEALANTS

- .1 Sealants: Two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/l max. VOC Content.
- .2 Primer: Water-based primer which imparts an aggressive, high tack finish on the treated substrate
 - .1 Flash Point: No flash to boiling point.
 - .2 Solvent Type: Water.
 - .3 VOC Content: Not to exceed 10 g/l.
 - .4 Application Temperature: -4°C and above.
 - .5 Freezing point (as packaged): -7°C.
- .3 Substrate Cleaner: non-corrosive type recommended by sealant manufacturer compatible with adjacent materials.

2.4 ACCESSORIES

- .1 Seam Tape: As recommended by the weather barrier manufacturer.
- .2 Fasteners:
 - .1 42mm rust resistant screw with 50mm diameter plastic cap or manufacturer approved 31.75mm or 50mm metal gasketed washer.
 - .2 Masonry tap-con fasteners with Caps: 50mm diameter plastic cap fasteners.

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 GENERAL

- .1 Perform Work in accordance with Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification requirements for materials and installation.
- .2 Perform Work in accordance with National Air Barrier Association - Professional Contractor Quality Assurance Program and requirements for materials and installation.
- .3 Perform Work in accordance with Canadian Urethane Foam Contractor's Association - Professional Contractor Quality Assurance Program and requirements for materials and installation.

3.3 EXAMINATION

- .1 Verify that surfaces and conditions are ready to accept work of this section.
- .2 Ensure surfaces are clean, dry, sound, smooth, continuous and comply with air barrier manufacturer's requirements.
- .3 Report unsatisfactory conditions to Architect in writing.
- .4 Do not start work until deficiencies have been corrected.
 - .1 Beginning of Work implies acceptance of conditions.

3.4 PREPARATION

- .1 Remove loose or foreign matter, which might impair adhesion of materials.
- .2 Ensure substrates are clean of oil or excess dust; masonry joints struck flush, and open joints filled; and concrete surfaces free of large voids, spalled areas or sharp protrusions.
- .3 Ensure substrates are free of surface moisture prior to application of self-adhesive membrane and primer.
- .4 Ensure metal closures are free of sharp edges and burrs.
- .5 Prime substrate surfaces to receive adhesive and sealants in accordance with manufacturer's instructions.

3.5 INSTALLATION

- .1 Refer to manufacturer's literature for recommendations on installation.
- .2 Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
- .3 Application of Self-Adhered Air Barrier Membrane
 - .1 Install air & vapour barrier to dry surfaces at air and surface temperatures of -4°C and above in accordance with manufacturer's recommendations, at locations indicated on Construction Documents.
 - .2 Prime substrate to receive air barrier membrane as required per manufacturers written instructions.
 - .3 Precut pieces of air & vapour barrier into easily handled lengths.

- .4 Remove silicone-coated release paper and position membrane carefully before placing length horizontally against the surface.
 - .5 Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
 - .6 When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
 - .7 Overlap horizontally adjacent pieces 50 mm and roll seams.
 - .8 Subsequent sheets of membrane applied above shall be positioned immediately below masonry reinforcement or ties. Bottom edge shall be slit to fit around reinforcing wires or ties, and membrane shall overlap the membrane sheet below by 50 mm. Roll firmly into place.
 - .9 Seal around masonry reinforcing or ties and all penetrations with termination mastic.
 - .10 Continue the membrane into all openings in the wall, such as doors, windows, etc., and terminate at points that will prevent visibility from interior.
 - .11 Coordinate the installation of air & vapour barrier with roof installer to ensure continuity of membrane with rooftop air & vapour membrane.
 - .12 At end of each working day seal top edge of air & vapour barrier to substrate with termination mastic.
 - .13 Do not allow the rubberized asphalt surface of the air & vapour barrier membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.
 - .14 Do not expose air & vapour barrier membrane to sunlight for more than thirty days prior to enclosure.
 - .15 Inspect installation prior to enclosing and repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 150 mm in all directions from the perimeter of the affected area.
- .4 Application of Transition Membrane.
- .1 Prime substrate to receive transition membrane as required per manufacturers written instructions.
 - .2 Apply transition membrane with a minimum overlap of 75mm onto each surface at all beams, columns and joints as indicated in detail drawings.
 - .3 Tie in to window and door frames, spandrel panels, roof and floor intersections and changes in substrate.
 - .4 Use pre-cut, easily handled lengths for each location.
 - .5 Remove silicone-coated release paper and position membrane flashing carefully before placing it against the surface.
 - .6 When properly positioned, place against surface by pressing firmly into place by hand roller.
 - .7 Overlap adjacent pieces 50 mm and roll all seams with a hand roller.
 - .8 Seal top edge of flashing with termination mastic.
 - .9 When transition flashing is pre-installed prior to application of Fluid Applied Membrane, apply transition flashing as above. Spray or trowel a continuous uniform film of Fluid Membrane at min. 1.5 mm (60 mils) dry film thickness using multiple, overlapping passes, with a minimum overlap of 75 mm onto transition flashing. For sill condition, spray or trowel Fluid Membrane onto pre-installed sill flashing and onto horizontal section of sill.
- .5 Application of Flexible Membrane Wall Flashing.
- .1 Prime substrate to receive wall flashing as required per manufacturers written instructions.
 - .2 Precut pieces of flashing to easily handled lengths for each location.
 - .3 Remove silicone-coated release paper and position flashing carefully before placing it against the surface.

- .4 When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
- .5 Overlap adjacent pieces 50 mm and roll all seams with a hand roller.
- .6 Trim bottom edge 13 mm back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
- .7 At heads, sills and all flashing terminations, turn up ends a minimum of 50 mm and make careful folds to form an end dam, with the seams sealed.
- .8 Seal top edge of flashing with termination mastic.
- .9 Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with poly-sulfide sealants, creosote, uncured coal tar products or EPDM.

3.6 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 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.7 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.

3.8 PROTECTION OF WORK

- .1 Protect finished work in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Do not permit adjacent work to damage work of this section.
- .3 Ensure finished work is protected from climatic conditions.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 The Aluminum Association, Inc. (AA)
 - .1 AA DAF45-03, Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 167-99(2004), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM A 240/A 240M-05a, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - .3 ASTM A 480/A 480M-05, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
 - .4 ASTM D 523-89(R1999), Standard Test Method for Specular Gloss.
 - .5 ASTM D 822-01, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 19-GP-14M-76(R1984), Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.

1.2 DESIGN REQUIREMENTS

- .1 Design metal cladding to provide for thermal movement of component materials caused by ambient temperature range of 80°C without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- .2 Maximum deviation from vertical and horizontal alignment of erected panels: 1 to 1000.

1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data sheets for cladding system materials. Include product characteristics, performance criteria, limitations and colours.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate dimensions and thickness of panels, fastening and anchoring methods, detail and location of joints and gaskets, thermal movement provision, wall openings, head, jamb and sill details, materials and finish, compliance with design criteria and requirements of related work.

1.5 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate 100 x 100 mm samples of wall system, representative of materials, finishes and colours.

1.6 QUALIFICATION

- .1 Installation of double skin metal cladding by installers certified by manufacturer of system used.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Store and protect material in accordance with panel manufacturer's recommendations.
- .2 Do not expose panels with strippable film to direct sunlight or extreme heat.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Divert unused metal materials from landfill to metal recycling facility as approved by Architect.
- .6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .7 Dispose of unused sealant material at official hazardous material collections site approved by Architect.
- .8 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

- .1 Prefinished Composite Metal Panel Type **MP-01**
 - 1. Composite panel: Thickness: 4 mm.
 - 2. Core: thermoplastic resin core.
 - 3. Aluminum face sheets: Thickness: 0.51 mm, Alloy: AA-3003.
 - 4. Colour, based on Alucobond Spectra series: Castle Grey Cool 30.
 - 5. Panel weight: 4 mm: 5.38 kg/m².
- .2 Prefinished Composite Metal Panel Type **MP-02** (Ventilated Soffit)
 - 1. Composite panel: Thickness: 2 mm.
 - 2. Core: None. Perforated IPA No. 115 (3mm perforations, 6mm centres, 23% open area).
 - 3. Aluminum face sheets: Thickness: 2.0 mm, Alloy: AA-3003.
 - 4. Colour, based on Alucobond Spectra series: Castle Grey Cool 30.
 - 5. Panel weight: 2 mm: 2.75 kg/m².
- .3 Aluminium extrusions: alloy AA-6063-T5.

- .4 Concealed sealants: one-component, butyl-polyisobutylene polymer base, solvent curing to CGSB 19-GP-14M.
- .5 Exposed sealants: one-component, silicone base, solvent curing, colour to match panel.
- .6 Accessories:
 - .1 Fasteners: aluminum extrusion, type rout and return, concealed in accordance with manufacturer's recommendations.
- .7 Acceptable product: Sobotec, SL-2000, or approved equivalent.

2.2 FABRICATION

- .1 Composition: two sheets of aluminum sandwiching a core of extruded thermoplastic formed in a continuous process with no glues or adhesives.
- .2 Factory fabricated.
- .3 Tolerances:
 - .1 Panel bow: maximum 0.8% of panel dimension in width and length.
 - .2 Panel dimensions: where final dimensions cannot be established by field measurement before completion of panel manufacturing, make allowance for field adjustments as recommended by manufacturer.
 - .3 Panel lines, breaks and angles: sharp, true and surfaces free from warp or buckle.
- .4 Panel finishes: Kynar, three coat, coil-coated baked enamel finish containing Kynar 500 polyvinylidene fluoride resin.
- .5 Panel and Wall Accessories:
 - .1 Provide proprietary aluminum extrusions to manufacturer's standard profiles for a complete installation.
 - .2 Fasteners: as recommended by panel manufacturer, concealed and non-corrosive.
 - .3 Extrusions and extrusion clips for attaching panels to the sub-structure: Purpose made aluminum.
 - .4 Extrusions shall be full length around panel perimeter for panel reinforcement and alignment. Intermittent clips are unacceptable.
 - .5 Joint filler strip: Same material and color as panels. Use of caulking at joints is not acceptable.
 - .6 Plastic shims, shall be used as thermal separator between extrusions and sub-girts.
 - .7 Sub-girts: To be manufactured from G-90 galvanized steel and shall be designed to accommodate expansion and contraction, dynamic movements and design load requirements.

Part 3 Execution

3.1 EXAMINATION

- .1 Before installation examine alignment of substrate and notify Consultant in writing if substrate does not comply with requirements of panel installer.

3.2 INSTALLATION

- .1 Install composite panels in accordance with manufacturer's written instructions and shop drawings. Allow for thermal movement.
- .2 Install panels plumb, true, level and in alignment to established lines and elevations.
- .3 Maintain following installation tolerances:
 - .1 Maximum variation from plane or location shown on shop drawings: 10 mm/10 m of length and up to 20 mm/100 m.
 - .2 Maximum deviation for vertical member: 3 mm in an 8.5 m run.
 - .3 Maximum deviation for a horizontal member: 3 mm in an 8.5 m run
 - .4 Maximum offset from true alignment between two adjacent members abutting end to end, in line: 0.75 mm.
- .4 Remove strippable coating from panels as they are erected.

3.3 CLEAN-UP

- .1 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00.01 - Rough Carpentry
- .2 Section 07 21 14 - Board Insulation
- .3 Section 07 62 00 - Sheet Metal Flashing and Trim
- .4 Section 07 92 00 - Joint Sealing

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 *ASTM D41-05, Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.*
 - .2 *ASTM D6164-05e1, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.*
 - .3 *ASTM C 1177/C 1177M Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.*
 - .4 *ASTM D6878, Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.*
- .2 Canadian General Standards Board (CGSB).
 - .1 *CGSB 37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.*
 - .2 *CGSB 37-GP-56M-80 A1985, Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.*
 - .3 *CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.*
- .3 Canadian Roofing Contractors Association (CRCA).
 - .1 *CRCA Roofing Specifications Manual-(1997).*
- .4 Canadian Standards Association (CSA International).
 - .1 *CSA A231.1-06, Precast Concrete Paving Slabs.*
 - .2 *CSA O121-08, Douglas Fir Plywood.*
 - .3 *CSA O151-04, Canadian Softwood Plywood.*
- .5 Health Canada / Workplace Hazardous Materials Information System (WHMIS).
 - .1 *Material Safety Data Sheets (MSDS).*

1.3 DESCRIPTION

- .1 Roof Covering Type **RC-01**. This TPO Adhered Roofing System incorporates maximum 6m wide, 60-mil thick scrim reinforced Thermoplastic Polyolefin (TPO) membrane. Insulation is typically mechanically fastened to the roof deck with fasteners and plates then a cover board is secured with adhesive and the membrane is fully adhered to the cover board with bonding adhesive. Adjoining sheets of membrane are overlapped approximately 50mm and joined together with a minimum 38m" wide hot air weld. This roof covering includes the entire assembly specified under this section.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit two copies of most recent technical roofing components data sheets describing materials' physical properties.
- .3 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .4 For each roof assembly, indicate each material, flashing, control joints, and tapered insulation details.
- .5 Provide layout for tapered insulation.
- .6 Samples: submit one (1): sample pavers, and 140mm x 140mm pieces of each type of roofing material.
- .7 Along with the project submittals (shop drawing and Request for Warranty), when fastener pullout values do not meet the requirements listed in the manufacturer specification, test results with the appropriate manufacturer fastener must be submitted by the roofing contractor for review.
- .8 For all projects (prior to project inspection by manufacturer) a final shop drawing must be approved by manufacturer.

1.5 QUALITY ASSURANCE

- .1 This roofing system must be installed by a manufacturer Authorized Roofing Applicator in compliance with shop drawings as approved by manufacturer. There must be no deviations made without the prior written approval of manufacturer. Submit laboratory test reports in accordance with Section 01450 - Quality Control.
- .2 Upon completion of the installation, an inspection will be conducted by the Field Service Representative of manufacturer to ascertain that the membrane roofing system has been installed according to manufacturer's published specifications and details applicable at the time of bid.
- .3 This roofing system must meet Underwriters Laboratories (ULC) Class A.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to the job site in the original, unopened containers labeled with the manufacturer's name, brand name and installation instructions.
- .2 Store Sure-Weld membrane in the original undisturbed plastic wrap.
- .3 Job site storage temperatures in excess of 90° F may affect shelf life of curable materials (i.e., adhesives and sealants).
- .4 When liquid adhesives and sealants are exposed to lower temperatures, restore to a minimum of 60° Fahrenheit before use.
- .5 Do not store adhesive containers with opened lids due to the loss of solvent, which will occur from flash off.
- .6 Insulation and underlayment must be stored so it is kept dry and is protected from the elements. Store insulation on a skid and completely cover with a breathable material such as tarp or canvas. If the insulation is lightweight, it should be weighted to prevent possible wind damage.

1.7 JOB CONDITIONS

- .1 Coordination between trades is essential to avoid unnecessary traffic over sections of the roof and to prevent damage to the membrane roofing system.

1.8 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 paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling.
- .4 Separate for reuse and recycling Steel, Metal, and Plastic waste.
- .5 Place materials defined as hazardous or toxic in designated containers.
- .6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .7 Clearly label location of salvaged material's storage areas and provide barriers and security devices.
- .8 Ensure emptied containers are sealed and stored safely.
- .9 Divert unused metal materials from landfill to metal recycling facility.
- .10 Unused paint or coating material must be disposed of at official hazardous material collections site.
- .11 Unused adhesive, sealant and asphalt materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .12 Dispose of unused adhesive material at official hazardous material collections site.
- .13 Dispose of unused sealant material at official hazardous material collections site.
- .14 Dispose of unused asphalt material at official hazardous material collections site.
- .15 Divert unused gypsum materials from landfill to recycling facility.
- .16 Fold up metal banding, flatten and place in designated area for recycling.

1.9 WARRANTY

- .1 A fifteen (15) year, Warranty by manufacturer shall be provided for the total system and included in contract.
- .2 The scope of the warranty shall include material and labour required to return the membrane to a watertight condition.

Part 2 Products

2.1 GENERAL

- .1 The components of this roofing system are to be products of a single manufacturer or accepted by manufacturer as compatible. The installation, performance or integrity of products by others, when selected by the specifier and accepted by manufacturer, is not the responsibility of manufacturer and is expressly disclaimed by the manufacturer Warranty.

2.2 VAPOUR RETARDER

- .1 40-mil composite that consists of 35 mils of self-adhering rubberized asphalt laminated to a 5-mil polyethylene film. A siliconized release liner prevents the material from bonding to itself in the roll and is easily removed for installation.
- .2 Acceptable Primer: Carlisle CCW-702 primer, or approved equivalent.
- .3 Acceptable Manufacturer: Carlisle 725TR Air & Vapor Barrier/Temporary Roof

2.3 INSULATION (PLAIN AND TAPERED)

- .1 Closed-cell, polyiso foam core integrally laminated to heavy, black (nonasphaltic), fiber-reinforced felt facers. Provide 1200mm x 1200mm insulation panel installed in two layers, for a total R value of R30 (LTTR). Slope insulation as per drawings details.
- .2 Acceptable Manufacturer: Carlisle ACFoam®-II, or approved equivalent.

2.4 INSULATION FASTENER

- .1 Insulation fasteners are used in conjunction with a manufacturer 70mm" Insulation plate for insulation attachment. Provide available in lengths as required. Fasteners to feature a buttress thread design for high pullout resistance and an extra sharp spade point for quick installation. It is designed to secure insulation to steel decks (22 gauge [0.76 mm] or heavier).
- .2 Acceptable Manufacturer: Carlisle InsulFast Insulation Fastener, or approved equivalent.

2.5 COVER BOARD

- .1 Patented design to employ glass mat facings on top and bottom. The facers are to be embedded into a water-resistant gypsum core providing excellent fire resistance, moisture resistance and wind uplift properties. Provide a non-asphaltic primer applied to the top glass mat facer.
- .2 Acceptable Manufacturer: Carlisle DensDeck Prime, or approved equivalent.

2.6 MEMBRANE

- .1 60-mil thick reinforced Thermoplastic Polyolefin (TPO) membrane. Field membrane sheets are to be 3.6m by 15m or 100' long to suit project conditions.
- .2 Acceptable Manufacturer: Carlisle Sure-Weld, or approved equivalent.
- .3 Colour: Grey

2.7 COVER BOARD ADHESIVE

- .1 Construction grade, two-component, polyurethane adhesive. The low-rise, expanding characteristics to be designed to bond manufacturer's membrane and insulations and cover board to a variety of substrates.
- .2 Acceptable Manufacturer: Carlisle FAST Dual Cartridge Adhesive, or approved equivalent.

2.8 RELATED MATERIALS

- .1 The following accessories are to be provided by the manufacturer:
 - .1 Non-Reinforced or Reinforced Flashing,
 - .2 Bonding Adhesive,

- .3 Sealants and Splicing Cements,
- .4 Water Cut-Off Mastic,
- .5 Weathered Membrane Cleaner,
- .6 Molded Pocket Sealant,
- .7 Heat Weldable Walkway Pads,
- .8 Pre-Molded Inside/Outside Corners,
- .9 Pipe Flashings, Curb Wraps and Sealant Pockets.

2.9 CARPENTRY

- .1 In accordance with Section 06 10 00.01 - Rough Carpentry.

2.10 ROOF DRAINS

- .1 Roof drains to be 0.050' Copper, with clamping ring to provide mechanical compression seal, cast aluminum dome strainer, 140mm diameter to suit existing diameter connection;
- .2 Acceptable manufacturer: Copper RetroDrain by Olyflow Drains, or approved equivalent.
- .3 Refer to and coordinate all plumbing requirements including installation and compatibility with Divisions 20 and 22 "Mechanical".

2.11 SHEET METAL FLASHINGS AND PIPE FLASHINGS

- .1 As indicated, in accordance with Section 07 62 00 - Sheet Metal Flashing and Trim.

Part 3 Execution

3.1 GENERAL

- .1 When feasible, begin the application at the highest point of the highest roof level and work to the lowest point to prevent moisture infiltration and to minimize construction traffic on completed sections. This will include completion of all flashings, terminations and daily seals.

3.2 ROOF DECKS CRITERIA

- .1 Proper substrate shall be provided and the structure shall be sufficient to withstand normal construction loads and live loads.
- .2 Defects in the roof deck must be reported and documented to the General Contractor for assessment. The manufacturer Authorized Applicator shall not proceed with installation unless defects are corrected.

3.3 SUBSTRATE PREPARATION

- .1 Substrate must be even without noticeable high spots or depressions, and must be free of accumulated water, ice or snow.

3.4 INSTALLATION

- .1 Refer to the applicable Material Safety Data Sheets and Technical Data Bulletins for applicable cautions and warnings.

3.5 VAPOUR RETARDER INSTALLATION

- .1 Surfaces to receive vapour retarder must be clean and dry. Prime the substrate with manufactured approved primer. Apply primer by spray, brush or with a long nap roller at 23 m2 to 28m2 per gallon. Primer will require one-hour minimum to dry at a temperature of 23.8°C. Primer has sufficient cure when it will not transfer when touched. Prime only those areas that will be covered with membrane the same day. Re-prime any areas that become wet or dirty.
- .2 Apply vapour retarder from low to high points, in a shingle fashion, so that the laps will shed water. Overlap all edges by at least 65mm. End laps should be staggered. Position membrane carefully to avoid fish-mouths and wrinkles. Roll the vapour retarder membrane immediately after installation.

3.6 INSULATION INSTALLATION

- .1 Install insulation in two layers, joins staggered in all directions. When sloped insulation is used, install it between the two layers of plain insulation.
- .2 Fasten insulation with appropriate fastener. All fasteners to engage in top flute. Follow all manufacturer's guidelines regarding rate and patterns for field, perimeter and corners.
- .3 Apply flat fill and sloped roof insulation boards in accordance with layout indicated on Shop Drawings.
- .4 Apply insulation boards parallel to roof perimeter long edges. Stagger end joints.
- .5 Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- .6 Lay second layer of insulation with joints staggered from first layer.
- .7 Cut boards to slope for a distance of 610 mm back from roof drains for positive drainage.
- .8 Apply no more insulation than can be covered with roofing membrane in same day.
- .9 Install single layer of overlay board, with joints staggered over insulation joints.

3.7 COVER BOARD INSTALLATION

- .1 Cover board must be secure to the insulation with adhesive in accordance with the latest manufacturer's details and specifications.
- .2 Follow all recommendations regarding bead size and spacing for field, perimeter and corners.

3.8 MEMBRANE PLACEMENT, ATTACHMENT AND HOT AIR WELDING

- .1 Sweep loose debris from the substrate.
- .2 Position TPO membrane over substrate and fold membrane back lengthwise so half the underside is exposed.
- .3 Apply adhesive to the exposed underside of the membrane and the corresponding substrate area with a plastic core medium nap paint roller at a coverage rate of approximately 5.6m2 square feet per gallon per finished surface (includes coverage on both membrane and substrate).

- .4 Allow adhesive to dry until tacky and roll coated membrane into coated substrate and avoid wrinkling.
- .5 Brush down the bonded section of membrane immediately with a soft bristle push broom.
- .6 Fold back the unbonded half of the sheet and repeat the bonding procedure.
- .7 Install adjoining membrane sheets in the same manner, overlapping edges a minimum of 50mm to provide for a minimum 38mm hot air weld. It is recommended that all splices be shingled to avoid bucking of water.
- .8 Hot air weld the membrane sheets a minimum of 38mm with an Automatic Hot Air Welding Machine.
- .9 Membrane that has been exposed to the elements for approximately 7 days must be prepared with weathered membrane cleaner. Wipe the surface where weathered membrane cleaner has been applied with a clean, dry wipe or other white rag to remove cleaner residue prior to hot air welding.

3.9 ADDITIONAL MEMBRANE SECUREMENT

- .1 The membrane must be secured at the perimeter of each roof level, roof section, expansion joint, curb, skylight, interior wall, penthouse, etc., at any angle change which exceeds 50mm in 305mm and at all other penetrations in accordance with manufacturer's details published with manufacturer's specifications.
- .2 Fasteners for steel deck, 22 gauge or heavier: Acceptable manufacturer: HP-X Fasteners/Piranha Plates, or approved equivalent, are required.

3.10 MEMBRANE FLASHING

- .1 Flash all walls and curbs with reinforced membrane. Non-Reinforced membrane shall be limited to inside and outside corners, field fabricated pipe seals, scuppers and sealant pockets where the use of premolded accessories are not practical. Terminate the flashing in accordance with an appropriate manufacturer details.
- .2 On all vertical surfaces, such as walls, curbs and pipes, bonding adhesive is required.

3.11 OTHER RELATED WORK

- .1 Copings, counterflashing and other metal work, not supplied by manufacturer, shall be fastened to prevent metal from pulling free or buckling and sealed to prevent moisture from entering the roofing system or building.

3.12 CLEANING

- .1 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their documented instructions.
- .2 Clean and remove all roof drains or debris and foreign matter fully for complete and obstructed drainage.
- .3 Repair or replace defaced or disfigured finishes caused by work of this section.

END OF SECTION

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Part 1 General

1.1 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 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual 1997.
- .3 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.
- .4 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.

1.2 SAMPLES

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, colour and finish.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .6 Divert unused metal materials from landfill to metal recycling facility as approved by Architect.
- .7 Unused paint and sealant material must be disposed of at an official hazardous material collections site as approved by Architect.
- .8 Unused paint and sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

- .9 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 PREFINISHED ALUMINUM SHEET

- .1 Finish: factory applied coating to CAN/CGSB-93.1 supplemented and amended as follows:
 - .1 Coating thickness: not less than 1.2 micrometres.
 - .2 Outdoor exposure period: 5 years.
- .2 Thickness specified for prefinished aluminum sheet applies to base metal.

2.2 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CAN/CGSB 37.5.
- .3 Underlay for metal flashing: dry sheathing to CAN/CGSB-51.32.
- .4 Sealants: In accordance with Section 07 92 00 – Joint Sealants.
- .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 application.
- .7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .8 Flux: rosin, cut hydrochloric acid, or commercial preparation suitable for materials to be soldered.
- .9 Touch-up paint: as recommended by prefinished material manufacturer.

2.3 FABRICATION

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

2.4 METAL FLASHINGS

- .1 Form flashings, copings and fascias to profiles indicated of 0.79 mm thick prefinished aluminum.

2.5 PANS

- .1 Form pans to receive roofing plastic from 0.79 mm thick prefinished aluminum with minimum 75 mm upstand above finished roof and 100 mm continuous flanges with no open corners. Rivet joints. Make pans minimum 50 mm wider than member passing through roof membrane.

2.6 REGLETS AND CAP FLASHINGS

- .1 Form recessed reglets and cap flashing of 0.79 mm thick prefinished aluminum to be built-in concrete and masonry work for base flashings as detailed and in accordance with CRCA FL series details. Provide slotted fixing holes and steel/plastic washer fasteners. Cover face and ends with plastic tape.

2.7 SCUPPERS

- .1 Form scuppers from 0.79 mm thick prefinished aluminum.
- .2 Sizes and profiles as indicated.
- .3 Provide necessary fastenings.

2.8 ALUMINUM FINISHES

- .1 Finish exposed surfaces of aluminum components in accordance with AA DAF45.
 - .1 Electrolytically deposited colour anodic finish: designation AAMA 2604,
 - .1 Colours to Vicwest colour system unless otherwise noted.
 - .2 **FL-01:** Stone Grey, 6071.
 - .3 **FL-02:** Aluconbond Spectra, Castle Gray Cool 30.
 - .4 **FL-03:** Charcoal, 6072.

Part 3 Execution

3.1 INSTALLATION

- .1 Install sheet metal work in accordance with Aluminum Sheet Metal Work in Building Construction as detailed.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.
- .4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using standing seams forming tight fit over hook strips.
- .5 Lock end joints and caulk with sealant.

- .6 Install surface mounted reglets true and level, and caulk top of reglet with sealant.
- .7 Insert metal flashing into reglets and under cap flashing to form weather tight junction.
- .8 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.
- .9 Caulk flashing at reglet and cap flashing with sealant.
- .10 Install pans, where shown around items projecting through roof membrane.

3.2 SCUPPERS

- .1 Install scuppers as indicated.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM E84 - 08a Standard Test Method for Surface Burning Characteristics of Building Materials
 - .2 ASTM E119 - 08a Standard Test Methods for Fire Tests of Building Construction and Materials
 - .3 ASTM E605 - 93(2006) Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
 - .4 ASTM E736 - 00(2006) Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
 - .5 ASTM E759 - 92(2005) Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members
 - .6 ASTM E760 - 92(2005) Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members
 - .7 ASTM E761 - 92(2005) Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members
 - .8 ASTM E859 - 93(2006) Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members
 - .9 ASTM E937 - 93(2005) Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
 - .10 ASTM E1354 - 08 Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
 - .11 ASTM G21 - 96(2002) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- .2 Underwriters Laboratories Inc. (UL) Fire Resistance Directory (Latest Edition)
 - .1 UL/ANSI 263 Fire Tests of Building Construction Materials
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101-07, Methods of Fire Endurance Tests of Building Construction and Materials.
 - .2 CAN/ULC-S102-07, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 TEST REPORTS

- .1 Submit product data including certified copies of test reports verifying fireproofing applied to substrate as constructed on project will meet or exceed requirements of Specification.
- .2 Submit test results in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.
- .3 For assemblies not tested and rated, submit proposals based on related designs using accepted fireproofing design criteria.

1.3 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate 12" x 12" sample of exposed fireproofing for approval of texture and colour.

