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Region Project	TITLE SHEET	Page 1
Number R.076919.001		2016-07-22

<u>PROJECT TITLE</u>	SAULT STE. MARIE, ONTARIO NATURAL RESOURCES CANADA THE GREAT LAKES FORESTRY CENTRE 1219 QUEEN ST. EAST NRCAN-GLFC STORM SEWER SYSTEM REPLACEMENT
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<u>PROJECT NUMBER</u>	R.076919.001
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<u>PROJECT DATE</u>	2016-07-22
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END OF SECTION

Professional Seal (Civil Engineer):



Consultant for Building Code Review:

N/A

Building Code Designation Number (BCDN):

N/A

END OF SECTION

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END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Title and description of Work.
- .2 Contract Method.
- .3 Work by others.
- .4 Future Work.
- .5 Work sequence.
- .6 Contractor use of premises.
- .7 Owner occupancy.

1.2 PRECEDENCE

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

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises the replacement of the existing storm sewer network and outfalls, located at 1219 Queen Street East, Sault Ste. Marie, ON.

1.4 CONTRACT METHOD

- .1 Construct work under unit price contract.

1.5 COST BREAKDOWN

- .1 Within 48 hours of notification of acceptance of bid furnish a cost breakdown by Section aggregating contract amount.
- .2 Show separately cost of equipment purchased exempt from Ontario Retail Sales Tax under your Ontario Sales Tax licence number.
- .3 Within 48 hours of acceptance of bid submit a list of subcontractors.

1.6 WORK BY OTHERS

- .1 The Contractor shall for the purpose of the Ontario Occupational Health and Safety Act and Regulations for Construction Projects, and for the duration of the Work of the Contract:
 - .1 Assume the role of Constructor in accordance with the Authority Having Jurisdictions.

1.7 FUTURE WORK

- .1 Project is designed for future parking lot re-grading and asphalt rehabilitation. Provide and install adjustment units on proposed maintenance holes and catch basins as specified on the drawings.

1.8 WORK SEQUENCE

- .1 Construct Work in stages to accommodate Owner's continued use of premises during construction.
- .2 Coordinate Progress Schedule and coordinate with Owner Occupancy during construction.
- .3 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.
- .4 Maintain fire access/control.

1.9 CONTRACTOR USE OF PREMISES

- .1 Contractor shall limit use of premises for Work, for storage, and for access, to allow;
 - .1 Owner occupancy.
 - .2 Public usage.
- .2 Coordinate use of premises under direction of Owner.

1.10 OWNER OCCUPANCY

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

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 ACCESS AND EGRESS

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

1.2 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 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 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 Departmental Representative to facilitate execution of work.

1.4 EXISTING SERVICES

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

1.5 SPECIAL REQUIREMENTS

- .1 Paint public or Departmental Representative occupied areas Monday to Friday from 18:00 to 07:00 hours only and on Saturdays, Sundays, and statutory holidays.
- .2 Carry out noise generating Work Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays.
- .3 Submit schedule in accordance with Section 01 32 16.
- .4 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .5 Keep within limits of work and avenues of ingress and egress.
- .6 Ingress and egress of Contractor vehicles at site is limited to Pine Street and Queen Street East.
- .7 Deliver materials outside of peak traffic hours 17:00 to 07:00 and 13:00 to 15:00 unless otherwise approved by Departmental Representative.

1.6 SECURITY

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.
- .2 Security clearances:
 - .1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter premises.
 - .2 Obtain requisite clearance, as instructed, for each individual required to enter premises.
 - .3 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.
- .3 Security escort:
 - .1 Personnel employed on this project 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 Departmental Representative at least 14 days before service is needed. For requests submitted within time noted above, costs of security escort will be paid for by Departmental Representative. Cost incurred by late request will be Contractor's responsibility.

- .3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 4 hours before scheduled time of escort. Cost incurred by late request will be Contractor's responsibility.
- .4 Calculation of costs will be based on average hourly rate of security officer for minimum of 8 hours per day for late service request and of 4 hours for late cancellations.

1.7 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions. Smoking is not permitted.

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 APPOINTMENT AND PAYMENT

- .1 Departmental Representative 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 supervision of Departmental Representative.
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

1.2 CONTRACTOR'S RESPONSIBILITIES

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

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 Departmental Representative.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting 4 days in advance of meeting date to Departmental Representative.
- .4 Provide physical space and make arrangements for meetings.
- .5 Preside at meetings.
- .6 Unless directed otherwise by Departmental Representative, record minutes of meetings. Minutes shall be circulated to attending parties and affected parties not in attendance within 2 days after meeting.
- .7 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 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 16.
 - .3 Schedule of submission of shop drawings, samples, mock-ups, colour chips. Submit submittals in accordance with Section 01 33 00.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section

- 01 52 00.
- .5 Site security in accordance with Section 01 56 00.
- .6 Health and safety in accordance with Section 01 35 29.
- .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .8 Record drawings and specifications in accordance with Sections 01 33 00 and 01 78 00.
- .9 Maintenance manuals in accordance with Section 01 78 00.
- .10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00.
- .11 Monthly progress claims, administrative procedures, photographs, hold backs.
- .12 Appointment of inspection and testing agencies or firms.
- .13 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

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

1.2 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Certificate of Substantial Performance and Certificate of Completion as defined times of completion are of essence of this contract.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Submit to Departmental Representative within 30 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.4 MASTER PLAN

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

1.5 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Excavation.
 - .6 Backfill.

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- .7 Piping.
- .8 Paving.
- .9 Testing and Commissioning.
- .10 Supplied equipment long delivery items.

1.6 PROJECT SCHEDULE REPORTING

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

1.7 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site meetings specified in Section 01 31 19, 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 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.
- .11 Submit number of hard copies specified for each type and format of submittal and also submit in electronic format as pdf files. Forward pdf, NMSEdit Professional spp, MS Word, MS Excel, MS Project and Autocad dwg files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

1.2 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 drawings stamped and signed by professional engineer registered or licensed in Province of Ontario of 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 5 working days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.

- .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit three hard copies and one electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit three hard copies and one electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit three hard copies and one electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit three hard copies and one electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .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 three hard copies and one electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit three hard copies and one electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections

and as requested by Departmental Representative.

- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit three hard copies and one electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .21 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.3 SAMPLES

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's business address.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of

samples.

- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UPS

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

1.5 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic and hard copy of colour digital photography in jpg format, fine resolution monthly with progress statement and as directed by Departmental Representative.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: 2 locations.
 - .1 Viewpoints and their location as determined by Departmental Representative.
- .4 Frequency of photographic documentation: weekly as directed by Departmental Representative.
 - .1 Upon completion of: excavation, services before concealment, and as directed by Departmental Representative.

1.6 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Safety and Insurance Board Experience Report.

1.7 FEES, PERMITS AND CERTIFICATES

- .1 Provide authorities having jurisdiction with information requested.
- .2 Pay fees and obtain certificates and permits required.
- .3 Furnish certificates and permits.

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
 - .3 Measures and controls to be implemented to address identified safety hazards and risks.
- .3 Provide a Fire Safety Plan, specific to the work location, in accordance with NBC, Division B, Article 8.1.1.3 prior to commencement of work. The plan shall be coordinated with, and integrated into, the existing Emergency Procedures and Evacuation Plan in place at the site. Departmental Representative will provide Emergency Procedures and Evacuation Plan. Deliver two copies of the Fire Safety Plan to the Departmental Representative not later than 14 days before commencing work.
- .4 Contractor's and Sub-contractors' Safety Communication Plan.
- .5 Contingency and Emergency Response Plan addressing standard operating procedures specific to the project site to be implemented during emergency situations. Coordinate plan with existing Emergency Response requirements and procedures provided by Departmental Representative.

- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.
- .7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8 Submit names of personnel and alternates responsible for site safety and health.
- .9 Submit records of Contractor's Health and Safety meetings when requested.
- .10 Submit copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative, weekly.
- .11 Submit copies of orders, directions or reports issued by health and safety inspectors of the authorities having jurisdiction.
- .12 Submit copies of incident and accident reports.
- .13 Submit Material Safety Data Sheets (MSDS).
- .14 Submit Workplace Safety and Insurance Board (WSIB)- Experience Rating Report.
- .15 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel, prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

1.3 FILING OF NOTICE

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

1.4 WORK PERMIT

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

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

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

1.7 REGULATORY REQUIREMENTS

- .1 Comply with the Acts and regulations of the Province of Ontario.
- .2 Comply with specified standards and regulations to ensure safe operations at site.

1.8 PROJECT/SITE CONDITIONS

- .1 Confined spaces in maintenance holes.

1.9 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns either accepting or requesting improvements.
- .3 Relief from or substitution for any portion or provision of minimum Health and Safety standards specified herein or reviewed site-specific Health and Safety Plan shall be submitted to Departmental Representative in writing.

1.10 COMPLIANCE REQUIREMENTS

- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990 Chapter 0.1, as amended.

1.11 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.
- .3 Where applicable the Contractor shall be designated "Constructor", as defined by Occupational Health and Safety Act and Regulations for Construction Projects for the Province of Ontario.

1.12 UNFORSEEN HAZARDS

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

1.13 POSTING OF DOCUMENTS

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

1.14 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.15 BLASTING

- .1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by Departmental Representative.

1.16 POWDER ACTUATED DEVICES

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

1.17 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
- .2 Assign responsibility and obligation to Competent Supervisor to stop or start Work when, at Competent Supervisor's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop Work for health and safety considerations.

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS.
- .3 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.
- .4 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
- .5 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .6 Include in Environmental Protection Plan:
 - .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
 - .3 Names and qualifications of persons responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.
 - .5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

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

1.3 REFERENCES

- .1 Canadian Environmental Protection Act (CEPA).
- .2 Provincial Water Quality Objectives (PWQOs).
- .3 Canadian Water Quality Guidelines (CWQGs).
- .4 Ambient Air Quality Criteria (AAQC).
- .5 Canadian Fisheries Act.

1.4 FIRES

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

1.5 DRAINAGE

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

1.6 SITE CLEARING AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties as indicated.
- .2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
 - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to areas indicated or designated by Departmental Representative.

1.7 WORK ADJACENT TO WATERWAYS

- .1 Construction equipment to be operated on land only.
- .2 Use waterway beds for borrow material only after written receipt of approval from Departmental Representative.

- .3 Waterways to be kept free of excavated fill, waste material and debris.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.

1.8 POLLUTION CONTROL

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

1.9 REFUELING PROCEDURES / REQUIREMENTS

- .1 The Contractor must ensure the following mitigation measures are implemented in order to reduce the risk of ground contamination from petroleum products:
 - .1 The list of persons and agencies to contact in the event of an emergency shall be posted in plain sight on the work site for the duration of the construction.
 - .2 Machinery will be clean and kept clean to limit any grease or oil deposits inside the work area.
 - .3 Frequent inspections will be performed to detect any oil, fuel, grease or other leaks. If a leak is detected, the necessary corrective action will be taken immediately.
 - .4 An emergency kit for the recovery of petroleum products will be kept on site at all times. The kit will include at least 30 meters of absorbent booms, a box of absorbent pads and solid absorbent material (powder or granules). The kit will be stored near the location of work and machinery, and kept within easy reach at all times to ensure a rapid response.
 - .5 In the event of a spill, the contractor will immediately report to the Spills Action Centre of the Ministry of the Environment Ontario at 1-800-268-6060. Hydrocarbons and contaminated soils will be recovered by a specialized firm at the Contractor's

expense.

1.10 HISTORICAL/ARCHAEOLOGICAL CONTROL

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

1.11 NOTIFICATION

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
 - .1 Take action only after receipt of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

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 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .3 Washwater to be tested and treated in accordance with authorities having jurisdiction prior to disposal.
- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .5 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with the Ontario Provincial Standard Specifications (OPSS) and Drawings (OPSD), National Building Code of Canada (NBC) 2010, National Fire Code of Canada (NFC) 2010 and Ontario Building Code (OBC) 2012, including all amendments up to bid closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply as directed by the Departmental Representative.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

- .1 Stop work immediately and notify Departmental Representative if materials which may contain designated substances or PCB's are discovered in course of work.

1.3 BUILDING SMOKING ENVIRONMENT

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

1.4 ACCESSIBLE DESIGN

- .1 Comply with CSA B651-12, Accessible Design for the Built Environment, unless specified otherwise. In any case of conflict or discrepancy between the building codes and CSA B651, the requirements of CSA B651 shall apply.

1.5 TAXES

- .1 Pay applicable Federal, Provincial and Municipal taxes.

1.6 EXAMINATION

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

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 ABBREVIATIONS AND ACRONYMS

- .1 The abbreviations and acronyms are commonly found in the Project Manual and represent the associated organizations or terms.

1.2 MATERIALS, EQUIPMENT AND METHODS

- .1 A:
- .1 AB: anchor bolt.
 - .2 AC: acoustic.
 - .3 AC PAN: acoustic panel.
 - .4 ACU: acoustic unit ceiling.
 - .5 AFF: above finished floor.
 - .6 AC PLAS: acoustic plaster.
 - .7 ACT: acoustic tile.
 - .8 ACR CU LVR: acrylic cube louvre.
 - .9 ADH: adhesive.
 - .10 ADJ: adjustable.
 - .11 A/C: air conditioner.
 - .12 AHU: air handling unit.
 - .13 AL: aluminum.
 - .14 ANOD: anodized.
 - .15 APPROX: approximate.
 - .16 ARCH: architecture.
 - .17 ARCH BLK: architectural block.
 - .18 AVB: air vapour barrier.
- .2 B:
- .1 B: base.
 - .2 BEAST: benthic assessment of sediment.
 - .3 BH: bore hole.
 - .4 BHP: brake horse power.
 - .5 BL: bottom layer.
 - .6 BLK: block.
 - .7 BLKD: bulkhead.
 - .8 BM: beam.
 - .9 BOT: bottom.
 - .10 BMP: best management practice.
 - .11 B PL: base plate.
 - .12 BRG: bearing.
 - .13 BRK: brick.
 - .14 BSMT: basement.
 - .15 BTEX: benzene, toluene, ethylbenzene and xylenes.
 - .16 BUR: built-up roof.
- .3 C:

- .1 CAL: caliper.
- .2 CANTIL: cantilever.
- .3 CB: catch basin.
- .4 CC: centre to centre.
- .5 CCN: contemplated change notice.
- .6 CDF: controlled density fill.
- .7 CEC: Canadian Electrical Code.
- .8 CF: chair fabric.
- .9 CHAN: channel.
- .10 CHS: Canadian hydrographic service.
- .11 CJ: construction joint.
- .12 CL: centreline.
- .13 CK: cork.
- .14 CLG: ceiling.
- .15 CLR: clear.
- .16 COL: column.
- .17 CONC: concrete.
- .18 CONC BLK: concrete block.
- .19 CONC BRK: concrete brick.
- .20 CONT: continuous.
- .21 CONT J: control joint.
- .22 COMPL: complete.
- .23 CM: centimetre. (Nursery stock).
- .24 CP: circulating pump.
- .25 CPL: cement plaster.
- .26 CPM: critical path method.
- .27 CPT: carpet.
- .28 CPTT: carpet tile.
- .29 CT: ceramic tile.
- .30 CTE: connect to existing.
- .31 CV: control valve.
- .32 CVT: conductive vinyl tile.
- .33 C/W: complete with.
- .4 D:
 - .1 D: deep.
 - .2 dB: decibels.
 - .3 DB: dry-bulb.
 - .4 DD: dutch door.
 - .5 DEG: degree.
 - .6 DF: drinking fountain.
 - .7 DIA: diameter.
 - .8 DIM: dimension.
 - .9 DL: dead load.
 - .10 DMNT: demountable.
 - .11 DP: dampproofing.
 - .12 DR: door.
 - .13 DRP: drapery.
 - .14 DWL: dowel.

- .5 E:
- .1 EA: each.
 - .2 EC: epoxy coating.
 - .3 ECF: engineered containment facility.
 - .4 EE: each end.
 - .5 EF: each face (architectural/structural).
 - .6 EF: exhaust fan (mechanical/electrical).
 - .7 EL: elevation.
 - .8 ELEC: electric.
 - .9 ELEV: elevator.
 - .10 EM: expanded metal.
 - .11 ENCL: enclosure.
 - .12 EQ: equal.
 - .13 ET: expansion tank.
 - .14 EXH: exhaust.
 - .15 EXIST: existing.
 - .16 EXPJ: expansion joint.
 - .17 EXP STRUCT: exposed structure.
 - .18 EXT: exterior.
 - .19 EW: each way.
 - .20 EWT: entering water temperature.
- .6 F:
- .1 FC: fuel contributed.
 - .2 FD: floor drain.
 - .3 FDN: foundation.
 - .4 FEAT W: feature wall.
 - .5 FEXT: fire extinguisher.
 - .6 FH: fire hose.
 - .7 FHC: fire hose cabinet.
 - .8 FHR: fire hose rack.
 - .9 FIN: finish.
 - .10 FIP: federal identity program.
 - .11 FL: floor.
 - .12 FLD: field.
 - .13 FLUOR: fluorescent.
 - .14 FR: frame.
 - .15 FRR: fire resistance rating.
 - .16 FTG: footing.
- .7 G:
- .1 GALV: galvanized steel.
 - .2 GB: grab bar.
 - .3 GBD: gypsum board.
 - .4 GC: General Conditions.
 - .5 GF: ground floor.
 - .6 GFCI: ground fault circuit interrupter.
 - .7 GL: glass or glazing.
 - .8 GL BLK: glass block.
 - .9 GPC: gypsum plaster ceiling.
 - .10 GPW: gypsum plaster wall.