1.4 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit manufacturer's product data for materials, providing descriptions sufficient for identification at job site. Include manufacturer's printed instructions for installation.
- .3 Fire Testing:
 - .1 Submit evidence that the aggregate slurry fireproofing has been subjected to full-scale UL 263/ASTM E119 fire testing at Underwriters Laboratories Inc., or another accredited laboratory, by the manufacturer.
- .4 Thickness Schedule: Provide schedule indicating material to be used, structural elements to be protected with spray applied fireproofing, hourly rating and material thickness provided and appropriate references.
- .5 Test Data: Independent laboratory test results for fireproofing shall be submitted for the following performance criteria:
 - .1 Bond Strength per ASTM E736
 - .2 Compressive Strength per ASTM E761
 - .3 Deflection per ASTM E759
 - .4 Bond Impact per ASTM E760
 - .5 Air Erosion per ASTM E859
 - .6 Corrosion Resistance per ASTM E937
 - .7 High Speed Air Erosion per ASTM E859
 - .8 Surface Burning Characteristics per ASTM E84
 - .9 Combustibility per ASTM E1354 Cone Calorimeter
 - .10 Mold Resistance per ASTM G21

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installation of aggregate slurry fireproofing by applicators certified or licensed by manufacturers of system used.
 - .2 Submit certification to Architect prior to commencement of work in accordance with 01 33 00 - Submittal Procedures.
- .2 Products, execution, and fireproofing thicknesses shall conform to the applicable code requirements for the required fire-resistance ratings.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

- .4 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01 30 00 - Submittals.

1.6 PROTECTION

- .1 At outdoor temperatures less than 5°C, ensure that a 5°C air and substrate temperature is maintained during and for 24 hours after application. Ensure that natural ventilation to properly dry the fireproofing during and subsequent to its application is provided. In enclosed areas lacking openings for natural ventilation, ensure that interior air is circulated and exhausted to the outside.
- .2 Provide temporary enclosures to prevent spray from contaminating air beyond application area.
- .3 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of fireproofing materials.

Part 2 Products

2.1 MANUFACTURERS

- .1 Single-Source Responsibility: fireproofing materials from one source from a single manufacturer.

2.2 MATERIALS

- .1 Sprayed fireproofing: ULC certified cementitious, asbestos-free aggregate slurry fireproofing qualified for use in ULC Designs specified.
 - .1 Acceptable product Monokote MK-6/HY, or approved equivalent.
- .2 Curing compound: type recommended by fireproofing manufacturer, qualified for use in ULC Designs specified.
- .3 Sealer: type recommended by fireproofing manufacturer, qualified for use in ULC Design specified.
- .4 Accessories: Provide accessories to comply with manufacturer's recommendations and to meet fire resistance design and code requirements, including, but not limited to bonding agents, mechanical attachments; application aids such as metal lath, scrim, or netting; and Monokote Accelerator.

2.3 PHYSICAL PERFORMANCE CHARACTERISTICS:

- .1 Fireproofing material shall meet the following minimum physical performance standards, or the requirement of the manufacturer, ULC Listed Assembly, or authority having jurisdiction, whichever is greater:
 - .1 Dry Density: to ASTM E605. Average density shall be a minimum average 15 pcf.
 - .2 Deflection: to ASTM E759; material shall not crack or delaminate from the surface to which it is applied.

- .3 Bond Impact: to ASTM E760: material subject to impact shall not crack or delaminate from the surface to which it is applied.
 - .4 Bond Strength: to ASTM E736: minimum average bond strength of 200 psf and a minimum individual bond strength of 150 psf.
 - .5 Air Erosion: to ASTM E859: maximum allowable total weight loss of the fireproofing material shall be 0.00 g/ft².
 - .6 High Speed Air Erosion: to ASTM E859: materials to be used in plenums or ducts shall exhibit no continued erosion after 4 hours at an air speed of 2500 ft/min.
 - .7 Compressive Strength: to ASTM E761: maximum deformation shall not exceed 10% when subjected to compressive forces of 1,483 psf
 - .8 Corrosion Resistance: to ASTM E937: fireproofing applied to steel shall not promote corrosion of steel.
 - .9 Surface Burning Characteristics: to ASTM E84:
 - .1 Flame Spread 0
 - .2 Smoke Development 0
 - .10 Resistance to Mold: to ASTM G21: material shall show resistance to mold growth for a period of 28 days for general use.
 - .11 Combustibility: to ASTM E1354: material shall have a maximum total heat release of 20 MJ/m² and a maximum 125 kw/m² peak rate of heat release 600 seconds after insertion when tested, with at a radiant heat flux of 75 kw/m² with the use of electric spark ignition. The sample shall be tested in the horizontal orientation.
 - .12 Fire-rating: One (1) Hour.
-
- .2 Fire Resistance Classification: The spray applied fireproofing material shall have been tested and reported by Underwriters Laboratories of Canada., or an other accredited laboratory, in accordance with the procedures of ANSI/ASTM E119 and shall be listed in the Underwriters Laboratories Fire Resistance Directory or the directory of an other accredited testing laboratory.
 - .3 Mixing water shall be clean, fresh, and suitable for domestic consumption and free from such amounts of mineral or organic substances as would affect the set of the fireproofing material. Provide water with sufficient pressure and volume to meet the fireproofing application schedule.

Part 3 Execution

3.1 INSPECTION

- .1 Verify that surfaces and conditions are ready to accept the Work of this section. Notify Architect in writing of any discrepancies. Commencement of the work or any parts thereof shall mean acceptance of the prepared substrate.
 - .1 Examine substrate, verify that all surfaces to receive spray applied fireproofing are free of oil, grease, loose mill scale, dirt or other foreign substances which may impair proper adhesion of the fireproofing to the substrate.

3.2 MANUFACTURER'S INSTRUCTIONS

- .1 Comply with manufacturer's written data, including product technical bulletins, installation instructions, preparation of substrate, applying materials, and protection of installed work.

3.3 PREPARATION

- .1 Substrate shall be free of material, which would impair bond.
- .2 General Contractor to coordinate and verify that painted substrate [s] provided are compatible and have suitable bonding characteristics to receive fireproofing.
- .3 Remove incompatible materials.
- .4 Ensure that items required to penetrate fireproofing are placed before installation of fireproofing.
- .5 Ensure that ducts, piping, equipment, or other items which would interfere with application of fireproofing are not positioned until fireproofing work is completed.
- .6 Prior to application of the fireproofing material, a bonding agent, approved by the fireproofing material manufacturer, shall be applied to all concrete substrates to receive fireproofing.
- .7 Complete placing of concrete on floor and roof decking prior to application of the fireproofing to the underside of steel deck and supporting beams and joists.
- .8 On roof decks without a concrete cover, complete all roofing applications and roof mounted equipment installation prior to application of the fireproofing to the underside of roof decking and supporting beams and joists. Prohibit all roof traffic upon commencement of the fireproofing and until the fireproofing material is dry.

3.4 APPLICATION

- .1 Apply bonding adhesive or primer to substrate if recommended by manufacturer.
- .2 Apply fireproofing to correspond with tested assemblies (ULC Design No.'s as indicated), or acceptable calculation procedures to provide fire resistance ratings indicated.
- .3 Apply fireproofing over substrate, building up to required thickness to cover substrate with monolithic blanket of uniform density and texture.
- .4 Apply a discontinuous textured spray of Spatterkote SK-3 in accordance with manufacturer's instructions to all cellular steel floor units with flat plate on the bottom and to roof deck assemblies as required to meet the fire resistance ratings, before application of the Monokote fireproofing to these surfaces
- .5 Apply fireproofing directly to open web joists without use of expanded lath.
- .6 Tamp smooth, surfaces visible in finished work and as indicated.
- .7 Apply curing compound to surface of cementitious fireproofing as required by manufacturer.

- .8 Apply sealer to surface of mineral fibre fireproofing as required by manufacturer and as indicated.

3.5 INSPECTION AND SITE TESTS

- .1 Inspection and testing of fireproofing will be carried out by Testing Laboratory designated by Architect.
- .2 Owner will pay costs for testing.

3.6 PATCHING

- .1 Patch damage to fireproofing caused by testing or by other trades before fireproofing is concealed, or if exposed, before final inspection.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Fire stopping and smoke seals within mechanical assemblies (i.e inside ducts, dampers) and electrical assemblies (i.e. inside cable trays) are specified in Division 15 and 16 respectively.

1.2 REFERENCES

- .1 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-1995, Fire Tests of Firestop Systems.

1.3 REGULATORY REQUIREMENTS:

- .1 The work of this Section shall conform to the requirements of the OBC 2006, latest revision, to ULC design requirements for each assembly and to all other applicable codes and regulations, to the satisfaction of the authorities having jurisdiction.

1.4 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate 300 x 300 mm samples showing actual firestop material proposed for project.

1.5 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings to show proposed material, reinforcement, anchorage, fastenings and method of installation. Construction details should accurately reflect actual job conditions.

1.6 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site. Include manufacturer's printed instructions for installation.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard.

Part 2 Products

2.1 MATERIALS

- .1 Fire stopping and smoke seal systems: in accordance with ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ULC-S115 and not to exceed opening sizes for which they are intended and conforming to special requirements.
 - .2 Firestop system rating: as indicated; Fire-resistance rating of installed fire stopping assembly shall not be less than the fire-resistance rating of the surrounding floor and wall assembly.
- .2 Service penetration assemblies: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No.40 U19.
- .3 Service penetration firestop components: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No.40 U19.13 and ULC Guide No.40 U19.15 under the Label Service of ULC.
- .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.

Part 3 Execution

3.1 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Do not proceed with the work until unsatisfactory conditions have been corrected to the satisfaction of the installer.

- .3 Commencement of the installation will be construed as acceptance of the site conditions and, thereafter, the Contractor shall be fully responsible for satisfactory work as specified herein.
- .4 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .5 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.
- .6 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.2 INSTALLATION

- .1 Install fire stopping and smoke seals at service penetrations through fire resistive construction and at all locations where the continuity of fire resistive construction is interrupted, as indicated on the drawings, as specified herein and as required for a complete project
- .2 Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.
- .3 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.
- .4 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .5 Tool or trowel exposed surfaces to a neat finish.
- .6 Remove excess compound promptly as work progresses and upon completion.

3.3 INSPECTION

- .1 Notify Consultant when ready for inspection and prior to concealing or enclosing firestopping materials and service penetration assemblies.

3.4 SCHEDULE

- .1 Firestop and smoke seal at:
 - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
 - .2 Edge of floor slabs at curtain wall and precast concrete panels.
 - .3 Top of fire-resistance rated masonry and gypsum board partitions.
 - .4 Intersection of fire-resistance rated masonry and gypsum board partitions.
 - .5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
 - .6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
 - .7 Openings and sleeves installed for future use through fire separations.

- .8 Around mechanical and electrical assemblies penetrating fire separations.
- .9 Rigid ducts: greater than 129 cm² and as indicated: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

3.5 CLEAN UP

- .1 Remove excess materials and debris and clean adjacent surfaces immediately after application.
- .2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C510-05a, Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
 - .2 ASTM C 639-01(2007), Standard Test Method for Rheological (Flow) Properties of Elastomeric Sealants.
 - .3 ASTM C 661-06(2011), Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
 - .4 ASTM C 679-03(2009)e1, Standard Test Method for Tack-Free Time of Elastomeric Sealants.
 - .5 ASTM C 793-05(2010), Standard Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants.
 - .6 ASTM C 794-10, Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
 - .7 ASTM C 1183-04(2008), Standard Test Method for Extrusion Rate of Elastomeric Sealants.
 - .8 ASTM C 1246-00(2006), Standard Test Method for Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants After Cure.
 - .9 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
 - .10 ASTM D 624-00(2007), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 - .11 ASTM D 2202-00(2010), Standard Test Method for Slump of Sealants.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 3.1-92, Leaded Gasoline.
 - .2 CAN/CGSB 7.1-98, Lightweight Steel Wall Framing Components.
 - .3 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .4 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.2 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .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 samples in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Submit duplicate samples of each type of material and colour.
- .5 Cured samples of exposed sealants for each color where required to match adjacent material.

- .6 Submit manufacturer's instructions in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Instructions to include installation instructions for each product used.

1.3 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.4 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, and corrugated cardboard packaging material for recycling.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .7 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Architect.
- .8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.
- .9 Fold up metal banding, flatten, and place in designated area for recycling.

1.5 PROJECT CONDITIONS

- .1 Environmental Limitations:
 - .1 Do not proceed with installation of joint sealants under following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 5 degrees C.
 - .2 When joint substrates are wet.
- .2 Joint-Width Conditions:
 - .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
 - .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding

- labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .3 Ventilate area of work as directed by Architect by use of approved portable supply and exhaust fans.

PART 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 offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.
- .3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Sealant Type A (**SA-01**): Polyurethane Hybrid sealant to CAN/CGSB-19.13: Type A, Fast Curing, Low-Modulus, Silane End-Capped.
 - .1 Rheological Properties to ASTM C 639: Non-sag (NS), 0" of sag in channel.
 - .2 Extrusion Rate to ASTM C 1183, minimum: 93.1 ml.
 - .3 Hardness Properties to ASTM C 661: 25.
 - .4 Weight Loss to ASTM C 1246: Pass.
 - .5 Skin Time: 1 hour.
 - .6 Tack Free Time to ASTM C 679: 3-4 hours.
 - .7 Stain & Color Change to ASTM C 510: No visible color change/No stain.
 - .8 Adhesion-in-Peel to ASTM C 794: Aluminum 20-25 pli, Concrete 18-22 pli. No Adhesion Loss.
 - .9 Effects of Accelerated Aging to ASTM C 793: Pass.
 - .10 Movement Capability: $\pm 35\%$.
 - .11 Colour: To match adjacent surfaces.
 - .12 Recommended Product: Dymonic FC by Tremco Inc.
- .2 Sealant Type B (**SB-01**): Silicones One Part to CAN/CGSB-19.13: Type B, General Construction Grade Silicone Sealant.
 - .1 One-part, acetoxysilicone sealant.
 - .2 Mildew resistant.
 - .3 Colour: Clear.
 - .4 Recommended Product: Tremsil 200 by Tremco Inc.
- .3 Sealant Type C (**SC-01**): Silicones One Part to CAN/CGSB-19.13: Type C, Moisture curing, acetoxysilicone sealant.
 - .1 Tack Free Time to ASTM C 679: 10 to 20 minutes.
 - .2 Flow, sag or slump to ASTM D2202: 0.4 mm.
 - .3 Working Time, Skin Formation: 7 to 15 minutes.
 - .4 As Cured: After 14 days at 25 degrees C and 50% R.H.
 - .1 Hardness (Shore A) to ASTM C661: 26 to 30.
 - .2 Tensile Strength at Max Elongation to ASTM D412: 2.06-2.75MPa.

- .3 Maximum Elongation to ASTM D412: 450-550%.
- .4 Tensile Strength at 100% Max Elongation to ASTM C 1184: 0.345-0.552MPa.
- .5 Tear Strength to ASTM D624: 7.0-7.5 kN/m.
- .6 Peel Strength to ASTM C794: Aluminum and Glass 2.28-2.63 kN/m.
- .7 Dynamic Movement to ASTM C719: $\pm 25\%$.
- .5 Colour: Aluminum and Black, to match window frame.
- .6 Recommended Product: Proglaze by Tremco Inc.
- .4 Sealant Type D (**SD-01**): Acoustical Sealant to CAN/CGSB 19.21:Type D, One-Part, Non-Skinning, Sound Dampening Sealant.
 - .1 Resistance to Sag to CGSB 7.1: Passes.
 - .2 Extrusion Rate to CGSB 3.1: Passes
 - .3 Viscosity Brookfield: 1,000,000 cps
 - .4 Shear Modulus using G_R component: 45,000 N/m².
 - .5 Density: 1720 Kg/m³.
 - .6 Colour: Dark grey.
 - .7 Recommended Product: Acoustical Sealant by Tremco Inc.

2.3 SEALANT SELECTION

- .1 Sealant Type A:
 - .1 Control and expansion joints in cast-in-place concrete.
 - .2 Joints between architectural precast concrete units.
 - .3 Control and expansion joints in unit masonry.
 - .4 Perimeter joints between EIFS and frames of doors, windows, storefronts, louvers and similar openings.
 - .5 Butt joints between metal panels.
 - .6 Joints between different materials listed above.
 - .7 Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers and similar openings.
 - .8 Control and expansion joints in soffits and overhead surfaces.
 - .9 Other exterior joints in vertical surfaces and non-traffic horizontal surfaces for which no other sealant is specified.
 - .10 Concealed lap and hook joints in sheet metal flashing and trim.
 - .11 Control and expansion joints on exposed interior surfaces of exterior walls.
 - .12 Perimeter joints on exposed interior surfaces of exterior openings.
 - .13 Joints on precast beams and planks.
 - .14 Perimeter joints between interior wall surfaces and frames of interior doors, windows, storefronts, louvers, elevator entrances and similar openings.
 - .15 Other interior joints in vertical surfaces and non-traffic horizontal surfaces subject to movement for which no other sealant is specified.
 - .16 Bedding joints under metal thresholds and saddles.
 - .17 Bedding joints between sheet metal flashing and other materials
- .2 Sealant Type B:
 - .1 Joints in kitchen counter tops and work surfaces.
 - .2 Joints between food service equipment and surrounding construction.
 - .3 Other interior joints, where incidental food contact may occur.
 - .4 Joints in toilet room and bathroom counter tops.
 - .5 Joints between plumbing fixtures and adjacent materials.
 - .6 Joints between locker room lockers and adjacent materials.
 - .7 Joints between food service equipment and surrounding construction.
 - .8 Other interior joints in wet areas where needed to limit mold and mildew growth.
- .3 Sealant Type C:

- .1 Perimeters joints of glazing on interior and exterior within frames; toe, heel, and cap beads, weather seal, and bedding.
- .2 Glass applications.
- .4 Sealant Type D:
 - .1 Acoustical sealing of drywall partitions, corridors and party walls.
 - .2 Lap joint and perimeter sealant for polyethylene vapour barriers over fibre glass batt or other insulations.

2.4 JOINT CLEANER

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
- .2 Primer: as recommended by manufacturer.

PART 3 EXECUTION

3.1 PROTECTION

- .1 Protect installed Work of other trades from staining or contamination.

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 Cleanup:
- .1 Clean adjacent surfaces immediately and leave Work neat and clean.
 - .2 Remove excess and droppings, using recommended cleaners as work progresses.
 - .3 Remove masking tape after initial set of sealant.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 Aluminum Association (AA).
 - .1 DAF-45-03, Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A 167-99, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM D 412-98a(2002)e1, Test Methods for Vulcanized Rubber Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
 - .3 ASTM D 2240-02b, Test Method for Rubber Property - Durometer Hardness.
 - .4 ASTM D 2628-91(1998), Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
- .3 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.122-99, Anticorrosive Vinyl Primer.
 - .3 CAN/CGSB-1.132-M90, Zinc Chromate Primer, Low Moisture Sensitivity.
 - .4 CAN/CGSB-1.213-95, Etch Primer (Pre-treatment Coating) for Steel and Aluminum.

1.2 DESIGN REQUIREMENTS

- .1 Joint movement: design to permit unrestricted lateral movement of up to +/-50% of joint width.
- .2 Service Temperature: design exterior expansion joint cover assemblies to accommodate joint movements within service temperature range of -35 to 65 degrees C.

1.3 PRODUCT DATA

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

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate lengths, fasteners, accessories, anchors, seals, butt joints, finishes and profiles required for each condition.

1.5 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate 150 mm long samples of each type, colour, and finish expansion joint cover assemblies.

1.6 QUALITY ASSURANCE

- .1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .2 Manufacturer's Instructions: manufacturer's installation instructions.
- .3 Manufacturers Field Services: submit manufacturers field reports.

1.7 PRE-INSTALLATION MEETINGS

- .1 Conduct pre-installation meeting one week prior to commencing work of this section, to verify project requirements, coordinate with other subtrades, establish condition and completeness of substrate, review manufacturer's installation instructions and manufacturer's warranty requirements.

1.8 DELIVERY AND STORAGE

- .1 Deliver products in original intact labelled containers and store undercover in a dry location until installed.
- .2 Store off ground, protect from weather and construction activities.

1.9 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Architect.
- .5 Divert unused paint and chemical compound material from landfill to official hazardous material collections site approved by Architect.
- .6 Do not dispose of unused paint and chemical compound materials into the sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Stainless steel brake formed or roll formed sections: to ASTM A 167, type 304, anodized finish.
- .2 Primer: to CAN/CGSB-1.213.
- .3 Centering Bars shall be spring steel, alloy 1074, and shall have pins which fully engage with the base members' tracks.
- .4 Water Barrier: Flexible EPDM, Class I, ASTM D4637, 45 mils thick (minimum) sheet.
- .5 Fasteners, accessories, sealant and other materials required for complete installation in accordance with the manufacturer's written installation instructions.

2.2 GENERAL:

- .1 Provide architectural joint systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
- .2 Design architectural joint systems for the following size and movement characteristics:
- .3 Nominal Joint Width: 12mm.
- .4 Maximum Joint Width: 25mm
- .5 Minimum Joint Width: 12mm

2.3 EXPANSION JOINT SYSTEMS:

- .1 Floor-to-Floor Joint Systems:
 - .1 Basis-of-Design Product: Construction Specialties, Inc. model ALR
 - .2 Type: Cover plate: Exposed Metal, Aluminum Finish: Mill.
 - .3 Cover Side Frame Design: Recessed to accept field-applied finish materials.
 - .4 Recess Depth: 3mm.
 - .5 Cover Plate Design: Plain
 - .6 Attachment Method: Mechanical anchors.
 - .7 Load Capacity: Standard.
 - .8 Moisture Barrier: Manufacturer's standard.
- .2 Wall-to-Wall Joint Systems:
 - .1 Basis-of-Design Product: Construction Specialties, Inc. model AWS
 - .2 Type: Accordion – substitution of flat seal profiles is not acceptable.
 - .3 Seal Material: Santoprene. Color: #270 Greige.
 - .4 Cover Plate Design: Plain.

2.4 FABRICATION

- .1 Fabricate expansion joint covers, square, true, straight and accurate to required sizes and profiles.
- .2 Fabricate in maximum practical lengths to minimize joints.
- .3 Shop assemble covers ready for installation where practicable.
- .4 Fabricate joint cover assemblies with anchors, levelling nuts, filler inserts and shop applied protection as required for a complete installation to suit installation and project requirements.
- .5 Provide acceptable means of anchorage, such as anchor clips, expansion bolts and shields, welded studs or toggles.
- .6 Factory fabricate terminations and transitions.

2.5 COVER PLATE

- .1 Floor joint cover plate: anodized stainless steel material, with plain face, as per manufacturer.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Set work plumb, square, level, free from distortion.
- .2 Secure work accurately to structure in manner not restricting joint movement.
- .3 Seal butt joints to manufacturer's instructions to provide watertight and light tight joints using sealant.
- .4 Protect cover plates during construction. Remove shop protection prior to final inspection.
- .5 Ensure sound and clean substrates before installation.

3.3 FIELD QUALITY CONTROL

- .1 Have manufacturer of products supplied under this Section review Work involved in handling, installation/application, protection and cleaning of its products, and submit written reports in acceptable format to verify compliance of Work with Contract.
- .2 Manufacturer's field services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits to review Work at stages listed:
 - .1 Twice during progress of Work at 25% and 60% complete.
 - .2 Upon completion of Work, after cleaning is carried out.
 - .3 Obtain reports within three days of review and submit.

3.4 CLEANUP

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.
- .2 Remove traces of primer, caulking, epoxy and filler materials; clean expansion joint covers.

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
 - .1 Quality Standards for Architectural Woodwork 1998.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable & Sprayable
- .3 Canadian Standards Association (CSA International).
 - .1 CSA O115-M1982 (R2001), Hardwood and Decorative Plywood.
 - .2 CAN/CSA O132.2 Series-90 (R1998), Wood Flush Doors.
 - .3 CAN/CSA-O132.5-M1992 (R1998), Stile and Rail Wood Doors.
 - .4 CSA Certification Program for Windows and Doors.
- .4 Environmental Choice Program (ECP).
 - .1 CCD-045-92, Sealants and Caulking Compounds.
 - .2 CCD-046-92, Adhesives.
- .5 National Fire Protection Association (NFPA).
 - .1 NFPA 80-2010, Standard for Fire Doors and Fire Windows.
 - .2 NFPA 252-2008, Standard Method of Fire Tests of Door Assemblies.
- .6 Underwriters' Laboratories of Canada (ULC).
 - .1 CAN-4S104M-80 (R1985), Fire Tests of Door Assemblies.
 - .2 CAN4-S105M-85 (R1992), Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:
 - .1 For caulking materials during application and curing.
 - .2 For door materials and adhesives.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate door types and cutouts for lights and louvers, sizes, core construction, transom panel construction and cutouts.

1.3 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit one 300 x 300 mm corner sample of each type wood door.
- .3 Submit duplicate samples of each type of veneer or hardwood for final colour selection or verification.

1.4 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Warranty:
 - .1 Warrant the work of this Section, in accordance with GC 12.3, but for five (5) years.
- .4 Warrant that interior doors will not warp, twist, show core holes, delaminate or sag.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Storage and Protection:
 - .1 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.
 - .2 Store doors in well ventilated room, off floor, in accordance with manufacturer's recommendations.
 - .3 Protect doors from scratches, handling marks and other damage. Wrap, Crate doors.
 - .4 Store doors away from direct sunlight.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling.
- .4 Divert unused paint and sealant materials from landfill to official hazardous material collections site approved by Consultant.
- .5 Do not dispose of unused paint and sealant materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.
- .6 Divert unused metal materials from landfill to metal recycling facility approved by Consultant.

- .7 Divert unused wood materials from landfill to recycling, reuse or composting facility approved by Consultant.
- .8 Damaged or broken glazing materials are not recyclable. These materials must not be disposed of with materials destined for recycling.

Part 2 Products

2.1 WOOD FLUSH DOORS

- .1 Solid core (**WD-01**): to CAN/CSA-O132.2.1.
 - .1 Construction:
 - .1 Solid wood core:
 - .2 Glued block core with wood edge band.
 - .3 Framed block glued core.
 - .4 Stile and rail core.
 - .5 5-ply construction.
 - .2 Face Panels:
 - .1 Maple veneer, Grade II.
 - .3 Adhesive: Type II (water resistant) for interior doors.

2.2 FABRICATION

- .1 Vertical edge strips to match face veneer.
- .2 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.
- .3 Radius vertical edges of double acting doors to 60 mm radius.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Unwrap and protect doors in accordance with CAN/CSA-O132.2 Series, Appendix A.
- .2 Install doors and hardware in accordance with manufacturer's printed instructions and CAN/CSA-O132.2 Series, Appendix A.
- .3 Fit hardware accurately and securely in accordance with the manufacturer's directions. Adjust operating parts for smooth, correct function. Refer to Section 08 71 10 – Door Hardware.

- .4 Install stops.
- .5 Secure transom and side panels by means of concealed fasteners or countersunk screws concealed by means of wood plugs matching panel in grain and colour.

3.3 ADJUSTMENT

- .1 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

3.4 CLEANING

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .2 Remove traces of primer, caulking; clean doors and frames.
- .3 Clean glass and glazing materials with approved non-abrasive cleaner.
- .4 On completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM D 1003-07e1, Standard Test Method for Haze and Luminous Transmittance of Plastics.
 - .2 ASTM D 1929-96(R2001) e1, Standard Test Method for Determining Ignition Temperature of Plastics.
 - .3 ASTM D 2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
 - .4 ASTM E 84-10, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - .5 ASTM E 330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - .6 ASTM F 1233-08, Standard Test Method for Security Glazing Materials and Systems.

1.2 SYSTEM DESCRIPTION

- .1 System includes the following:
 - .1 Flat factory prefabricated structural insulated translucent sandwich panels,
 - .2 Aluminum installation system, including all sub-framing and securement angles.
 - .3 Aluminum sill flashing

1.3 SUBMITTALS

- .1 Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of components.
- .2 Submit shop drawings. Include elevations and details.
- .3 Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum.
- .4 When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
 - .1 Sandwich panels: 350mm x 760mm units
 - .2 Factory finished aluminum: 140mm long sections
- .5 Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
- .6 Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project. Reports required are:

- .1 International Building Code Evaluation Report
- .2 Flame Spread and Smoke Developed (UL 723) – Submit UL Card
- .3 Burn Extent (ASTM D 635)
- .4 Color Difference (ASTM D 2244)
- .5 Impact Strength (UL 972)
- .6 Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
- .7 Bond Shear Strength (ASTM D 1002)
- .8 Beam Bending Strength (ASTM E 72)
- .9 Insulation U-Factor (NFRC 100)
- .10 NFRC System U-Factor Certification (NFRC 700)
- .11 Solar Heat Gain Coefficient (NFRC or Calculations)
- .12 Condensation Resistance Factor (AAMA 1503)
- .13 Air Leakage (ASTM E 283)
- .14 Structural Performance (ASTM E 330)
- .15 Water Penetration (ASTM E 331)
- .16 1200°F Fire Resistance (SWRI)
- .17 LEED Credits
- .18 Daylight Autonomy

1.4 QUALITY ASSURANCE

- .1 Manufacturer's Qualifications:
 - .1 Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least thirty consecutive years and which can show evidence of those materials being satisfactorily used on at least ten projects of similar size, scope within a 100 km radius of Ottawa, Ontario. At least five of these projects shall have been in successful use for ten years or longer.
 - .2 Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency.
 - .3 Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.
- .2 Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

1.5 PERFORMANCE REQUIREMENTS

- .1 The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

- .2 When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- .3 Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.

1.6 DELIVERY STORAGE AND HANDLING

- .1 Deliver panel system, components and materials in manufacturer's standard protective packaging.
- .2 Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.7 WARRANTY

- .1 Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within one year of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects in accessories, insulated translucent sandwich panels and other components of the work.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Divert metal cut-offs from landfill by disposal at nearest metal recycling facility.
- .3 Divert uninstalled materials for reuse at nearest used building materials facility or similar type facility.
- .4 Divert unused caulking and sealant materials from landfill through disposal at special wastes depot.
- .5 Unused or damaged glazing materials are not recyclable and must not be diverted to municipal recycling programs.
- .6 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .7 Dispose of corrugated cardboard, polystyrene and plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

Part 2 Products

2.1 MANUFACTURER

- .1 The basis for this specification is for products manufactured by Kalwall Corporation. Other manufacturers may bid this project provided they comply with all of the performance requirements of this specification and submit evidence thereof, including a submittal to be received by consultant a minimum of ten business days prior to original tender close date that confirms compliance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES., a detailed listing of at least twenty projects located in the Ottawa area as detailed in 1.3.A of this specification section, and a project specific daylight autonomy report and model to confirm design daylight levels will be met. Listing other manufacturers' names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein.
- .2 Kalwall Corporation, distributed by Bravura Daylighting Specialists. Contact Mike Vetzal 1-800-803-1235 mvetzal@bravuradesign.com

2.2 PANEL COMPONENTS

- .1 Face Sheets
 - .1 Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
 - .2 Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
 - .3 Face sheets shall not deform, deflect or drip when subjected to fire or flame.
- .2 Interior face sheets:
 - .1 Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 50 and smoke developed no greater than 250 when tested in accordance with UL 723.
 - .2 Burn extent by ASTM D 635 shall be no greater than 1".
- .3 Exterior face sheets:
 - .1 Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching. Accelerated testing methods such as G90 shall not be accepted.
 - .2 Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.
- .4 Appearance:
 - .1 Exterior face sheets: Smooth 0.70" thick and Crystal in color.
 - .2 Interior face sheets: Smooth 0.45" thick and White in color.
 - .3 Face sheets shall not vary more than $\pm 10\%$ in thickness and be uniform in color.

- .5 Grid Core
 - .1 Thermally broken I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
 - .2 I-beam Thermal break: Minimum 1.5", thermoset fiberglass composite.
- .6 Laminate Adhesive
 - .1 Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
 - .2 Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
 - .3 Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
 - .1 50% Relative Humidity at 68° F: 540 PSI
 - .2 182° F: 100 PSI
 - .3 Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
 - .4 Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.3 PANEL CONSTRUCTION

- .1 Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
 - .1 Thickness: 2-3/4"
 - .2 Light transmission: 13% per NFRC 202
 - .3 Solar heat gain coefficient 0.17.
 - .4 Panel U-factor by NFRC certified laboratory: 2-3/4" thermally broken grid 0.14
 - .5 Complete insulated panel system shall have NFRC certified U-factor of 0.19
 - .6 Grid pattern: Nominal size 12"x24"; pattern Shoji.
- .2 Standard panels shall deflect no more than 1.9" at 30 PSF in 10' 0" span without a supporting frame by ASTM E 72.
- .3 Standard panels shall withstand 1200° F fire for minimum one hour without collapse or exterior flaming.

2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

- .1 Closure system: Thermally broken extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
- .2 Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.
- .3 Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.

- .4 Finish:
 - .1 Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's standards.

Part 3 Execution

3.1 EXAMINATION

- .1 Installer shall examine substrates, supporting structure and installation conditions.
- .2 Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Metal Protection:
 - .2 Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 - .3 Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

3.3 INSTALLATION

- .1 Install the panel system in accordance with the manufacturer's suggested installation recommendations and approved shop drawings.
- .2 Anchor component parts securely in place by permanent mechanical attachment system.
- .3 Accommodate thermal and mechanical movements.
- .4 Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.
- .5 Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

3.4 CLEANING

- .1 Clean the panel system interior and exterior, immediately after installation.
- .2 Refer to manufacturer's written recommendations.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
 - .1 ANSI/BHMA A156.1-2006, Butts and Hinges.
 - .2 ANSI/BHMA A156.2-2003, Bored and Preassembled Locks and Latches.
 - .3 ANSI/BHMA A156.3-2008, Exit Devices.
 - .4 ANSI/BHMA A156.4-2008, Door Controls - Closers.
 - .5 ANSI/BHMA A156.5-2010, Auxiliary Locks and Associated Products.
 - .6 ANSI/BHMA A156.6-2010, Architectural Door Trim.
 - .7 ANSI/BHMA A156.8-2010, Door Controls - Overhead Stops and Holders.
 - .8 ANSI/BHMA A156.13-2005, Mortise Locks and Latches Series 1000.
 - .9 ANSI/BHMA A156.16-2008, Auxiliary Hardware.
- .2 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
 - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

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 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 on own letterhead.
 - .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.

1.3 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.

1.4 MAINTENANCE MATERIALS SUBMITTALS

- .1 Extra Stock Materials:

- .1 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Tools:
 - .1 Supply 2 sets of wrenches for each type of door closers, locksets, and fire exit hardware.

1.5 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.

1.6 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, labelled 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 and strippable coating.
 - .4 Replace defective or damaged materials with new.
- .5 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding, and packaging materials.

PART 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 2, keyed as specified, function and finish as stated in Hardware Schedule.
 - .1 Acceptable Product: Corbin Russwin, CL3800 Series, or approved equivalent.
 - .2 Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, grade 1, keyed as specified, function and finish as stated in Hardware Schedule.
 - .1 Acceptable Product: Corbin Russwin, ML2000 Series, or approved equivalent.
- .2 Butts and hinges:
 - .1 Butts hinges: to ANSI/BHMA A156.1, standard weight, full mortise, five knuckle, non-rising removable flat button tip pin, size and finish as stated in Hardware Schedule.
 - .1 Acceptable Product: Hager Hinge, BB1279, or approved equivalent.

- .2 Butts hinges: to ANSI/BHMA A156.1, heavy weight, full mortise, five knuckle, non-rising removable flat button tip pin, size and finish as stated in Hardware Schedule.
 - .1 Acceptable Product: Hager Hinge, BB1168, or approved equivalent.
- .3 Continuous hinges: to ANSI/BHMA A156.26, concealed leaf, heavy duty, 8 mm hinge side, size and finish as stated in Hardware Schedule.
 - .1 Acceptable Product: Hager Hinge, Roton 780-112HD / 780 – 224HD, or approved equivalent.
- .3 Door Closers and Accessories:
 - .1 Door closers: to ANSI/BHMA A156.4, cast-iron cylinder, heavy duty forged arm, adjustable speed, function and finish as stated in Hardware Schedule.
 - .1 Acceptable Product: Ingersoll-Rand, LCN 4040XP Series, or approved equivalent.
 - .2 Floor stops: 44.5 mm diameter, 28.6 mm high domed floor mounted door stop, black rubber bumper.
- .4 Auxiliary locks and associated products: to ANSI/BHMA A156.5, listed in Hardware Schedule.
 - .1 Cylinders: as listed in Hardware Schedule. Key into keying system as noted.
- .5 Architectural door trim: to ANSI/BHMA A156.6, size and finish as stated in Hardware Schedule.
 - .1 Kick plate: 1.27 mm thick, stainless steel, countersunk screw mounting, height as indicated in Schedule.
- .6 Auxiliary hardware: to ANSI/BHMA A156.16, listed in Hardware Schedule.
 - .1 Door silencer: 13 mm diameter x 3 mm thick rubber silencer for 6 mm diameter hole frame insert, black colour.

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 Use fasteners compatible with material through which they pass.

2.4 KEYING

- .1 All locks and cylinders to be master keyed and construction master keyed to an existing Factory system. Hardware supplier to prepare detailed keying schedule in conjunction with Owner and Architect.
- .2 Medeco interchangeable core cylinders to be purchased from School Board's preferred locksmith
- .3 Supply keys in duplicate for every lock in this Contract.
- .4 Supply 3 master keys for each master key.
- .5 Stamp keying code numbers on keys and cylinders.

PART 3 EXECUTION

3.1 INSTALLATION

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

3.4 DEMONSTRATION

- .1 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 door closers, magnetic holder, locksets and fire exit hardware.
- .2 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 SCHEDULE

- .1 Refer to following hardware schedule for detailed hardware requirements.
- .2 HARDWARE GROUP HG-01 – Interior Door Hardware:
 - .1 3 ea Hinges, BB1168 628
 - .2 1 ea Door Closer 4041 CUSH AL
 - .3 3 ea Door Silencer SR64 GRY GRY
 - .4 1 ea Latch set, SAT, AL70PD, 626
 - .5 1 ea Kickplate K10A 203.1 x 927.2mm X Tape 630

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 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 C 1396/C 1396M-09a, Standard Specification for Gypsum Wallboard.
- .2 Association of the Wall and Ceilings Industries International (AWCI)
 - .1 AWCI Levels of Gypsum Board Finish-97.
- .3 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.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in original packages, containers or bundles bearing manufacturers brand name and identification.
- .2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.
- .3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

1.3 SITE ENVIRONMENTAL REQUIREMENTS

- .1 Maintain temperature minimum 10 degrees C, maximum 21 degrees C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours 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.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling.
- .4 Divert unused gypsum from landfill to gypsum recycling facility for disposal approved by Consultant.
- .5 Divert unused metal materials from landfill to metal recycling facility approved by Consultant.
- .6 Divert unused wood materials from landfill to recycling or composting facility approved by Consultant.
- .7 Divert unused paint and caulking material from landfill to official hazardous material collections site approved by Consultant.
- .8 Do not dispose of unused paint and caulking materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

Part 2 Products

2.1 MATERIALS

- .1 Standard board (**GB-01**): to ASTM C36/C36M regular, thickness as indicated, 1200 mm wide x maximum practical length, ends square cut, edges squared.
 - .1 Acceptable Product: CGC, Sheetrock, or approved equivalent.
- .1 Fire-resistant board (**GB-02**): to ASTM C36/C36M Type X, thickness as indicated, 1200 mm wide x maximum practical length, ends square cut, edges squared.
 - .1 Acceptable Product: CGC, Sheetrock Firecode 'C' Core, or approved equivalent.

- .2 Fire-Rated Fiberglass-Mat Faced Gypsum Sheathing Type X (**GB-04**): to ASTM C1177/C1177M, water resistant, mold resistant, thickness as indicated, 1200 mm wide x maximum practical length, ends square cut, edges squared.
 - .1 Acceptable Product: CGC, Georgia-Pacific Gypsum, DensGlass Gold Fireguard, or approved equivalent.
- .3 Resilient clips: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
- .4 Steel drill screws: to ASTM C1002.
- .5 Stud adhesive: to CAN/CGSB-71.25.
- .6 Shadow mould: 35 mm high, snap-on trim, of extruded PVC plastic, white colour.
- .7 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 12 mm wide, with self sticking permanent adhesive on one face, lengths as required.
- .8 Joint compound: to ASTM C475, asbestos-free.

Part 3 Execution

3.1 COORDINATION

- .1 Examine the mechanical and electrical drawings and coordinate with appropriate other trades to establish openings, additional support, furring out and other special provisions required for mechanical and electrical fixtures and fittings and access hatches built into the work of this Section.
- .2 Examine the architectural drawings and coordinate with appropriate other trades to establish openings, additional support and other special provisions required for items built into or partially supported by the work of this Section.

3.2 ERECTION

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Do application of gypsum sheathing in accordance with ASTM C1280.
- .3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 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 and 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 in accordance with ASTM C840, 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, joists and between the layers of gypsum board, 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 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.
- .2 Apply single and double layer gypsum board to metal furring or framing using screw fasteners for first layer and second layer. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
 - .2 Double-Layer Application:
 - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
 - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
 - .3 Apply base layers at right angles to supports unless otherwise indicated.
 - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.
- .3 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, and any additional penetrations in partitions where perimeter sealed with acoustic sealant.

- .4 Apply board using stud adhesive on furring or framing.
- .5 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
- .6 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.
- .7 Install gypsum board with face side out.
- .8 Do not install damaged or damp boards.
- .9 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.
- .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 where indicated, at changes in substrate construction, 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 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.
- .11 Install expansion joint straight and true.
- .12 Splice corners and intersections together and secure to each member with 3 screws.
- .13 Install access doors to electrical and mechanical fixtures specified in respective sections.
- .1 Rigidly secure frames to furring or framing systems.

- .14 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.
- .15 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 Level 4: 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; surfaces smooth and free of tool marks and ridges.
- .16 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.
- .17 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.
- .18 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .19 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .20 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.
- .21 Mix joint compound slightly thinner than for joint taping.
- .22 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.
- .23 Allow skim coat to dry completely.
- .24 Remove ridges by light sanding or wiping with damp cloth.
- .25 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM C645-08a, Specification for Non-structural Steel Framing Members.
 - .2 ASTM C754-07, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-1.40-97, Primer, Structural Steel, Oil Alkyd Type.

1.2 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling.
- .4 Divert unused metal materials from landfill to metal recycling facility.

1.4 SUBMITTALS

- .1 Submit 3 copies of engineering calculations or data verifying the capacity of the members and the ability of the assemblies to meet the design requirements.
- .2 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
 - .1 Each shop drawing submitted shall bear the stamp and signature of a qualified Professional Engineer and registered in the Province of Ontario. The metal stud systems contractor shall retain the services of a Professional Structural Engineer for the Project and pay for engineering services in connection with shop drawings and review during construction of the metal stud systems.
 - .2 Include all necessary shop details and erection diagrams. Indicate member sizes, locations, thicknesses exclusive of coating, coating and materials. Include connection details for attaching framing to itself and for attachment to the structure. Show splice details where permitted. Indicate dimension, openings requirement of related work and critical installation procedures. Show temporary bracing required for erection purposes.

- .3 Indicate design loads.
- .3 Do not fabricate until all submittals are reviewed by the Architect.
- .4 Submit 3 copies of field review reports from the Systems contractors Structural Engineer.

Part 2 Products

2.1 MATERIALS

- .1 Non-load bearing channel stud framing: to ASTM C645, stud sizes as indicated, roll formed from 0.91 mm thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460 mm centres.
- .2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, flange heights:
 - .1 Bottom channel: 32 mm
 - .2 Deflection channel (fixed to u/s of structure): 65 mm
 - .3 Top channel: 50 mm.
- .3 Metal channel stiffener: 1.4 mm thick cold rolled steel, coated with rust inhibitive coating.
- .4 Insulating strip: rubberized, moisture resistant 3 mm thick foam strip, 12 mm wide, with self sticking adhesive on one face, lengths as required.

Part 3 Execution

3.1 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 spacing as indicated and not more than 50 mm from abutting walls, and at each side of openings and corners. 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 door/window frames 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. 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 door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. 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, furring channel or wood blocking 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 underside of deck and structure except where noted otherwise on drawings.
- .15 Maintain clearance under deck, beams and joists to avoid transmission of structural loads to studs. Use double track slip joint.
 - .1 Install 50 mm deep deflection channel at top of partitions.
 - .2 Nest 65 mm deep top track into deflection channel a minimum of 30 mm and a maximum of 40 mm. Do not fasten tracks together.
- .16 Install continuous insulating strips to isolate studs from un-insulated surfaces.
- .17 Install two continuous beads of acoustical sealant and insulating strip under studs and tracks around perimeter of sound control partitions.

3.2 CLEANING

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

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM F1303-99, Specification for Sheet Vinyl Floor Covering with Backing.

1.2 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate 300 x 300 mm sample pieces of sheet material, 300 mm long base, treads, risers edge strips.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for resilient flooring for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 EXTRA MATERIALS

- .1 Provide extra materials of resilient sheet flooring and adhesives in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide 2% of each colour, pattern and type flooring material required for project for maintenance use.
- .3 Extra materials to be in one piece and from same production run as installed materials.
- .4 Clearly identify each roll of sheet flooring and each container of adhesive.
- .5 Deliver to Owner, upon completion of the work of this section.
- .6 Store where directed by Owner.

1.5 ENVIRONMENTAL REQUIREMENTS

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

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Do not dispose of unused sealant and adhesive materials into landfill. Divert materials to municipal hazardous materials depot approved by Consultant.
- .3 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Architect.
- .4 Remove from site and dispose of packaging materials at appropriate recycling facilities.

- .5 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling.

Part 2 Products

2.1 MATERIALS

- .1 Resilient Stair Tread/Riser Combination **ST-01** (New Music Room): to ASTM F-1344.
 - .1 Type: TS Rubber Vulcanized Thermoset.
 - .2 Class: 1.
 - .3 Thickness: 3.17 mm.
 - .4 Texture: round.
 - .5 Nosing: Rounded, 40 mm vertical face, 1-piece tread and riser length.
 - .6 Edging: integrated one-piece visually impaired safety strip, colour 'L'-yellow, 50mm.
 - .7 Accessories, include stair stringer trim with stair tread.
 - .8 Acceptable manufacturer: Roppe Low Profile Raise Diamond #30, color 187 Blue, or approved equivalent.
- .2 Resilient Stair Tread/Riser Combination **ST-02** (Existing Stage Area): to ASTM F-1344.
 - .1 Type: TS Rubber Vulcanized Thermoset.
 - .2 Class: 1.
 - .3 Thickness: 3.17 mm.
 - .4 Texture: Hammered.
 - .5 Nosing: Rounded, 40 mm vertical face, 1-piece length tread and riser length.
 - .6 Edging: integrated one-piece visually impaired safety strip, colour 'K' Black, 50mm.
 - .7 Acceptable manufacturer: Roppe Hammered Design #95, color 177 Steel Blue, or approved equivalent.
- .3 Resilient Acoustic Flooring **RS-01** (New Music Room): to ASTM F-1344.
 - .1 Type: Flexible PVC Resilient Flooring with polyurethane reinforcement.
 - .2 Wear Layer: heterogeneous in construction with a 0.65mm clear PVC wear layer.
 - .3 Acoustic Impact Sound Reduction: ≥ 19 dB as per ASTM F 1303-99.
 - .4 Fire Resistance: Class 1 as per ASTM E648.
 - .5 Slip Resistance: Class DS (dry condition)
 - .6 Thickness: 3.7 mm.
 - .7 Acceptable manufacturer: Polyflor SilentFlor, color 9983 Onyx, or approved equivalent.
- .4 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.
- .5 Sub-floor filler and leveller: white premix latex requiring water only to produce cementitious pastes recommended by flooring manufacturer for use with their product.
 - .1 Acceptable Products by: H.B. Fuller, or approved equivalent.

- .1 TEC TA 320 Perfect Finish.
- .6 Metal edge strips:
 - .1 Aluminum extruded, smooth, mill finish stainless steel with lip to extend under floor finish, shoulder flush with top of adjacent floor finish.
 - .1 Acceptable Products by: Schluter Systems, or approved equivalent.
- .7 Edging to floor penetrations: type recommended by flooring manufacturer.
- .8 Sealer and wax: type recommended by resilient flooring material manufacturer for material type and location.

Part 3 Execution

3.1 SITE VERIFICATION OF CONDITIONS

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

3.2 PREPARATION

- .1 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- .2 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.
- .3 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.
- .4 A moisture test must be carried out, to ensure that the subfloor has dried out to a level consistent with the application of vinyl flooring. The test to be carried out using a hygrometer, in accordance with the instructions in BS 8203. The result should not exceed 75%RH, once equilibrium has been achieved.

3.3 APPLICATION: FLOORING

- .1 Install flooring in accordance with the manufacturer's current and written instructions.
- .2 Provide a high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to the outside. Do not let contaminated air recirculate through a district or whole building air distribution system.
- .3 To minimize emissions from adhesives, use water-based, solvent-free styrene-butadiene-rubber adhesive for linoleum. Butadiene exposure may cause eye and nose irritation, headaches, dizziness, and vomiting.
- .4 Apply low VOC adhesive uniformly using recommended trowel. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .5 Lay flooring with seams parallel to building lines to produce a minimum number of seams. Border widths minimum 1/3 width of full material.

- .6 Run sheets in direction of traffic and install according to manufacturer's printed instructions.
- .7 As installation progresses, and after installation roll flooring with 45 kg minimum roller to ensure full adhesion.
- .8 Cut flooring neatly around fixed objects.
- .9 Terminate flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.
- .10 Install metal edge strips at unprotected or exposed edges where flooring terminates.

3.4 APPLICATION: STAIRS

- .1 Finish stair risers with resilient sheet and install prior to tread material.
- .2 Install stair nosings, stair treads, stair stringer trim, and stair risers one piece for full width of stair. Adhere over entire surface and fit accurately.

3.5 CLEANING

- .1 Remove excess adhesive from floor, base and wall surfaces without damage.
- .2 Clean, seal and wax floor and base surface to flooring manufacturer's printed instructions.

3.6 PROTECTION

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

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C 423-07, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .4 Underwriter Laboratories of Canada (ULC)
 - .1 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.

1.2 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.
- .3 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit duplicate 300x300mm sample of each type of acoustical unit.

1.3 QUALITY ASSURANCE

- .1 Construct one representative mock-up of each type acoustical wall treatment system.
- .2 Construct mock-up 10 m² minimum to indicate method of assembly, installation and fixing.
- .3 Allow 24 hours for inspection of mock-up by Consultant before proceeding with work.
- .4 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of the finished work.

1.4 ENVIRONMENTAL REQUIREMENTS

- .1 Commence installation after building enclosed and dust generating activities are completed.
- .2 Permit wet work to dry prior to commencement of installation.
- .3 Maintain uniform minimum temperature of 15 degrees C and relative humidity of 20- 40% prior to, during and after installation.

1.5 DELIVERY, HANDLING AND STORAGE

- .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.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Acoustical construction products must:
 - .1 Not require being labelled as poisonous, corrosive, flammable or explosive under Consumer Chemical and Container Regulations of the Hazardous Products Act.
 - .2 Be accompanied by detailed instructions for proper handling and installation so as to minimize health concerns.
- .2 Acoustical Panel Type **AP-01**: Cementitious wood fibre acoustic units: to CAN/CGSB-92.1.
 - .1 Standard units: 50 mm thick, square fabric wrapped edges, fabric finish.
 - .2 Sizes: 1200mm x 600mm.
 - .3 Flame spread rating of 15, smoke developed 15 or less.
 - .4 Urea-formaldehyde free.
 - .5 Wood Fibre Acoustic Units: Acceptable Manufacturer: Tectum, or approved equivalent.
 - .6 Fabric Covering: Acceptable Manufacturer: HytexRib, or approved equivalent.
 - .7 Mounting Style: Ceiling Suspended.
 - .8 Colour(s): Type **FB-01**: Parchment, 24-03.
- .3 Acoustical Panel Type **AP-02**: Cementitious wood fibre acoustic units: to CAN/CGSB-92.1.
 - .1 Standard units: 50 mm thick, square fabric wrapped edges, fabric finish.
 - .2 Sizes: 1200mm x 600mm
 - .3 Flame spread rating of 15, smoke developed 15 or less.
 - .4 Urea-formaldehyde free.
 - .5 Wood Fibre Acoustic Units: Acceptable Manufacturer: Tectum, or approved equivalent.
 - .6 Fabric Covering: Acceptable Manufacturer: HytexRib, or approved equivalent.
 - .7 Mounting Style: Wall Mounted.
 - .8 Colour(s): Type **FB-02**: Parchment, 24-03.
- .4 Acoustical Panel Type **AP-03**: Wood Frame/foam acoustic units: to CAN/CGSB-92.1.
 - .1 Standard units: 80 mm thick, square fabric wrapped edges, fabric finish.
 - .2 Frame: Poplar wood frame, multiplex
 - .3 Acoustical medium: CME35H foam,
 - .4 Sizes: 600mm x 690mm
 - .5 Flame spread rating of 15, smoke developed 15 or less.
 - .6 Urea-formaldehyde free.
 - .7 Wood Fibre Acoustic Units: Acceptable Manufacturer: BuzziTile, Hexa 8, or approved equivalent.
 - .8 Mounting Style: Wall-mounted.
 - .9 Fabric Colour(s):
 - .1 Type **FB-03**: Fabric FA-'Mandarin' 129
 - .2 Type **FB-04**: Fabric FA-'Shitake' 124
 - .3 Type **FB-05**: Fabric FA-'Violet' 72
- .5 Provide all mounting brackets, fasteners and accessories from system manufacturer.
- .6 Adhesive: type recommended by acoustic unit manufacturer.
- .7 Staples, nails and screws: to CSA B111, non-corrosive finish, type recommended by acoustic unit manufacturer.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Ensure substrate surface is straight to tolerance of plus or minus 3 mm over 3000 mm.
- .2 Install acoustic units to clean, dry and firm substrate using [adhesive] [staples][screws] [nails].
- .3 Install acoustic units plumb and aligned. Arrange units as indicated.
- .4 Scribe acoustic units to fit adjacent work. Butt joints tight, terminate edges with moulding.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Keep acoustic installation and all components clean. Remove blemishes immediately.

3.4 PROTECTION

- .1 Use polyethylene to protect finished acoustical wall treatment from damage.
- .2 Remove prior to substantial completion.

END OF SECTION

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PART 1 GENERAL

1.1 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 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.2 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Contractor: minimum of five 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: working under direct supervision of qualified trades person in accordance with trade regulations.
- .2 Pre-Installation Meeting:
 - .1 Convene pre-installation meeting one week prior to beginning on-site installations in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building subtrades.
 - .4 Review [manufacturer's] installation instructions and warranty requirements.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

1.3 SCHEDULING

- .1 Submit work schedule for various stages of painting to Architect for review. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from Architect for changes in work schedule.
- .3 Schedule painting operations to prevent disruption of occupants.

1.4 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 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 duplicate 200 x 300 mm sample panels of each paint, 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 white birch plywood for finishes over wood surfaces.
 - .3 13 mm gypsum board for finishes over gypsum board and other smooth 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 numbers.
 - .4 MPI Environmentally Friendly classification system rating.

1.5 MAINTENANCE

- .1 Extra Materials:
 - .1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.
 - .2 Quantity: provide one - four litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.
 - .3 Delivery, storage and protection: comply with Architect requirements for delivery and storage of extra materials.

1.6 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 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.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling.
 - .4 Separate for reuse and recycling and place in designated containers Steel, Metal, and Plastic waste.
 - .5 Place materials defined as hazardous or toxic in designated containers.
 - .6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, and Regional and Municipal regulations.
 - .7 Ensure emptied containers are sealed and stored safely.
 - .8 Unused paint and coating materials must be disposed of at official hazardous material collections site as approved by Architect.
 - .9 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.
 - .10 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
 - .11 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
 - .12 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.
- .14 Set aside and protect surplus and uncontaminated finish materials. Deliver to or arrange collection by employees, or organizations for verifiable re-use or re-manufacturing.

1.7 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 Architect 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 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 Architect such that painted surfaces will have dried and cured sufficiently before occupants are affected.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Provide paint products meeting MPI "X-Green" Performance Standards.
- .2 Paint materials listed in the MPI Green Approved Products List (APL) are acceptable for use on this project.
- .3 Use MPI listed materials having minimum E3 rating where indoor air quality (odour) requirements exist.
- .4 Conform to latest MPI requirements for interior painting work including preparation and priming.
- .5 Provide paint materials for paint systems from single manufacturer.
 - .1 Acceptable Manufacturers:
 - .1 Benjamin Moore.
 - .2 CAFCO Industries.
- .6 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.

2.2 COLOURS

- .1 Selection of colours from manufacturer's full range of colours.
- .2 Where specific products are available in restricted range of colours, selection based on limited range.
- .3 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.
- .4 Colour Schedule, based on Benjamin Moore.
 - .1 **PT-01:** Easter Lily, 2150-70.
 - .2 **PT-02:** Gray Shower, 2125-30.
 - .3 **PT-03:** Brookside Moss, 2145-30.
 - .4 **PT-04:** Avocado, 2145-10.
 - .5 **PT-05:** White Cloud, 2159-70.

.6 **PT-06: Split Pea, 2146-30.**

2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. Obtain written approval from Architect 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 Level Category:	Units @ 60 Degrees:	Units 85 Degrees:
G1 – Matte finish (Flat)	0 to 5	Max. 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	Min. 35
G5 – Semi-gloss finish	35 to 70	
G6 – Gloss finish	70 to 85	
G7 – High gloss finish	More than 85	

- .2 Gloss level ratings of painted surfaces as indicated.

2.5 INTERIOR PAINTING SYSTEMS

- .1 Concrete vertical surfaces: including horizontal soffits:
 - .1 INT 3.1C - High performance architectural latex G3 finish.
- .2 Concrete horizontal surfaces: floors and stairs:
 - .1 INT 3.2C - Epoxy G5 finish.
- .3 Concrete masonry units: smooth and split face block and brick:
 - .1 INT 4.2D - High performance architectural latex G3 finish.
- .4 Structural steel and metal fabrications: columns, beams, joists:
 - .1 INT 5.1W - Alkyd G1 finish (over quick dry shop primer).
- .5 Steel - high heat: (boilers, furnaces, heat exchangers, breeching, pipes, flues, stacks, etc., with temperature range as noted):
 - .1 INT 5.2D - High heat resistant coating, maximum 593 degrees C.
- .6 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts.
 - .1 INT 5.3M - High performance architectural latex G5 finish.
- .7 Dressed lumber: including doors, door and window frames, casings, mouldings:
 - .1 INT 6.3H - Clear lacquer G5 finish.
- .8 Wood paneling and casework: partitions, panels, shelving, millwork:
 - .1 INT 6.4Y - Clear lacquer G5 finish.

- .9 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
 - .1 INT 9.2B - High performance architectural latex G2 and G3 finish.
 - .1 Ceilings: G2 finish.
 - .2 Walls: G3 finish.