- .11 GT: glass tile.
- .8 H:
 - .1 HB: hose bib.
 - .2 HC: hollow core.
 - .3 HCWD: hollow core wood door.
 - .4 HD: hand dryer.
 - .5 HDW: hardware.
 - .6 HDWD: hardwood.
 - .7 HEX: heat exchanger.
 - .8 HM: hollow metal.
 - .9 HOR: horizontal.
 - .10 HOR EF: horizontal each face.
 - .11 HP: hydro pole.
 - .12 HPA: Hamilton Port Authority.
 - .13 HR: hour.
 - .14 HRV: heat recovery ventilator.
 - .15 HT: height.
 - .16 HTR: heater.
 - .17 HUM: humidifier.
 - .18 HWT: hot water tank.
 - .19 HYD: hydrant.
 - .20 HZ: Hertz frequency, cycles per second.
- .9 I:
 - .1 ICF: insulated concrete formwork.
 - .2 ID: inside diameter.
 - .3 INS: insulation.
 - .4 INTLK: interlock.
- .10 J:
 - .1 JT: joint.
- .11 K:
 - .1 KPL: kick plate.
- .12 L:
 - .1 LAT: leaving air temperature.
 - .2 LAV: lavatory.
 - .3 LDG: landing.
 - .4 LG: long.
 - .5 LINO: linoleum.
 - .6 LL: live load.
 - .7 LT: light.
 - .8 LWT: leaving water temperature.
- .13 M:
 - .1 MAS: masonry.
 - .2 MAS FL: masonry flashing.
 - .3 MAX: maximum.
 - .4 MBG: metal bar grating.

- .5 MCL: metal cube louvre.
 - .6 MECH: mechanical.
 - .7 MET: metal.
 - .8 MET DK: metal deck.
 - .9 MET FL: metal flashing.
 - .10 MET GRID CLG: metal grid ceiling.
 - .11 MET GRTG: metal grating.
 - .12 MET LIN CLG: metal linear ceiling.
 - .13 MET T PTN: metal toilet partition.
 - .14 MH: maintenance hole.
 - .15 MIN: minimum.
 - .16 MLP: metal lath and plaster.
 - .17 MO: masonry opening.
 - .18 MR: marble.
 - .19 MT: metal threshold.
 - .20 MWP: membrane waterproofing.
- .14 N:
- .1 NBC: national building code.
 - .2 NC: normally closed.
 - .3 NF: near face.
 - .4 NFC: national fire code.
 - .5 NIC: not in contract.
 - .6 NO: number.
 - .7 NRC: noise reduction coefficient.
 - .8 NRP: non removable pin.
 - .9 NTS: not to scale.
- .15 O:
- .1 OA: outside air.
 - .2 OBC: Ontario building code.
 - .3 OC: on centre.
 - .4 OD: outside diameter.
 - .5 OPNG: opening.
 - .6 OPR: operator.
 - .7 OVHD: overhead.
 - .8 OWSJ: open web steel joist.
- .16 P:
- .1 P: prefinished.
 - .2 PAH: polynuclear aromatic hydrocarbons.
 - .3 PARG: parging.
 - .4 PCC: precast concrete.
 - .5 PCT: porcelain ceramic tile.
 - .6 PED ACS FLG: pedestal access flooring.
 - .7 PF: panel fabric.
 - .8 PH: phase.
 - .9 PL: plate.
 - .10 PLAM: plastic laminate.
 - .11 PLAS: plaster.

- .12 PLYWD: plywood.
- .13 PR: pair.
- .14 PREFAB: prefabricated.
- .15 PREFIN: prefinished.
- .16 PRESS: pressure.
- .17 PRFL: profile.
- .18 PRV: pressure regulating valve.
- .19 PT: paint.
- .20 PTD: paper towel dispenser.
- .21 PTN: partition.
- .22 PVC: polyvinyl chloride.

- .17 Q:
 - .1 QTB: quarry tile base.
 - .2 QTF: quarry tile floor.
 - .3 QTR: quarry tile roof.

- .18 R:
 - .1 R: radius.
 - .2 RA: return air.
 - .3 RAD: return air damper.
 - .4 RB: resilient base.
 - .5 RC: reinforced concrete.
 - .6 RCPT: receptacle.
 - .7 RD: roof drain.
 - .8 REINF: reinforced/reinforcing.
 - .9 REQD: required.
 - .10 REQT: requirement.
 - .11 RFT: rubber floor tile.
 - .12 RM: room.
 - .13 RO: rough opening.
 - .14 RP: radiant panel.
 - .15 RRS: recycled rubber sheet.
 - .16 RRT: recycled rubber tile.
 - .17 RSD: rolling steel door.
 - .18 RSF: rubber sheet flooring.
 - .19 RT: rubber tile.
 - .20 RTU: roof top unit.
 - .21 RWL: rain water leader.

- .19 S:
 - .1 SA: supply air.
 - .2 SAN SEW: sanitary sewer.
 - .3 SCHED: schedule.
 - .4 SC: solid core.
 - .5 SCRN: screen.
 - .6 SCWD: solid core wood door.
 - .7 SD: smoke developed.
 - .8 SDT: static dissipative tile.
 - .9 SECT: section.
 - .10 SH: sill height.

- .11 SIM: similar.
 - .12 SL: sliding.
 - .13 SLR: sealer.
 - .14 SPEC: specification.
 - .15 SS: stainless steel.
 - .16 STD: standard.
 - .17 STL: steel.
 - .18 STL BM: steel beam.
 - .19 STC: sound transmission class.
 - .20 STL FL DK: steel floor deck.
 - .21 STL PL: steel plate.
 - .22 STN: stone.
 - .23 STR: structure or structural.
 - .24 ST SEW: storm sewer.
 - .25 S&U: stain and urethane.
 - .26 S&V: stain and varnish.
 - .27 SVT: solid vinyl tile.
- .20 T:
- .1 T: top.
 - .2 T&B: top and bottom.
 - .3 TCB: turbidity control plan.
 - .4 TEL: telephone.
 - .5 TER: terrazzo.
 - .6 TERT: terrazzo tile.
 - .7 THKNS: thickness.
 - .8 THR: threshold.
 - .9 TMPD: tempered.
 - .10 TOPG: topping.
 - .11 TRANSV: transverse.
 - .12 TYP: typical.
- .21 U:
- .1 U: urethane.
 - .2 U/C: undercut.
 - .3 UGRD: underground.
 - .4 UNO: unless noted otherwise.
 - .5 UOS: unless otherwise specified.
 - .6 U/S: underside.
 - .7 UR: urinal.
- .22 V:
- .1 V: volt.
 - .2 VCF: vinyl coated fabric.
 - .3 VCT: vinyl composition tile.
 - .4 VEL: velocity.
 - .5 VERT: vertical.
 - .6 VERT B: vertical blinds.
 - .7 VERT EF: vertical each face.
 - .8 VSF: vinyl sheet flooring.
 - .9 VPT: vinyl plank flooring.

- .10 VT: vinyl tile.
- .11 VWC: vinyl wall covering.
- .23 W:
 - .1 WB: wet-bulb.
 - .2 WC: water closet.
 - .3 W-C: wall connectors.
 - .4 WD: wood.
 - .5 WDV: wood veneer.
 - .6 WG: water gauge.
 - .7 WH: wall hydrant.
 - .8 WHMIS: workplace hazardous materials information system.
 - .9 WP: waterproofing.
 - .10 WR: washroom.
 - .11 WSIB: workplace safety and insurance board.
 - .12 WT: weight.
 - .13 WTP: water treatment plant.

1.3 STANDARDS ORGANIZATIONS

- .1 Standards writing organizations:
 - .1 AA - Aluminum Association.
 - .2 ACPA - American Concrete Pipe Association.
 - .3 ANSI - American National Standards Institute.
 - .4 ASHRAE - American Society of Heating and Refrigerating and Air-Conditioning Engineers.
 - .5 ASTM - American Society for Testing and Materials.
 - .6 AWI/AWMAC - Architectural Woodwork Institute/Architectural Woodwork Manufacturers Association of Canada.
 - .7 AWPA - American Wood Preservers' Association.
 - .8 AWWA - American Water Works Association.
 - .9 BHMA - Builders Hardware Manufacturers Association.
 - .10 CCDC - Canadian Construction Documents Committee.
 - .11 CCMPPA - Canadian Concrete Masonry Producers Association.
 - .12 CGSB - Canadian General Standards Board.
 - .13 CNTA - Canadian Nursery Trades Association.
 - .14 CPCA - Canadian Painting Contractors Association.
 - .15 CRCA - Canadian Roofing Contractors Association.
 - .16 CSA - Canadian Standards Association.
 - .17 CSC - Construction Specifications Canada.
 - .18 CSDMA - Canadian Steel Door Manufacturers Association.
 - .19 CSI - Construction Specifications Institute.
 - .20 CSSBI - Canadian Sheet Steel Building Institute.
 - .21 CRCA - Canadian Roofing Contractors Association.
 - .22 DHI - Door and Hardware Institute.
 - .23 EEMAC - Electrical and Electronic Manufacturer's Association of Canada.
 - .24 ESA - Electrical Safety Authority.
 - .25 FCC - Fire Commissioner of Canada.
 - .26 FSC - Forest Stewardship Council.

- .27 GANA - Glass Association of North America.
- .28 HMMA - Hollow Metal Manufacturers Association.
- .29 IEEE - Institute of Electrical and Electronics Engineers Inc.
- .30 ISO - International Organization for Standardization.
- .31 IWFA - International Window Film Association.
- .32 LEED - LEED Canada, Leadership in Energy and Environmental Design.
- .33 MPI - Master Painters Institute.
- .34 NAAMM - National Association of Architectural Metal Manufacturers.
- .35 NCPI - National Clay Pipe Institute.
- .36 NEMA - National Electrical Manufacturers Association.
- .37 NFPA - National Fire Protection Association.
- .38 OPSD - Ontario Provincial Standard Drawings.
- .39 OPSS - Ontario Provincial Standard Specifications.
- .40 PPI - Plastics Pipe Institute.
- .41 SDI - Steel Door Institute.
- .42 SCAQMD - South Coast Air Quality Management District.
- .43 TIA - Telecommunications Industry Association.
- .44 TIAC - Thermal Insulation Association of Canada.
- .45 TTMAC - Terrazzo Tile and Marble Association of Canada.
- .46 UL - Underwriters Laboratories.
- .47 ULC - Underwriters Laboratories of Canada.
- .48 US EPA - United States Environmental Protection Agency.
- .49 WH - Warnock Hersey.

1.4 FEDERAL GOVERNMENT DEPARTMENTS AND AGENCIES

- .1 Departments, agencies and crown corporations.
 - .1 CEAA - Canadian Environmental Assessment Agency.
 - .2 CSC - Correctional Service Canada.
 - .3 CRA - Canada Revenue Agency.
 - .4 DND - Department of National Defence.
 - .5 EC - Environment Canada.
 - .6 FHBRO - Federal Heritage Buildings Review Office.
 - .7 HC - Health Canada.
 - .8 HCD - Heritage Conservation Directorate.
 - .9 LC - Labour Canada.
 - .10 PC - Parks Canada.
 - .11 PWGSC - Public Works and Government Services Canada.
 - .12 RCMP - Royal Canadian Mounted Police.
 - .13 TBS - Treasury Board Secretariat.
 - .14 TC - Transport Canada.

1.5 PROVINCIAL GOVERNMENT DEPARTMENTS AND AGENCIES

- .1 MOEE - Ontario Ministry of Environment and Energy.
- .2 MOL - Ontario Ministry of Labour.

.3 MTO and MOT - Ontario Ministry of Transportation.

.4 TSSA - Technical Standards and Safety Authority.

1.6 INTERNATIONAL GOVERNMENT DEPARTMENTS AND AGENCIES

.1 DOHMH - New York City Department of Health and Mental Hygiene, USA.

.2 GSA - Government Services Administration, USA.

1.7 UNITS OF MEASURE METRIC

.1 The following abbreviations of units of measure are commonly found in the Project Manual:

- .1 C: Celsius.
- .2 cm: centimetre.
- .3 kg: kilogram.
- .4 kg/m³: kilogram per cubic metre.
- .5 kN: kilonewton.
- .6 kPa: kilopascals.
- .7 kw: kilowatts.
- .8 l/s: litre per second.
- .9 m: metre.
- .10 m³: cubic metre.
- .11 mg/kg: milligrams per kilogram.
- .12 mg/L: milligrams per litre.
- .13 mm: millimetres.
- .14 MPa: megapascal.
- .15 NTU: nephelometric turbidity unit.
- .16 ppm: parts per million.
- .17 ug/L: micrograms per litre.
- .18 ug/m³: micrograms per cubic metre.

1.8 UNITS OF MEASURE IMPERIAL

.1 The following abbreviations of units of measure are commonly found in the Project Manual:

- .1 BTU: British thermal units.
- .2 CFM: cubic feet per minute.
- .3 F: Fahrenheit.
- .4 ft: foot/feet.
- .5 FPI: fins per inch.
- .6 FPM: feet per minute.
- .7 ga: gauge.
- .8 gpm: gallons per minute.
- .9 in: inches.
- .10 lbs: pounds.
- .11 NTU: nephelometric turbidity unit.

- .12 psi: pounds-force per square inch.
- .13 PSIG: PSI gauge.
- .14 ppm: parts per million.
- .15 RPM: revolutions per minute.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Tests and mix designs.
- .3 Mock-ups.
- .4 Mill tests.

1.2 INSPECTION

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative 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 Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.3 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work, above and beyond those required of the Contractor. Cost of such services will be borne by Departmental Representative.
- .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 Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

1.4 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.

1.5 PROCEDURES

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay 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.

1.6 REJECTED WORK

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

1.7 REPORTS

- .1 Submit 4 copies of inspection and test reports to Departmental

Representative.

- .2 Provide copies to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

1.8 TESTS AND MIX DESIGNS

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

1.9 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
- .2 Construct in all locations acceptable to Departmental Representative as specified in specific Section.
- .3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Departmental Representative will assist in preparing a schedule fixing dates for preparation.
- .6 Mock-ups may remain as part of Work.

1.10 MILL TESTS

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

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PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Temporary utilities.

1.2 RELATED SECTIONS

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

1.3 SUBMITTALS

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

1.4 INSTALLATION AND REMOVAL

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

1.5 DEWATERING

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

1.6 WATER SUPPLY

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

1.7 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

- .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures of minimum 10°C in areas where construction is in progress.
- .5 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
- .7 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.8 TEMPORARY POWER AND LIGHT

- .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools.
- .2 Arrange for connection with appropriate utility company. Pay all costs for installation, maintenance and removal.
- .3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.

- .4 Provide and maintain temporary lighting throughout project.

1.9 TEMPORARY COMMUNICATION FACILITIES

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

1.10 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 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 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 and sediment and erosion control drawings.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Construction aids.
- .2 Office and sheds.
- .3 Parking.
- .4 Project identification.

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.189-2000, Exterior Alkyd Primer for Wood.
 - .2 CAN/CGSB-1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA O121-08(R2013), Douglas Fir Plywood.
 - .3 CAN/CSA-Z321-96(R2006), Signs and Symbols for the Occupational Environment, withdrawn but still available from CSA, CCOHS and Techstreet.

1.3 SUBMITTALS

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

1.4 INSTALLATION AND REMOVAL

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas which have to be 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.

1.5 SCAFFOLDING

- .1 Scaffolding in accordance with CSA Z797.
- .2 Provide and maintain ramps, ladders, swing staging, platforms, and temporary stairs necessary for the execution of the works.

1.6 HOISTING

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

1.7 SITE STORAGE/LOADING

- .1 Confine work and operations of employees to areas defined by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.8 CONSTRUCTION PARKING

- .1 Parking will be permitted on site provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site.
- .3 Build and maintain temporary roads where indicated or directed by Departmental Representative and provide snow removal during period of Work.
- .4 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.
- .5 Clean construction runways and taxi areas where used by Contractor's equipment.

1.9 SECURITY

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

1.10 OFFICES

- .1 Provide office heated to 22°C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide a clearly marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors may provide their own offices as necessary. Direct location of these offices.
- .4 Departmental Representative's Site office.
 - .1 Provide temporary office for Departmental Representative.
 - .2 Inside dimensions minimum 3.6 m long x 3 m wide x 2.4 m high, with floor 0.3 m above grade, complete with 4 50% opening windows and one lockable door.
 - .3 Insulate building and provide heating system to maintain 22° C inside temperature at -20° C outside temperature.
 - .4 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colours. Finish floor with 19 mm thick plywood.
 - .5 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10% upward light component.
 - .6 Provide private washroom facilities adjacent to office complete with flush or chemical type toilet, lavatory and mirror and maintain supply of paper towels and toilet tissue.
 - .7 Equip office with 1 x 2 m table, 4 chairs, 6 m of shelving 300 mm wide, one 3 drawer filing cabinet, one plan rack and one coat rack and shelf.
 - .8 Maintain in clean condition.

1.11 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in a 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 a manner to cause least interference with work activities.

1.12 SANITARY FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take such precautions as required by local health

authorities. Keep area and premises in sanitary condition.

1.13 CONSTRUCTION SIGNAGE

- .1 Provide and erect, within three weeks of signing Contract, a project sign in a location designated by Departmental Representative.
- .2 Construction sign 1.2 x 2.4 m, of wood frame and plywood construction painted with exhibit lettering produced by a professional sign painter.
- .3 Indicate on sign, name of Owner, Consultant and Contractor, of a design style established by Departmental Representative.
- .4 No other signs or advertisements, other than warning signs, are permitted on site.
- .5 Provide project identification site sign comprising foundation, framing, and one 1200 x 2400 mm signboard as detailed and as described below.
 - .1 Foundations: 15 MPa concrete to CSA A23.1/A23.2 minimum 200 mm x 900 mm deep.
 - .2 Framework and battens: SPF, pressure treated minimum 89 x 89 mm.
 - .3 Signboard: 19 mm Medium Density Overlaid Douglas Fir Plywood to CSA O121.
 - .4 Paint: alkyd enamel to CAN/CGSB-1.59 over exterior alkyd primer to CAN/CGSB-1.189.
 - .5 Fasteners: hot-dip galvanized steel nails and carriage bolts.
 - .6 Vinyl sign face: printed project identification, self adhesive, vinyl film overlay, supplied by Departmental Representative.
- .6 Locate project identification sign as directed by Departmental Representative and construct as follows:
 - .1 Build concrete foundation, erect framework, and attach signboard to framing.
 - .2 Paint all surfaces of signboard and framing with one coat primer and two coats enamel. Colour white on signboard face, black on other surfaces.
 - .3 Apply vinyl sign face overlay to painted signboard face in accordance with installation instruction supplied.
- .7 Direct requests for approval to erect a Consultant/Contractor signboard to Departmental Representative. For consideration general appearance of Consultant/Contractor signboard must conform to project identification site sign. Wording shall be in both official languages.
- .8 Signs and notices for safety and instruction shall be in both official languages. Graphic symbols shall conform to CAN/CSA-Z321.
- .9 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier

if directed by Departmental Representative.

1.14 PROTECTION AND MAINTENANCE OF TRAFFIC

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

1.15 CLEAN-UP

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

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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.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Barriers.
- .2 Environmental Controls.
- .3 Traffic Controls.
- .4 Fire Routes.

1.2 RELATED SECTIONS

- .1 Section 01 51 00 - Temporary Utilities.
- .2 Section 01 52 00 - Construction Facilities.

1.3 REFERENCES

- .1 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-1.189-2000, Exterior Alkyd Primer for Wood.
 - .2 CAN/CGSB-1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA):
 - .1 CSA O121-08(R2013), Douglas Fir Plywood.

1.4 INSTALLATION AND REMOVAL

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

1.5 HOARDING

- .1 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.
- .2 Erect temporary site enclosure using modular freestanding fencing: galvanized, minimum 1.8 m high, chain link or welded steel mesh, pipe rail. Provide one lockable truck entrance gate and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys. Maintain fence in good repair.

1.6 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.

1.7 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 the 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 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.
- .4 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

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Product quality, availability, storage, handling, protection, and transportation.
- .2 Manufacturer's instructions.
- .3 Quality of Work, coordination and fastenings.
- .4 Existing facilities.

1.2 RELATED SECTIONS

- .1 Section 01 45 00 - Quality Control.
- .2 Section 01 73 00 - Execution of works.

1.3 REFERENCES

- .1 Within text of specifications, reference may be made to reference standards.
- .2 Conform to these standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 The cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.
- .5 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.
- .6 OPSS Ontario Provincial Standard Specifications and OPSD Ontario Provincial Standard Drawings quoted in these specifications are available online at <http://www.raqsa.mto.gov.on.ca/techpubs/ops.nsf/OPSHomepage>.

1.4 QUALITY

- .1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of Products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.5 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.6 METRIC SIZED MATERIALS

- .1 SI metric units of measurement are used exclusively on the drawings and in the specifications for this project.
- .2 The Contractor is required to provide metric products in the sizes called for in the Contract Documents except where a valid claim can be made that a particular product is not available on the Canadian

market.

- .3 Claims for exemptions from use of metric sized products shall be in writing and fully substantiated with supportive documentation. Promptly submit application to Departmental Representative for consideration and ruling. Non-metric sized products may not be used unless Contractor's application has been approved in writing by the Departmental Representative.
- .4 Difficulties caused by the Contractor's lack of planning and effort to obtain modular metric sized products which are available on the Canadian market will not be considered sufficient reasons for claiming that they cannot be provided.
- .5 Claims for additional costs due to provision of specified modular metric sized products will not be considered.

1.7 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 and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.8 TRANSPORTATION

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

1.9 MANUFACTURER'S INSTRUCTIONS

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

1.10 QUALITY OF WORK

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

1.11 CO-ORDINATION

- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.12 REMEDIAL WORK

- .1 Refer to Section 01 73 00.
- .2 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
- .3 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.13 LOCATION OF FIXTURES

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

1.14 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.

1.15 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.

1.16 PROTECTION OF WORK IN PROGRESS

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

1.17 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/or building occupants 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 SECTION INCLUDES

- .1 Field engineering survey services to measure and stake site.
- .2 Survey services to establish and confirm inverts for Work.
- .3 Recording of subsurface conditions found.

1.2 REFERENCES

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

1.3 QUALIFICATIONS OF SURVEYOR

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

1.4 SURVEY REFERENCE POINTS

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

1.5 SURVEY REQUIREMENTS

- .1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
- .2 Establish lines and levels, locate and lay out, by instrumentation.

- .3 Stake for grading, fill and topsoil placement and landscaping features.
- .4 Stake slopes and berms.
- .5 Establish pipe invert elevations.

1.6 EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.
- .2 Remove abandoned service lines as indicated. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

1.7 LOCATION OF EQUIPMENT AND FIXTURES

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

1.8 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.

1.9 SUBMITTALS

- .1 Submit name and address of Surveyor to Departmental Representative.
- .2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying and noting those

elevations and locations of completed Work that conform and do not conform with Contract Documents.

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.
- .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.

1.2 MATERIALS

- .1 Required for original installation.
- .2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00.

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 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 Remove samples of installed Work for testing.
- .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 Submit proposed materials, finishes and installation method for patching to Departmental Representative for approval, prior to patching.
- .11 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

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PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Progressive cleaning.
- .2 Final cleaning.

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use clearly marked separate bins for recycling. Refer to Section 01 74 20.
- .7 Remove waste material and debris from site and deposit in waste container at end of each working day.
- .8 Dispose of waste materials and debris off site.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 FINAL CLEANING

- .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review, remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris 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 Departmental Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .8 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .9 Remove dirt and other disfiguration from exterior surfaces.
- .10 Sweep and wash clean paved areas.
- .11 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.
- .12 Clean roofs, downspouts, and drainage systems.
- .13 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .14 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

PWGSC Ontario	CONSTRUCTION/DEMOLITION	Section 01 74 20
Region Project	WASTE MANAGEMENT AND	Page 1
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PART 1 - GENERAL

1.1 CONSTRUCTION & DEMOLITION WASTE

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

1.2 WASTE PROCESSING SITES

- .1 Province of: Ontario.
 - .1 Ministry of Environment and Energy, 135 St. Clair Avenue West, Toronto, ON, M4V 1P5.
 - .2 Telephone: 800-565-4923 or 416-323-4321.
 - .3 Fax: 416-323-4682.
- .2 Recycling Council of Ontario: 215 Spadina Avenue, #225, Toronto, ON, M5T 2C7.
 - .1 Telephone: 416-657-2797.
 - .2 Fax: 416-960-8053.
 - .3 Email: rco@rco.on.ca.
 - .4 Internet: <http://www.rco.on.ca/>.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Government Chief Responsibility for the Environment.

Province	Address	General Inquiries	Fax
Ontario	Ministry of Environment and Energy 135 St. Clair Avenue West, Toronto, ON, M4V 1P5.	(800)565-4923 or (416)323-4321	(416)323-4682
	Environment Canada Toronto, ON	(416) 739-4826	(416) 739-4776

END OF SECTION

PART 1 - GENERAL

1.1 INSPECTION AND DECLARATION

- .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 - .2 Request Departmental Representative's Inspection.
- .2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to 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 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 Departmental Representative and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request reinspection.

1.2 CLEANING

- .1 In accordance with Section 01 74 11.
- .2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 As-built, samples, and specifications.
- .2 Product data, materials and finishes, and related information.
- .3 Operation and maintenance data.
- .4 Warranties and bonds.
- .5 Final site survey.

1.2 SUBMISSION

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

1.3 FORMAT

- .1 Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: Identify each binder with type or printed title '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.
- .9 Provide 1:1 scaled CAD files in dwg format. Forward pdf, NMSEdit Professional spp, MS Word, MS Excel, MS Project and Autocad dwg files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

1.4 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project;
 - .1 Date of submission; names,
 - .2 Addresses, and telephone numbers of Contractor with name of responsible parties;
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to clearly 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.

1.5 AS-BUILTS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Amendments and addenda.
 - .4 Change Orders and other modifications to the Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of 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 Departmental Representative.
- .6 Turn one set, paper copy and electronic copy, of AS-BUILT drawings and specifications over to Departmental Representative on completion of work. Submit files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.
- .7 If project is completed without significant deviations from Contract drawings and specifications submit to Departmental Representative one set of drawings and specifications marked "AS-BUILT".

1.6 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
- .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: legibly mark each item to record

actual construction, including:

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

1.7 FINAL SURVEY

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

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 WARRANTIES AND BONDS

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
- .4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Certificate of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

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

1.2 MEASUREMENT AND PAYMENT

- .1 Measurement Procedures.
 - .1 Measure removal of asphaltic concrete pavement in square metres.
 - .2 Measure removal of Portland cement concrete pavement and brick sidewalks in square metres.
 - .3 Measure removal of base and sub-base pavement materials in cubic metres in place.
 - .4 Measure removal of concrete in cubic metres.
 - .5 Measure removal of culverts, pipe sewers and drains in metres for each diameter.
 - .1 End points of measurements will be at centres of maintenance holes or catch basins or open ends of pipes, as applicable.
 - .6 Measure removal of maintenance holes and catch basins in units.
 - .7 Measure removal of cable duct banks in metres from end to end of duct bank for each size.
 - .8 Measure removal of fences and curbs in metres.
 - .9 Payment for salvage, stockpiling, sealing, disposal, alternative disposal, recycling, excavating, backfilling and restoration will be included in above removal items.
 - .10 Measure removal of waste and materials designated for alternate disposal from site in tonnes.
 - .11 Measure abandonment of pipes and culverts in metres for each diameter.

1.3 REFERENCES

- .1 Definitions:
 - .1 Demolition: rapid destruction of building following removal of hazardous materials.
 - .2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.
 - .3 Waste Audit (WA): detailed inventory of materials in building. Indicates quantities of reuse, recycling and landfill.
 - .1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.

- .2 Indicates quantities of reuse, recycling and landfill.
- .4 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.
- .2 Reference Standards:
 - .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .2 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.
 - .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS.PROV 510 November 2014 - Construction Specification for Removal

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Site Meetings.
 - .1 Convene pre-demolition meeting one week prior to beginning work of this Section in accordance with Section 01 31 19 to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
 - .2 Arrange for site visit with Departmental Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.
 - .3 Hold project meetings bi-weekly.
 - .4 Ensure key personnel, site supervisor, project manager, and subcontractor representatives attend.
 - .5 Departmental Representative will provide written and verbal notification of change of meeting schedule established upon contract award 24 hours prior to scheduled meeting.
- .2 Scheduling: meet project time lines without compromising specified minimum rates of material diversion.
 - .1 Notify Departmental Representative in writing when unforeseen delays occur.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.
 - .2 Submit for approval drawings, diagrams or details showing

sequence of demolition work and supporting structures and underpinning, where required by authorities having jurisdiction.

- .3 Hazardous Materials:
 - .1 Provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.
- .4 Waste Reduction Workplan:
 - .1 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 20 and indicate:
 - .1 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.
 - .2 Schedule of selective demolition.
 - .3 Number and location of dumpsters.
 - .4 Anticipated frequency of tippage.
 - .5 Name and address of haulers, waste facilities, and waste receiving organizations.
- .5 Certificates:
 - .1 Submit copies of certified weigh bills, bills of lading and receipts from authorized disposal sites and reuse and recycling facilities for material removed from site upon request of Departmental Representative.
 - .2 Written authorization from Departmental is required to deviate from haulers, facilities, and receiving organizations listed in Waste Reduction Workplan.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial regulations.

1.7 DELIVERY, STORAGE AND HANDLING

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

- .3 Develop Waste Reduction Workplan related to Work of this Section.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

1.8 SITE CONDITIONS

- .1 Site Environmental Requirements.
 - .1 Perform work in accordance with Section 01 35 43.
 - .2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .3 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
 - .1 Ensure proper disposal procedures are maintained throughout the project.
 - .4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
 - .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.
 - .6 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .2 Existing Conditions.
 - .1 Remove contaminated or hazardous materials as defined by authorities having jurisdiction from site, prior to start of demolition Work, and dispose of at designated disposal facilities in safe manner, in accordance with TDGA and other applicable regulatory requirements.

PART 2 - PRODUCTS

2.1 EQUIPMENT

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

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.
- .4 Disconnect and Cap Designated Mechanical Services.
 - .1 Natural Gas Supply Lines: remove in accordance with gas company requirements.
 - .2 Sewer and Water Lines: remove in accordance with authority having jurisdiction and securely plug to form watertight seal.
 - .3 Other Underground Services: remove and dispose of as indicated.

3.2 REMOVAL OF HAZARDOUS WASTES

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

3.3 REMOVAL OPERATIONS

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Removal of pavements, curbs and gutters:
 - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.
 - .2 Protect adjacent joints and load transfer devices.
 - .3 Protect underlying and adjacent granular materials.
- .4 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving.
- .5 Excavate at least 300 mm below pipe invert, when removing pipes under existing or future pavement area.

- .6 Decommission water wells and monitoring wells in accordance with Provincial and Municipal regulations.
- .7 Remove designated trees during demolition.
 - .1 Obtain written approval of Departmental Representative prior to removal of trees not designated.
- .8 Sell, donate, dispose of alternately trees designated for removal and identified by Departmental Representative to be healthy and marketable.
 - .1 Grind, chip, or shred other vegetation for mulching and composting, or use as mill pulp or process fuel.
- .9 Stockpile topsoil for final grading and landscaping:
 - .1 Provide erosion control and seeding if not immediately used.
- .10 Salvage:
 - .1 Dismantle items containing materials for salvage and stockpile salvaged materials at locations as indicated.
- .11 Disposal of Material:
 - .1 Dispose of materials not designated for salvage or reuse on site at authorized facilities approved in Waste Reduction Workplan.
- .12 Backfill:
 - .1 Backfill in areas as indicated and in accordance with Section 31 23 33.01.

3.4 STOCKPILING

- .1 Label stockpiles, indicating material type and quantity.
- .2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.
- .3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.
- .4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

3.5 REMOVAL FROM SITE

- .1 Remove stockpiled material as directed by Departmental Representative, when it interferes with operations of project.
- .2 Remove stockpiles of like materials by alternate disposal option once

collection of materials is complete.

- .3 Transport material designated for alternate disposal using approved haulers, facilities and receiving organizations listed in Waste Reduction Workplan and in accordance with applicable regulations.
 - .1 Written authorization from Departmental Representative is required to deviate from haulers, facilities and receiving organizations listed in Waste Reduction Workplan.
- .4 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.
 - .1 Disposal Facilities: approved and listed in Waste Reduction Workplan.
 - .2 Written authorization from Departmental Representative is required to deviate from disposal facilities listed in Waste Reduction Workplan.