2.6 SOURCE QUALITY CONTROL

- .1 Perform following tests on each batch of consolidated post-consumer material before surface coating is reformulated and canned. Testing by laboratory or facility which has been accredited by 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 using Technique no. 8081 as defined in EPA SW-846.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 GENERAL

- .1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Architect 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 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 Architect.
- .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .3 Protect factory finished products and equipment.
- .4 Protect passing pedestrians, building occupants and general public in and about the building.
- .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 Architect.
- .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 wiping with dry, clean cloths.
 - .2 Wash surfaces with a biodegradable detergent 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.
- .4 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.
- .5 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.
- .6 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.
- .7 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.
- .8 Touch up of shop primers with primer as specified.
- .9 Do not apply paint until prepared surfaces have been accepted by Architect.

3.5 APPLICATION

- .1 Method of application to be as approved by Architect. Apply paint by brush or roller. Conform to manufacturer's application instructions unless specified otherwise.
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.
- .2 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
- .3 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .4 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .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 tops of interior cupboards and cabinets and projecting ledges.
- .7 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .8 Finish closets and alcoves as specified for adjoining rooms.
- .9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRIC AL 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 Architect and General Contractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.
- .3 Field inspection of painting operations to be carried out by independent inspection firm as designated by Architect.
- .4 Advise Architect when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .5 Cooperate with inspection firm and provide access to areas of work.
- .6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Architect.

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 Architect. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Architect.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.2-02, Medium Density Fiberboard (MDF) for Interior Application.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM E 90-04, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - .2 ASTM E 336-05, Standard Test Method for Measurement of Airborne Sound Insulation in Buildings.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-M87, Hardboard.
- .4 Underwriters Laboratories' of Canada (ULC)
 - .1 CAN/ULC-S102-03, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 DESIGN REQUIREMENTS

- .1 Design and fabricate folding partitions with minimum STC of 52, tested to ASTM E 90.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .1 Indicate installation requirements including dimensions, head and jamb conditions, track layout, stacking arrangement, switching, hardware, finish and colour, operating mechanism, electrical requirements and location.
- .4 Samples:
 - .1 Submit duplicate 300 x 300 mm samples of partition finish for each colour selected.
- .5 Quality assurance/control submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Test reports: submit certified test reports for folding panel partitions from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .2 Submit test data indicating compliance with design requirements regarding sound transmission and fire hazard classification.
 - .3 Submit acoustical test data to ASTM E 90 and ensure construction details and weight are provided.
 - .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .5 Manufacturer's Instructions: submit manufacturer's installation instructions. Indicate special handling criteria, installation sequence and cleaning procedures.
 - .6 Manufacturer's Field Reports: manufacturer's field reports specified.

- .6 Closeout Submittals:
 - .1 Provide operation and maintenance data for folding panel partitions for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

- .1 Site Meetings: as part of Manufacturer's Services described in Part 3 - Execution, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.
 - .2 Upon completion of Work, after cleaning is carried out.
- .2 Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.
- .3 Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.
- .4 Preparation of the opening shall conform to the criteria set forth per ASTM E557 "Standard Practice for Architectural Application and Installation of Operable Partitions."

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.

1.6 WARRANTY

- .1 Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.
- .2 Warranty period: Three (3) years from date of Substantial Performance.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Folding Partition Type **FP-01**
 - .1 76mm acoustical panel wall, manual operation with series of individual flat panels, manually operated, top supported with operable floor seals.
 - .2 Acceptable Manufacturer: ModernFold, Acousti-Seal 931, STC 52.
- .2 Panel core: 76mm thick panel, steel frame, complete with horizontal steel reinforcement and protective panel edge manufacturer's standard fabrication.
- .3 Panel Trim: No exposed panel trim required or allowed, hardware to be of one consistent color, minimal groove appearance at panel joints.
- .4 Colours and Finishes:
 - .1 Fabric Panel Finish: Luma – 'Harvest' 111873-712,
 - .2 Panel Trim: Taupe SW 6152
 - .3 Hinge Colour: Taupe SW 6152,

2.2 OPERATION

- .1 Acoustically sealed Paired Panel: Series of paired flat panels hinged together in pairs, manually operated, top supported with operable floor seals and automatic top seals.

- .2 Final Closure: Horizontally expanding panel edge with removable crank.

2.3 PANEL CONSTRUCTION

- .1 Nominal 4.25-inch (108mm) thick panels in manufacturer's standard 51-inch (1295mm) widths. All panel horizontal and vertical framing members fabricated from minimum 16-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.
- .2 Panel skin shall be:
 - .1 Roll-formed steel wrapping around panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction. Acoustical ratings of panels with this construction minimum: 52 STC
- .3 Hinges for Closure Panels, Pass Doors, and Pocket Doors shall be:
 - .1 Full leaf butt hinges, attached directly to the panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.
 - .2 Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at all panel joints.
- .4 Panel Weights: 52 STC - 11 lbs./square foot

2.4 SOUND SEALS

- .1 Vertical Interlocking Sound Seals between panels: Aluminum astragals, with tongue and groove configuration in each panel edge. Rigid plastic astragals are not acceptable.
- .2 Horizontal Top Seals shall be continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.
- .3 Horizontal bottom floor seals shall be Modernfold Sureset™ bottom seal:
 - .1 Modernfold SA2 Bottom Seal. Automatic operable seals providing nominal 51mm operating clearance with an operating range of 13mm to 38mm which automatically drop as panels are positioned, without the need for tools or cranks.

2.5 SUSPENSION SYSTEM

- .1 Tracks: Precision heat-treated extruded aluminum. Track to be supported by pairs of 10mm diameter threaded rods.
- .2 Exposed track soffit: Aluminum, integral to track, pre-painted white..
- .3 Carriers: Shall have horizontal counter-rotating wheels with oversized heavy duty thrust steel bearings. Carriers permit panels to traverse L, T, or X intersections without mechanical switching.

2.6 OPTIONS

- .1 Single Pass Doors:
 - .1 Matching pass door same thickness and appearance as the panels. ADA compliant pass door to be trimless and equipped with friction latch and flush pulls for panic operation. No threshold will be permitted.
- .2 Hardware:
 - .1 Equip partition with manufacturer's standard hardware. Hardware finish selected from manufacturer's standard finishes. Automatic door closures.

- .3 Sound seals:
 - .1 Provide automatic operable sound seals to manufacturer's standard, SA2.
 - .2 Use head and floor retractable compression type seals to manufacturer's standards.
 - .3 Design retractable seals to secure panel in position.
 - .4 Use manufacturer's standard astragal inserts for jamb and panel joint seal.
- .4 Pocket Door: Same finish and appearance as adjacent panels type, by manufacturer

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

- .1 Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- .1 General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.
- .2 Install operable partitions and accessories after other finishing operations, including painting have been completed.
- .3 Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.
- .4 Broken, cracked, chipped, deformed or unmatched panels are not acceptable.
- .5 Secure and level track.
- .6 Install folding partitions in accordance with manufacturer's printed instructions.
- .7 Touch up damaged finishes, repair damage to partitions to match original finish.
- .8 Clean folding partition system and protect from damage.
- .9 Adjust and leave partitions in smooth operating condition.
- .10 Adjust operable partitions to operate smoothly, easily and quietly, free from binding, warp excessive deflection, distortion, nonalignment, misplacement, disruption or malfunction throughout entire operational range. Lubricate hardware and other moving parts.

3.4 FIELD QUALITY CONTROL

- .1 Site Tests:
 - .1 Acoustic field testing: have field sound performance certified by independent acoustical consultant in accordance with ASTM E 336.
- .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.
- .4

3.5 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 Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.
- .4 Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer that insure operable partitions are without damage or deterioration at time of Substantial Completion.

3.6 ADJUSTING

- .1 Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.7 DEMONSTRATION

- .1 Demonstrate proper operation and maintenance procedures to Owner's representative.
- .2 Provide Operation and Maintenance Manual to Owner's representative.

END OF SECTION

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Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C136 / C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .2 ASTM D4318-17e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Ontario Provincial Standard Specification
 - .1 OPSS 1010, Aggregates – Base, Sub-base, Select Sub-grade and Backfill Material.
 - .2 OPSS 1004, Aggregates – Miscellaneous.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

1.2 DEFINITIONS

- .1 Rock excavation: solid material in excess of 2.00 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment. Frozen material not classified as rock.
- .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation including dense tills, hardpan, frozen materials, unsuitable materials and partially cemented materials which can be ripped and excavated with heavy construction equipment.
- .2 Topsoil: Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .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 C136: Sieve sizes to CAN/CGSB-8.2.

.2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

- .3 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.
- .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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control:
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
 - .2 Submit for review by Consultant proposed heave prevention and 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 and inspection results and report as described in PART 3 of this Section.
- .3 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 and location plan of relocated and abandoned services, as required.
- .4 Samples:
 - .1 Submit samples if requested in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Inform Consultant at least 4 weeks prior to beginning Work, of proposed source of fill and unshrinkable fill materials and provide access for sampling.

1.4 EXISTING CONDITIONS

- .1 Examine the site thoroughly and investigate all conditions likely to affect site work. Submission of tender will be deemed to indicate compliance with above-noted conditions.
- .2 Comply with all recommendations and instructions of geotechnical engineer.
- .3 Size, depth and location of existing utilities and structures as indicated on plans are for guidance only. Completeness and accuracy are not guaranteed.
- .4 Buried services:
 - .1 Before commencing work establish and verify location of buried services on and adjacent to site.
 - .2 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
 - .3 Prior to beginning excavation Work, notify applicable authorities having jurisdiction and Consultant; establish location and state of use of buried utilities

and structures. Consultant and authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.

- .4 Confirm locations of buried utilities by careful test excavations.
 - .5 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered. Where utility lines or structures exist in area of excavation, obtain direction of Consultant before removing or re-routing.
 - .6 Pay cost to repair utility lines damaged by the Contractor's activities.
 - .7 Record location of maintained, re-routed and abandoned underground lines.
 - .8 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
- .5 Existing buildings and surface features:
- .1 Conduct condition survey of existing buildings, lawns, fencing, wires, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Consultant.

1.5 INSPECTION AND TESTING

- .1 Testing of materials and compaction will be carried out by testing laboratory designated by the Consultant.
- .2 Obtain review of the work of this section as follows:
 - .1 Upon completion of sub-grade excavation.
 - .2 Before pouring footings or concrete fill materials.
 - .3 Before backfilling footing trenches.
 - .4 Before backfilling outside the foundations.
 - .5 Before backfilling service trenches.
- .3 Following approval of the subgrade and as soon as the first 300 mm of fill has been placed and compacted, the Contractor shall notify the Consultant who may then arrange the testing to determine the density of the layer by means of field density equipment. Field density testing will be conducted by an independent testing agency appointed by the Owner. Advance notification of twenty-four (24) hours is to be given prior to the required testing. Each 300 mm of placed and compacted granular fill may be tested at the discretion of the testing agency.
- .4 If compaction tests disclose inadequate compaction, additional tests required to ascertain that re-compaction is sufficient shall be paid for by the Contractor.

1.6 SHORING, BRACING AND UNDERPINNING

- .1 Comply with Contract Safety Requirements, and applicable local regulations.
- .2 Engage services of qualified professional Engineer who is registered or licensed in the Province of Ontario to design and inspect shoring, bracing and underpinning required for Work.
- .3 Submit design and supporting data at least 2 weeks prior to beginning Work.

- .4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in the Province of Ontario.
- .5 Keep design and supporting data on site.
- .6 The Professional Engineer responsible for design of temporary structures shall submit proof of insurance coverage for professional liability except where engineer is an employee of the contractor, in which case the contractor shall submit proof that the work by the professional engineer is included in contractor's insurance coverage.
- .7 Do not use soil material until written report of soil test results are reviewed by Consultant.

Part 2 Products

2.1 EARTH

- .1 Existing site material including backfill, top soil, peat, clay, silt, weathered shale, rubble and products of demolition

2.2 IMPORTED EARTH FILL

- .1 Material approved by the Geotechnical Engineer.

2.3 EXISTING FILL

- .1 For use under landscaped areas where settlement of the ground surface can be accepted.

2.4 GRANULAR FILL

- .1 Granular "A" Fill:
 - .1 Clean, hard, durable crushed gravel or stone free from shale, clay, friable material, cementation, organic material, frozen material and other deleterious materials.
 - .2 Gradations to be within limits specified in OPSS 1010 for Granular "A".
- .2 Granular "B" Fill:
 - .1 Clean, hard, durable crushed stone, free from shale, clay, friable material, cementation, organic material, frozen material and other deleterious materials.
 - .2 Gradations to be within limits specified in OPSS 1010 for Granular "B", Type II, subject to maximum dimensions as recommended in the geotechnical report.
- .3 Sand Bedding:
 - .1 Clean sand, free from shale, clay friable material, cementation, organic material, frozen material and other deleterious materials.
 - .2 Gradations to be within limits specified in OPSS 1004.

2.5 CLEAR CRUSHED STONE

- .1 19mm.

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.
- .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 from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 PREPARATION/PROTECTION

- .1 Protect existing features in accordance with 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 STOCKPILING

- .1 Stockpile fill materials in areas as indicated or as designated by the Consultant.
 - .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.

3.5 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 and Health and Safety Act for the Province of Ontario.
 - .1 Ensure strength and rigidity sufficient to prevent collapse and to support existing building and/or services.
- .2 Erect and maintain adequate hoardings to protect all banks against accidents to the public and to workers employed on the work.

- .3 Obtain and pay for any necessary approvals from all authorities having jurisdiction for shoring and hoarding.

3.6 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off and high ground water conditions.
- .3 Dispose of water in manner not detrimental to public and private property, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .4 Provide for Engineer's review details of proposed dewatering or heave prevention methods, including well points.
- .5 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.
- .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.

3.7 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Remove paving, demolished foundations and rubble, masonry and other obstructions encountered during excavation.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .5 For trench excavation, unless otherwise authorized by Engineer 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.
- .6 Keep excavated and stockpiled materials safe distance away from edge of trench.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material off site. Comply with regulations of authorities having jurisdiction.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Excavate for mechanical, electrical trades and all other items requiring excavation.
- .11 Notify the Consultant when soil at the bottom of excavation appears unsuitable and proceed as directed by the Consultant and Geotechnical Engineer.
- .12 Obtain Geotechnical Engineer's approval of completed excavation.
- .13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Geotechnical Engineer.

- .14 The following shall set the protocol to be used when soil or rock conditions, other than the conditions described in the Geotechnical Report are discovered.
 - .1 Contractor shall immediately notify the Geotechnical Consultant and the Architect who will in turn notify the Owner.
 - .2 Geotechnical Consultant in consultation with the Engineer shall determine the necessary action. The extent of remedial action shall be estimated in order to determine the most cost effective resolution.
 - .3 The change in scope of work shall be quantified by both the Contractor and the Geotechnical Consultant and duly recorded.
 - .4 Failure to follow the above process may result in rejection of the Contractor's claim.
- .15 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with Granular A or Granular B Type II (maximum size 50 mm) compacted to at least 98% Standard Proctor Maximum Dry Density.
 - .2 Fill under other areas with Granular B Type I or II fill compacted to minimum of 95% Standard Proctor Maximum Dry Density Hand trim, make firm and remove loose material and debris from excavations.
- .16 Where soil supported floor slabs are to be placed, excavate and remove all the existing layers of fill and topsoil in accordance with the Geotechnical Report.
- .17 Ensure that the surface on which the footings are to be laid is clean, undisturbed native material, level and free from loose material. Form steps as indicated.
- .18 Protect bottom and sides of the excavation from exposure to sun and wet weather to prevent cave-ins and softening of the bed upon which the concrete or drains rest.
- .19 Keep surfaces against which concrete, or fill, will be placed, free of frost. Where such surfaces become frozen, thaw and remove material to a firm base to the satisfaction of the Engineer.

3.8 FILL TYPES AND COMPACTION

- .1 For grading beneath base and subbase layers of paved areas, use Granular "B" Type II Material or other suitable materials as approved by the Geotechnical Engineer. Place in maximum 300 mm thick lifts and compact to at least 95% of Standard Proctor Maximum Dry Density.
- .2 Within building area: as per Geotechnical report.
- .3 Under concrete slabs: as per Geotechnical report.

3.9 EXCAVATION AND BACKFILL FOR UNDERGROUND SERVICES

- .1 Examine drawings and site in order to locate services. Report any difficulties or discrepancies to the Engineer.
- .2 Excavate for new buried services in order to provide Class "B" bedding. Backfill each before the next section is excavated.
- .3 Class "B" bedding shall be as follows:
 - .1 Excavate trenches to provide a uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground.

Trench widths below a point 300 mm above the pipe shall not exceed the diameter of the pipe plus 800 mm; above this height, sides of trenches may be sloped back at the natural angle of repose of the material.

- .2 Level bottom of trench. Bottom of trenches shall be undisturbed soil, bedrock, approved existing fill or Granular "B" Type I or II over one of the above.
- .3 Place a minimum of 150 mm thick layer of Granular A for pipe bedding. Compact stone to minimum of 95% of the materials SPMDD to provide positive support for pipe.
- .4 Bring stone up sides of pipe to spring line of pipe and compact stone to provide positive support for pipe.
- .5 Do hand backfilling using Granular A over pipe to a depth of 300 mm above the obvert to provide adequate protection against mechanically placed backfill.
- .6 Backfill within 1.8 metres of finished grade shall match existing soils exposed at trench wall, up to top of subgrade.
- .7 Compact all backfill to 95% Standard Proctor Density in maximum 300 mm lifts.
- .8 For backfill in grassed and landscaped areas above the 300 mm granular pipe protection identified in Item .5 above, site excavated backfill material may be used and installed in accordance with the Geotechnical Report.

3.10 EXCAVATION AND BACKFILL UNDER EXTERIOR CONCRETE AND ASPHALT

- .1 Prepare site as per paragraph 3.2 and 3.3.
- .2 Where required, raise the subgrade to achieve elevations shown on drawings, and to the specified granular basecourses, place and compact Granular B Type II or better fill material in maximum 300 mm layers. Thoroughly consolidate each layer before depositing next layer of gravel. Obtain a minimum density of 95% Standard Proctor, maximum dry density.
- .3 Do all required backfilling of service trenches. Use Granular B Type II fill material or native material as specified in the Geotechnical Report. Proceed as per Items .6, .7, and .8 of Item 3.9 above.
- .4 Where necessary to provide specified base courses for exterior paving, excavate and remove existing soils.
- .5 Proof-roll soil subgrade using heavy vibratory compaction equipment prior to placing Granular "B" Type II sub-base. Remove soft areas and backfill with OPSS Granular "B" Type II, with a maximum particle size of 50 mm. Correct any irregularities or depressions, providing smooth slope towards catch basin locations.
- .6 Place OPSS Granular "B" Type II sub-base material to required elevation, allowing for placement of Granular A base course

3.11 EXCAVATION AND BACKFILL UNDER PLANTED AND SODDED AREAS

- .1 Excavate and/or place approved miscellaneous fill material to the required suitable depth which will allow incorporation of new grading, including landscaping finish shown on drawings.
- .2 Where required to achieve elevations shown on drawings, except where noted otherwise, place approved fill material in 500 mm maximum loose – thickness layers and compact by means of passing motorized earth moving equipment over each layer

(except close to structures in which case light hand tampers shall be used) to achieve 90% of material's SPMD.

3.12 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 h after placing.
- .3 Place layers simultaneously on both sides of installed work to equalize loading.
- .4 Difference not to exceed 0.15 m.
- .5 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 the Engineer or:
 - .2 If approved by the Engineer, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by the Engineer.

3.13 RESTORATION

- .1 Upon completion of work, remove surplus materials and debris, trim slopes, and correct defects noted by the Engineer. Refer to landscape and site plan drawings for surface finish requirements.
- .2 Replace topsoil as indicated or as directed by Consultant.
- .3 Reinstall lawns to elevation which existed before excavation.
- .4 Reinstall pavements disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstall areas affected by Work as directed by Consultant.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

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Part 1 General

1.1 REFERENCE STANDARDS

- .1 Ontario Provincial Standard Specification
 - .1 OPSS 1010, Aggregates – Base, Sub-base, Select Sub-grade and Backfill Material.

1.2 DELIVERY, STORAGE AND HANDLING

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

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and dispose of unused or contaminated materials at approved dumpsite in accordance with good waste management practices.

Part 2 Products

2.1 MATERIALS

- .1 Granular 'A' fill: properties to meet the requirements of Ontario Provincial Standard Material Specification OPSS 1010.
 - .1 Crushed material consisting of pit run or screened stone, gravel, sand.
- .2 Granular 'B' Type II fill: properties to meet the requirements of Ontario Provincial Standard Material Specification OPSS 1010.

Part 3 Execution

3.1 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PLACEMENT AND INSTALLATION

- .1 Place granular base after subgrade surface is inspected and approved in writing by Consultant.
- .2 Placing:
 - .1 Construct granular base to depth and grade in areas indicated.

- .2 Ensure no frozen material is placed.
- .3 Place material only on clean unfrozen surface, free from snow and ice.
- .4 Place material using methods which do not lead to segregation or degradation of aggregate.
- .5 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Consultant may authorize thicker lifts(layers) if specified compaction can be achieved.
- .6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .7 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .3 Compaction Equipment:
 - .1 Ensure compaction equipment is capable of obtaining required material densities.
- .4 Compacting:
 - .1 Compact to density not less than corrected maximum dry density specified in individual specification sections.
 - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
 - .3 Apply water as necessary during compacting to obtain specified density.
 - .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Consultant.
 - .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 SITE TOLERANCES

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.4 CLEANING

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

3.5 PROTECTION

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Consultant.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Section 32 11 23 - Aggregate Base Courses.

1.2 REFERENCE STANDARDS

- .1 Asphalt Institute (AI)
 - .1 AI MS-2-2015, Asphalt Mix Design Methods.
- .2 ASTM International
 - .1 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - .2
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 310, Construction Specification for Hot Mixed Asphalt.
 - .2 OPSS 1150-2010, Material Specification for Hot Mix Asphalt.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Test and Evaluation Reports:
 - .1 Submit asphalt concrete mix design and trial mix test results to Consultant for review at least 4 weeks prior to beginning Work.

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.

Part 2 Products

2.1 BASECOURSE MATERIALS

- .1 Granular base materials to following requirements:
 - .1 Granular 'A', in accordance with Section 32 11 23 - Aggregate Base Courses.
 - .2 Granular 'B' Type II, in accordance with Section 32 11 23 - Aggregate Base Courses.

2.2 ASPHALTIC CONCRETE

- .1 Hot mix asphaltic concrete shall conform with OPSS 1150 using:
 - .1 HL3 Fine or Superpaver 12.5 for the wear course.
 - .2 HL8 for the base course where specified.
- .2 Asphaltic concrete to be made with PG 58-34 asphalt cement on all lifts.

Part 3 Execution

3.1 PREPARATION

- .1 Before placing granular sub-base, subgrade shall be brought to proper grades, alignment, and compaction, in accordance with OPSS 310.
- .2 The finished subgrade surface shall be smooth and shall conform to the required cross section and gradients and to a tolerance in cross section of not more than 12 mm in 3.0 m.
- .3 Where the base is rough or uneven, a levelling course shall be placed using a paver or motor grader, and shall be properly compacted before placing sub-base. All soft spots and unsuitable materials in subgrade shall be excavated and filled in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling. Compact to 95% of the maximum density (of subgrade material) obtainable by Method C to ASTM Specification D698.

3.2 INSTALLATION OF GRANULAR BASE COURSES

- .1 At areas where new asphalt paving is indicated on drawings:
 - .1 Granular bases under asphalt concrete paving shall consist of compacted OPPS Granular 'A' and Granular 'B' Type II material as shown on the drawings.
- .2 Placing and spreading shall be done in a manner so that segregation of particle size does not occur. Each course of granular sub-base and base shall be compacted to 100% SPMDD in maximum 150 mm lifts. Granular material shall be brought to its optimum moisture content by sprinkling or other method.
- .3 Density requirements specified herein for granular base and sub-base are the required percentage of the maximum density obtainable by Method C of ASTM Specification D698.
- .4 The finished surface shall be smooth and granular shall conform to the required cross section and gradients and to a tolerance in cross section of not more than 6 mm in 3 m.
- .5 Immediately prior to the laying of asphalt, any damage or irregularities and all dust, dirt, clay or other foreign matter shall be removed. The base shall be true to line and section, shall be compacted to the required density and shall be free of standing water. The temperature of the surface on which the hot mix asphalt is placed shall be not less than 5 degrees C and rising.
- .6 Paving shall not be carried out until base has been reviewed by the Consultant and tested.

3.3 INSTALLATION OF ASPHALTIC CONCRETE PAVING

- .1 Place asphalt concrete to thicknesses, grades and lines as indicated.
- .2 The preparation, mixing, delivery, laying and compaction of the asphalt, together with allowable tolerances in laying, shall be in accordance with OPSS 310.
- .3 Asphaltic concrete paving courses shall be compacted to 98% of the density of a laboratory specimen made in the proportion of the job mix formula prepared and tested in accordance with the procedures set forth for the Marshall Method of Mix Design in the Asphalt Institute Manual M.S. No. 2.

- .4 Hand tamp edges of asphaltic concrete, where not protected by adjacent concrete curbs, or building walls, to square, straight lines.
- .5 Protect all adjacent surfaces including concrete pavement from residues from asphalt paving.
- .6 The finished surface shall be smooth and shall conform to the required cross section and gradients and to a tolerance in cross section of not more than 3 mm in 3 m when checked with a straight edge.
- .7 Where new asphalt paving adjoins existing, neatly saw cut existing asphaltic paving in a straight line. Provide level junction between new and existing work.

3.4 DEFECTIVE WORK

- .1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required.
 - .1 If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.
- .2 Repair areas showing checking, rippling, or segregation.
- .3 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.
- .4 Defective paving shall be removed and replaced to the satisfaction of the Consultant.

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.

END OF SECTION

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Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Section 32 11 23 - Aggregate Base Courses.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A775/A775M-17, Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
 - .2 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.
 - .3 ASTM C920-18, Standard Specification for Elastomeric Joint Sealants.
 - .4 ASTM C494/C494M-17, Standard Specification for Chemical Admixtures for Concrete.
 - .5 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³))
 - .6 ASTM D1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .2 CSA Group
 - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA-A3000-13, Cementitious Materials Compendium.
 - .3 CSA G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CSA S269.1-16, Falsework and Formwork.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Record Documentation:
 - .1 Maintain a set of record drawings on site on which the progress of the work can be recorded.
 - .2 Record the time and casting date for each section of concrete and the date for removal of each section of formwork.
 - .3 Record test samples taken as described in PART 3 – FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE

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

- .2 Submit to Consultant, minimum 4 weeks prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
- .3 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA A23.1, and that mix design is adjusted to prevent alkali aggregate reactivity problems.
- .2 Quality Control Plan:
 - .1 Provide written report to Consultant verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 – PRODUCTS.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: maximum allowable time limit for concrete to be delivered to site of Work and discharged, not to exceed 120 minutes after batching.
 - .1 Do not modify maximum time limit without prior receipt of written agreement from Consultant and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by Consultant.
 - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

1.6 SITE CONDITIONS

- .1 Visit site to determine available access, storage and working areas. Determine any interference from existing services.
- .2 Use of accelerating or set retarding admixtures during hot or cold weather concrete placing shall be subject to the Consultant's approval.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Use trigger operated spray nozzles for water hoses.
- .2 Designate a cleaning area for tools to limit water use and runoff.
- .3 Carefully coordinate the specified concrete work with weather conditions.
- .4 Ensure emptied containers are sealed and stored safely for disposal, out of reach of children.
- .5 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies, streams, or stormwater system. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, non-combustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.
- .6 Choose least harmful, appropriate cleaning method which will perform adequately.

Part 2 Products

2.1 PERFORMANCE CRITERIA

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Consultant and provide verification of compliance as described in PART 1 – QUALITY ASSURANCE.
- .2 Exposed concrete:
 - .1 Architectural concrete finishing to be approved by the Consultant.
 - .2 Ensure that exposed concrete surfaces are dense, even, uniform in colour, texture and distribution of exposed aggregates, free from defects such as honeycombing, voids, loss of fines, visible flow lines, cold joints, excessive bug holes, inadequate cover to reinforcement and incorrect tie holes, spacers, reglets, formwork joints or construction joints.
 - .3 Ensure that exposed concrete members have sharp accurate definitions of corners, reglets, etc. and are free from chips and spalls.
 - .4 Failure to meet all the above requirements shall be cause for rejection at the discretion of the Consultant.

2.2 DESIGN REQUIREMENTS

- .1 Mix design requirements:
 - .1 Submit concrete mix design to Consultant for review 4 weeks prior to commencing work.

2.3 MATERIALS

- .1 Granular bases in accordance with Section 32 11 23 - Aggregate Base Courses.
- .2 Portland cement: to CSA A3000, type GU.
- .3 Aggregates: to CSA A23.1/A23.2. Coarse aggregates to be normal density.
- .4 Supplementary cementing materials: to CSA A3000.
- .5 Admixtures:
 - .1 Air entraining admixture: to ASTM C260/C260M.
 - .2 Chemical admixtures: to ASTM C494/C494M. Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing.
 - .3 Do not use calcium chloride admixtures.
- .6 Pre-moulded joint fillers:
 - .1 Bituminous impregnated fibre board: to ASTM D1751.
- .7 Welded steel wire fabric: to CSA G30.18. Provide in flat sheets only.
- .8 Dowel bars: plain round bars of grade 300: to CSA G40.20/G40.21.
- .9 Epoxy Coating of non-prestressed reinforcement: to ASTM A775/A775M.
- .10 Caulking to all concrete paving joints:
 - .1 Type PC-01: To ASTM C920
 - .1 Non-sag, one component, self leveling silicone sealant with ultra low modulus and elastomeric

- .2 Acceptable Products: Sikasil-728 SL by Sika, or approved equivalent.
Contact Information: Phone: (800) 325-9504, www.sika.com
- .3 Provide caulking full depth of joint to line 6mm below finished pavement surface.
- .2 Or: Two-component, self-levelling, polyurethane elastomeric sealant.
- .1 Acceptable Product: Sikaflex® 2c SL, by Sika Canada Inc, or approved equivalent.