3.6 RESTORATION

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

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
 - .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work
 - .3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

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

1.2 MEASUREMENT PROCEDURES

- .1 No measurement will be made under this Section. Include costs in items of work for which concrete formwork and falsework is required.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA A23.1-14/A23.2-14, Concrete materials and methods of concrete construction/Test methods and standard practices for concrete.
 - .2 CSA 086-14, Engineering Design in Wood (Limit States Design).
 - .3 CSA 0121-08(R2013), Douglas Fir Plywood.
 - .4 CSA 0151-09(R2014), Canadian Softwood Plywood.
 - .5 CSA 0153-13, Poplar Plywood.
 - .6 CAN3-0188.0-M78, Standard Test Methods for Mat-Formed Wood Particleboards and Waferboard.
 - .7 CSA 0437 Series-93(R2011), Standards for OSB and Waferboard.
 - .8 CSA S269.1-16, Falsework and Formwork.
 - .9 CAN/CSA-S269.3-M92(R2013), Concrete Formwork.
- .2 Council of Forest Industries of British Columbia (COFI)
 - .1 COFI Exterior Plywood for Concrete Formwork.
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 919 November 2011, Construction Specification for Formwork and Falsework

1.4 SHOP DRAWINGS

- .1 Submit shop drawings for formwork and falsework in accordance with Section 01 33 00.
- .2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Show size of tie hold, plastic plug, and plug recess. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA-S269.3 for formwork drawings.
- .3 Indicate formwork design data, such as permissible rate of concrete

placement, and temperature of concrete, in forms.

- .4 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.
- .5 Each shop drawing submission shall bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20 and the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA 0121 and CSA 086.
- .2 Form ties:
 - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.
 - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .3 Form liner:
 - .1 Plywood: Douglas Fir to CSA 0121, T and G.
 - .2 Waferboard: to CAN3-0188.0.
- .4 Form release agent: non-toxic, biodegradable, low VOC.
- .5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 15

to 24 mm²/s at 40°C, flashpoint minimum 150°C, open cup.

- .6 Falsework materials: to CSA S269.1.

PART 3 - EXECUTION

3.1 FABRICATION AND ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1/A23.2.
- .8 Align form joints and make watertight. Keep form joints to minimum.
- .9 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .12 Clean formwork in accordance with CSA A23.1/A23.2, before placing concrete.
- .13 If slip forming and flying forms are used, submit details of equipment and procedures for Departmental Representative's approval.

3.2 REMOVAL AND RESHORING

- .1 Remove formwork when concrete has reached 75% of its design strength or minimum period required, whichever comes later, and replace immediately with adequate reshoring.
- .2 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .3 Space reshoring in each principal direction at not more than 3000 mm apart.
- .4 Re-use formwork and falsework subject to requirements of CSA A23.1/A23.2.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 03 10 00 - Concrete Formwork.
- .2 Section 03 30 00 - Cast-in-Place Concrete.

1.2 PRICE AND PAYMENT PROCEDURES

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

1.3 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI Detailing Manual 2004.
- .2 ASTM International
 - .1 ASTM A276/A276M-16, Standard Specification for Stainless Steel Bars and Shapes.
 - .2 ASTM A775/A775M-07b(2014), Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .3 ASTM A955/A955M-16, Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcement.
 - .4 ASTM A1064/A1064M-16, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .3 CSA International
 - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA A23.3-14, Design of Concrete Structures.
 - .3 CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CSA W186-M1990(R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.
- .5 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS.PROV 905 November 2014, Construction Specification for Steel Reinforcement for Concrete.

- .2 OPSS.PROV 1440 November 2014, Material Specification for Steel Reinforcement for Concrete.
- .3 OPSS 1442 November 2007, Material Specification for Epoxy Coated Reinforcing Steel Bars for Concrete.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .1 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
 - .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
 - .1 Provide type C tension lap splices unless otherwise indicated.

1.5 QUALITY ASSURANCE

- .1 Submit in accordance with Section 01 45 00 and as described in PART 2 - SOURCE QUALITY CONTROL.
 - .1 Mill Test Report: upon request provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
 - .2 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

1.6 DELIVERY, STORAGE AND HANDLING

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

- .2 Delivery and Acceptance Requirements: 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 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Workplan related to Work of this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA G30.18, unless indicated otherwise, minimum 30% recycled content.
- .3 Deformed steel wire for concrete reinforcement: to ASTM A1064/A1064M, minimum 30% recycled content.
- .4 Welded steel wire fabric: to ASTM A1064/A1064M, minimum 30% recycled content.
 - .1 Provide in flat sheets only.
- .5 Epoxy coating of non-prestressed reinforcement: to ASTM A775/A775M.
- .6 Chairs, bolsters, bar supports, spacers: to CSA A23.1/A23.2.
- .7 Mechanical splices: subject to approval of Departmental Representative.
- .8 Plain round bars: to CSA G40.20/G40.21.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2, ACI Detailing Manual and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, weld reinforcement in

accordance with CSA W186.

- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
 - .1 Ship epoxy coated bars in accordance with ASTM A775A/A775M.

2.3 SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Inform Departmental Representative of proposed source of material to be supplied.

PART 3 - EXECUTION

3.1 FIELD BENDING

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

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA A23.1/A23.2.
- .2 Use plain round bars as slip dowels in concrete.
 - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
 - .2 When paint is dry, apply thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.
- .5 Protect epoxy and paint coated portions of bars with covering during transportation and handling.

3.3 FIELD TOUCH-UP

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

3.4 CLEANING

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 03 10 00 - Concrete Formwork.
- .2 Section 03 20 00 - Concrete Reinforcing.
- .3 Section 32 16 15 - Concrete Walks, Curbs and Gutters.

1.2 PRICE AND PAYMENT PROCEDURES

- .1 Measurement and Payment:
 - .1 Measure cast-in-place concrete in cubic metres calculated from neat dimensions.
 - .1 Concrete placed beyond dimensions indicated will not be measured.
 - .2 No deductions will be made for volume of concrete displaced by reinforcing steel, structural steel, or piles.
 - .3 No deductions will be made for volume of concrete less than 0.1 m² in cross sectional area displaced by individual drainage openings.
 - .4 Supply and installation of anchor bolts, nuts and washers and bolt grouting will not be measured but considered incidental to work.

1.3 REFERENCES

- .1 Abbreviations and Acronyms:
 - .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.
 - .1 Type GU, GUb and GUL - General use cement.
 - .2 Type MS and MSb - Moderate sulphate-resistant cement.
 - .3 Type MH, MHb and MHL - Moderate heat of hydration cement.
 - .4 Type HE, HEb and HEL - High early-strength cement.
 - .5 Type LH, LHb and LHL - Low heat of hydration cement.
 - .6 Type HS and HSb - High sulphate-resistant cement.
 - .2 Fly ash:
 - .1 Type F - with CaO content less than 15%.
 - .2 Type CI - with CaO content ranging from 15 to 20%.
 - .3 Type CH - with CaO greater than 20%.
 - .3 GGBFS - Ground, granulated blast-furnace slag.
- .2 Reference Standards:
 - .1 ASTM International
 - .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

- .3 ASTM C494/C494M-15a, Standard Specification for Chemical Admixtures for Concrete.
- .4 ASTM C1017/C1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .5 ASTM D1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .6 ASTM D1752-04a(2013), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 CSA International
 - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283-06(R2016), Qualification Code for Concrete Testing Laboratories.
 - .3 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .3 Ontario Provincial Standard Specifications, Construction
 - .1 OPSS.PROV 904 November 2014, Construction Specification for Concrete Structures
 - .2 OPSS 1212 November 2003, Hot Poured Rubberized Asphalt Joint Sealing Compound.
 - .3 OPSS 1301 November 2007, Material Specification for Cementing Materials.
 - .4 OPSS 1302 September 1996, Material Specification for Water.
 - .5 OPSS 1308 November 2003, Material Specification for Joint Filler in Concrete.
 - .6 OPSS 1315 November 2008, Material Specification White Pigmented Curing Compounds for Concrete.
 - .7 OPSS.PROV 1350 November 2014, Material Specification for Concrete - Materials and Production.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 31 19, convene pre-installation meeting one week prior to beginning concrete works.
 - .1 Ensure key personnel, site supervisor, Departmental Representative speciality contractor - finishing, forming, concrete producer and testing laboratories attend.
 - .1 Verify project requirements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 At least 4 weeks prior to beginning Work, provide Departmental Representative with samples of materials proposed for use as follows:
 - .1 1 L of curing compound.
 - .2 1 m length of each type of joint filler.
 - .3 15 kg of fine aggregate, 25 kg of 19 mm coarse aggregate and 50 kg of 37.5 mm coarse aggregate.
- .3 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
- .4 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 90 minutes for concrete to be delivered to site of Work and discharged after batching.
- .5 Provide two copies of WHMIS MSDS.

1.6 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00.
- .2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.
 - .6 Formwork removal.
 - .7 Joints.
- .4 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged within 90 minutes maximum after batching.
 - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by Departmental Representative.
 - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

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

2.2 PERFORMANCE CRITERIA

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

2.3 MATERIALS

- .1 Portland Cement: to CAN/CSA-A3001, Type GU.
- .2 Water: to CSA A23.1/A23.2.
- .3 Aggregates: to CSA A23.1/A23.2.
- .4 Admixtures:
 - .1 Air entraining admixture: to ASTM C260/C260M.
 - .2 Chemical admixture: to ASTM C494/C494M and ASTM C1017/C1017M. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

- .5 Curing compound: to CSA A23.1/A23.2 white and ASTM C309, Type 2 Class B.
- .6 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board (Type A): to ASTM D1751.
 - .2 Sponge rubber (Type B): to ASTM D1752.
- .7 Weep hole tubes: plastic.

2.4 MIXES

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
 - .2 Provide concrete mix to meet following plastic state requirements:
 - .1 Uniformity: according to the Within Batch Uniformity of Concrete clause, except the acceptance and rejection limits for uniformity shall be according to CSA A23.1, Table 13.
 - .2 Workability: free of surface blemishes, loss of mortar, colour variations, and segregation.
 - .3 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure: C-2.
 - .2 Compressive strength at 28 days: 30 Mpa minimum.
 - .1 Intended application: curbs and gutters, and headwalls.
 - .3 Aggregate size 19.0 mm maximum.
 - .4 Provide quality management plan to ensure verification of concrete quality to specified performance.
 - .5 Concrete supplier's certification: both batch plant and materials meet CSA A23.1/A23.2 requirements.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete.
 - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.

- .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .10 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 INSTALLATION/ APPLICATION

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Anchor bolts:
 - .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
 - .2 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
- .3 Drainage holes and weep holes:
 - .1 Form weep holes and drainage holes in accordance with Section 03 10 00. If wood forms are used, remove them after concrete has set.
 - .2 Install weep hole tubes and drains as indicated.
- .4 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.
- .5 Finishing and curing:
 - .1 Finish concrete to CSA A23.1/A23.2.
 - .2 Use procedures as reviewed by Departmental Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
 - .3 Use curing compounds compatible with applied finish on concrete

surfaces. Provide written declaration that compounds used are compatible.

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

3.3 SURFACE TOLERANCE

- .1 Concrete tolerance to CSA A23.1/A23.2, Table 21, Straightedge Method.

3.4 FIELD QUALITY CONTROL

- .1 Site tests: conduct tests as follows in accordance with Section 01 45 00 and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .1 Concrete pours.
 - .2 Slump.
 - .3 Air content.
 - .4 Compressive strength at 7 and 28 days.
 - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
 - .1 Ensure testing laboratory is certified to CSA A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .4 Departmental Representative will pay for costs of tests as specified in Section 01 29 83.
- .5 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .7 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve Contractor of his

contractual responsibility.

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 11.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Divert unused concrete materials from landfill to local facility after receipt of written approval from Departmental Representative.
 - .2 Provide appropriate area on job site where concrete trucks can be safely washed.
 - .3 Divert unused admixtures and additive materials from landfill to official hazardous material collections site as approved by Departmental Representative.
 - .4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
 - .5 Prevent admixtures and additive materials from entering drinking water supplies or streams.
 - .6 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.
 - .7 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 02 41 13 - Selective Site Demolition.
- .2 Section 31 32 19.01 - Geotextiles.
- .3 Section 33 05 16 - Maintenance Holes and Catch Basin Structures.
- .4 Section 33 41 00 - Storm Utility Drainage Piping.

1.2 MEASUREMENT PROCEDURES

- .1 Work performed under this Section will be incidental to work in Section 33 05 16, and Section 33 41 00.
- .2 Excavated materials will be measured in cubic metres in their original location.
 - .1 Common excavation quantities measured will be actual volume removed within following limits:
 - .1 Width for trench excavation as indicated.
 - .2 Width for excavation for structures as indicated.
 - .3 Depth from ground elevation and surface of pavement, surface of sidewalk immediately prior to excavation, to elevation as indicated or as directed by Departmental Representative.
 - .2 Rock quantities measured will be actual volume removed within following limits:
 - .1 Width for trench excavation as indicated.
 - .2 Width for excavation for structures to be bounded by vertical planes up to 500 mm outside of and parallel to neat lines of footings as indicated.
 - .3 Depth from rock surface elevations immediately prior to excavation, to elevation as indicated.
 - .4 Where design elevation is less than 300 mm below original rock surface, depth will be considered to be 300 mm below original rock surface.
 - .5 Volume of individual boulders and rock fragments will be determined by measuring three maximum mutually perpendicular dimensions.
- .3 Sheet piling and bracing left in place on direction of Departmental Representative will be measured in square metres of surface area of plane surface of sheet piling.
- .4 Shoring, bracing, cofferdams, underpinning and de-watering of excavation will not be measured separately for payment.

- .5 Backfilling to authorized excavation limits will be measured in cubic metres compacted in place for each type of material specified.
- .6 Placing and spreading of topsoil will be measured for payment in cubic metres calculated from cross sections taken in area of excavation from original location.
 - .1 If double handling of topsoil is directed by Departmental Representative (stockpiling and later placing), then quantities will be measured twice; on excavation from original location and on excavation from stockpile.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117-13, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .4 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .5 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS.PROV 401 November 2015, Construction Specification for Trenching, Backfilling, and Compacting.
 - .2 OPSS.PROV 1004 November 2012, Material Specification for Aggregates - Miscellaneous.
 - .3 OPSS.PROV 1010 April 2013, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.
- .4 Province of Ontario:
 - .1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, and Regulations for Construction Projects, O. Reg. 213/91 as amended.

1.4 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock excavation: excavation of material from solid masses of

igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 1 m³. Frozen material not classified as rock.

- .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .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 Unsuitable materials:
 - .1 Weak, chemically unstable, and compressible materials.
 - .2 Frost susceptible materials under excavated areas.
 - .3 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136/C136M: Sieve sizes to CAN/CGSB-8.1.
 - .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.

1.5 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00.
- .2 Quality Control: in accordance with Section 01 45 00:
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
 - .2 Submit for review by Departmental Representative proposed dewatering and heave prevention methods as described in PART 3 of this Section.
 - .3 Submit to Departmental Representative written notice at least

- 7 days prior to excavation work, to ensure cross sections are taken.
- .4 Submit to Departmental Representative written notice when bottom of excavation is reached.
 - .5 Submit to Departmental Representative testing, 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, clearance record from utility authority, location plan of relocated and abandoned services, as required.
- .4 Samples:
- .1 Submit samples in accordance with Section 01 33 00.
 - .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
 - .3 Submit 70 kg samples of type of fill specified including representative samples of excavated material.
 - .4 Ship samples prepaid to Departmental Representative, in tightly closed containers to prevent contamination and exposure to elements.

1.6 QUALITY ASSURANCE

- .1 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.
- .3 Keep design and supporting data on site.
- .4 Engage services of qualified professional Engineer who is registered or licensed in Province of Ontario, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .5 Do not use soil material until written report of soil test results are reviewed by Departmental Representative.
- .6 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
- .2 Divert excess aggregate materials from landfill to local quarry or recycling facility for reuse as directed by Departmental Representative.

1.8 EXISTING CONDITIONS

- .1 Examine borehole records available in Appendix 1.
- .2 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .4 Prior to beginning excavation Work, notify Departmental Representative and applicable authorities having jurisdiction. Establish location and state of use of buried utilities and structures. Departmental Representative and authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .5 Confirm locations of buried utilities by careful test excavations.
 - .6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .7 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing. Costs for such Work to be paid by Departmental Representative.
 - .8 Record location of maintained, re-routed and abandoned underground lines.
 - .9 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
 - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair

- as directed by Departmental Representative.
- .3 Where required for excavation, cut roots or branches in accordance with authorities having jurisdiction.

1.9 EXCAVATION AND BACKFILLING REQUIRED BY OTHER SECTIONS

- .1 Excavation and backfilling for site services work is included in this Section and shall be carried out in accordance with provisions specified herein and as indicated on drawings. This work to be laid out and supervised by trade concerned.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Type 1 fill: to OPSS.PROV 1010, for Granular A aggregate. Maximum size 19.0 mm
- .2 Type 2 fill: to OPSS.PROV 1010, for Granular B Type 2 aggregate. Maximum size 26.5 mm.
- .3 Type 3 fill: selected material from excavation (native material), or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.
- .4 Sand: clean, washed, minimum 100% passing 4.75 mm sieve, maximum 5% passing 0.075 mm sieve to OPSS.PROV 1004.
- .5 Drainage material: 19 mm clear stone to OPSS.PROV 1004.
- .6 Shearmat: honeycomb type bio-degradable cardboard 100 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.
- .7 Geotextiles: to Section 31 32 19.01.

PART 3 - EXECUTION

3.1 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly in accordance with Section 02 41 13.

3.2 PREPARATION/PROTECTION

- .1 Protect existing features in accordance with Section 01 56 00 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 Departmental Representative's approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

3.3 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as indicated after area has been cleared of brush, weeds, and grasses and removed from site.
- .2 Strip topsoil to depths as indicated.
 - .1 Do not mix topsoil with subsoil.
- .3 Stockpile in locations as indicated.
 - .1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .4 Dispose of unused topsoil as directed by Departmental Representative.

3.4 STOCKPILING

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

3.5 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29 and Health and Safety Act for the Province of Ontario.
- .2 Construct temporary Works to depths, heights and locations as indicated or directed by Departmental Representative.
- .3 During backfill operation:
 - .1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
 - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
- .4 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .5 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.
 - .2 Remove excess materials from site and restore watercourses as indicated.

3.6 DEWATERING AND HEAVE PREVENTION

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

discharging to storm sewers, watercourses or drainage areas.

3.7 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as indicated.
- .3 Remove concrete, paving, walks and other obstructions encountered during excavation in accordance with Section 02 41 13 and Section 01 74 20.
- .4 Excavation must not interfere with normal 45° splay of bearing from bottom of any footing.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
 - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 15 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .8 Restrict vehicle operations directly adjacent to open trenches.
- .9 Dispose of surplus and unsuitable excavated material off site.
- .10 Do not obstruct flow of surface drainage or natural watercourses.
- .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify Departmental Representative when bottom of excavation is reached.
- .13 Obtain Departmental Representative approval of completed excavation.
- .14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .15 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified

- for footings.
- .2 Fill under other areas with Type 2 fill compacted to not less than 95% of Maximum Dry Density.
- .16 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.
- .17 Install geotextiles in accordance with Section 31 32 19.01.

3.8 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698.
 - .1 Grassed Areas: Type 3 fill (native material) compacted to 95% maximum dry density.
 - .2 Paver Walkways: Type 2 fill compacted to 100% maximum dry density.
 - .3 Pavement Areas: Type 2 fill compacted to 100% maximum dry density.

3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated and as specified in Section 33 41 00.
- .2 Place bedding and surround material in unfrozen condition.

3.10 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.

- .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
- .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 150 mm.
- .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative or:
 - .2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.
- .6 Install drainage system in backfill as indicated.

3.11 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 20, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as indicated.
- .3 Reinstate pavement, sidewalk and lawns to elevation which existed before excavation.
- .4 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

PART 1 - GENERAL

1.1 MEASUREMENT AND PAYMENT

- .1 Measure geotextiles in square metres of surface covered by material. No allowance will be made for seams and overlaps.

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM D4355/D4355M-14, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
 - .2 ASTM D4491-99a(2014)e1, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - .3 ASTM D4533/D4533M-15, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - .4 ASTM D4632/D4632M-15a, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - .5 ASTM D4751-12, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - .6 ASTM D4873/D4873-16, Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
 - .7 ASTM D6241-14, Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50 mm Pro.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No. 11.1-1994(R2013), Textile Test Methods - Bursting Strength - Diaphragm Pressure Test.
 - .2 CAN/CGSB-4.2 No. 11.2-M89(2013), Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
 - .3 CAN/CGSB-4.2 No. 12.2-2012, Textile Test Methods - Tearing Strength - Trapezoid Method.
 - .4 CAN/CGSB-148.1-M, Methods of Testing Geosynthetics.
- .3 CSA International
 - .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .4 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 1860 April 2012, Material Specification for Geotextiles.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit following samples 4 weeks prior to beginning Work.
 - .1 Minimum length of 3 m of roll width of geotextile.
 - .2 Methods of joining.
- .4 Test and Evaluation Reports:
 - .1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.
- .5 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Reduction Workplan highlighting recycling and salvage requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 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 geotextiles from direct sunlight and UV rays.
 - .3 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIAL

- .1 Geotextile: non-woven type 270R synthetic fibre fabric, supplied in rolls.
 - .1 Width: 3.81/4.57 m minimum.
 - .2 Length: 109.8/91.4 m minimum.
- .2 Physical properties:
 - .1 Thickness: to CAN/CGSB-148.1, No.3, minimum 0.5 mm.

- .2 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 500 g/m2.
- .3 Grab tensile strength: to ASTM D4632, 445 N.
- .4 Grab elongation: to ASTM D4632, 50%.
- .5 Tear Resistance: to ASTM D4533, 200 N.
- .6 Puncture CBR: to ASTM D6241, 1320 N.
- .3 Hydraulic properties:
 - .1 Apparent opening size (AOS): to ASTM D4751, 0.212 micrometres.
 - .2 Permittivity: to ASTM D4491, 2.00 pers.
 - .3 Water Flow Rate: to ASTM D4491, 5689 l/min/m2
 - .4 UV Stability: to ASTM D4355, 70% @ 500 hours.
- .4 Securing pins and washers: to CSA G40.20/G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m2, Coating Grade 85 to ASTM A123/A123M.
- .5 Factory seams: sewn in accordance with manufacturer's recommendations.
- .6 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

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 geotextile material installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with securing pins or with appropriate fill for the required location.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .4 Overlap each successive strip of geotextile 300 mm over previously laid strip.
- .5 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .6 After installation, cover with overlying layer within 4 hours of placement.
- .7 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .8 Place and compact soil layers in accordance with Section 31 23 33.01.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 31 32 19.01 - Geotextiles.

1.2 MEASUREMENT PROCEDURES

- .1 Measurement of rip-rap shall be by area in square meters following the contour of the ground.

1.3 REFERENCES

- .1 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS.PROV 1004 November 2012, Material Specification for Aggregates - Miscellaneous.
 - .2 OPSS 511 November 2013, Construction Specification for Rip-Rap, Rock Protection, and Granular Sheeting.
- .2 Ontario Provincial Standard Drawings (OPSD)
 - .1 OPSD 810.020 November 2013, General Rip-Rap Layout for Ditch Inlets.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.
- .2 Collect and separate plastic, paper packaging, corrugated cardboard in accordance with Waste Management Plan.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Fold up metal banding, flatten and place in designated area for recycling.
- .5 Divert left over aggregate materials from landfill to local quarry for reuse as approved by Departmental Representative.
- .6 Divert left over geotextiles to local plastic recycling facility as approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 Stone

- .1 Rip-rap: type R-50 to OPSS 1004

2.2 GEOTEXTILE FILTER

- .1 Geotextile: in accordance with Section 31 32 19.01.

PART 3 - EXECUTION

3.1 PLACING

- .1 Rip-Rap shall be placed in accordance with OPSS 511, OPSD 810.020 and as follows:
 - .1 Where rip-rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated.
 - .2 Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.
 - .3 Place geotextile on prepared surface in accordance with Section 31 32 19.01 and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.
 - .4 Place rip-rap to thickness and details as indicated.
 - .5 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.
 - .6 Hand placing:
 - .1 Use larger stones for lower courses and as headers for subsequent courses.
 - .2 Stagger vertical joints and fill voids with rock spalls or cobbles.
 - .3 Finish surface evenly, free of large openings and neat in appearance.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Materials and installation for temporary asphalt concrete pavement for car park areas, service road and drive aisles to buildings.

1.2 RELATED SECTIONS

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

1.3 PROTECTION

- .1 Protect buildings, landscaping, roads, driveways, sidewalks, trees and shrubs on site and adjacent property that may be damaged by paving machinery, equipment or personnel. Make good property damaged due to paving operations.
- .2 Take necessary precautions to protect workmen and public from hazards of paving operations.
- .3 Keep vehicular traffic off newly paved areas until paving properly cured.
- .4 Provide access to building at all times. Arrange paving schedule so as not to interfere with normal use of premises.

1.4 MEASUREMENT AND PAYMENT

- .1 Excavation will be measured in cubic meters of materials encountered of whatever nature position.
- .2 Granular sub-base will be measured in tonnes of aggregate incorporated into the work.
- .3 Granular base will be measured in tonnes of aggregate incorporated into the work.
- .4 Crushed rock screenings will be measured in tonnes of aggregate incorporated into the work.
- .5 Compaction is considered included in the supplying and placing of aggregates and will not be measured separately for payment.
- .6 Asphalt surface course will be measured by the tonne used and accepted in the work.

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- .7 Primer is considered included in the asphalt surface course and will not be measured separately for payment.
- .8 Cleaning pavement surfaces will be measured in square metres of surface cleaned.

1.5 REFERENCES

- .1 Asphalt Institute (AI)
 - .1 AI MS-2-1994 Sixth Edition, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
- .2 ASTM International
 - .1 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
- .4 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 310 November 2012, Construction Specification for Hot-Mix Asphalt.
 - .2 OPSS.PROV 1003 April 2013, Material Specification for Aggregates - Hot-Mix Asphalt.
 - .3 OPSS.PROV 1010 April 2013, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.
 - .4 OPSS 1103 November 2012, Material Specification for Emulsified Asphalt.
 - .5 OPSS 1150 November 2010, Material Specification for Hot-Mix Asphalt.
- .5 CIMA+ Standard Details
 - .1 Detail 201, Typical Section - Temporary Granular Foundation and Asphalt Pavement.
 - .2 Detail 202, Typical Section - Granular Foundation.
 - .3 Detail 205, Typical Section - Transition Between Differing Pavement Structures.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

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

- .3 Samples:
 - .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks prior to beginning Work.
 - .2 Submit samples of following materials proposed for use 4 weeks prior to beginning Work.
 - .1 One 5 L container of asphalt cement.
- .4 Test and Evaluation Reports:
 - .1 Submit manufacturer's test data and certification that asphalt cement meets specification requirements.
 - .2 Submit asphalt concrete mix design and trial mix test results to Departmental Representative for review at least 4 weeks prior to beginning Work.
- .5 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Reduction Workplan highlighting recycling and salvage requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Submit to Departmental Representative copies of freight and waybills for asphalt cement as shipments are received.
 - .1 Departmental Representative reserves right to check weights as material is received.
- .3 Develop Waste Reduction Workplan related to Work of this Section.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Asphalt surface course: to Ontario Provincial Standard Specification OPSS 1150, for type HL 4. Maximum size aggregate 19.0 mm.
- .2 Primer: emulsified asphalt to Ontario Provincial Standard Specification OPSS 1103, for rapid setting type.

- .3 Granular base: to Ontario Provincial Standard Specification OPSS.PROV 1010, for Granular A. Maximum size 19.0 mm.
- .4 Granular sub-base: to Ontario Provincial Standard Specification OPSS.PROV 1010, for Granular B. Maximum size 26.5 mm.

2.2 EQUIPMENT

- .1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
- .2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.
- .3 Vibratory rollers:
 - .1 Drum diameter: 750 mm minimum.
 - .2 Amplitude of vibration (machine setting): 0.5 mm maximum for lifts less than 40 mm thick.
- .4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
 - .1 Boxes with tight metal bottoms.
 - .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
 - .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
 - .4 Use only trucks which can be weighed in single operation on scales supplied.
- .5 Suitable hand tools.

2.3 MIX DESIGN

- .1 Mix design in accordance with OPSS 1150.
- .2 Mix design to be approved in writing by Departmental Representative.
- .3 Mix design to be developed by testing laboratory approved in writing by Departmental Representative.
- .4 Design of mix: by Marshall method.
- .5 Do not change job-mix without prior approval of Departmental Representative. When change in material source proposed, new job-mix formula to be approved by Departmental Representative.

PART 3 - EXECUTION

3.1 EXCAVATING

- .1 In accordance with Section 31 23 33.01.
- .2 Excavate to elevations and dimensions indicated or required for construction of work.
- .3 Make excavation to clean lines to minimize quantity of fill material required.
- .4 Earth bottoms of excavations to be dry undisturbed soil, reasonably level, free from loose or organic matter.

3.2 INSPECTION

- .1 Check graded subgrade for conformity with elevations and cross-sections before placing granular sub-base and granular base material.
- .2 Proof-roll subgrade, sub-base and base surface with mass and type of roller approved by Departmental Representative.
 - .1 Check for unstable areas.
 - .2 Check for areas requiring additional compaction.
- .3 Notify Departmental Representative of unsatisfactory conditions.
- .4 Do not begin paving work until such conditions have been corrected and are ready to receive paving.
- .5 When complete, have Departmental Representative inspect excavations to verify soil bearing capacity, depths and dimensions.
- .6 Excavation, beyond limits shown on drawings, if authorized in writing by Departmental Representative, will be paid for as extra to Contract price in accordance with General Conditions. Quantities will be calculated in place, compaction included. Truck load measurements not acceptable.
- .7 Correct unauthorized excavation at no extra cost by filling with Select Subgrade material.

3.3 GRANULAR SUB-BASE AND GRANULAR BASE

- .1 Place 350 mm compacted thickness of OPSS Granular B, Type II sub-base.

- .2 Place 150 mm compacted thickness of OPSS Granular A, granular base.
- .3 Place in layers not exceeding 150 mm compacted thickness. Compact each layer to 100% maximum dry density.

3.4 PLANT AND MIXING REQUIREMENTS

- .1 Batch and continuous mixing plants:
 - .1 To ASTM D995.

3.5 ASPHALT CONCRETE PAVING

- .1 Obtain Departmental Representative's approval of base and existing surface prior to placing asphalt.
- .2 Place asphalt concrete to thicknesses, grades and lines as indicated.
- .3 Place 40 mm of compacted HL4 asphaltic concrete surface course.
- .4 Placing conditions:
 - .1 Place asphalt mixtures only when air temperature is 5 degrees C minimum.
 - .2 When temperature of surface on which material is to be placed falls below 10 degrees C, provide extra rollers as necessary to obtain required compaction before cooling.
 - .3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.
- .5 When hand spreading is used:
 - .1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section.
 - .1 Use measuring blocks and intermediate strips to aid in obtaining required cross-section.
 - .2 Distribute material uniformly without broad casting material.
 - .3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes.
 - .1 Reject material that has formed into lumps and does not break down readily.
 - .4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.
 - .5 Provide heating equipment to keep hand tools free from asphalt.
 - .1 Control temperature to avoid burning material.
 - .2 Do not use tools at higher temperature than temperature of mix being placed.

3.6 COMPACTING

- .1 Do not change rolling pattern unless mix changes or lift thickness changes.
 - .1 Change rolling pattern only as directed by Departmental Representative.
- .2 Roll asphalt continuously to maximum relative density not less than 92%.
- .3 General:
 - .1 Provide roller per OPSS 310.
 - .2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.
 - .3 Operate roller slowly initially to avoid displacement of material. Do not exceed 5 km/h for breakdown and intermediate rolling for static steel-wheeled and pneumatic tired rollers. Do not exceed 9 km/h for finish rolling.
 - .4 Overlap successive passes of roller by minimum of 200 mm and vary pass lengths.
 - .5 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.
 - .6 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.
 - .7 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.
 - .8 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

3.7 JOINTS

- .1 Cut back bituminous course to full depth in straight or curved lines as required to expose fresh vertical surfaces. Remove any broken or loose material.
- .2 Paint exposed edge of asphaltic joints, edges of maintenance holes and catch basin frames, curbs and similar items with asphalt primer prior to placing asphalt courses.
- .3 Where paving comprises two courses overlap longitudinal joints not less than 600 mm.
- .4 Carefully place and compact hot asphaltic material against joints.

3.8 FINISH TOLERANCES

- .1 Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low.
- .2 Finished asphalt binder and surface courses not to have irregularities exceeding 6 mm and 3 mm when checked with 3 m straight edge placed in any direction.

3.9 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.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 32 16 15 - Concrete Walks, Curbs and Gutters.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .2 ASTM C979/C979M-16, Standard Specification for Pigments for Integrally Coloured Concrete.
- .2 Canadian Standards Association (CSA)
 - .1 CSA-A23.1-14/A23.2-14, Concrete materials and methods of concrete construction/Test methods and standard practices for concrete.
 - .2 CSA A179-14, Mortar and Grout for Unit Masonry.
 - .3 CSA-A231.1-14/A231.2-14, Precast Concrete Paving Slabs/Precast Concrete Pavers.
 - .4 CSA A283-00, Qualification Code for Concrete Testing Laboratories.
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS.PROV 355 November 2012, Construction Specification for the Installation of Interlocking Concrete Pavers.
 - .2 OPSS.PROV 1002 April 2013, Material Specification for Aggregates - Concrete.
 - .3 OPSS.PROV 1004 November 2012, Material Specification for Aggregates - Miscellaneous.
 - .4 OPSS.PROV 1010 April 2013, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.
- .4 Ontario Provincial Standard Drawings (OPSD)
 - .1 OPSD 561.010 November 2006, Interlocking Concrete Pavers on Granular Base (Non-Vehicular).