2.4 MIXES

- .1 Proportion normal density concrete in accordance with CSA A23.1, to give following properties for all concrete.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
 - .2 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure: C-1.
 - .2 Compressive strength at 28 days age: 35 Mpa minimum.
 - .3 Intended application: Exterior slab on grade.
 - .3 Provide quality management plan to ensure verification of concrete quality to specified performance.
 - .4 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

Part 3 Execution

3.1 GRADE PREPARATION

- .1 Do grade preparation work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.2 GRANULAR BASE

- .1 Obtain Consultant's approval of subgrade before placing granular base.
- .2 Place granular base material to lines, widths, and depths as indicated.
- .3 Compact granular base in maximum 150 mm layers to at least 100% of maximum density to ASTM D698.

3.3 FORMWORK

- .1 Verify lines, levels and centres before proceeding with formwork and ensure dimensions agree with drawings.
- .2 Refer to landscape architectural drawings for concrete members requiring architectural exposed finishes.
- .3 Fabricate and erect formwork in accordance with CAN/CSA-S269.1 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .4 Align form joints and make watertight, keep form joints to minimum.

- .5 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .6 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .7 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.
- .8 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 36 hours for slabs and walkways.

3.4 REINFORCING STEEL AND DOWELS

- .1 Place reinforcing steel and dowels as indicated and in accordance with CSA-A23.1/A23.2.
- .2 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Use plain round bars as slip dowels in concrete.
 - .1 Install dowels into existing concrete using epoxy and in accordance with manufacturer's recommendations to the specified embedment depth.
- .3 Place sufficient number of joint dowel assemblies in advance of paver to avoid delay in concrete placement.
- .4 Remove oil, grease, dirt and deleterious material from reinforcing bars before placing concrete.
- .5 Prior to placing concrete, obtain Consultant approval of reinforcing material and placement.
- .6 Ensure cover of reinforcement is maintained during concrete pour.

3.5 PLACING

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Place concrete to lines, grades and depths as indicated.
- .3 Discharge concrete into forms as soon as practical after mixing.
- .4 Use hand placing where machine spreading is not feasible.
- .5 Spread uniformly with approved equipment to thickness sufficient to allow for proper consolidation and finishing. Do not apply external tractive force to paver.
- .6 Operate with continuous forward momentum. Schedule concrete supply to minimize interruptions.
- .7 When completing concrete placement for day, carry placement through to scheduled control joint location.
- .8 Where concrete placement is stopped for more than 30 min due to breakdowns, weather or other reasons, construct extra bulkhead and construction joint as directed by Consultant.
- .9 Do not place concrete on frozen surface.
- .10 No concrete shall be placed during rain.
- .11 When rain appears imminent paving operation should cease. Protect freshly laid concrete from rain damage and adverse weather condition and in accordance with

CSA A23.1/A23.2. Extend protective coverings over edges of concrete and arrange so as not to bear on unprotected edges.

- .12 Concrete placed when the ambient temperature is at or above 27 degrees C to be cured by continuous water curing from soaker hoses providing complete coverage of the pavement to minimize the temperature rise of the concrete.
- .13 When concrete has been placed in cold weather and the site temperature is expected to drop below 5 degrees C, insulating curing blankets or other suitable material shall be placed on the concrete pavement and weighted to prevent movement. Curing to continue until the cumulative number of days, or fraction thereof, during which the temperature of the concrete is above 10 degrees C, has totalled a minimum of 7 days. Alternatively, if compressive tests of cylinders cured under field conditions achieve at least 70% of the specified compressive strength, curing may be discontinued.
- .14 Concrete pavement placed in cool weather shall experience a minimum of 30 day air-drying period, following final curing, before first application of de-icing salts.

3.6 FINISHING

- .1 Finish concrete to CSA A23.1/A23.2.
- .2 Finishing of the concrete surface shall take place while the concrete is sufficiently plastic to achieve the desired grades, elevations and texture.
- .3 The surface shall be uniform, dense, free from undulations and projections, struck off true to grade and cross-sections, and finished with a float.
- .4 Excessive fines and water shall not be drawn to the surface.
- .5 Use procedures noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
- .6 Provide curing and protection for concrete to CSA A23.1, Clause 7.4.
- .7 Use curing compounds compatible with applied finish on concrete surfaces.
- .8 Where joints are formed rather than sawn, form longitudinal and transverse joints after final pass of finishing machine.
- .9 Hand finish areas inaccessible to finishing machines to same quality and surface characteristics as machine finished surfaces.
- .10 Finish concrete surface with approved float at proper time. Operate from edge to edge with wiping motion while advancing, with each succeeding pass overlapping previous one.
- .11 Check surface with approved 3.5 m long straightedge. Correct irregularities exceeding 5 mm before concrete takes initial set.
- .12 Finish edges of slabs with edging tool to form smooth squared surface. Do not patch with cement paste.
- .13 Localized defects shall be repaired using concrete.
- .14 Shrinkage cracking as a result of improper curing will be cause for rejection of the concrete element in question. The concrete must be removed and replaced at no cost to the Owner.

3.7 SURFACE FINISHING

- .1 Finish formed surfaces in accordance with CSA A23.1, Clause 7.7.
- .2 Surface texture:
 - .1 Broom finish on paved surfaces, unless otherwise indicated.
 - .2 Trowel finish for concrete planter curb.
- .3 Commence texturing immediately after float finishing.
- .4 Broom Finish: Use stiff bristled broom to produce nonslip concrete surface finish approved by Consultant, with fine granular texture free from disfigurations.
- .5 Texturing to be straight, precise and not damaging to pavement edges.
- .6 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.
- .7 Geometrical Requirements:
 - .1 2% slope for drainage to top of planter curbs.
- .8 Edges and joints are to be finished with a 75 mm edging tool.
- .9 Smooth all tooled edges to a maximum depth of 1 mm.

3.8 TOLERANCES

- .1 Finished concrete surface to be within 5 mm of design grade but not uniformly high or low.
- .2 Finished concrete surface not to have irregularities exceeding 3 mm when checked with 3 m straight edge placed in any direction.

3.9 JOINTS

- .1 General:
 - .1 Construct joints plumb, straight and square to details indicated.
 - .2 Install preformed joint filler at locations and to details indicated.
 - .3 Install isolation joints around structures and features that project through, into or against pavement.
- .2 Contraction joints:
 - .1 Install tooled contraction joint in slabs on grade at locations indicated after floating, when concrete is stiff but still plastic.
 - .2 Contraction joints shall be formed to a depth that is 0.25 of slab thickness and 6mm in width.
- .3 For expansion / isolation joints:
 - .1 Locate and form expansion and isolation joints as indicated.
 - .2 Isolation joints shall be installed where new concrete abuts rigid objects, walls, buildings, or changes in direction and as shown on plans.
 - .3 Install premoulded joint filler in expansion and isolation joints from bottom of slab to within 6mm of finished surface to CSA A23.1/A23.2. Finished joint should not deviate in horizontal alignment more than 6mm from a straight line.
 - .4 Furnish filler for each joint in single piece for depth and width required for joint.

- .5 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .6 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 6mm of slab surface unless indicated otherwise.
- .7 Provide full depth joint at end of day's construction or when concrete placement is interrupted for more than 30 minutes.
- .4 Sealing:
 - .1 Seal joints before allowing vehicular traffic on new pavement.
 - .2 Provide Consultant with copy of sealant manufacturer's instructions for application.
 - .3 Just prior to sealing joint, clean with compressed air or flush with high pressure water to remove laitance, curing compound and protrusions of hardened concrete. Clean and dry by compressed air to remove loose and foreign material.
 - .4 Do not apply joint sealant in rainy weather or when ambient temperature is less than 5 degrees C.
 - .5 Insert approved filler and bond breaking material in joint prior to applying sealant, then fill joint from bottom up with sealant to avoid trapping air.
 - .6 Prepare sealant for application using equipment and methods in accordance with manufacturer's instructions.
 - .7 Apply sealant strictly in accordance with manufacturer's recommendations with special attention to temperature ranges for safe heating and for application of hot poured sealants and cleanliness of concrete to be bonded.
 - .8 On completion of first application of sealant, return and top up any underfilled areas.
 - .9 Replace sealant which fails to bond to concrete or fails to cure properly, as directed by Consultant.

3.10 BACKFILL

- .1 Allow concrete to cure for 7 days prior to backfilling.
- .2 Backfill to designated elevations with material as directed by Consultant. Compact and shape to required contours as indicated.

3.11 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.

3.12 PROTECTION

- .1 Keep vehicular traffic off newly paved areas until paving has properly cured and joints have been sealed.

3.13 SCHEDULE: ARCHITECTURAL FINISHES

- .1 The following shall be designated 'Architectural' finished elements of the project, requiring measures as noted above:
 - .1 Curbs and sidewalks.

END OF SECTION

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Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's instructions, printed product literature and data sheets for furniture and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit shop drawings indicating dimensions, sizes, assembly, anchorage and installation details for each furnishing specified.

1.2 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for care and cleaning of site furnishings for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect furnishings from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 BENCH

- .1 Acceptable Product:
 - .1 Comfort™ Series Bench Model #02JH3899, surface-mounted, backless plastic coated steel bench, no arms, complete with stainless steel tamper-proof fastenings.
 - .2 Manufacturer: Barco Products, 165 Summerlea Road, Brampton, ON L6T 4P6
Tel. 1-855-337-4815
- .2 Dimensions: 1830 mm length (6')
- .3 Base Type:
 - .1 Surface-mounted.
 - .2 Benches to be anchored to concrete pavement with stainless steel anti-vandal anchors, to be provided by Contractor.

- .4 Finish:
 - .1 Bench seat: Premium-grade, weather and vandal resistant thermoplastic coating, colour to be red.
 - .2 Frame: Heavy-gauge Black powder-coated steel tubular frame.
- .5 Quantity: 2 units

Part 3 Execution

3.1 INSTALLATION

- .1 Assemble furnishings in accordance with manufacturer's written recommendations.
- .2 Install and anchor as indicated.
- .3 Touch-up damaged finishes to approval of Consultant.

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

3.3 PROTECTION

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

END OF SECTION

Part 1 General

1.1 PAYMENT

- .1 Testing of topsoil: Owner will pay for cost of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.

1.2 REFERENCE STANDARDS

- .1 Agriculture and Agri-Food Canada
 - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Council of Ministers of the Environment
 - .1 PN1340-2005, Guidelines for Compost Quality.

1.3 DEFINITIONS

- .1 Compost:
 - .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
 - .2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
 - .3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below (25) (50)), and contain no toxic or growth inhibiting contaminants.
 - .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category A.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality control submittals:
 - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.
 - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.
- .2 Divert unused soil amendments from landfill to official hazardous material collections site.
- .3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 TOPSOIL

- .1 Topsoil for planting beds (trees and shrubs) and sodded areas:
 - .1 Mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.
 - .2 Topsoil shall meet the following physical and chemical properties:
 - .1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70% sand, and 7 to 15% clay.
 - .2 Total organic matter, 10 to 18% by weight.
 - .3 pH: 6.5 to 8.0
 - .4 Electrical Conductivity: less than 2.5 milliSiemens/cm
 - .5 Fertility: major soil nutrients present in following amounts:
 - .1 Phosphorus (P): 10 to 60 ppm
 - .2 Potassium (K): 80 to 250 ppm
 - .3 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 - .3 Contain no toxic elements or growth inhibiting materials.
 - .4 Contains no weed seeds in quantities that cause noticeable weed infestations in the final planting bed.
 - .5 Finished surface free from:
 - .1 Debris and stones over 50 mm diameter.
 - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
 - .6 Consistence: friable when moist.

2.2 SOURCE QUALITY CONTROL

- .1 Advise Consultant of sources of topsoil to be utilized with sufficient lead time for testing.
- .2 Contractor is responsible for amendments to supply topsoil as specified.
- .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .4 Soil sampling, testing and analysis to be in accordance with Provincial standards.

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.
- .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 OF EXISTING GRADE

- .1 Verify that grades are correct.
 - .1 If discrepancies occur, notify Consultant and do not commence work until instructed by Consultant.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
 - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
 - .2 Remove debris which protrudes more than 50 mm above surface.
 - .3 Dispose of removed material off site.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
 - .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.3 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Place topsoil after Consultant has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 For sodded areas keep topsoil 15 mm below finished grade.
- .4 Spread topsoil as indicated to following minimum depths after settlement.
 - .1 150 mm for sodded areas.
 - .2 450 mm for planting beds.
- .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.4 FINISH GRADING

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
 - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Leave surfaces smooth, uniform and firm against deep footprinting.

3.5 ACCEPTANCE

- .1 Consultant will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.6 SURPLUS MATERIAL

- .1 Dispose of materials except topsoil not required off site.

3.7 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 91 19.13 - Topsoil Placement and Grading.

1.2 REFERENCE STANDARDS

- .1 Canada "Fertilizers Regulations" (C.R.C., c. 666), enabled under the Canada Statute "Fertilizers Act", R.S., 1985, c. F-10.
- .2 Canada "Seeds Regulations" (C.R.C., c. 1400), enabled under the Canada Statute "Seeds Act", R.S.C., 1985, c. S-8.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling:
 - .1 Schedule sod laying to coincide with preparation of soil surface.
 - .2 Schedule sod installation when frost is not present in ground.

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Schedule deliveries in order to keep storage at the job site to a minimum without causing delays.
- .2 Deliver, unload and store rolled sod on pallets only.
- .3 Do not deliver small, irregular or broken pieces of sod. Consultant will reject these.
- .4 During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling.
- .5 During dry weather, protect sod from drying. Water sod as necessary to ensure its vitality and prevent dropping soil in handling. The Consultant will reject dried-out sod.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Divert unused fertilizer from landfill to official hazardous material collections site.
- .2 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health and environmental hazard.

Part 2 Products

2.1 MATERIALS

- .1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
 - .1 Supply sod in standard-sized units and of a uniform thickness, rolled for easy handling.
 - .2 Turf Grass Nursery Sod types:
 - .1 Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.
 - .3 Turf Grass Nursery Sod quality:
 - .1 Not more than 1 broadleaf weed and up to 1% native grasses per 40 square metres.
 - .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 60 mm.
 - .3 Mowing height limit: 35 to 65 mm.
 - .4 Soil portion of sod: 6 to 15 mm in thickness.
- .2 Water:
 - .1 Free of impurities that would inhibit growth.
- .3 Fertilizer:
 - .1 To Canada "Fertilizers Act" and Fertilizers Regulations.
 - .2 Complete, commercial fertilizer, slow release containing maximum 35 % soluble nitrogen. Ratio to be 2:1:1.

2.2 SOURCE QUALITY CONTROL

- .1 Obtain written approval from Consultant of sod at source.
- .2 When proposed source of sod is approved, use no other source without written authorization from Consultant.

Part 3 Execution

3.1 PREPARATION

- .1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading. If discrepancies occur, notify Consultant and commence work when instructed by Consultant.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Fine grade surface free of humps and hollows to smooth, even grade, to elevations indicated, to tolerance of plus or minus 8 mm, for Turf Grass Nursery Sod, surface to drain naturally.
- .4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site.

3.2 SOD PLACEMENT

- .1 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.
- .2 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .3 Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.3 FERTILIZING PROGRAM

- .1 Apply fertilizer in accordance with manufacturer's instructions.

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 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
 - .1 Clean and reinstate areas affected by Work.

3.5 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following operations from time of installation until acceptance.
 - .1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
 - .2 Cut grass to 60 mm when or prior to it reaching height of 80 mm.
 - .3 Maintain sodded areas weed free 95%.
 - .4 Fertilization program:
 - .1 One month following sodding, apply fertilizer at 1 kg N / 100 m², follow with thorough watering. Application must be done before June 15 or after August 15.

3.6 ACCEPTANCE

- .1 Turf Grass Nursery Sod areas will be accepted by Consultant provided that:
 - .1 Sodded areas are properly established.
 - .2 Sod is free of bare and dead spots.
 - .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 60 mm.
 - .4 Sodded areas have been cut minimum 2 times prior to acceptance.
 - .5 Fertilizing in accordance with fertilizer program has been carried out at least once.
- .2 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.
- .3 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.

3.7 MAINTENANCE DURING WARRANTY PERIOD

- .1 Repair and resod dead or bare spots to satisfaction of Consultant.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 91 19.13 - Topsoil Placement and Grading.

1.2 REFERENCE STANDARDS

- .1 Agriculture and Agri-Food Canada (AAFC).
 - .1 Plant Hardiness Zones in Canada-2000.
- .2 Canadian Nursery Landscape Association (CNLA)
 - .1 Canadian Standards for Nursery Stock-2017.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 Canada "Fertilizers Regulations" (C.R.C., c. 666), enabled under the Canada Statute "Fertilizers Act", R.S., 1985, c. F-10.

1.3 DEFINITIONS

- .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Topsoil:
 - .1 Coordinate such that planting will immediately follow application of topsoil.
- .2 Plant Material:
 - .1 Schedule tree planting in spring season between May 15 and June 30 or fall season between September 1 and October 15. Ensure growing medium is frost free.
 - .2 Obtain approval from Consultant of schedule 14 days in advance of shipment of plant material.
- .3 Scheduling: obtain approval from Consultant of schedule 7 days in advance of shipment of plant material.
- .4 Plant schedule to include:
 - .1 Quantity and type of plant material
 - .2 Harvest dates
 - .3 Shipping dates
 - .4 Arrival dates on site
 - .5 Planting Dates

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 fertilizer, mycorrhiza, and mulch and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit samples of mulch.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
- .2 Protect plant material from damage during transportation:
 - .1 When delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
 - .2 When delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
 - .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
- .3 Immediately store and protect plant material which will not be installed within 2 hours after arrival at site in storage location approved by Consultant.
- .4 Protect stored plant material from frost, wind and sun and as follows:
 - .1 For pots and containers, maintain moisture level in containers. Heel-in fibre pots.
 - .2 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.
 - .3 Store plants in a shaded area.
- .5 Store and protect mulching material, fertilizer and mycorrhiza to prevent damage from moisture and contamination.
- .6 Store and manage hazardous materials in accordance with manufacturer's written instructions.

1.7 WARRANTY

- .1 Contractor hereby warrants that plant material as itemized on plant list will remain free of defects for:
 - .1 Two (2) full years from the date of substantial completion (if all plant material has been installed at this time) and upon acceptance by Consultant, providing adequate maintenance has been provided.
 - .2 Replacements required during the warranty period shall be plants of the same kind and size as shown in the plant list and on the drawings, furnished and planted as specified in the contract documents. The cost of replacement shall be the responsibility of the Contractor.
 - .3 Warranty shall include:
 - .1 Costs of labour and materials to inspect, remove, and replace plant materials.
 - .2 Correction or replacement of topsoil, if required to provide viable plant growing medium.
- .2 End-of-warranty inspection will be conducted by Consultant.

- .3 Consultant reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

Part 2 Products

2.1 PLANT MATERIAL

- .1 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.
 - .1 Source of plant material: grown in Zone 5a or colder.
 - .2 Plant material must be planted in zone specified as appropriate for its species.
 - .3 Plant material in location appropriate for its species.
- .2 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.
- .3 Each plant to be labelled by plant name and size. Labels shall be attached securely to all plants, bundles and containers of plant materials when delivered.
- .4 Substitution of plant materials will not be permitted unless authorized in writing by the Consultant.
- .5 Trees:
 - .1 With straight trunks, well and characteristically branched for species.
 - .2 Trunk of each tree shall be a single trunk unless otherwise specified, growing from a single un-mutilated crown of roots.
 - .3 Any trees with abrasion of the bark, sunscald, disfiguring knots or fresh cuts of limbs over 31mm which have not completely callused shall be rejected.
 - .4 Trees to be freshly dug and supplied balled and burlapped (B&B).
 - .1 Deciduous trees must be dug with large firm ball.
 - .2 For trees up to 100 mm in caliper, base size of rootball shall be based on caliper taken at 15 cm above natural ground level.
 - .3 Rootballs must include 75% of fibrous and feeder root system.
 - .4 Secure rootballs with 5 oz Hessian burlap, heavy twine, and rope.
 - .5 Protect rootballs against sudden changes in temperature and exposure to heavy rainfall.
 - .6 Frozen rootballs will be permitted, provided they are sufficiently protected to prevent breakage.
- .6 Shrubs:
 - .1 Container grown stock:
 - .1 Shrubs must have grown in container for minimum of one growing season, but not longer than two growing seasons.
 - .2 Root system must be able to hold soil when removed from container.
 - .3 Rootbound plants are not acceptable.
 - .4 Container stock must have been fertilized with slow release fertilizer.

2.2 WATER

- .1 Free of impurities that would inhibit plant growth.

2.3 MULCH

- .1 Shredded cedar bark fiber, free of weeds, bark chips, leaves or small branches.
- .2 Shredded wood: varying in size from 25 to 75 mm in length.
- .3 Wood mulch must not originate from diseased or insect infested trees, from treated wood products, or from sawdust of any tree.

2.4 FERTILIZER

- .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
 - .1 Commercial fertilizer containing maximum 35% water soluble nitrogen. Ratio to be 2:1:2.

2.5 MYCORRHIZAL INNOCULANT

- .1 Endomycorrhizal and Ectomycorrhizalfungi-based inoculant that contains several species of fungus which are compatible with deciduous trees. Packaged for individual planting holes, in biodegradable packets.
- .2 *Active* ingredients to include: Glomus intraradices, Pisolithus tinctorius, Rhizopogon sp., and Sclerotinia sp.

2.6 SOURCE QUALITY CONTROL

- .1 Obtain approval from Consultant of plant material prior to planting.

2.7 ACCEPTANCE OF PLANT MATERIAL

- .1 Plant material shall be inspected by the Consultant following delivery to the site. Any material not meeting the specification shall be rejected, and removed from the site by the Contractor.
- .2 This inspection shall not invalidate rejection of stock at later inspections, should it prove deficient or damaged due to Contractors activities.

Part 3 Execution

3.1 PRE-PLANTING PREPARATION

- .1 Proceed only after receipt of written acceptability of plant material from Consultant.
- .2 Remove damaged roots and branches from plant material.
- .3 Locate and protect utility lines.
- .4 Notify and acquire written acknowledgement from utility authorities before beginning excavation of planting pits for trees and shrubs.

3.2 EXCAVATION AND PREPARATION OF PLANTING BEDS

- .1 Establishment of sub-grade for planting beds in accordance with planting detail.

- .2 Preparation of planting beds in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.
- .3 For individual planting holes:
 - .1 Stake out location and obtain approval from Consultant prior to excavating.
 - .2 Excavate to depth and width as indicated.
 - .3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
 - .4 Scarify sides of planting hole.
 - .5 Remove water which enters excavations prior to planting. Notify Consultant if water source is ground water.

3.3 PLANTING

- .1 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball. Do not pull burlap or rope from under root ball.
- .2 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
- .3 Plant vertically in locations as indicated.
 - .1 Orient plant material to give best appearance in relation to structure, roads and walks.
- .4 For trees and shrubs:
 - .1 Plant to such depth that the finished grade level of the plant, after settlement, will be the same as that at which the plant grown, and so that the root flare is the finish grade.
 - .2 Apply mycorrhizal inoculant:
 - .1 Ensure new root growth is in contact with mycorrhiza.
 - .2 Use mycorrhiza as recommended by manufacturer's written recommendations.
 - .3 Backfill soil in 150 mm lifts.
 - .4 Tamp each lift to eliminate air pockets.
 - .5 When two thirds of depth of planting pit has been backfilled, fill remaining space with water.
 - .6 After water has penetrated into soil, backfill to finish grade.
 - .7 Form watering saucer as indicated.
- .5 Remove damaged or objectionable branches with clean, sharp tools to meet Canadian Standards for Nursery Stock. Do not prune leader.
- .6 Water plant material thoroughly. Open ended hoses are not permitted. Hoses must be fitted with watering wand.
- .7 After soil settlement has occurred, fill with soil to finish grade.

3.4 MULCHING

- .1 Ensure soil settlement has been corrected prior to mulching.
- .2 Spread mulch as indicated.

3.5 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following maintenance operations from time of planting to acceptance by Consultant.
 - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
 - .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
 - .2 Remove weeds.
 - .3 Replace or respread damaged, missing or disturbed mulch.
 - .4 Remove dead or broken branches from plant material.
 - .5 Reset plants to proper grades and upright position.
 - .6 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings. Plant material must be replaced during the warranty period, as required by the Consultant. Replacement of plants only at the end of the warranty period will not be acceptable.

3.6 ACCEPTANCE

- .1 Consultant will inspect and determine acceptance of installation and growth.

3.7 MAINTENANCE DURING WARRANTY PERIOD

- .1 From time of acceptance by Consultant 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 Reform damaged watering saucers.
 - .3 Remove weeds.
 - .4 Replace or respread damaged, missing or disturbed mulch.
 - .5 Apply fertilizer in early spring as indicated by soil test.
 - .6 Remove dead, broken or hazardous branches from plant material.
 - .7 Remove trunk protection, tree supports and level watering saucers at end of warranty period.
 - .8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

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

- .2 Divert discarded burlap, wire and plastic plant containers materials from landfill to plastic recycling facility.
- .3 Dispose of unused fertilizer at official hazardous material collection site.
- .4 Divert unused wood and mulch materials from landfill to composting facility.

END OF SECTION

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Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33.01 - Excavating, Trenching and Backfilling
- .2 Section 33 46 16 - Subdrainage

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³)).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-34.22-94, Asbestos-Cement Drain Pipe.
- .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 B182.2-11, PSM Type Polyvinylchloride (PVC) Sewer Pipe and Fittings.

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 drainage material 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 with manufacturer's written instructions and 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect drainage material from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.5 SITE CONDITIONS

- .1 Examine sub-surface investigation report which is bound into Project Manual.
- .2 Known underground utility lines and buried objects are as indicated on plans.

Part 2 Products

2.1 BEDDING AND SURROUND MATERIALS

- .1 Coarse filter aggregate: in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Fine filter aggregate: to CSA A23.1/A23.2.
- .3 Flexible plastic tubing and fittings: perforated nominal inside diameter 100 mm.

2.2 BACKFILL MATERIAL

- .1 Type 2, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Excavated or graded material existing on site may be suitable to use if approved by Consultant.

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 drainage materials 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.
- .2 Make sure graded subgrade, sub-base, base conforms with required drainage pattern before placing bedding material.
- .3 Make sure improper slopes, unstable areas, areas requiring additional compaction or other unsatisfactory conditions are corrected to approval of Consultant.
- .4 Make sure foundation wall, rigid insulation and dampproofing have been installed and approved by Consultant before placing bedding material.

3.2 BEDDING PREPARATION

- .1 Cut trenches in subgrade and place bedding materials in uniform layers not exceeding 150 mm compacted thickness and to depth as indicated.
- .2 Shape bed true to grade and to provide continuous, uniform bearing surface for tubing.
- .3 Shape transverse depressions, as required, to suit joints.
- .4 Compact each layer full width of bed to at least 95% of corrected maximum dry density.
- .5 Fill excavation below design elevation of bottom of specified bedding with compacted bedding material.

3.3 PIPE OR TUBING INSTALLATION

- .1 Make sure tubing interior and coupling surfaces are clean before laying.

- .2 Lay perforated tubing minimum to slope of 1:100. For pipe face perforations and coupling slots downward.
- .3 Lay non-perforated tubing to slope of 1:50 from perforated tubing to disposal area. Make joints watertight.
- .4 Grade bedding to establish pipe slope.
- .5 Install end plugs at ends of collector drains to protect pipe ends from damage and ingress of foreign material.
- .6 Connect non-perforated pipe to existing building drains drain by appropriate adapters manufactured for this purpose.
- .7 Provide cleanouts on non-perforated pipe at changes of pipe direction and in runs greater than 15 m.
- .8 Connect drainage system to building storm sewers, as indicated.

3.4 PIPE OR TUBING SURROUND MATERIAL

- .1 Upon completion of pipe laying and after Consultant has inspected and approved Work in place, surround and cover pipe and install geotextile filter.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness, as indicated. Do not drop material within pipe.
- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Compact each layer from pipe invert to mid-height of pipe to at least 95% of corrected maximum dry density.
- .5 Compact each layer from mid-height of pipe to underside of backfill to at least 90% of corrected maximum dry density.
- .6 Place low strength unshrinkable fill where compaction cannot be achieved using mechanical methods.

3.5 BACKFILL MATERIAL

- .1 Place backfill material above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .2 Under paving and walks, compact backfill to at least 95% corrected maximum dry density. In other areas, compact to at least 90% corrected maximum dry density.
- .3 Use appropriate compaction equipment.
 - .1 Conduct hand tamping around confined areas of pipe.
 - .2 Do not use water or other hydraulic means to place or consolidate backfill material.

3.6 FOUNDATION

- .1 Make penetrations through foundation structures only after receipt of written approval from Consultant.

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

PART 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

- .1 Ontario Provincial Standard Specifications (OPSS)
 - 1. OPSS 405 – November 2008, Construction Specification for Pipe Subdrains.
 - 2. OPSS 1003 – November 2006, Specification for Aggregates – Hot Mix Asphalt.
 - 3. OPSS 1840 – April 2011, Material Specification for Non-Pressure Polyethylene(PE) Plastic Pipe Products.
 - 4. OPSS 1860 – November 2010, Material Specification for Geotextiles.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Inform Departmental Representative of proposed source of bedding and filter materials and provide access for sampling at least 4 weeks prior to commencing Work.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit manufacturer's instructions, printed product literature and data sheets for pipes, pipe fittings, granular materials and geotextiles, including product characteristics, performance criteria, physical size, finish, limitations and proof of conformance to referenced 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.