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00.
- .2 Indicate layout, pattern and relationship of paving joints to fixtures and project formed details.

1.4 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00.
- .2 Submit following sampling and testing data:
 - .1 Sieve analysis for gradation of bedding and joint material.
 - .2 Unit paver sampling and testing.
 - .3 Evaluation of cleaning and sealing compound.

1.5 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00.
- .2 Submit full size sample of each type of standard size pavers.

1.6 MOCK-UPS

- .1 Construct mock-up in accordance with Section 01 45 00.
- .2 Install 3 x 3 m area mock-up. Mock-up area will be used to determine surcharge of bedding layer, joint sizes, lines, laying pattern(s), colour(s) and texture.
- .3 Acceptance of work will be determined by Departmental Representative from standard mock-up area.
- .4 Protect mock-up for inclusion in work.

1.7 MEASUREMENT FOR PAYMENT

- .1 Precast concrete paving will be measured for payment in square metres.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.
- .2 Fold up metal banding, flatten and place in designated area for recycling.

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PART 2 - PRODUCTS

2.1 CONCRETE PAVERS

- .1 Concrete pavers: to CSA-A231.2 and as follows:
 - .1 Reuse of existing concrete pavers upon approval of the departmental representative.
 - .2 Shape size and colour of new pavers to match existing pavers on site.
- .2 Manufactured in moulds, with spacers, suitable for installation and delivered on site in cubes of laying panels, in protective wrapping.
- .3 Pigment in concrete pavers: to ASTM C979.

2.2 GRANULAR BASE, BEDDING AND JOINT MATERIAL

- .1 Granular base: to Ontario Provincial Standard Specification OPSS.PROV 1010, for Granular A. Maximum size 19.0 mm.
- .2 Bedding and joint sand: clean, non-plastic, free from deleterious or foreign matter, natural or manufactured from crushed rock or gravel. Do not use limestone screenings or stone dust.
- .3 Bedding sand: meeting requirements of concrete sand to OPSS.PROV 1002.
- .4 Joint sand: meeting gradation requirements of mortar sand to OPSS.PROV 1004 and physical requirements of OPSS.PROV 1002.

2.3 EDGE RESTRAINTS

- .1 Structural curb:
 - .1 Concrete curb: to Section 32 16 15.
- .2 Aluminum, Aluminum Association alloy 6063 T-5 hardness, 78 x 140 mm edging, complete with line and splice stakes of Aluminum Association ally 6061, T-6 hardness, manufactured for use in paver installations.
 - .1 Anchoring: to manufacturer's instructions. Aluminum anchor stakes designed for use with edging selected, 30.5 mm length, 1 per 300 mm of edging section and at each side of joints.

2.4 CLEANING COMPOUND

- .1 Clear, organic solvent, designed and recommended by manufacturer for cleaning concrete pavers of contamination encountered.

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- .2 Acid based chemical detergent, designed and recommended by manufacturer for removal of contamination encountered on pavers.

PART 3 - EXECUTION

3.1 STRUCTURAL SURFACE

- .1 Verify that structural surfaces conform to levels and compaction required for installation of unit pavers. If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Verify that top of structural surface (top of base) does not exceed plus or minus 10 mm of grade over 3 m straightedge.
- .3 Ensure that structural surface is not frozen or standing water is present during installation.

3.2 STRUCTURAL CURBS

- .1 Verify that structural curbs conform to elevations and alignments required for installation of unit pavers. If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.

3.3 INSTALLATION OF EDGE RESTRAINTS

- .1 Install restraints true to grade, in accordance with manufacturer's recommendations.

3.4 PLACING OF BEDDING MATERIAL

- .1 Ensure bedding material is not saturated or frozen at all times until installation is complete.
- .2 Spread and screed material on structural surface to achieve 25 mm compacted thickness after vibrating pavers in place. Do not use joint sand for bedding sand.
- .3 Do not disturb screeded material. Do not use bedding material to fill depressions in structural surface.

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3.5 INSTALLATION OF CONCRETE PAVERS

- .1 Lay pavers to pattern(s) indicated. Joints between pavers: 2 to 3 mm wide, or as recommended by manufacturer.
- .2 Use appropriate end, edge and corner stones. Saw cut pavers to fit around obstructions and at abutting structures.
- .3 Use a low amplitude, high frequency plate compactor capable of at least 22 kN centrifugal compaction force to vibrate pavers into bedding sand.
- .4 Inspect, remove, and replace chipped, broken and damaged pavers.
- .5 Sweep dry joint sand material into joints.
- .6 Settle sand by vibrating pavers with plate compactor.
- .7 Continue application of joint material and vibrating of pavers until joints are full. Do not vibrate within 1 m of unrestrained edges of pavers.
- .8 Complete installation to within 1 m of laying face, with sand-filled joints, at completion of each work day.
- .9 Sweep off excess joint material when installation is complete.
- .10 Proof roll street pavements with at least two passes of a 10 T rubber-tired roller.
- .11 Final surface elevations not to exceed plus or minus 6 mm under 3 m long straightedge.
- .12 Surface elevation of pavers: 3 to 4 mm above adjacent drainage inlets, concrete collars or channels.
- .13 Ensure conformance of final elevations.

3.6 CLEANING

- .1 Carry out cleaning at times and conditions recommended by manufacturer of cleaning compound and as directed by Departmental Representative.
- .2 Remove and dispose of loose, extraneous materials from surfaces to be cleaned.
- .3 Apply cleaning compounds appropriate for removal of various contaminants encountered in accordance with manufacturer's recommendations.

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- .4 Final surface to be free of contamination.

3.7 FIELD QUALITY CONTROL

- .1 Retain concrete testing laboratory accredited in accordance with CSA A238.
- .2 Sample and test in accordance with CSA-A231.2.
- .3 Do sampling and testing once for each 5,000 square metres of material on site, as directed by Departmental Representative.
- .4 Departmental Representative will select 10 pavers for testing from material on site for each sampling.
- .5 Submit test results to Departmental Representative for approval of precast concrete pavers.

END OF SECTION

PART 1 - GENERAL

1.1 PRICE AND PAYMENT PROCEDURES

- .1 Measurement and Payment:
- .2 Measure supply and application of calcium chloride in litres applied.
- .3 Measure Supply and application of water for dust control in cubic meters.
- .4 No extra compensation will be paid for calcium chloride and water ordered and applied on Saturdays, Sundays or holidays.

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-15.1-92, Calcium Chloride.
- .2 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 506 November 2013, Construction Specification for Dust Supressants.
 - .2 OPSS 2501 April 2015, Material Specification for Calcium Chloride.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Reduction Workplan highlighting recycling and salvage requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .1 Supply calcium chloride in quantities and at times as directed by Departmental Representative.
 - .2 Deliver calcium chloride to site in moisture-proof bags, in bulk in tank cars, covered hopper cars, or covered trucks.

Indicate name of manufacturer, name of product, net weight or mass, and percentage of calcium chloride guaranteed by manufacturer.

- .3 Storage and Handling Requirements:
 - .1 Store bags of calcium chloride in weather-proof enclosures.
- .4 Develop Waste Reduction Workplan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Calcium chloride, Type I: to OPSS 2501 and CAN/CGSB-15.1, 35% aqueous solution.
- .2 Water: in accordance with Departmental Representative's approval.

PART 3 - EXECUTION

3.1 APPLICATION

- .1 Apply calcium chloride and water with equipment approved by Departmental Representative at rate according to manufacturer's instructions when directed by Departmental Representative.
- .2 Apply water and aqueous calcium chloride with distributors equipped with means of shut-off and with spray system to ensure uniform application.

3.2 CLEANING

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

- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .2 Place materials defined as hazardous or toxic in designated containers.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 03 10 00 - Concrete Formwork.
- .2 Section 03 20 00 - Concrete Reinforcing.
- .3 Section 03 30 00 - Cast-In-Place Concrete.
- .4 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .5 Section 32 14 13 - Precast Concrete Unit Paving.

1.2 MEASUREMENT AND PAYMENT

- .1 Concrete curb and gutter will be measured by length in meters along the flow line of the gutter whether straight or curved, without separation into types.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117-13, Standard Test Method for Materials Finer than 0.075-mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D698-12e2, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600 kN-m/m³).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA A23.1-14/A23.2-14, Concrete materials and methods of concrete construction/Test methods and standard practices for concrete.
- .4 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 353 November 2010, Construction Specification for Concrete Curb and Gutter Systems.
 - .2 OPSS.PROV 1010 April 2013, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.
- .5 Ontario Provincial Standard Drawings (OPSD)
 - .1 OPSD 600.040 November 2012, Concrete Barrier Curb with Standard Gutter.
- .6 CIMA+ Standard Details
 - .1 Detail 120, Typical Section - Landscape Concrete Curb.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00.
- .2 Product Data: submit WHMIS MSDS.
- .3 Inform Departmental Representative of proposed source of materials and provide access for sampling at least 4 weeks prior to commencing work.
- .4 If materials have been tested by accredited testing laboratory or testing laboratory approved by Departmental Representative within previous 2 months and have passed tests equal to requirements of this specification, submit test certificates from testing laboratory showing suitability of materials for this project.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Concrete mixes and materials: in accordance with Section 03 30 00.
- .2 Reinforcing steel: in accordance with Section 03 20 00.
- .3 Joint filler and Curing Compound: in accordance with Section 03 30 00.
- .4 Granular base: to Ontario Provincial Standard Specification OPSS.PROV 1010, for Granular A. Maximum size 19.0 mm.
- .5 Fill material: to Section 31 23 33.01 and following requirements:
 - .1 Select Subgrade to OPSS.PROV 1010.

PART 3 - EXECUTION

3.1 GRADE PREPARATION

- .1 Do grade preparation work in accordance with Section 31 23 33.01.
- .2 Construct embankments using excavated material free from organic matter

or other objectionable materials.

- .1 Dispose of surplus and unsuitable excavated material in approved location on site or off site.
- .3 Place fill in maximum 150 mm layers and compact to at least 95% of maximum dry density to ASTM D698.

3.2 GRANULAR BASE

- .1 Obtain Departmental Representative'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 CONCRETE

- .1 Obtain Departmental Representative's approval of granular base and reinforcing steel prior to placing concrete.
- .2 Do concrete work in accordance with Section 03 30 00.
- .3 Provide edging as indicated with 5 mm radius edging tool.
- .4 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Departmental Representative can be demonstrated. Hand finish surfaces when directed by Departmental Representative.

3.4 TOLERANCES

- .1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

3.5 EXPANSION AND CONTRACTION JOINTS

- .1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 6 m.
- .2 Install expansion joints as indicated and at intervals of 6 m.

3.6 ISOLATION JOINTS

- .1 Install isolation joints around maintenance holes and catch basins

and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.

- .2 Install joint filler in isolation joints in accordance with Section 03 30 00 and OPSS 353.
- .3 Seal isolation joints with sealant approved by Departmental Representative.

3.7 CURING

- .1 Cure concrete by adding moisture continuously in accordance with CSA A23.1/A23.2 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound as directed by Departmental Representative.
- .2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.
- .3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

3.8 BACKFILL

- .1 Allow concrete to cure for 7 days prior to backfilling.
- .2 Backfill to designated elevations with material as directed by Departmental Representative.
 - .1 Compact and shape to required contours as indicated.

3.9 CLEANING

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

END OF SECTION

PART 1 - GENERAL

1.1 MEASUREMENT FOR PAYMENT

- .1 Pavement marking: measured in metres of solid lines or painted length of dash lines.
- .2 Symbols and letters: measured in units.

1.2 REFERENCES

- .1 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - September 2014.
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 710 November 2010, Construction Specification for Pavement Marking.
 - .2 OPSS 1712 February 1991, Organic Solvent Based Traffic Paint.
- .4 CIMA+ Standard Details
 - .1 Detail 407, Pavement Marking (Painted Lines).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature and data sheets for pavement markings and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29 and 01 35 43.
- .3 Samples:
 - .1 Submit to Departmental Representative following material sample quantities at least 4 weeks prior to commencing work.
 - .1 Two 1 L samples of each type of paint.
 - .2 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, MPI specification number and formulation number and batch number.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:

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

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Paint:
 - .1 To MPI -EXT 2.1B, Alkyd zone/traffic marking.
 - .2 Paints: in accordance with MPI recommendation for surface conditions.
 - .3 Colour: to MPI listed, yellow, white and blue for accessibility as indicated.
 - .4 Upon request, Departmental Representative will supply qualified product list of paints applicable to work. Qualified paints may be used but Departmental Representative reserves right to perform further tests.
- .2 Thinner: to MPI listed manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates and surfaces to receive pavement markings previously installed under other Sections or Contracts are acceptable for product installation in accordance with MPI instructions prior to pavement markings installation.
 - .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Pavement surface: dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.
- .3 Proceed with Work only after unacceptable conditions have been rectified.

3.2 EQUIPMENT REQUIREMENTS

- .1 Paint applicator: approved pressure type mobile with positive shut-off distributor capable of applying paint in single, double and dashed lines and capable of applying marking components uniformly, at rates specified, and to dimensions as indicated.

3.3 APPLICATION

- .1 Pavement markings: Lay out pavement markings.
- .2 Unless otherwise approved by Departmental Representative, apply paint only when air temperature is above 5 degrees C, wind speed is less than 60 km/h and no rain is forecast within next 4 hours.
- .3 Apply traffic paint at a rate which results in a uniform thickness of 230±25 microns dry film.
- .4 Do not thin paint unless approved by Departmental Representative.
- .5 Symbols and letters to dimensions indicated.
- .6 Paint lines: of uniform colour and density with sharp edges.
- .7 Thoroughly clean distributor tank before refilling with paint of different colour.

3.4 TOLERANCE

- .1 Paint markings: within plus or minus 12 mm of dimensions indicated.
- .2 Remove incorrect markings in accordance with OPSS 710.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION OF COMPLETED WORK

- .1 Protect pavement markings until dry.
- .2 Repair damage to adjacent materials caused by pavement marking application.

END OF SECTION

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PART 1 - GENERAL

1.1 MEASUREMENT AND PAYMENT

- .1 Measure supply and erection of chain link fence in metres erected.

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A90/A90M-13, Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - .3 ASTM A123/A123M-15, Standard Specification for Zinc (Hot Dip Galvanized) coatings on Iron and Steel Products.
 - .4 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 ASTM F 626-14, Standard Specification for Fence Fittings.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-138.1-96, Fabric for Chain Link Fence.
 - .2 CAN/CGSB-138.2-96, Steel Framework for Chain Link Fence.
 - .3 CAN/CGSB-138.3-96, Installation of Chain Link Fence.
 - .4 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 CSA International
 - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A3000-13, Cementitious Materials Compendium.
- .4 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 772 November 2012, Construction Specification for Chain-Link Fence.
 - .2 OPSS 1541 November 2012, Material Specification for Chain-Link Fence Components.
- .5 Ontario Provincial Standard Drawings (OPSD)
 - .1 OPSD 972.130 November 2012, Fence, Chain-Link Installation - Roadway.
 - .2 OPSD 972.132 November 2012, Fence, Chain-Link Details and Table.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for concrete mixes, fences, and posts and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect fence materials from damage.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Workplan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Concrete mixes and materials: in accordance with CSA A23.1/A23.2.
 - .1 Nominal coarse aggregate size: 20-5.
 - .2 Compressive strength: 20 MPa minimum at 28 days.
- .2 Chain-link fence fabric: to OPSS 1541 and CAN/CGSB-138.1.
 - .1 50mm x 50 mm diamond pattern, 9 ga. galvanized steel.
 - .2 Height of fabric: 1.8 m, to match existing fence height.
- .3 Posts, braces and rails: to OPSS 1541 and CAN/CGSB-138.2, galvanized steel pipe. Dimensions as indicated. Top and mid brace rail to match existing.
- .4 Bottom tension wire: to OPSS 1541 and CAN/CGSB-138.2, single strand, galvanized steel wire.
- .5 Tie wire fasteners: to OPSS 1541 and ASTM F 626.

- .6 Tension bar: to OPSS 1541 and ASTM A653/A653M, 5 x 20 mm minimum galvanized steel.
- .7 Fittings and hardware: to OPSS 1541, CAN/CGSB-138.2 and ASTM F 626 galvanized steel.
 - .1 Tension bar bands: 3 x 20 mm minimum galvanized steel or 5 x 20 mm minimum aluminum to ASTM F 626.
 - .2 Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail to ASTM F 626.
 - .3 Turnbuckles to be drop forged.
- .8 Organic zinc rich coating: to CAN/CGSB-1.181.

2.2 FINISHES

- .1 Galvanizing:
 - .1 For chain link fabric: to CAN/CGSB-138.1 Grade 2.
 - .2 For pipe: 550 g/m² minimum to ASTM A90.
 - .3 For other fittings: to ASTM A123-09/A123M.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- .1 Grading: Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.
 - .1 Provide clearance between bottom of fence and ground surface of 30 mm to 50 mm.