PART 2 Products

2.1 PLASTIC PIPE FOR SUBDRAINS

- .1 Non-perforated High Density Polyethylene Pipe (HDPE)
 - .1 Stiffness of 320 kPa.
 - .2 Nominal diameter of 100 mm.
 - .3 Double wall corrugated profile.
 - .4 Conform to requirements of OPSS 1840.
- .2 Perforated HDPE pipe
 - .1 Pipe to be pre-wrapped by supplier with geotextile meeting the requirements of OPSS 1860.
 - .2 Stiffness of 320 kPa.
 - .3 Nominal diameter of 100 mm.
 - .4 Double wall corrugated profile.
 - .5 Conform to requirements of OPSS 1840.

- .3 Bedding and granular filter material to meet the requirements of OPSS 1003 HL4 Coarse Aggregate.
- .4 Geotextile surrounding granular filter material shall conform to OPSS 1860, and be non-woven, Class 1.

PART 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: Verify that conditions of substrate provided by excavation are acceptable for sub-drainage 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.

3.2 TRENCHING

- .1 Do trenching and backfilling in accordance with Section 31 23 33.01 – Excavating Trenching and Backfilling. Width of trench not to exceed 450 mm.
- .2 Place bedding and filter material after approval of trench by Departmental Representative.

3.3 BEDDING

- .1 Place minimum 50 mm layer of bedding material to full trench width and compact to minimum 95% of corrected maximum dry density.

3.4 INSTALLATION OF PIPE SUB-DRAINS

- 1. Lay pipe drains on prepared bed, true to line and grade with inverts smooth and free of sags or high points.
- 2. Ensure barrel of each pipe is in contact with bed throughout full length.
- 3. Begin laying at outlet and proceed in upstream direction.
- 4. Make joints tight in accordance with manufacturer's instructions
- 5. Make watertight connections to existing drains, existing manhole and storm sewer where indicated or as directed by Departmental Representative.
- 6. Plug open upstream ends of pipes with watertight plugs or caps.
- 7. Surround and cover drain with filter material in uniform 150 mm layers to an elevation of at least 150 mm above top of drain and compact to at least 95% of corrected maximum dry density.
- 8. Backfill remainder of trench to Section 31 23 33.01 – Excavating Trenching and Backfilling.
- 9. Do not place bedding surround and backfill materials in frozen condition.

10. Protect sub-drains against flotation during installation. Do not lay pipe in water or on wet bed.

3.5 CLEANING

- .1 Leave Work area clean and secure at end of each day.
- .2 Upon completion, remove surplus materials, rubbish, tools and equipment.

END OF SECTION

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Conseil des
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de l'Est de l'Ontario

École Le Prélude – Music Room

Conseil des Écoles Publiques de l'Est de l'Ontario
6025 Promenade Longleaf
Orléans, Ontario

Appendix A – Geotechnical Report

May 3, 2018

Client Project No: GFER-16-009
Civitas Project No: 1553





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**GEOTECHNICAL INVESTIGATION
PROPOSED CHAPEL HILL ELEMENTARY SCHOOL
LONGLEAF DRIVE AT APPLE LEAF WAY
CITY OF GLOUCESTER, ONTARIO**

Prepared For

Conseil des écoles publiques de l'Est de l'Ontario

July 22, 1999

Report No. G7458-1

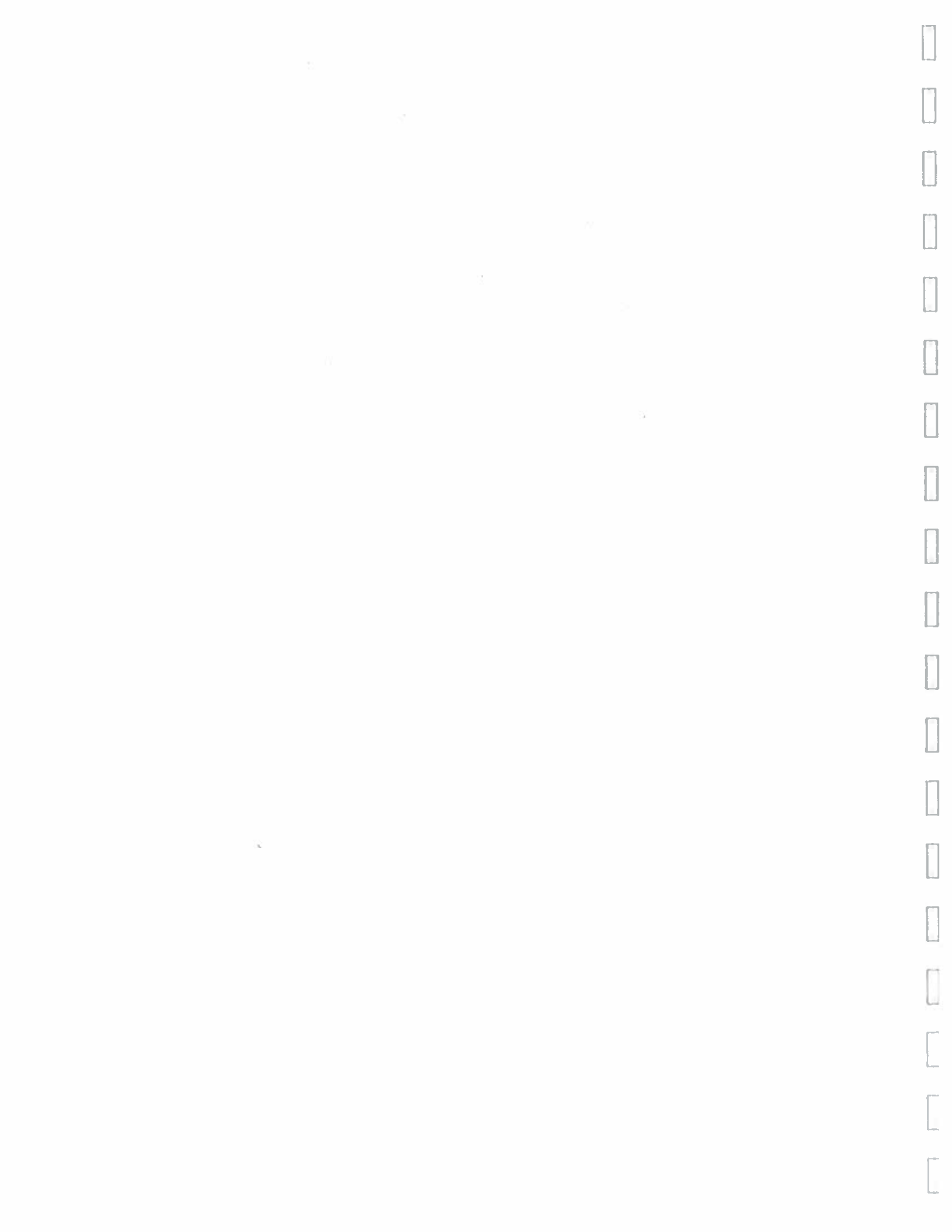


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APPENDICES

Appendix 1	Soil Profile & Test Data Sheets Symbols and Terms
Appendix 2	Figure 1 - Key Plan Drawing No. G7458-1 - Test Hole Location Plan



1.0 INTRODUCTION

At the request of Mr. Philip Benoit, with the Conseil des écoles publiques de l'Est de l'Ontario, this firm conducted a geotechnical investigation for a proposed elementary school on Longleaf Drive in the City of Gloucester, Ontario. The investigation was carried out in accordance with our letter of quotation File: G7458-01.PRO, dated July 12, 1999.

The subject property occupies a parcel of land on the southwest side of Longleaf Drive in Chapel Hill South. More specifically, the site consists of Part of Lot 7, Concession 3 (Ottawa Front), Township of Gloucester, (being proposed Blocks 118 and 121 on Draft Plan M-PLan).

It is our understanding, that the proposed school building will consist of a two (2) storey slab-on-grade structure. The remainder of the site will consist of asphaltic paved roadways, parking lots and landscaped areas.

The property is currently vacant, along with the majority of the adjoining lands, which are designated residential lots. The location and proposed layout of the site are shown in Figure 1 - Key Plan and on Drawing No. G7458-1 - Test Hole Location Plan, both included in Appendix 2 of this report.

This report has been prepared specifically and solely for the aforementioned project. It contains all of our findings and includes geotechnical recommendations pertaining to the design and construction of the project as it is understood.



2.0 METHODOLOGY

2.1 Fieldwork Program

The fieldwork was conducted during the interim of July 16 to July 19, 1999, and consisted of the placement of eight (8) boreholes. Two (2) shallow boreholes were placed in proposed parking lot and access roadways, while the remaining six (6) boreholes were placed in the area of the proposed school building and a future addition. The borehole locations are shown on the Test Hole Location Plan in Appendix 2.

The boreholes were conducted by means of a track-mounted CME-55 drill rig operated by a crew of two (2), under the full-time supervision of an engineer from our geotechnical department. All boreholes were backfilled with excavated materials prior to leaving the site.

2.2 Sampling Program

The soil profile encountered at each borehole location was recorded. All samples were initially classified in the field based on their textural classification. Occasional soil samples were recovered using a split spoon sampler in conjunction with the associated Standard Penetration Test (SPT). The results of the SPT's are recorded as "N" values on the Soil Profile & Test Data sheets in Appendix 1.

Undrained shear strengths along with the remoulded strength of the cohesive soils (silty clay) were measured in the boreholes at selected depths using a field vane. The depths at which the split spoon samples and field vanes were obtained from the boreholes are shown as "SS" and "FV", respectively, on the Soil Profile & Test Data sheets.



Piezometers were installed in the six (6) deep boreholes to enable the measurement of the stabilized groundwater levels following the drilling procedure.

Sample Storage

All samples will be stored in the laboratory for a period of three months after issuance of this report. They will then be discarded unless we are otherwise directed.

2.3 Survey

The borehole locations were determined in the field by John D. Paterson and Associates Limited personnel.

The ground surface elevations at the borehole locations were determined by means of a levelling survey conducted by John D. Paterson and Associates Limited personnel. The top spindle of the fire hydrant located on the north side of Longleaf Drive opposite the north corner of the subject site was utilized as the benchmark. According to the topographic plan provided by Annis, O'Sullivan, Vollebekk Ltd., the top spindle of the fire hydrant had an Elevation = 87.21 m. The approximate location of the fire hydrant is shown on the Test Hole Location Plan.



3.0 OBSERVATIONS

3.1 Surface Conditions

The subject property is currently vacant and vegetated by sparse grass with occasional shrubs. A dirt road runs north-south through the middle of the plot of land with a shallow ditch along the western edge of the road and a small ditch section heading eastward off of the gravel road in the central portion of the site. Both ditches were dry at the time of the investigation.

In general, the site surface is relatively flat, although it undulates significantly on a localized scale. This is primarily the result of previous stripping and filling operations which have taken place on the subject site.

3.2 Subsurface Profile

In general, the soil profile encountered at the borehole locations was observed to consist of fill and/or topsoil over a silty sand deposit, which is underlain by a silty clay stratum. Reference should be made to the Soil Profile & Test Data sheets for specific details of the soil profile at each borehole location.

The fill material, encountered primarily in Boreholes 1, 2 and 3 consisted of silt and clay with occasional sand, gravel and construction debris.

The in situ silty sand deposit was observed to range in thickness from 0 to 700 mm and was classified as loose to compact in relative density.

The most significant soil deposit was the silty clay deposit, the thickness of which was not determined, although it is considered to be a relatively deep deposit. Based on the field shear vane testing the silty clay deposit encountered in the boreholes was classified as very stiff to firm in consistency.



The client should be aware that any information pertaining to the soils and all borehole logs are furnished as a matter of general information only, and borehole descriptions are not to be interpreted as descriptive of conditions at locations other than those described by the test locations themselves.

3.3 Groundwater

The measured stabilized groundwater depths and associated groundwater surface elevations are listed below. The groundwater measurements indicate a stabilized groundwater surface elevation ranging between approximately 83 to 85 m. However, the water levels measured in Boreholes 6 and 8 are not considered to be representative of the stabilized water table on the subject site.

Fluctuations in the groundwater table should be anticipated throughout the year with elevated water levels expected in seasonally wet periods, such as spring, and following substantial precipitation events.

Table 1 Groundwater Levels			
Borehole Number	Stabilized Water Depth (m)	Water Surface Elevation (m)	Recording Date (dd/mm/yy)
BH 3	1.35	85.1	19/07/99
BH 4	1.8	84.3	"
BH 5	2.5	83.8	"
BH 6	3.1	83.05	"
BH 7	2.59	83.6	"
BH 8	3.6	82.7	"



4.0 DESIGN AND CONSTRUCTION CONSIDERATIONS

4.1 Geotechnical Assessment

It is our understanding that the proposed elementary school will consist of a two (2) storey slab-on-grade structure with interior load-bearing masonry walls. The school development will include an asphaltic concrete parking lot area to the north of the school building with vehicle access provided off of Longleaf Drive. A bus loop is proposed for the east side of the site, between the school building and Longleaf Drive.

Based on the subsurface information gathered during the geotechnical investigation, the native silty clay deposit is considered to be a suitable bearing medium for the support of spread footings for the proposed building structure. However, the compressible nature of the underlying silty clay deposit will limit grade raises on the subject site.

4.2 Site Grading and Preparation

Stripping Depth

All organic-rich soil (topsoil) and unsuitable fill materials encountered within the proposed building area, roadways and parking lots should be removed prior to the placement of granular materials or concrete for footings. According to the soil profiles encountered at the borehole locations, the anticipated average stripping depth will be approximately 200 mm below the existing grade, although localized deeper areas may be encountered.

All prepared bearing media and subgrade surfaces should be inspected by geotechnical personnel prior to the placement of new fill materials or concrete for footings.



Grade Raise Restriction

Previous works conducted in the vicinity of the subject property have indicated that the silty clay deposit is susceptible to consolidation under applied loads and/or the lowering of the water table within the clay deposit. Consolidation testing was not carried out specifically for the subject site. However, significant grade raises are not anticipated for the subject development.

For the subject development, it was expected that the finished floor of the school would reside approximately 600 mm above the level of Longleaf Drive, which would place the finished floor at an approximate Elevation of 86.6 metres. Based on a review of the current topographic plan provided by Annis, O'Sullivan, Vollebakk Ltd. the existing grade around the building would be raised by approximately 300 to 400 mm.

Assuming a finished floor Elevation of 86.6 m, the associated grade raises are not be expected to result in significant consolidation of the underlying clay deposits, and ultimately settlement of the subject structure. It is recommended that grade raises be restricted where practical, and that precautions be taken to minimize groundwater drawdown within the clay deposit.

If the finished floor elevation is greater than that noted above or more significant grade raises are planned, it is recommended that the grading plan be reviewed by the geotechnical consultant and, if warranted by grading concerns, that settlement analyses be conducted to ensure that the settlements will be within tolerable limits.

The potential effects of groundwater drawdown within the silty clay deposit can be minimized by the placement of clay dykes at 50 to 75 metre intervals along service trenches placed below the water table in the clay deposit. The dykes should be a minimum of 1.0 metre in length and should extend across the full width of the trench through the bedding and granular cover material.



Granular Materials

All backfill used for grading beneath building areas should consist of clean, sand and gravel or crushed rock, such as OPSS Granular B Type I or Type II material. This material should be tested and approved prior to delivery to the site. The fill should be placed in lifts no greater than 200 to 300 mm and compacted using suitable compaction equipment. Fill placed beneath the building areas should be compacted to at least 95 percent of its standard Proctor maximum dry density.

4.3 Foundation Design

Bearing Media/Allowable Bearing Pressures (Footings)

Founding conditions at the site are considered to be favourable for the construction of the proposed structure at a shallow founding depth. Based on the soil profile encountered at the site, it is anticipated that the founding medium will consist of silty clay. Allowable bearing capacities for footings constructed on in situ silty clay are summarized below. The bearing capacities provided were based on a maximum footing width of 1.2 metres for strip footings and 2.0 metre for column footings.

Table 2 Allowable Bearing Capacities	
Bearing Medium	Allowable Bearing Capacity
Silty Clay (Above Elevation of 85.0 metres)	120 kPa
Silty Clay (Below Elevation of 85.0 metres)	75 kPa

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The above noted bearing pressures are based on footings being constructed on undisturbed in situ soil bearing surfaces. An undisturbed in situ soil bearing surface consists of one from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, fill and organic-rich deposits, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings or select granular fill.

It is recommended that the geotechnical consultant be retained to provide inspection services during construction, in order that all bearing media and subgrades can be evaluated upon exposure.

Lateral Support to Bearing Media

In situ soil bearing media under a footing should be provided with sufficient lateral support. Lateral support is provided when a plane extending down and out from the bottom edge of the footing at a minimum of 1H:1V, and preferably 1.5H:1V, passes only through in situ soil or a material of the same or higher capacity as the bearing soil. Where the soil is a saturated silty sand, the above-noted lateral support criteria should be increased to 2H:1V and 3H:1V, respectively.

Settlement

Detailed settlement analyses were not performed for this investigation. However, footings designed to the allowable soil pressures detailed under this subsection will experience total and differential settlement. The allowable soil pressures have been chosen, based on an interpretation of our field observations, and our experience, to keep settlements within tolerable limits. It is taken that total footing settlements of 25 mm and differential settlements, between adjacent footings, of 15 mm, or an angular distortion of $L/300$ are tolerable to the proposed structure.

The silty clay deposit is susceptible to consolidation under applied load. The amount of consolidation that will occur from the expected grade raise, with no drawdown of the water table in the clay deposit, will depend on the areal extent of the grade raise and the magnitude of the foundation loads from the proposed structure. For the type of structure planned and the anticipated grade raises the settlements should be tolerable.



Frost Protection

Perimeter footings are required to be insulated against the destructive forces of frost action. A minimum of 1.5 metres of soil cover, or the equivalent, should normally be provided for exterior "heated" footings (footings adjacent to a heated space). Exterior unheated footings, for structural elements such as exterior canopy pier footings and wing walls, are more prone to deleterious movements associated with frost action than the exterior walls of the structure and will require additional protection, such as a soil cover of 2.1 metres or equivalent.

It is not expected that an insulated foundation design will be utilized for the subject development. Insulation details can be provided upon request.

Groundwater Control

It is expected, that the majority of excavations will be carried out above the identified groundwater levels, and as a result, the rate of groundwater flow into most excavations will be relatively low. Water infiltration into deeper excavations will likely range from low to moderate depending upon permeability of the soil encountered. It is anticipated that groundwater infiltration will be controllable by pumping from open sumps. Elevated water levels will be encountered during particularly wet seasons or immediately following a significant precipitation event.

The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding and/or subgrade media.

The contractor should also be aware of the susceptible nature of the in situ soils to disturbance during construction activities. The fine grained soils will be easily disturbed, particularly those with high moisture contents. Construction procedures should be adopted that will minimize equipment and personnel traffic over prepared subgrade surfaces.

Winter Construction

In the event of construction during winter months, founding media are required to be protected from freezing temperatures by the use of straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavation should be insulated from sub-zero temperatures immediately upon exposure, until the time that heat can be supplied to the building and foundations have sufficient soil cover to prevent freezing of the bearing medium.

4.4 Slab-on-Grade Construction

With the removal of all fill, topsoil and deleterious materials (including disturbed in situ soil), the native soils are suitable subgrade media on which to backfill for floor slab construction. The clay fill observed on site is not considered suitable as sub-slab fill material. It is recommended that OPSS Granular B Type I of Type II fill materials be utilized as sub-slab fill with the upper 200 mm of sub-slab fill consisting of Granular A crushed stone material.

4.5 Foundation Drainage and Backfill

It is recommended that a perimeter drainage system be provided for the proposed structure. Such a system should consist of a 100 mm diameter perforated corrugated plastic pipe, surrounded by 150 mm of 10 mm diameter clear crushed stone, placed adjacent to the exterior edge of the footing around the perimeter of the structure. The drainage tile/pipe should be provided with a filter cloth to prevent fine grained particles entering and clogging the pipe. The drainage pipe should be connected to the storm sewer or a sump pit allowing for sufficient gravity flow.



The foundation wall backfill should consist of free-draining non-frost susceptible granular material, such as clean sand or OPSS Granular B Type I material to provide adequate drainage of the foundation wall backfill. An alternative solution is to attach a prefabricated drainage membrane to the exterior of the foundation wall. It is also recommended that the exterior grade adjacent to structures be sloped to shed surface water away from the foundations.

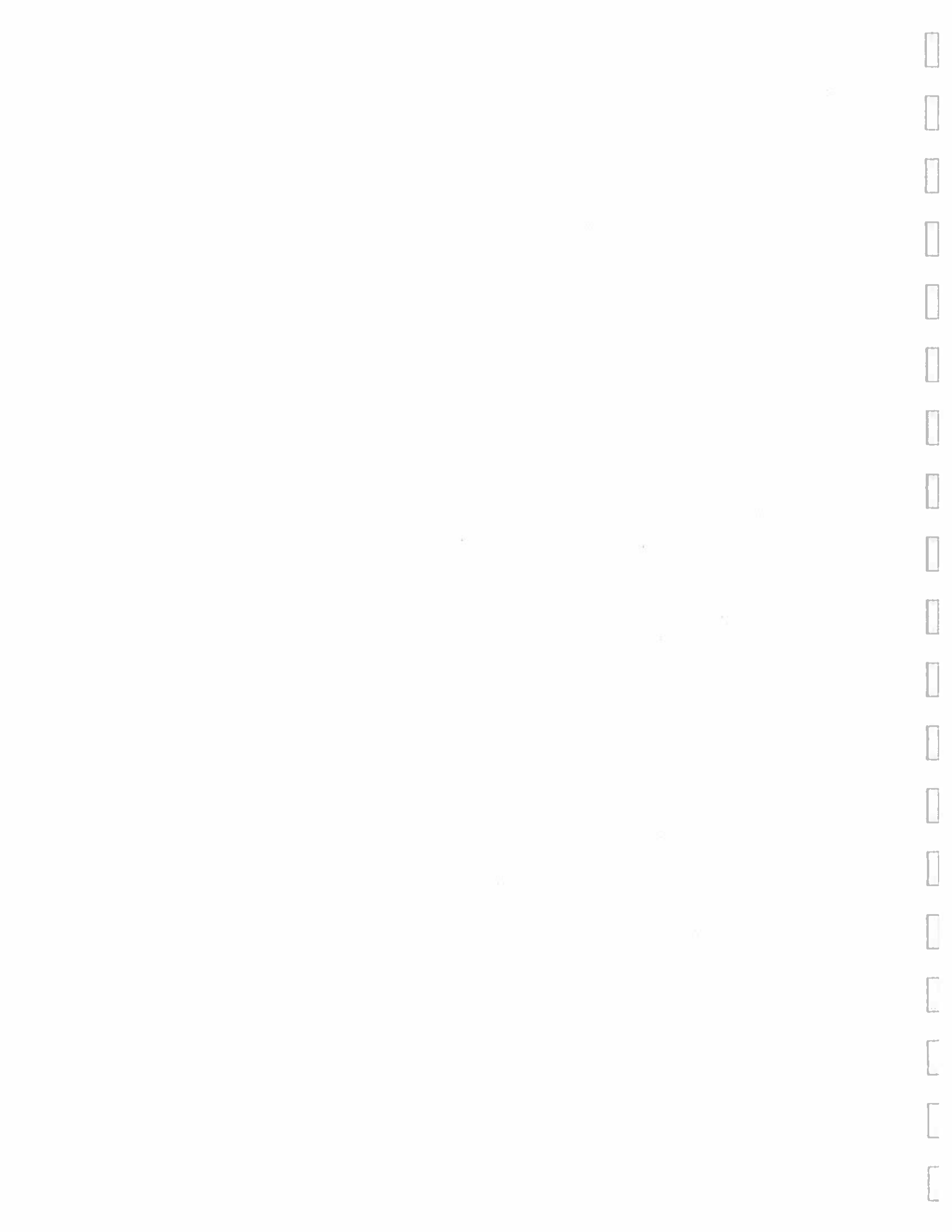
4.6 Excavation Support

Excavations for the building foundations will be relatively shallow and can be unsupported open cuts. A minimum excavation slope inclination of 1H:1V is recommended, assuming that the foundation excavation base will be above the groundwater table.

It is recommended that a trench box be used at all times to protect men working in trenches with steep or vertical sides. It is expected that services will be installed by cut and cover methods and excavations will not be left open for extended periods of time.

4.7 Pavement Design

With the complete removal of all fill, topsoil and disturbed native soil, the in situ soils are suitable subgrade media for pavement construction. Typical minimum pavement material thicknesses for the roadways and parking lot structures are provided on the following pages. All granular base and subbase materials are required to be compacted to a minimum of 95 percent of their standard Proctor maximum dry density values.



Subgrade

It is expected that a combination of in situ silty sand and silty clay will be compose the subgrade media. All expected subgrade media are suitable materials provided proper subgrade preparation is undertaken during construction. If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type I or II material.

Granular Base and Subbase Materials

It is our recommendation that OPSS Granular A and B Type II materials consist entirely of crushed rock, rather than crushed gravel, because crushed rock has significantly better structural qualities than sand based materials.

Table 3 Light Duty Pavement - Car Parking Only	
Thickness (mm)	Material Description
50	HL-3 - Asphaltic Concrete
150	BASE - OPSS Granular A crushed stone material
300	SUBBASE - OPSS Granular B Type II crushed stone material
-	SUBGRADE - Either in situ soils or OPSS Granular B Type II (or Type I) material placed over in situ soils

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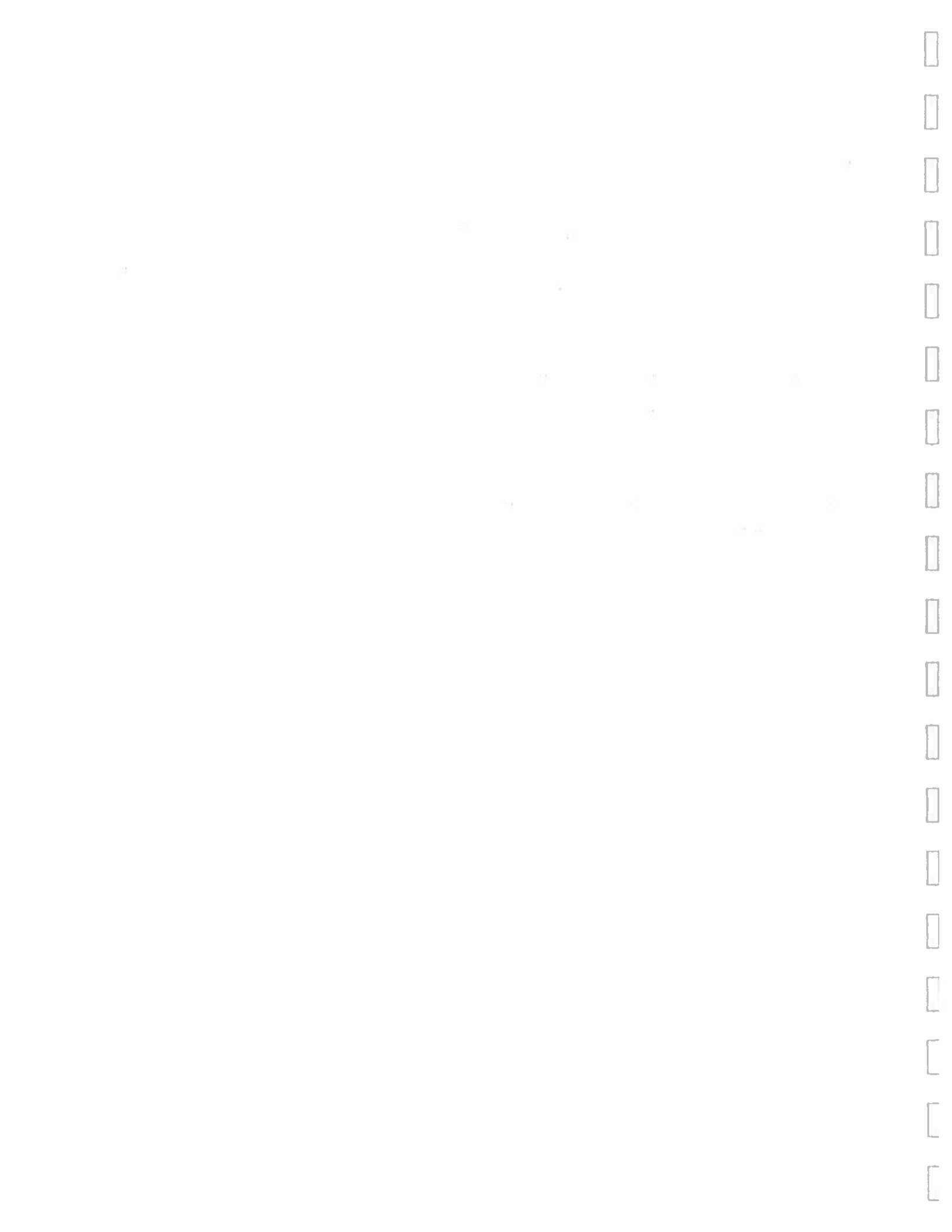
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Table 4 Heavy Duty Pavement - Roadways and Fire Lanes	
Thickness (mm)	Material Description
40	HL-3 - Asphaltic Concrete
40	HL-8 - Asphaltic Concrete
150	BASE - OPSS Granular A crushed stone material
400	SUBBASE - OPSS Granular B Type II crushed stone material
-	SUBGRADE - Either in situ soils or OPSS Granular B Type II (or Type I) material placed over in situ soils



5.0 INSPECTION SERVICES

The use of the allowable bearing pressures contained in this report for the design of the foundation is conditional on footings being constructed on undisturbed in situ soil bearing surfaces, approved as such by this firm.

A geotechnical inspection program is recommended, whereby the following aspects of construction are inspected.

- Inspection of all bearing surfaces prior to placing concrete for footings or select granular material for engineered bearing medium, if required.
- Inspection of in situ soil subgrades prior to backfilling and, where necessary, follow up field density tests, to ensure that the specified level of compaction has been achieved.
- Inspection of the installation of foundation insulation, if required.
- Concrete testing of structural elements, footings, etc.

The completion of an inspection program of this type will result in the issuance of an engineering report confirming that these works have been completed in the recommended manner.



6.0 CLOSURE

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review our recommendations when your drawings and specifications are complete.

A soils investigation of this nature is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, we request that we be notified immediately in order to permit reassessment of our recommendations.

JOHN D. PATERSON AND ASSOCIATES LIMITED

Mark S. D'Arcy, P. Eng.



Carlos P. Da Silva, P.Eng.

Report Distribution:

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APPENDIX 1

SOIL PROFILE & TEST DATA SHEETS

SYMBOLS AND TERMS





Geotechnical Investigation
Prop. Chapel Hill Elem. School, Longleaf Drive
Gloucester, Ontario

DATUM TBM - Top spindle of fire hydrant located opposite north corner of subject site. Approx. geodetic elevation = 87.21m.

FILE NO. **G7458**

REMARKS

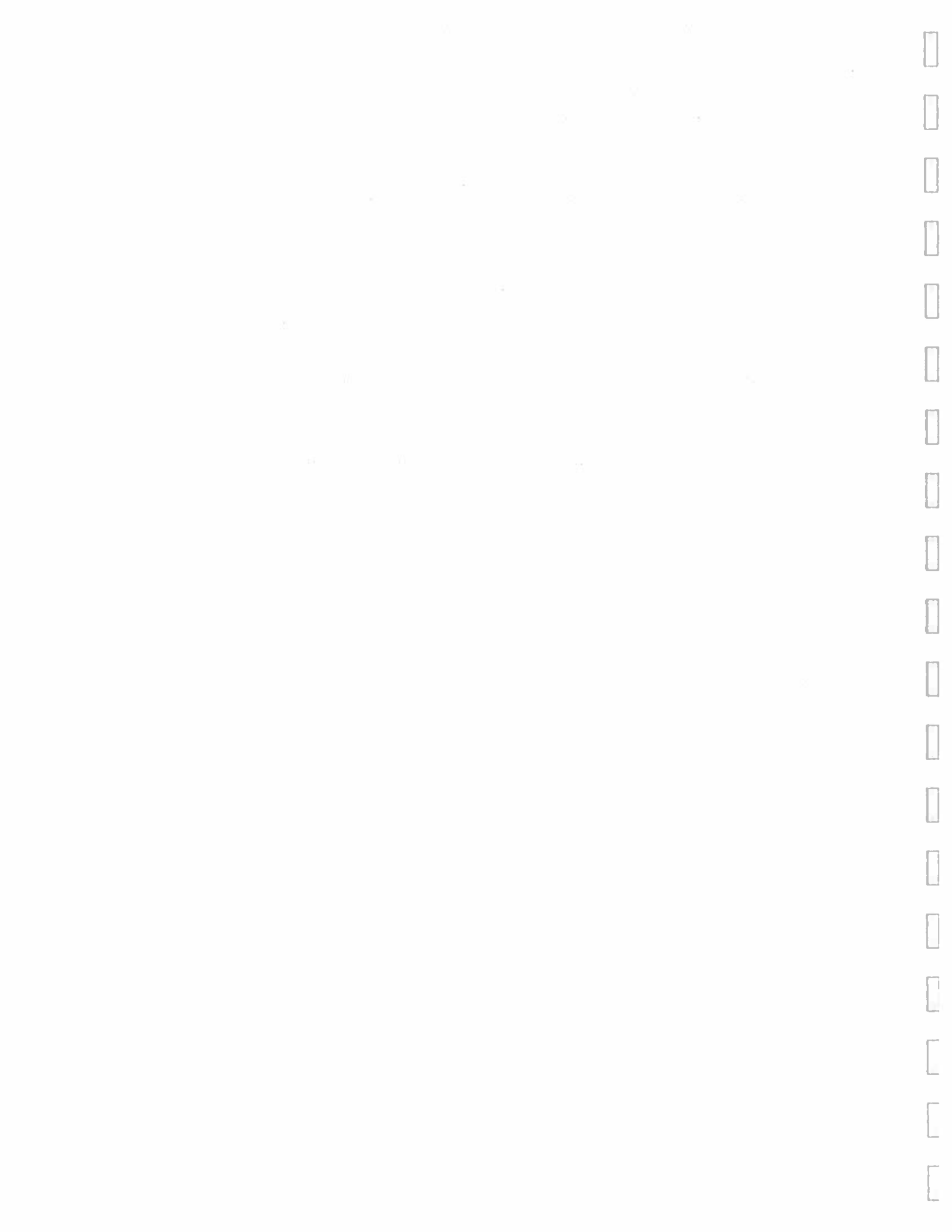
HOLE NO. **BH 1**

BORINGS BY CME 55 Power Auger

DATE 16 July 1999

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	86.45					
FILL: Grey, mixture of clay, silt and sand	[Hatched Pattern]											
Dark brown silty TOPSOIL	[Solid Black]											
Stiff, reddish brown SILTY CLAY	[Diagonal Hatching]	SS	1	58	6	1	85.45					
End of Borehole		FV	2									
(BH dry upon completion)												

Shear Strength (kPa)
 ▲ Undisturbed △ Remoulded



SOIL PROFILE & TEST DATA

**Geotechnical Investigation
Prop. Chapel Hill Elem. School, Longleaf Drive
Gloucester, Ontario**

DATUM TBM - Top spindle of fire hydrant located opposite north corner of subject site. Approx. geodetic elevation = 87.21m.

FILE NO. **G7458**

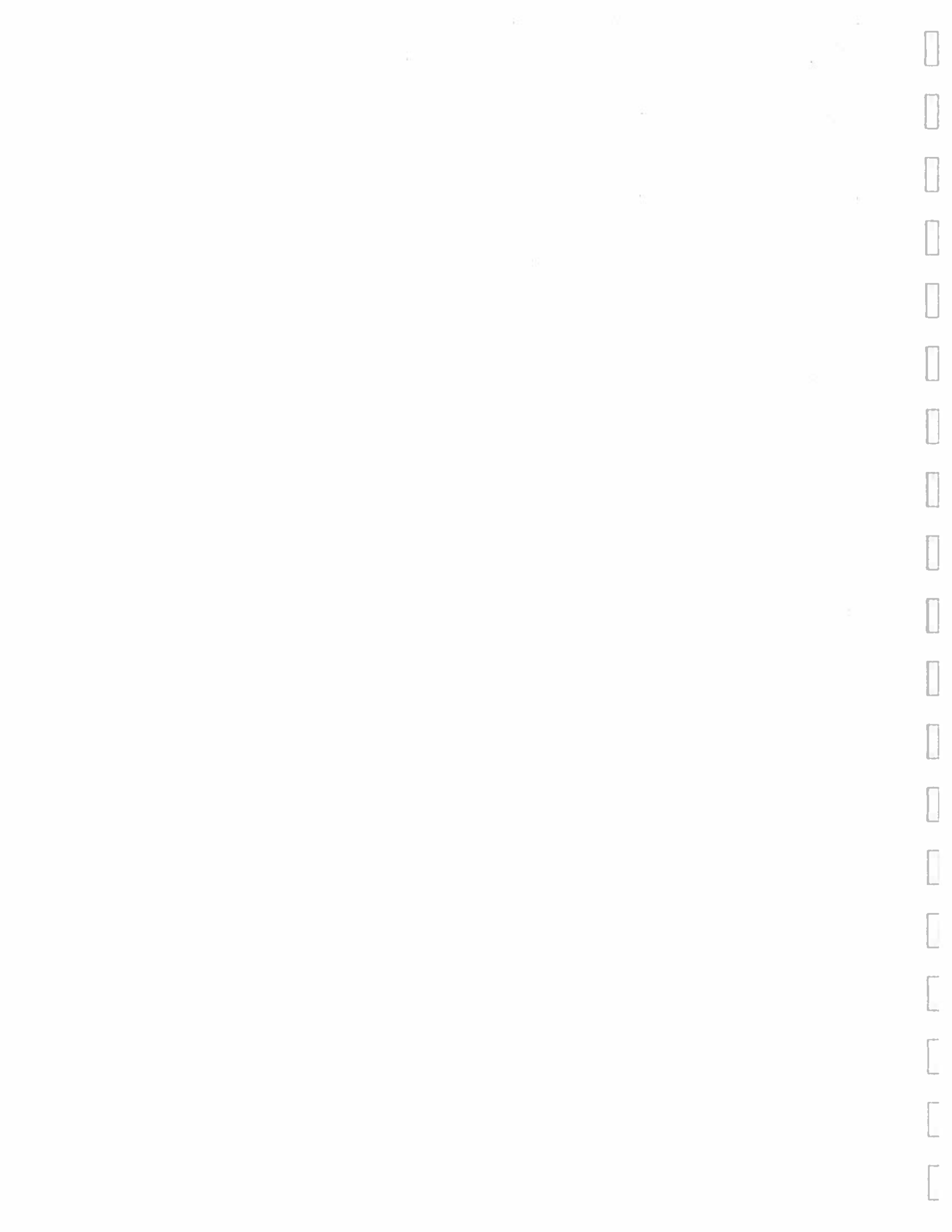
REMARKS

HOLE NO. **BH 2**

BORINGS BY CME 55 Power Auger

DATE 16 July 1999

[illegible]



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SOIL PROFILE & TEST DATA

Geotechnical Investigation
Prop. Chapel Hill Elem. School, Longleaf Drive
Gloucester, Ontario

DATUM TBM - Top spindle of fire hydrant located opposite north corner of subject site. Approx. geodetic elevation = 87.21m.

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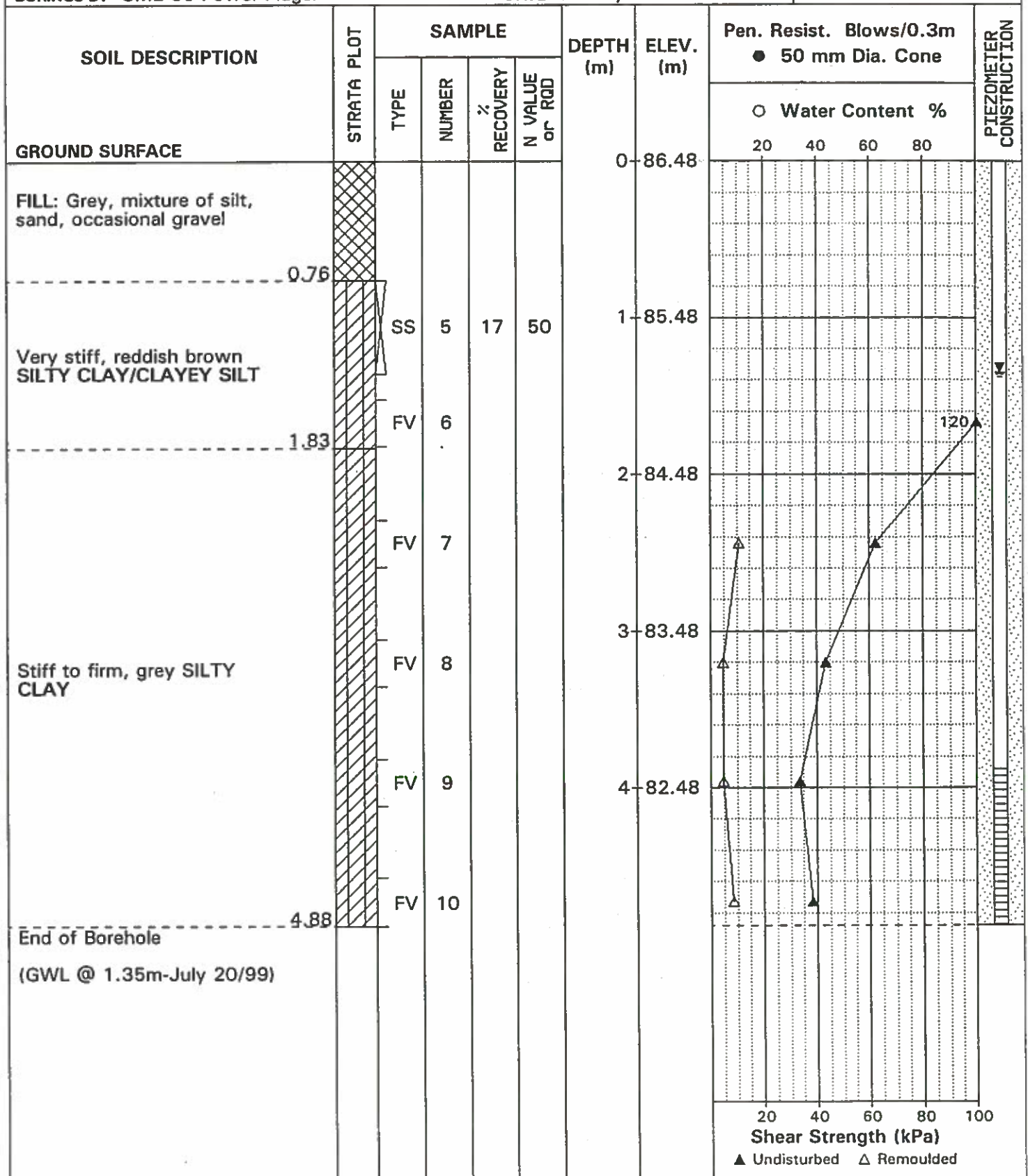
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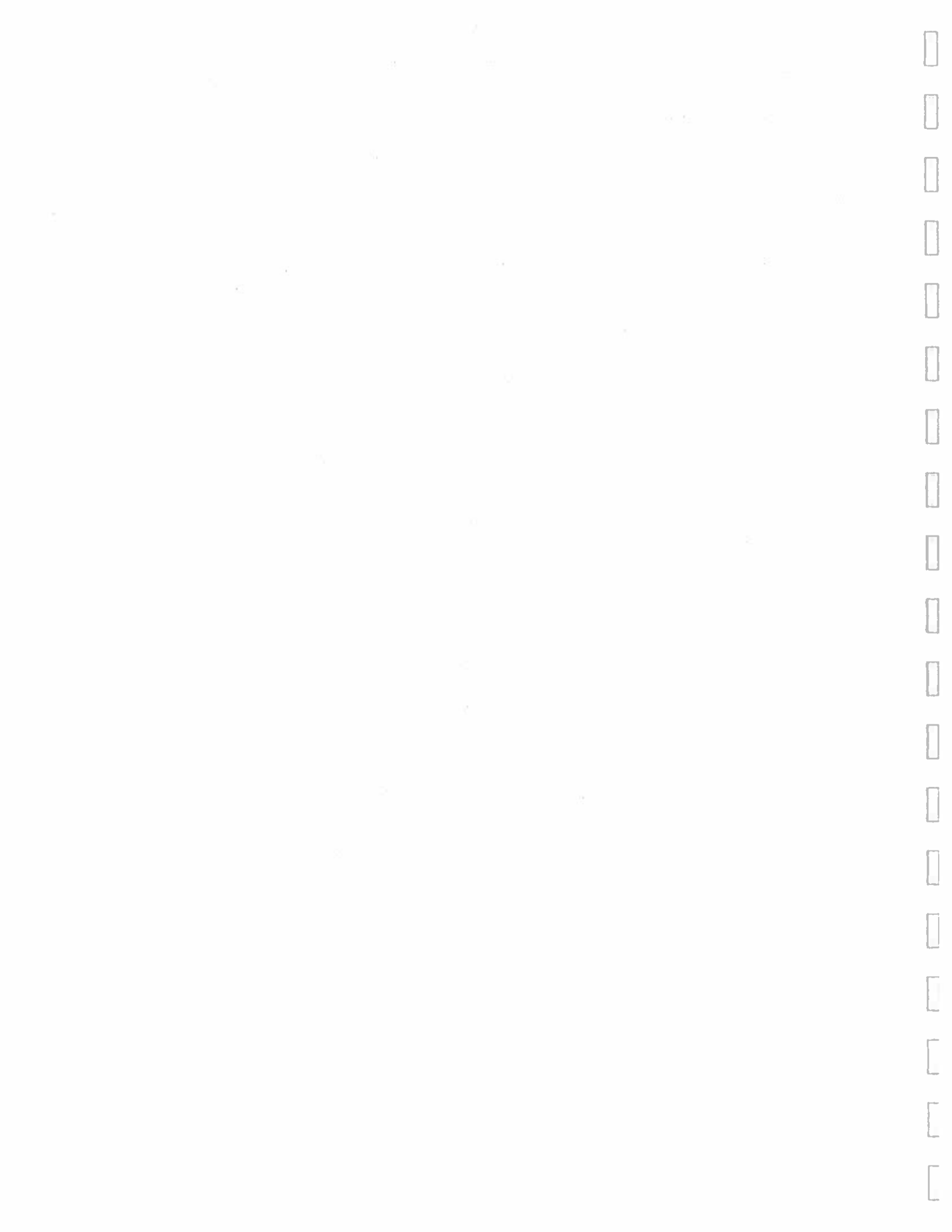
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BORINGS BY CME 55 Power Auger

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SOIL PROFILE & TEST DATA

Geotechnical Investigation

Prop. Chapel Hill Elem. School, Longleaf Drive
Gloucester, Ontario

DATUM TBM - Top spindle of fire hydrant located opposite north corner of subject site. Approx. geodetic elevation = 87.21m.

REMARKS

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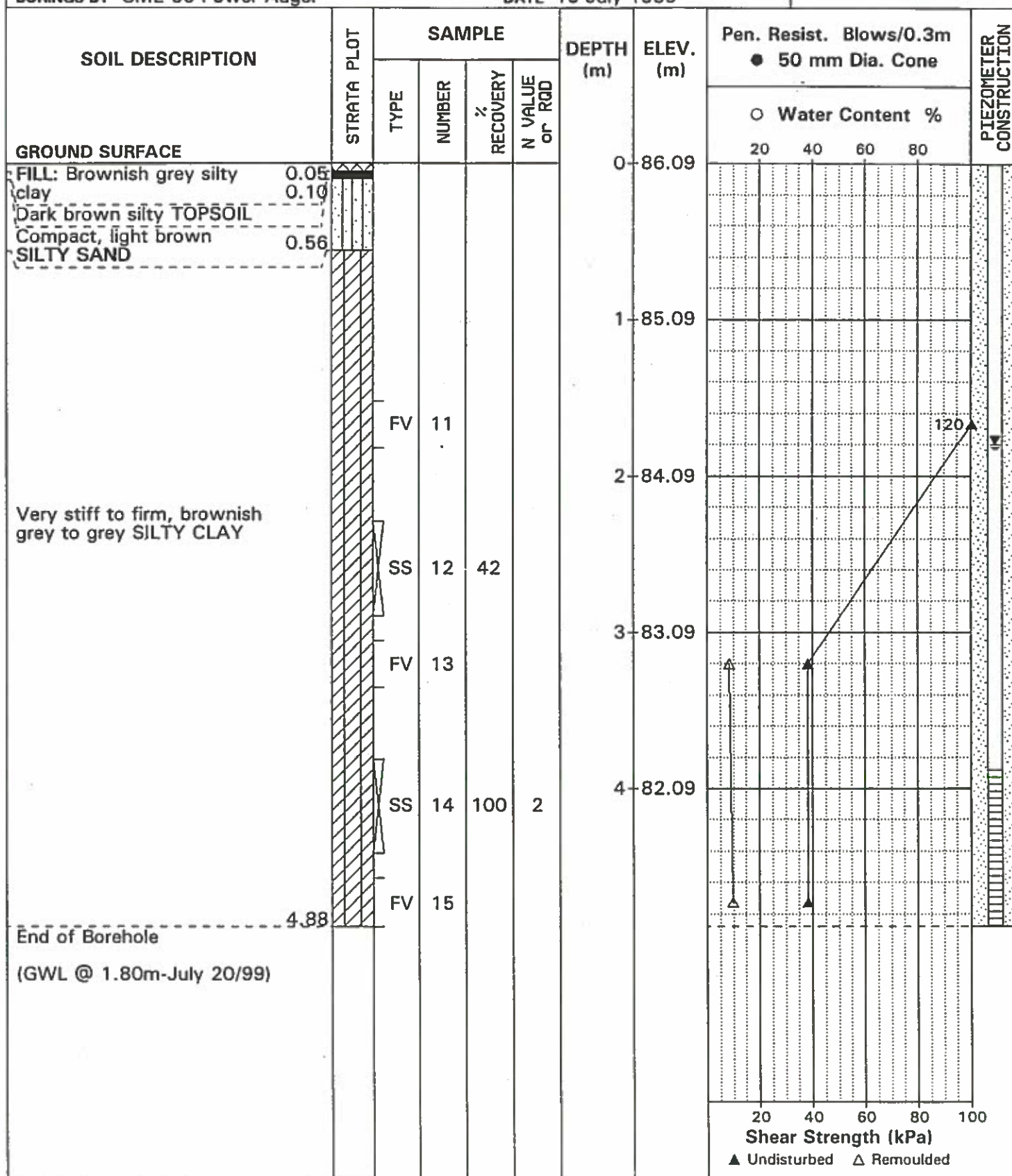
G7458

HOLE NO.

BH 4

BORINGS BY CME 55 Power Auger

DATE 16 July 1999





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SOIL PROFILE & TEST DATA

Geotechnical Investigation
Prop. Chapel Hill Elem. School, Longleaf Drive
Gloucester, Ontario

DATUM TBM - Top spindle of fire hydrant located opposite north corner of subject site. Approx. geodetic elevation = 87.21m.

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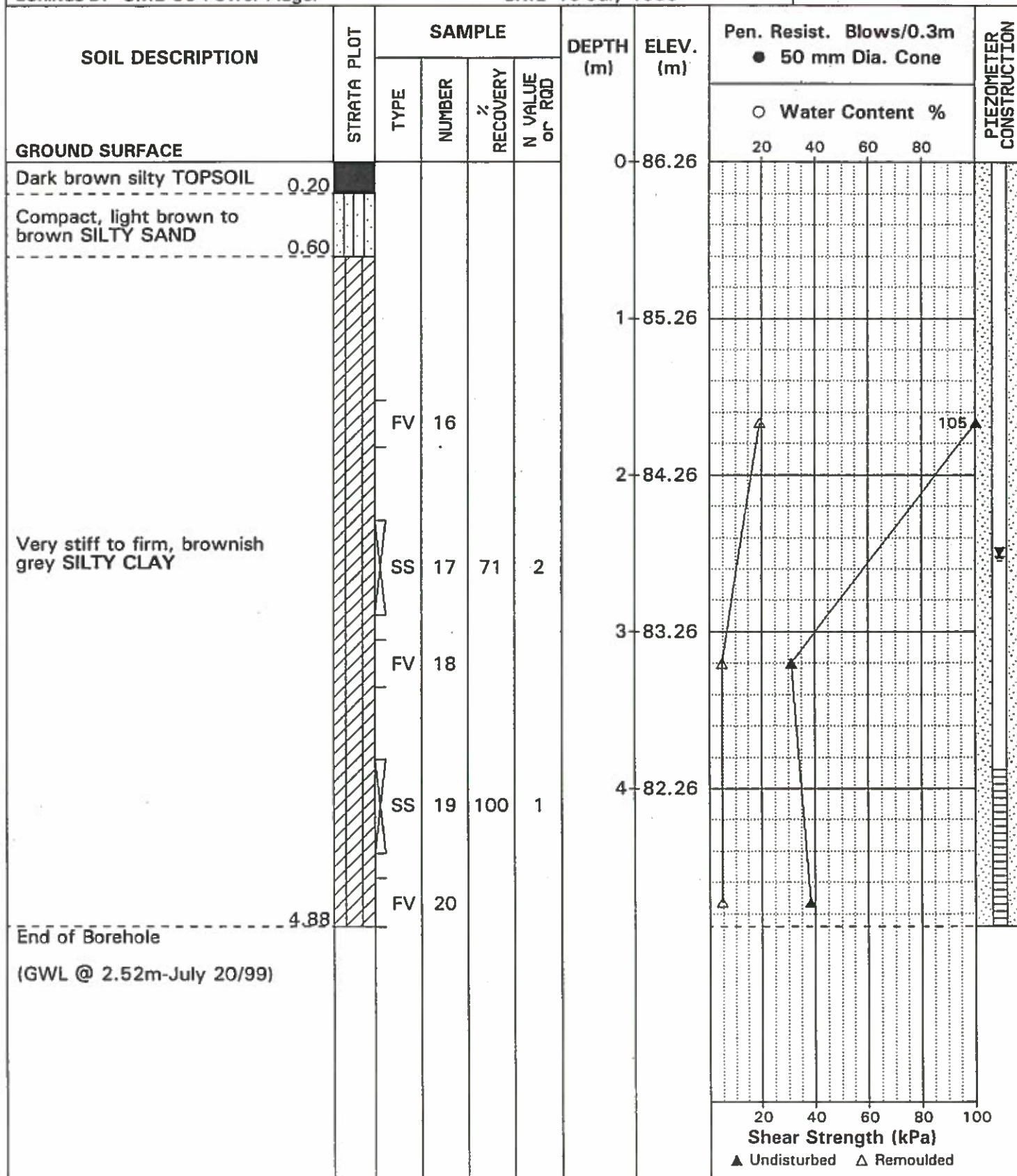
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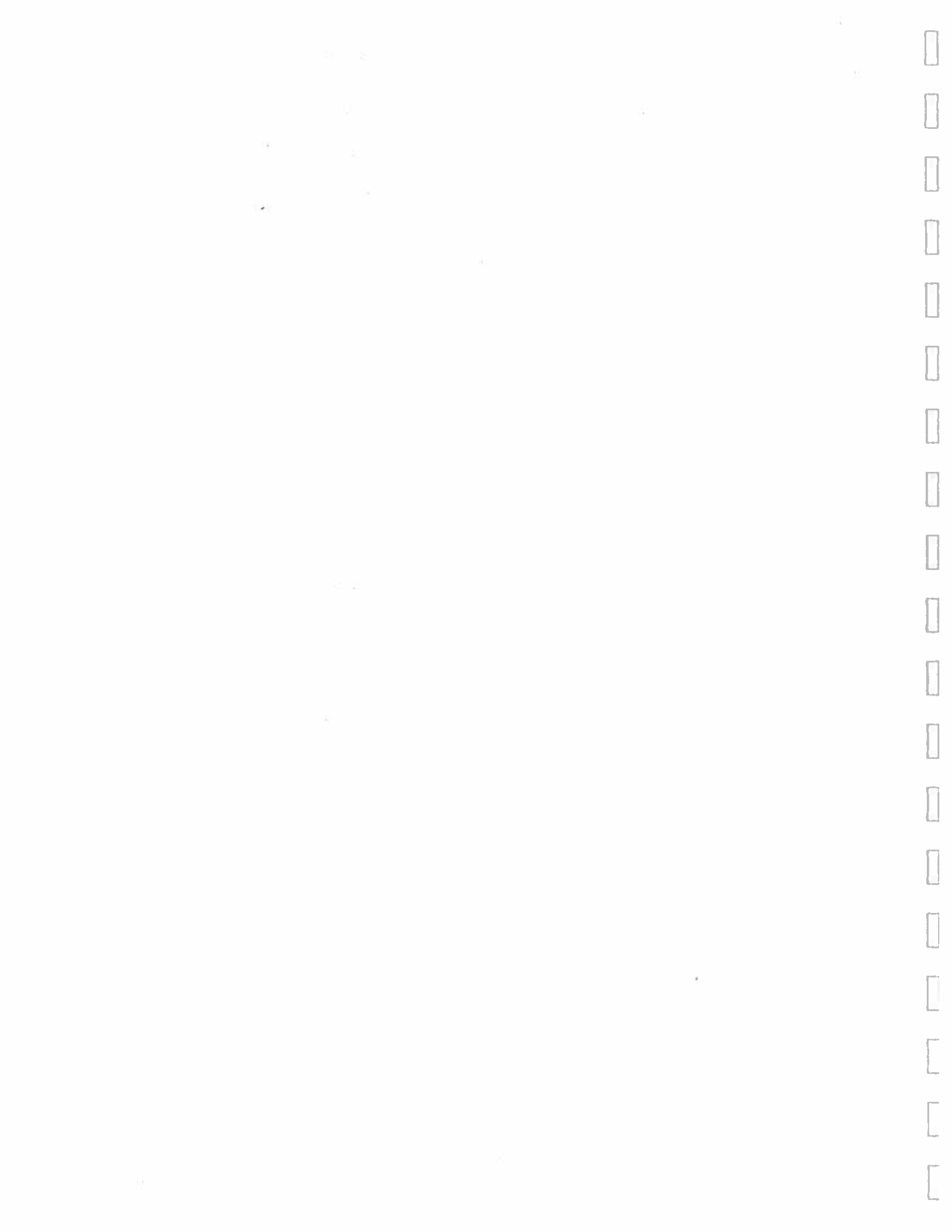
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BORINGS BY CME 55 Power Auger

DATE 16 July 1999





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SOIL PROFILE & TEST DATA

Geotechnical Investigation
Prop. Chapel Hill Elem. School, Longleaf Drive
Gloucester, Ontario

DATUM TBM - Top spindle of fire hydrant located opposite north corner of subject site. Approx. geodetic elevation = 87.21m.

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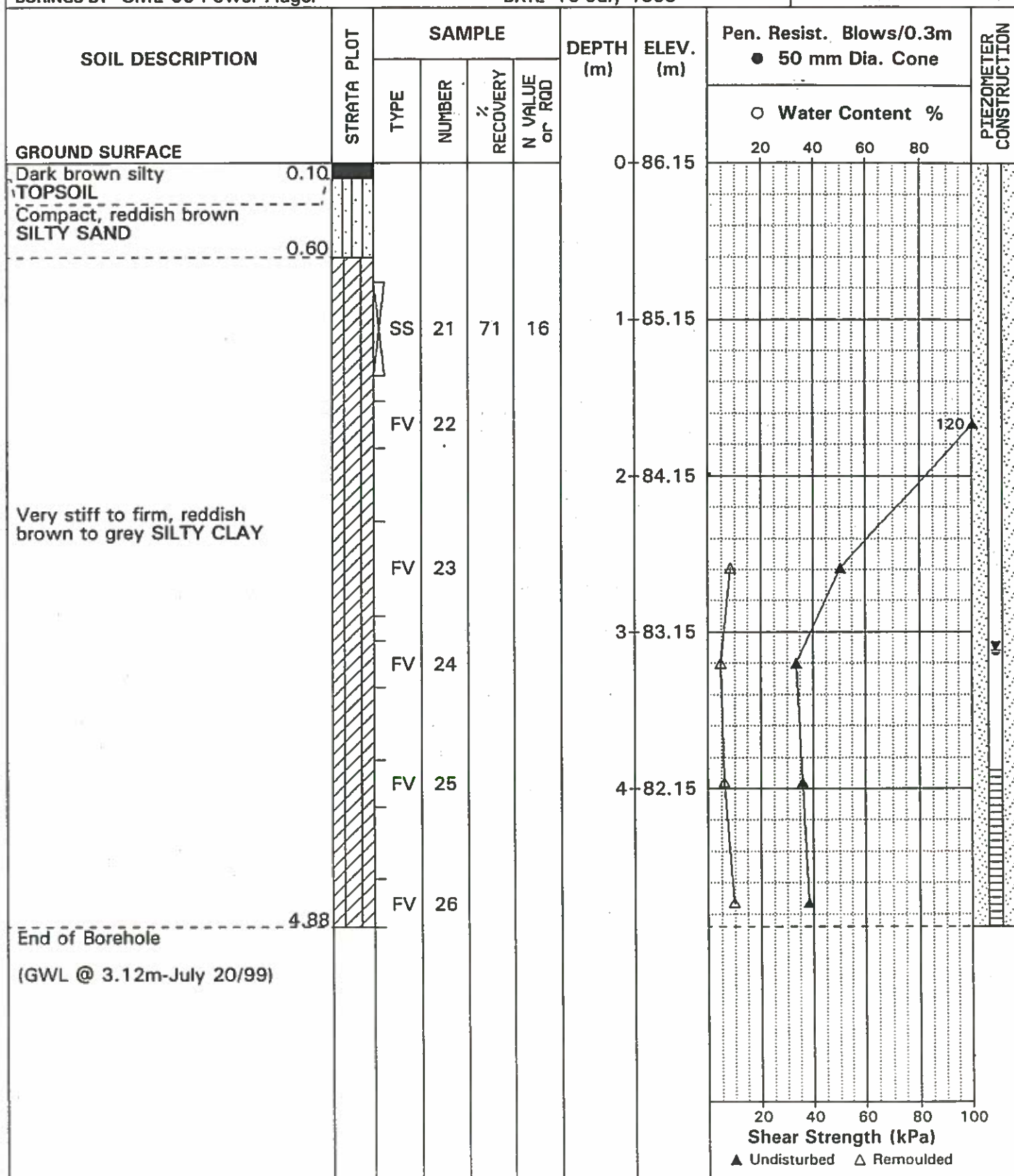
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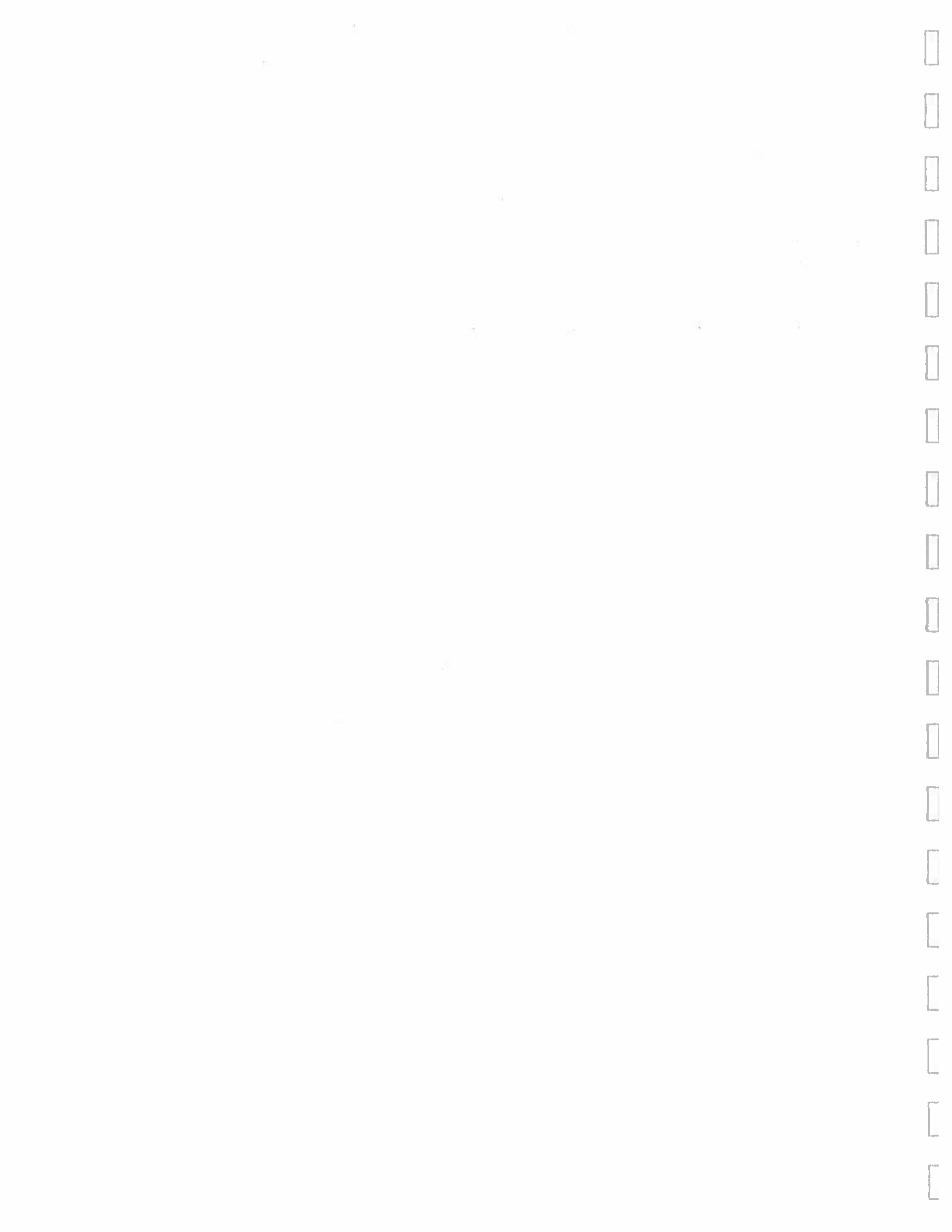
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BORINGS BY CME 55 Power Auger

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SOIL PROFILE & TEST DATA

Geotechnical Investigation
Prop. Chapel Hill Elem. School, Longleaf Drive
Gloucester, Ontario

DATUM TBM - Top spindle of fire hydrant located opposite north corner of subject site. Approx. geodetic elevation = 87.21m.

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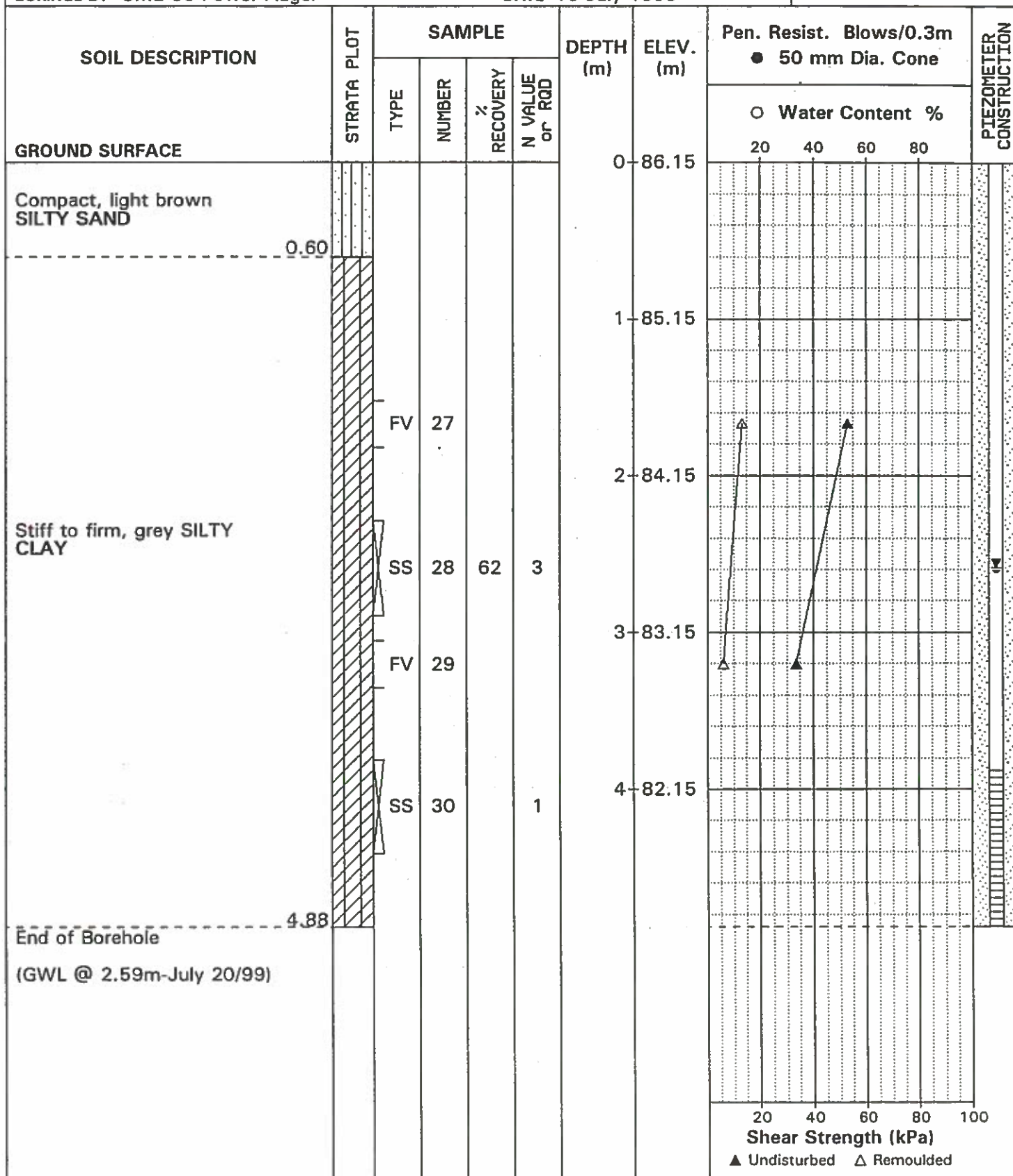
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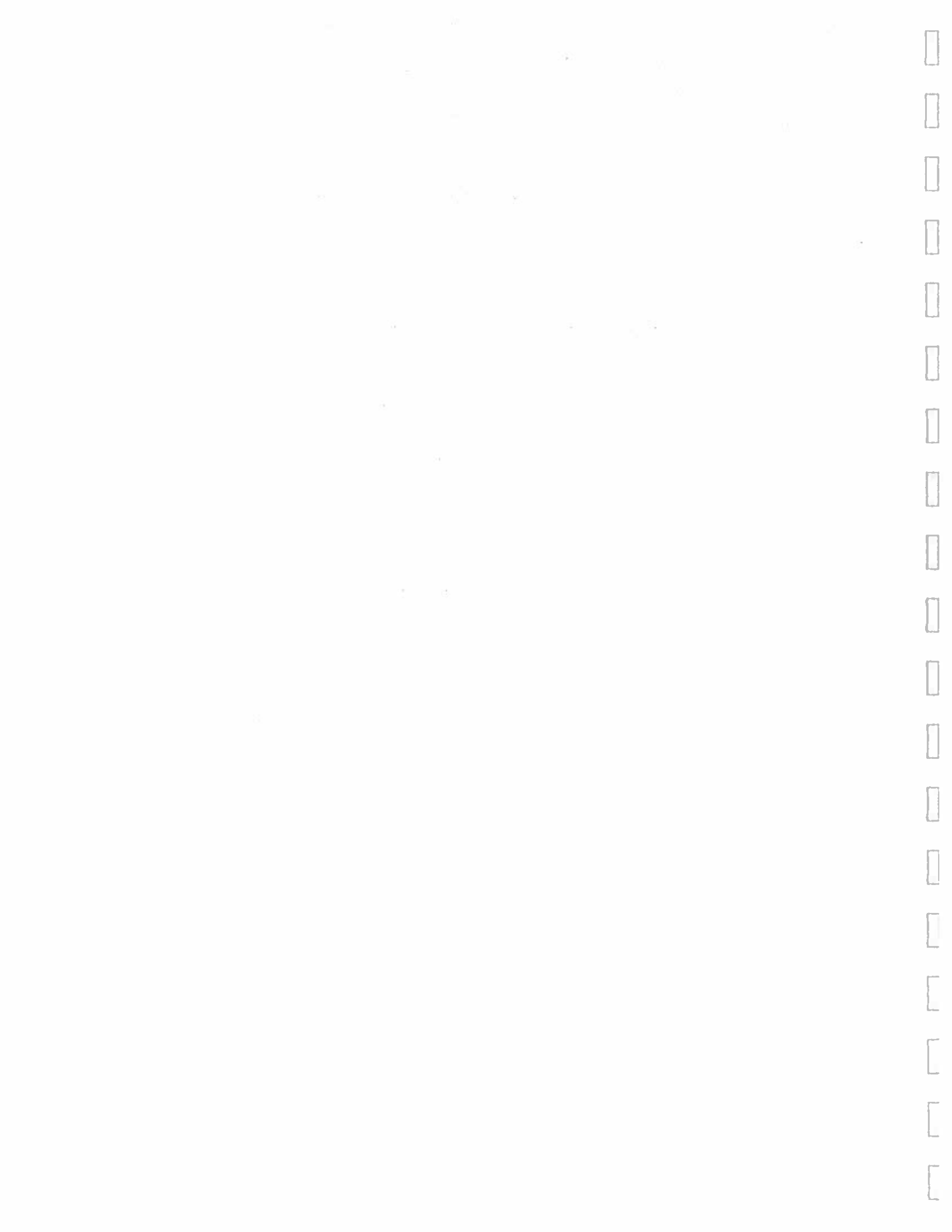
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BH 7

BORINGS BY CME 55 Power Auger

DATE 16 July 1999







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SOIL PROFILE & TEST DATA

Geotechnical Investigation

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Gloucester, Ontario

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FILE NO.

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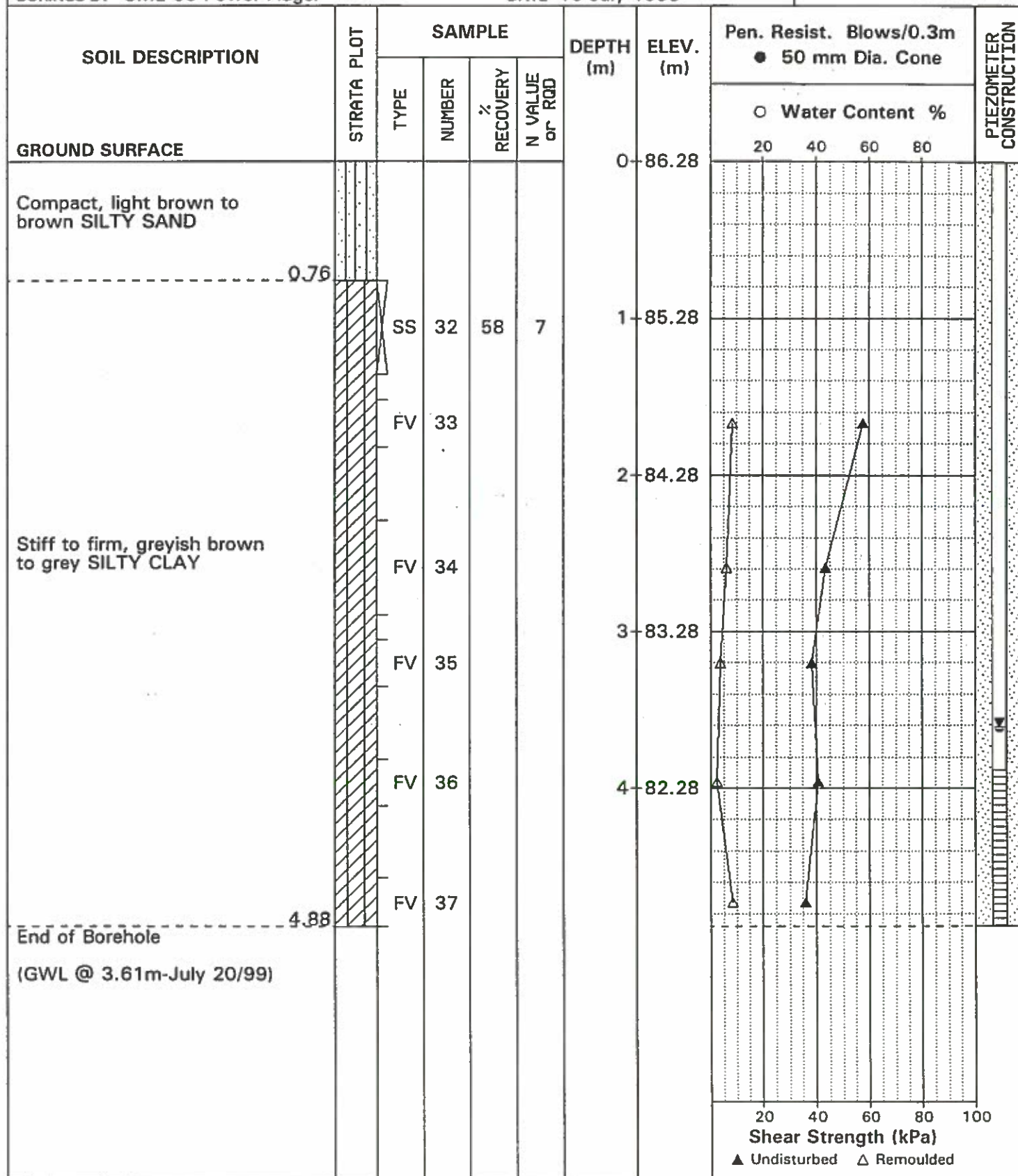
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BORINGS BY CME 55 Power Auger

DATE 16 July 1999





SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30



SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their "sensitivity". The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called "mechanical breaks") are easily distinguishable from the normal in-situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.) Rock core samples are obtained with the use of standard diamond drilling bits



SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
D _{xx}	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D ₁₀	-	Grain size at which 10% of the soil is finer (effective grain size)
D ₆₀	-	Grain size at which 60% of the soil is finer
C _c	-	Concavity coefficient = $(D_{30})^2 / (D_{10} \times D_{60})$
C _u	-	Uniformity coefficient = D_{60} / D_{10}

C_c and C_u are used to assess the grading of sands and gravels:

Well-graded gravels have: $1 < C_c < 3$ and $C_u > 4$

Well-graded sands have: $1 < C_c < 3$ and $C_u > 6$

Sand and gravels not meeting the above requirements are poorly-graded or uniformly-graded.

C_c and C_u are not applicable for the description of soils with more than 10% silt and clay (more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

p' _o	-	Present effective overburden pressure at sample depth
p' _c	-	Preconsolidation pressure of (maximum past pressure on) sample
C _{cr}	-	Recompression Index (in effect at pressures below p' _c)
C _c	-	Compression Index (in effect at pressures above p' _c)

OC Ratio Overconsolidation ratio = p'_c / p'_o

Void Ratio Initial sample void ratio = volume of voids / volume of solids

W_o Initial water content (at start of consolidation test)

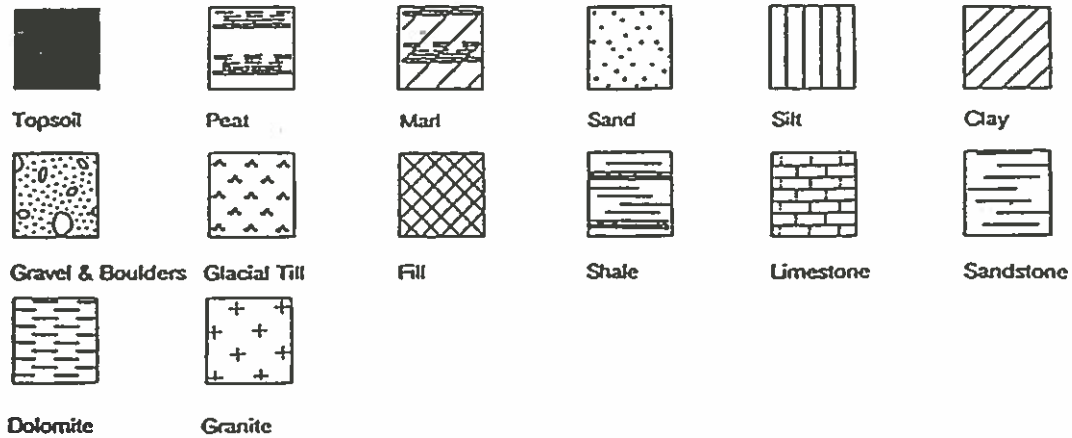
PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

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SYMBOLS AND TERMS (continued)

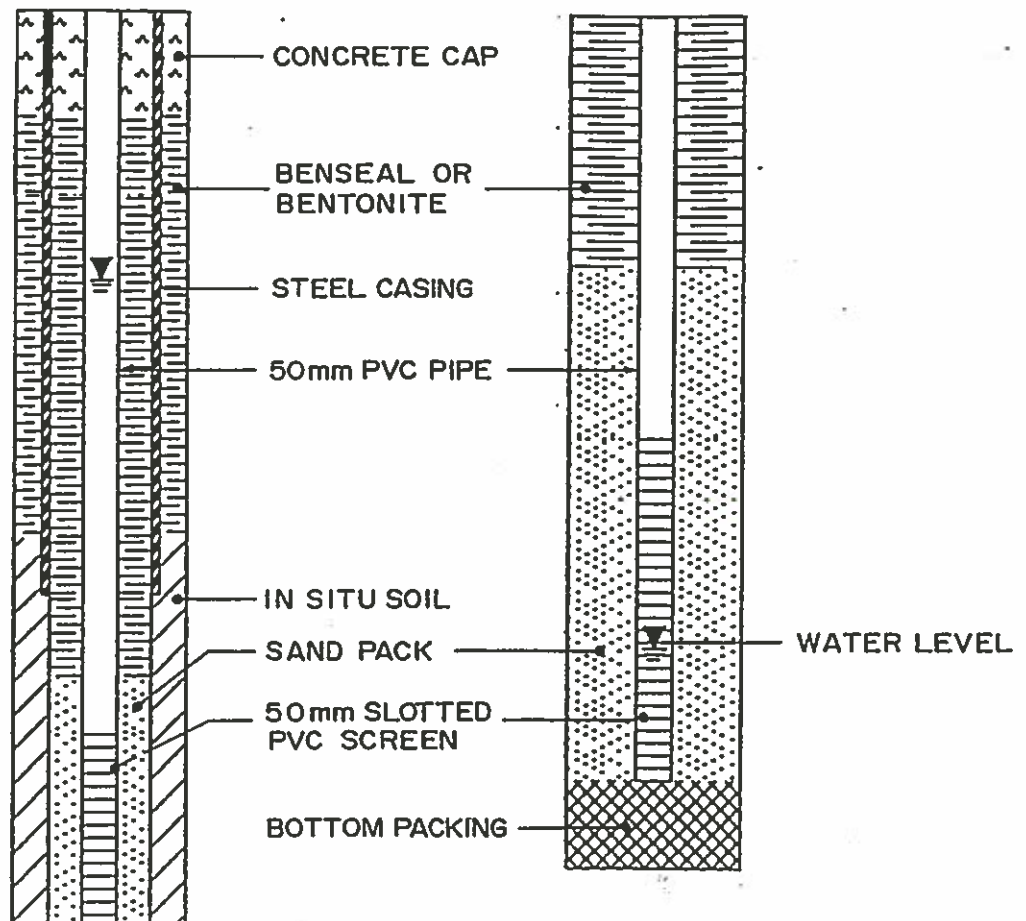
STRATA PLOT



MONITORING WELL AND PIEZOMETER CONSTRUCTION

Monitoring Well Construction

Piezometer Construction





TEXTURAL SOIL CLASSIFICATION CHART

DESCRIPTION OF SOIL TEXTURE	SIZE OF PARTICLES	WEIGHT PERCENTAGE TO THE TOTAL DRY WEIGHT OF SOIL	DESCRIPTION OF SOIL TEXTURE	SIZE OF PARTICLES	WEIGHT PERCENTAGE TO THE TOTAL DRY WEIGHT OF SOIL
CLAY	Clay	50 to 100	SAND with a trace of Silt and Clay	Clay and Silt Sand and Gravel Gravel	5 to 12 88 to 95 0 to 10
LEAN CLAY	Clay Silt Sand and Gravel	30 to 50 0 to 50 0 to 50	GRAVEL with some Silt and Clay	Clay Silt Sand and Gravel Gravel	0 to 15 0 to 30 70 to 88 45 to 88
SILTY CLAY	Clay Silt Sand and Gravel	30 to 50 50 to 70 0 to 20	SAND - GRAVEL with some Silt and Clay	Clay Silt Sand and Gravel Gravel	0 to 15 0 to 30 70 to 88 10 to 45
SANDY CLAY	Clay Silt Sand and Gravel	30 to 50 0 to 20 50 to 70	SAND with some Silt and Clay	Clay Silt Sand and Gravel Gravel	0 to 15 0 to 30 70 to 88 0 to 10
SILT	Clay Silt Sand and Gravel	0 to 20 65 to 100 0 to 20	SILTY GRAVEL	Clay Silt Sand and Gravel Gravel	0 to 15 15 to 50 42.5 to 70 40 to 70
CLAYEY SILT	Clay Silt Sand and Gravel	15 to 30 50 to 80 0 to 35	SILTY SAND - GRAVEL	Clay Silt Sand and Gravel Gravel	0 to 15 15 to 50 42.5 to 70 10 to 40
SANDY SILT	Clay Silt Sand and Gravel	0 to 15 42.5 to 80 20 to 50	SILTY SAND	Clay Silt Sand and Gravel Gravel	0 to 15 15 to 50 42.5 to 70 0 to 10
CLAYEY SANDY SILT	Clay Silt Sand and Gravel	15 to 30 35 to 50 20 to 42.5	CLAYEY GRAVEL	Clay Silt Sand and Gravel Gravel	15 to 30 0 to 35 50 to 85 40 to 85
GRAVEL	Clay and Silt Sand and Gravel Gravel	0 to 5 95 to 100 50 to 100	CLAYEY SAND - GRAVEL	Clay Silt Sand and Gravel Gravel	15 to 30 0 to 35 50 to 85 10 to 40
SAND - GRAVEL	Clay and Silt Sand and Gravel Gravel	0 to 5 95 to 100 10 to 50	CLAYEY SAND	Clay Silt Sand and Gravel Gravel	15 to 30 0 to 35 50 to 85 0 to 10
SAND	Clay and Silt Sand and Gravel Gravel	0 to 5 95 to 100 0 to 10	CLAYEY SILTY GRAVEL	Clay Silt Sand and Gravel Gravel	15 to 30 20 to 42.5 35 to 50 30 to 50
GRAVEL with a trace of Silt and Clay	Clay and Silt Sand and Gravel Gravel	5 to 12 88 to 95 50 to 100	CLAYEY SILTY SAND - GRAVEL	Clay Silt Sand and Gravel Gravel	15 to 30 20 to 42.5 35 to 50 10 to 30
SAND - GRAVEL with a trace of Silt and Clay	Clay and Silt Sand and Gravel Gravel	5 to 12 88 to 95 10 to 50	CLAYEY SILTY SAND	Clay Silt Sand and Gravel Gravel	15 to 30 20 to 42.5 35 to 50 0 to 10

NOTE

FINE, MEDIUM and COARSE SAND are all described by "SAND".
However they respectively have at least 60% of the particles
in the 0.074 to 0.42 mm, 0.42 to 2.00 mm and 2.00 to 4.74 mm ranges.



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APPENDIX 2

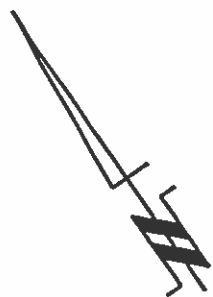
FIGURE 1 - KEY PLAN

DRAWING NO. G7458-1 - TEST HOLE LOCATION PLAN



APPLE HILL WAY

PROPOSED RESIDENTIAL



LEGEND:



BOREHOLE LOCATION

86.45

GROUND SURFACE ELEV.
(m)



JOHN D. PATERSON AND ASSOCIATES

Consulting Geotechnical and Environmental Engineers
28 Concourse Gate, Unit 1, Nepean, Ontario

LOCATION PLAN

Dwg. No.

G7458-1

Report No. G7458-99

Date: 99/07



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