3.3 ERECTION OF FENCE

- .1 Erect fence along lines as indicated and to OPSS 772 and CAN/CGSB-138.3.
- .2 Excavate post holes to dimensions and depth indicated per OPSS 972.132.
- .3 Space line posts maximum 3 m apart, measured parallel to ground surface.
- .4 Space straining posts at equal intervals not to exceed 150 m if distance between end or corner posts on straight continuous lengths of fence over reasonably smooth grade, is greater than 150 m.
- .5 Install additional straining posts at sharp changes in grade and where directed by Departmental Representative.
- .6 Install corner post where change in alignment exceeds 10 degrees.
- .7 Install end posts at end of fence and at buildings.
- .8 Place concrete in post holes then embed posts into concrete to depths indicated.
 - .1 Extend concrete 50 mm above ground level and slope to drain away from posts.
 - .2 Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.
- .9 Install fence fabric after concrete has cured, minimum of 5 days.
- .10 Install brace between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface.
 - .1 Install braces on both sides of corner and straining posts in similar manner.
- .11 Install overhang tops and caps.
- .12 Install top rail between posts and fasten securely to posts with waterproof caps.
- .13 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.
- .14 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 400 mm intervals.
 - .1 Knuckled selvedge at bottom.
 - .2 Twisted selvedge at top.
- .15 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 500 mm intervals. Give tie wires minimum two twists.

3.4 TOUCH UP

- .1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas as indicated.
 - .1 Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
 - .1 Clean and trim areas disturbed by operations. Dispose of surplus excavated material and replace damaged sod.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 03 20 00 - Concrete Reinforcing.
- .2 Section 03 30 00 - Cast-In-Place Concrete.
- .3 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .4 Section 33 41 00 - Storm Utility Drainage Piping.

1.2 MEASUREMENT PROCEDURES

- .1 Measure supply and installation of maintenance holes and catch basins in units including frames, gratings and covers, excavation and backfilling for the following classes:
 - .1 2 m or less.
 - .2 Greater than 2 m but not more than 2.5 m.
 - .3 Greater than 2.5 m but not more than 3 m.
 - .4 Greater than 3 m but not more than 3.5 m.
 - .5 Further stages in increments of 0.5 m.
- .2 Measure adjusting tops of existing maintenance holes or catch basins in units adjusted.
- .3 Measure frame and gratings in units supplied and installed.

1.3 REFERENCES

- .1 ASTM International
 - .1 ASTM A48/A48M-03(2012), Standard Specification for Gray Iron Castings.
 - .2 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM C117-13, Standard Test Method for Materials Finer than 75-mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .4 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .5 ASTM C139-14, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - .6 ASTM C478M-15a, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).
 - .7 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 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 CSA Group
 - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA A165 Series-14, CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
 - .3 CAN/CSA A179-14, Mortar and Grout for Unit Masonry.
 - .4 CSA A257 Series-14, Standards for Concrete Pipe and Manhole Sections.
 - .5 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .6 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
- .4 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 407 November 2015, Construction Specification For Maintenance Hole, Catch Basin, Ditch Inlet And Valve Chamber Installation.
 - .2 OPSS 408 November 2015, Adjusting or Rebuilding Maintenance Holes, Catch Basins, Ditch Inlets, and Valve Chambers.
 - .3 OPSS 511 November 2013, Construction Specification for Rip-Rap, Rock Protection and Granular Sheetting.
 - .4 OPSS.PROV 1004 November 2012, Material Specification for Aggregates - Miscellaneous.
 - .5 OPSS 1351 November 2014, Material Specification for Precast Reinforced Concrete Components for Maintenance Holes, Catch Basins, Ditch Inlets and Valve Chambers.
 - .6 OPSS 1850 April 2013, Material Specification for Frames, Grates, Covers and Gratings.
- .5 Ontario Provincial Standard Drawings (OPSD)
 - .1 OPSD 400.020 November 2013, Cast Iron, Square Frame with Square Flat Gratefor Catch Basins, Herring Bone Openings.
 - .2 OPSD 400.082 November 2014, Cast Iron, Raised Curb Inlet Frame with Cover for Catch Basins Out of Roadway.
 - .3 OPSD 401.010 November 2013, Cast Iron, Square Frame with Circular Closed or Open Cover for Maintenance Holes.
 - .4 OPSD 403.010 November 2103, Galvanized Steel Honeycomb Grating for Ditch Inlets.
 - .5 OPSD 405.010 November 2013, Maintenance Hole Steps Hollow.
 - .6 OPSD 610.010 November 2009, Catch Basin Frame with Grate Installation at Curb with Gutter.
 - .7 OPSD 610.030 November 2009, Frame with Cover Installation for Inlet Type Catch Basins.
 - .8 OPSD 701.010 November 2014, Precast Concrete Maintenance Hole 1200 mm Diameter.
 - .9 OPSD 701.011 November 2014, Precast Concrete Maintenance Hole 1500 mm Diameter.
 - .10 OPSD 701.012 November 2014, Precast Concrete Maintenance Hole

- 1800 mm Diameter.
- .11 OPSD 704.010 November 2014, Precast Concrete Adjustment Units for Maintenance Holes, Catch Basins, and Valve Chambers.
- .12 OPSD 705.010 November 2014, Precast Concrete Catch Basin 600x600mm.
- .13 OPSD 705.030 November 2014, Precast Concrete Ditch Inlet 600x600mm.
- .14 OPSD 810.020 November 2013, General Rip-Rap Layout for Ditch Inlets.
- .15 OPSD 1003.020 November 2011, Cast-In-Place Maintenance Hole Drop Structure Wye.
- .6 CIMA+ Standard Details
 - .1 Detail 301, Maintenance Hole - Frost Protection.
 - .2 Detail 303, Catch Basin - Frost Protection.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for maintenance holes and catch basin structures 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.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Reduction Workplan highlighting recycling and salvage requirements.

1.5 QUALITY ASSURANCE

- .1 Submit in accordance with Section 01 45 00.
- .2 Certifications:
 - .1 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work. Include manufacturer's drawings, information and shop drawings where pertinent.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation

instructions and special handling criteria, installation sequence, and cleaning procedures.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: 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 maintenance holes and catch basin structures from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Workplan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Cast-in-place concrete:
 - .1 In accordance with Section 03 30 00.
- .2 Precast maintenance hole units: to OPSD 701.010 to 701.015, circular, sizes as specified on drawings.
 - .1 Sumps for Storm Maintenance Hole Units: to OPSD 701.010.
- .3 Precast catch basin sections: to OPSD 705.010 and 705.030 as specified on drawings.
 - .1 Sumps for Precast Catch Basin to: to OPSD 705.010 and 705.030.
- .4 Joints: made watertight using rubber rings, bituminous compound, epoxy resin cement or cement mortar.
- .5 Mortar: to OPSS 407.
 - .1 Aggregate: to CAN/CSA A179.
 - .2 Cement: to CAN/CSA-A3002.
- .6 Ladder rungs: to OPSD 405.010.

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- .7 Adjusting rings: precast concrete to ASTM C478M and OPSD 704.010.
- .8 Drop maintenance hole pipe: same as sewer pipe.
.1 to OPSD 1003.020.
- .9 Frames, gratings, covers to dimensions as indicated and following requirements:
 - .1 Metal gratings and covers to bear evenly on frames.
 - .1 Frame with grating or cover to constitute one unit.
 - .2 Assemble and mark unit components before shipment.
 - .2 Gray iron castings: to ASTM A48/A48M, strength class 30B.
 - .3 Maintenance hole frames and covers: to OPSD 401.010 Type A closed cover.
 - .4 Maintenance hole/catch basin frames and covers: to OPSD 401.010 Type B open cover.
 - .5 Catch basin frames and covers: to OPSD 400.020, 400.082/401.010 or 403.010 as specified on drawings.
- .10 Granular bedding and backfill: in accordance with Section 31 23 33.01.
- .11 Rip-Rap for ditch inlets type R50 to OPSS.PROV 1004.

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 maintenance holes and catch basin structures installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 EXCAVATION AND BACKFILL

- .1 Excavate and backfill in accordance with Section 31 23 33.01 and as indicated.
- .2 Obtain approval of Departmental Representative before installing outfall structures, maintenance holes or catch basins.

3.3 CONCRETE WORK

- .1 Do concrete work in accordance with Section 03 30 00.
- .2 Place concrete reinforcement in accordance with Section 03 20 00.
- .3 Position metal inserts in accordance with dimensions and details as indicated.

3.4 INSTALLATION

- .1 Construct units in accordance with details indicated, plumb and true to alignment and grade.
- .2 Complete units as pipe laying progresses.
 - .1 Maximum of 3 units behind point of pipe laying will be allowed.
- .3 Dewater excavation to approval of Departmental Representative and remove soft and foreign material before placing concrete base.
- .4 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% maximum dry density to ASTM D698.
- .5 Precast units:
 - .1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base.
 - .2 Make each successive joint watertight with Departmental Representative's approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination of these materials.
 - .3 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
 - .4 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.
- .6 For sewers:
 - .1 Place stub outlets and bulkheads at elevations and in positions indicated.
 - .2 Bench to provide smooth U-shaped channel.
 - .1 Side height of channel to be full diameter of sewer.
 - .2 Slope adjacent floor at 1 in 20.
 - .3 Curve channels smoothly.
 - .4 Slope invert to establish sewer grade.
- .7 Compact granular backfill to 100% maximum density to ASTM D698.
- .8 Installing units in existing systems:
 - .1 Where new unit is installed in existing run of pipe, ensure full

- support of existing pipe during installation, and carefully remove that portion of existing pipe to dimensions required and install new unit as specified.
- .2 Make joints watertight between new unit and existing pipe.
- .3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready for operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.
- .9 Place frame and cover on top section to elevation as indicated.
 - .1 If adjustment required use concrete ring.
- .10 Clean units of debris and foreign materials.
 - .1 Remove fins and sharp projections.
 - .2 Prevent debris from entering system.
- .11 Install safety platforms in maintenance holes having depth of 5 m or greater, as indicated.

3.5 ADJUSTING TOPS OF EXISTING UNITS

- .1 Remove existing gratings and frames and store for re-use at locations designated by Departmental Representative.
- .2 Sectional units:
 - .1 Raise or lower straight walled sectional units by adding or removing precast sections as required.
 - .2 Raise or lower tapered units by removing cone section, adding, removing, or substituting riser sections to obtain required elevation, then replace cone section.
- .3 Monolithic units:
 - .1 Raise monolithic units by roughening existing top to ensure proper bond and extend to required elevation with cast-in-place concrete.
 - .2 Lower monolithic units with straight wall by removing concrete to elevation indicated for rebuilding.
 - .3 When monolithic units with tapered upper section are lowered more than 150 mm, remove concrete for entire depth of taper plus as much straight wall as necessary, then rebuild upper section to required elevation with cast-in-place concrete.
 - .4 Install additional maintenance hole ladder rungs in adjusted portion of units as required.
 - .5 Re-use existing gratings and frames.

3.6 SEALING OVER EXISTING UNITS

- .1 Fill with cast-in-place concrete.

3.7 FIELD QUALITY CONTROL

.1 Leakage Test:

- .1 Install watertight plugs or seals on inlets and outlets of each new maintenance hole and fill maintenance hole with water.
- .2 Leakage not to exceed 3 litres per hour per metre of head above the lowest pipe invert in the maintenance hole.
- .3 If permissible leakage is exceeded, correct defects.
- .4 Repeat until approved by Departmental Representative.
- .5 Departmental Representative will issue Test Certificate for each maintenance hole passing test.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 03 20 00 - Concrete Reinforcing.
- .2 Section 03 30 00 - Cast-In-Place Concrete.
- .3 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .4 Section 33 05 16 - Maintenance Holes and Catch Basin Structures.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

- .1 Measurement procedures:
 - .1 Measure supply and installation of storm sewer including testing and including excavation and backfilling and granular bedding and surround along the horizontal centerline length of pipe from centre of one drainage structure to the centre of another drainage structure in metres of each pipe size and installed.

1.3 REFERENCES

- .1 ASTM International
 - .1 ASTM C14M-15a, Standard Specification for Nonreinforced Concrete Sewer, Storm Drain and Culvert Pipe (Metric).
 - .2 ASTM C76M-15, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
 - .3 ASTM C117-13, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .4 ASTM C136/C136M-14, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .5 ASTM C443M-11, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
 - .6 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - .7 ASTM D1056-14, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
 - .8 ASTM D2680-01(2014), Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
 - .9 ASTM D3034-15, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - .10 ASTM F794-03(2014), Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 CSA International
 - .1 CAN/CSA-A3000-13, Cementitious Materials Compendium.
 - .2 CSA A257 Series-14, Standards for Concrete Pipe and Manhole Sections.
 - .3 CAN/CSA-B1800-15, Thermoplastic Non-pressure Pipe Compendium - B1800 Series.
 - .4 CSA G401-14, Corrugated Steel Pipe Products.
- .4 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS.PROV 410 November 2015, Construction Specification for Pipe Sewer Installation in Open Cut.
 - .2 OPSS.PROV 1010 April 2013, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.
 - .3 OPSS 1605 November 2010, Material Specification for Extruded Expanded Polystyrene Pavement Insulation.
 - .4 OPSS.PROV 1820 November 2014, Material Specification for Circular and Elliptical Concrete Pipe.
 - .5 OPSS 1841 November 2015, Material Specification for Non-Pressure Polyvinyl Chloride Pipe Products.
- .5 Ontario Provincial Standard Drawings (OPSD)
 - .1 OPSD 802.010 November 2014, Flexible Pipe Embedment and Backfill Earth Excavation.
 - .2 OPSD 802.031 November 2014, Rigid Pipe Bedding, Cover, and Backfill Type 3 Soil - Earth Excavation.
 - .3 OPSD 804.040 November 2006, Concrete Headwall for Sewer or Culvert Pipe Outlet.
 - .4 OPSD 804.050 November 2013, Concrete Headwall for Sewer or Culvert Pipe Outlet.
 - .5 OPSD 1109.030 November 2015, Insulation for Sewer and Watermains in Shallow Trenches.

1.4 SCHEDULING

- .1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.
- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and backfill and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .4 Certification to be marked on pipe.
- .5 Test and Evaluation Reports: submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.
- .6 Manufacturer's Instructions: submit to Departmental Representative 1 copy of manufacturer's installation instructions.
- .7 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Reduction Workplan highlighting recycling and salvage requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect pipes from damage.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Workplan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan] in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 CONCRETE PIPE

- .1 Non-reinforced circular concrete pipe and fittings: to CSA A257, designed for flexible rubber gasket joints to CSA A257.
- .2 Reinforced circular concrete pipe and fittings: to CSA A257, designed for flexible rubber gasket joints to CSA A257.
- .3 Lifting holes:
 - .1 Pipe 900 mm and less diameter: no lift holes.
 - .2 Pipe greater than 900 mm diameter: lift holes not to exceed two in piece of pipe.
 - .3 Provide pre-fabricated plugs to effectively seal lift holes after installation of pipe.

2.2 CORRUGATED STEEL PIPE

- .1 Corrugated steel pipe and couplers: to CSA G401.
 - .1 Gaskets: to ASTM D1056.

2.3 PLASTIC PIPE

- .1 Type PSM Poly Vinyl Chloride (PVC): to CAN/CSA-B1800.
 - .1 Standard Dimensional Ratio (SDR): 35.
 - .2 Standard gasket and integral bell system.
 - .3 Nominal lengths: 6 m.

2.4 PIPE BEDDING, EMBEDMENT AND SURROUND MATERIAL

- .1 Granular material in accordance with OPSS 401 and the following requirements:
 - .1 OPSS.PROV 1010, Granular A, maximum size 19.0 mm.

2.5 INSULATION

- .1 Extruded expanded polystyrene insulation to OPSS 1605.

2.6 BACKFILL MATERIAL

- .1 In accordance with Section 31 23 33.01.

2.7 JOINT MORTAR

- .1 Portland cement: to CAN/CSA-A3000, normal type GU.
- .2 Mortar: one part Portland cement to OPSS 1301 to two parts mortar sand to OPSS 1004 mixed with minimum amount of water to OPSS 1302 to obtain optimum consistency for use intended. Do not use additives.

2.8 HEADWALLS AND GRATING

- .1 Cast-in-place concrete: to Section 03 30 00.
- .2 Concrete reinforcing: to Section 03 20 00.
- .3 Concrete Headwall: to OPSD 804.040.
- .4 Grating: to OPSD 804.050.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

3.2 TRENCHING

- .1 Do trenching Work in accordance with Section 31 23 33.01 and per OPSD 802.010 and/or OPSD 802.031 as required.
- .2 Protect trench from contents of sewer.
- .3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

3.3 GRANULAR BEDDING

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding material in uniform layers not exceeding 200 mm compacted thickness to depth as indicated.

- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
 - .1 Do not use blocks when bedding pipes.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 100% maximum dry density to ASTM D698.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted bedding material.

3.4 INSTALLATION

- .1 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Departmental Representative.
- .2 Handle pipe using methods approved by Departmental Representative.
 - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .3 Lay pipes on prepared bed, true to line and grade with pipe invert smooth and free of sags or high points.
 - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Joint deflection permitted within limits recommended by pipe manufacturer.
- .6 Water to flow through pipes during construction only as permitted by Departmental Representative.
- .7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Install plastic pipe and fittings in accordance with CAN/CSA-B1800.
- .9 Joints:
 - .1 Concrete pipe:
 - .1 Install gaskets as recommended by manufacturer.
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .3 Align pipes before joining.
 - .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
 - .5 Avoid displacing gasket or contaminating with dirt or other

- foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.
- .6 Complete each joint before laying next length of pipe.
 - .7 Minimize joint deflection after joint has been made to avoid joint damage.
 - .8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
 - .9 Mortared joints:
 - .1 Pipe interior: circular pipes 700 mm diameter and larger, and arch or elliptical pipe equivalent to 900 mm diameter or larger shall have interior gap between ends of adjacent pipes filled with mortar.
 - .1 Apply mortar minimum 7 days after backfilling has been completed to allow pipe settlement to occur.
 - .2 Finish interior surface of joints smooth.
 - .2 Pipe exterior: for bell and spigot pipe, use mortar to seal outside of joints. Press and bed mortar into place.
 - .1 Allow mortar to set minimum of 1 hour before backfilling.
 - .10 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative, to prevent "creep" during down time.
 - .11 Plug lifting holes with Departmental Representative approved prefabricated plugs, set in shrinkage compensating grout.
 - .12 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
 - .13 Make watertight connections to manholes and catch basins.
 - .1 Use shrinkage compensating grout when suitable gaskets are not available.
 - .14 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.
 - .1 Joint to be structurally sound and watertight.
 - .15 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

3.5 PIPE SURROUND

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.

- .1 Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers not exceeding 200 mm compacted thickness as indicated.
 - .1 Do not dump material within 1 m of pipe.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 100% maximum dry density to ASTM D698.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 100% maximum density to ASTM D698.
- .7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.6 INSULATION

- .1 Where depth of cover is less than 1.5 m provide insulation per detail 1109.030.
- .2 Where depth of cover is greater than or equal to 1.0 m use HI-40 (275 kPa) insulation.
- .3 Where depth of cover is less than 1.0 m use HI-60 (400 kPa) insulation.

3.7 BACKFILL

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround, in uniform layers not exceeding 300 mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least 100% maximum dry density to ASTM D698. In other areas, compact backfill to at least 95% maximum dry density to ASTM D698.

3.8 HEADWALLS AND GRATING

- .1 Headwalls in accordance with OPSD 804.040.
- .2 Grating in accordance with OPSD 804.050 and as follows.
 - .1 Grating to be hinged to open upwards as opposed to the side. Contractor to provide shop drawing to Departmental Representative for approval.

3.9 FIELD TESTS AND INSPECTIONS

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 Deflection testing: to OPSS 410.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Television and photographic inspections:
 - .1 Carry out inspection of installed sewers by television camera, photographic camera or by other related means.
 - .2 Provide means of access to permit Departmental Representative to do inspections.
 - .3 Payment for inspection services in accordance with Price and Payment Procedures in PART 1.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

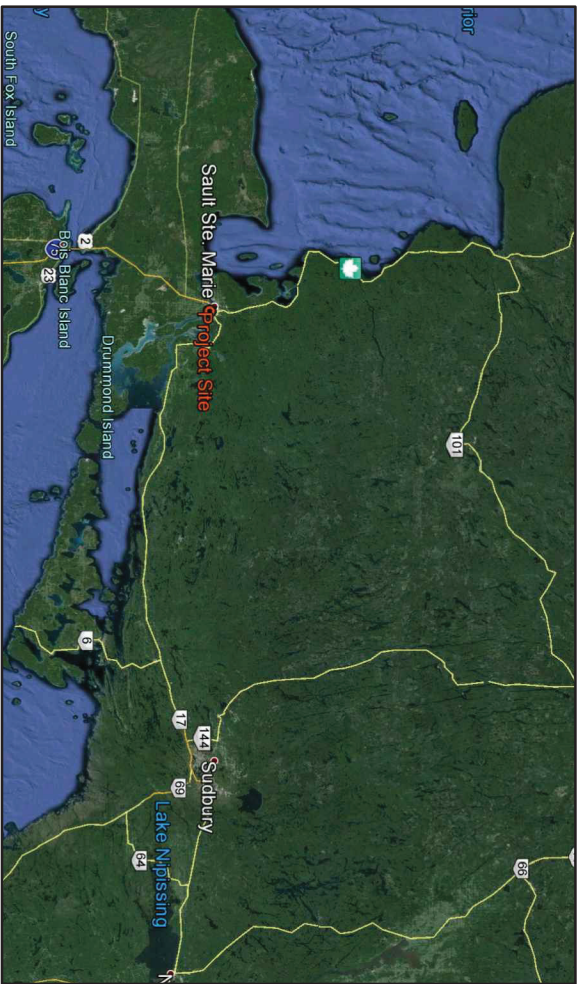
APPENDIX 1

Borehole Records

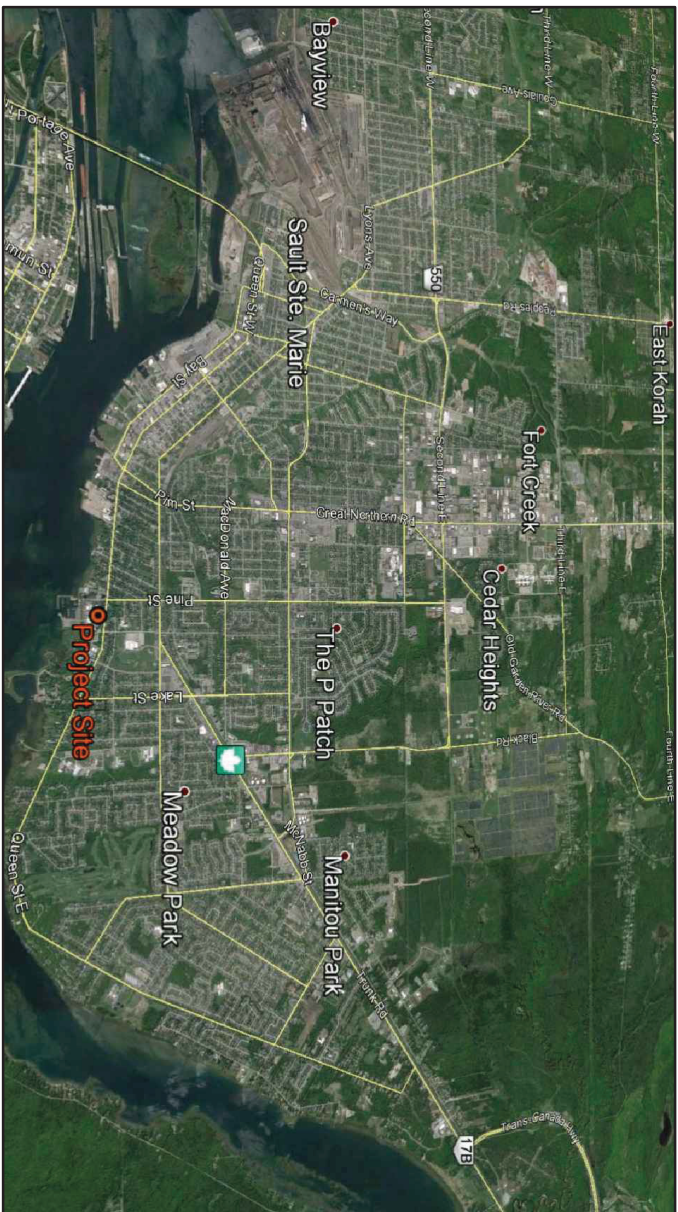
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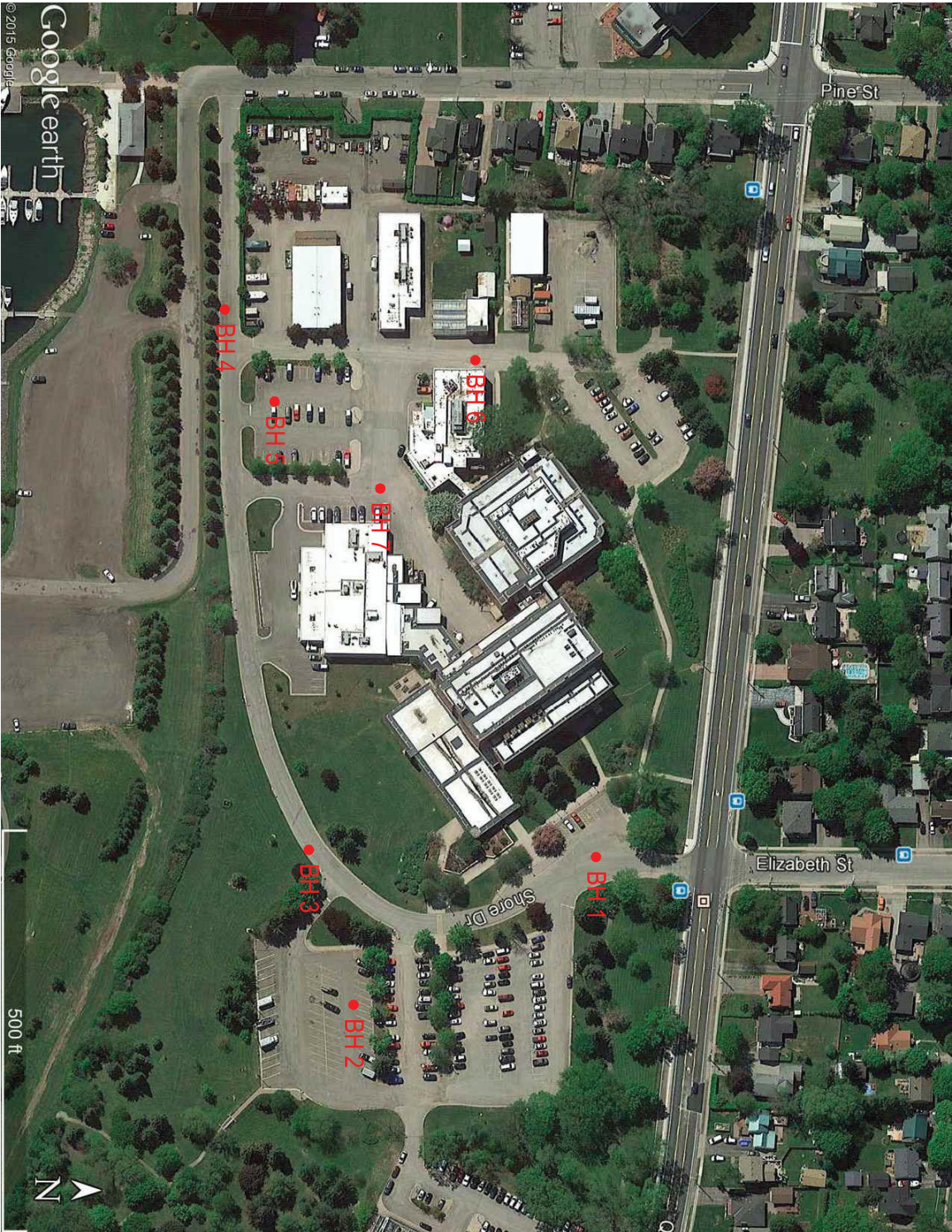
Appendix A Site Reference Plan



KEY PLAN



SITE PLAN



ENLARGED SITE PLAN SHOWING BOREHOLE LOCATIONS

"IMAGERY IS COURTESY OF GOOGLE EARTH"

Project GEOTECHNICAL INVESTIGATION FOR GREAT LAKE FORESTRY		Consultant	
Title KEY PLAN & SITE PLAN SHOWING BOREHOLE LOCATIONS	Scale As Noted		
	Dr. K. Nott	Ch. J. Black	
	Date Nov. 27, 2015		
CAD File 15-1148-Site Plan Showing BH Location.dwg		Dwg. No. 1	



Appendix B

Abbreviations, Terminology, and Principal Symbols Use

ABBREVIATIONS, TERMINOLOGY AND PRINCIPAL SYMBOLS USED IN REPORT AND BOREHOLE LOGS

Borehole & Test Pit Logs

Sampling method

AA	Auger Sample	W	Washed Sample
SS	Split Spoon Sample	HQ	Rock Core (63.5mm diam.)
ST	Thin Walled Shelby Tube	NQ	Rock Core (47.5mm diam.)
BS	Block Sample	BQ	Rock Core (36.5mm diam.)

In-Situ Soil Testing

Standard Penetration Test (SPT), “N” value is the number of blows required to drive a 51mm outside diameter split barrel sampler into the soil a distance of 300 mm with a 63.5kg weight free falling a distance of 760mm after an initial penetration of 150mm has been achieved. The SPT, “N” value is qualitative term used to interpret the compactness condition of cohesion less soils and is used only as a very approximation to estimate the consistency and undrained shear strength of cohesive soils.

Dynamic Cone Penetration Test (DCPT) is the number of blows required to drive a cone with a 60 degree apex attached to “A” size drill rods continuously into the soil for each 300mm penetration with a 63.5 kg weight free falling a distance of 760mm.

Cone Penetration Test (CPT) is an electronic cone point with a 10 cm² base area with a 60 degree apex pushed through the soil at a penetration rate of 2cm/s.

Field Vane Test (FVT) consists of a vane blade, a set of rods and torque measuring apparatus used to determine the undrained shear strength of cohesive soils.

Soil Descriptions

The soil descriptions and classifications are based on an expanded Unified Soil Classification System (USCS). The USCS classifies soils on the basis of engineering properties. The system divides soils into three major categories; coarse grained and highly organic soils. The soil is then subdivided based on either gradation or plasticity characteristics. The classification excludes particles larger than 75mm. To aid in quantifying material amounts by weight within the respective grain size fractions the following terms have been included to expand the USCS:

Soil Classification		Terminology	Proportion
Clay	<0.002 mm		
Silt	0.002 to 0.06 mm	“trace”, trace sand, etc.	1% to 10%
Sand	0.075 to 4.75 mm	“some”, some sand, etc.	10% to 20%
Gravel	4.75 to 75 mm	Adjective, sandy, gravelly, or (with)	20% to 35%
Cobbles	75 to 200 mm	and, and gravel, and silt, etc.	>35%
Boulders	>200 mm	noun, Sand, Gravel, Silt, etc.	>35% and main fraction

Notes:

- Soil properties, such as strength, gradation, plasticity, structure, etcetera, dictate the soils engineering behaviour over grain size fractions;
- With the exception of soil samples tested for grain size distribution or plasticity, all soil samples have been classified based on visual and tactile observations. The accuracy of visual and tactile observation is not sufficient to differentiate between changes in soil classification or precise grain size and is therefore an approximate description.

The following table outlines the qualitative terms used to describe the relative density condition of cohesionless soil:

Cohesionless Soil	
Compactness Condition	SPT N-Index (blows per 300 mm)
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

The following table outlines the qualitative terms used to describe the consistency of cohesive soils related to undrained shear strength and SPT, N-Index:

Cohesive Soil		
Consistency	Undrained Shear Strength (kPa)	SPT N-Index (blows per 300 mm)
Very soft	<12	<2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

Note: Utilizing the SPT, N-value to correlate the consistency and undrained shear strength of cohesive soils is only very approximate and needs to be used with caution.

Soil & Rock Physical Properties

General

W	Natural water content or moisture content within the soil sample
γ	Unit weight
γ'	Effective unit weight
γ_d	Dry unit weight
γ_{sat}	Saturated unit weight
ρ	Density
ρ_s	Density of solid particles
ρ_w	Density of water
ρ_d	Dry density
ρ_{sat}	Saturated density
e	Void ratio
n	Porosity
S_r	Degree of saturation
E_{50}	Strain of 50% maximum stress (cohesive soil)

Consistency

W	Liquid limit
W_p	Plastic limit
I_p	Plasticity limit
W_s	Shrinkage limit
I_L	Liquidity index
I_C	Consistency index
e_{max}	Void ratio in loosest state
e_{min}	Void ratio in densest state
I_D	Density index (formerly relative density)

Shear Strength

C_u, S_u	Undrained shear strength parameter (total stress)
C'_d	Drained shear strength parameter (effective stress)
r	Remolded shear strength
τ_p	Peak residual shear strength
τ_r	Residual shear strength
ϕ'	Angle of interface friction, coefficient of friction = $\tan \phi'$

Consolidation (One Dimensional)

Cc	Compression index (normally consolidated range)
Cr	Recompression index (over consolidated range)
Cs	Swelling index
mv	Coefficient of volume change
cv	Coefficient of consolidation
Tv	Time factor (vertical direction)
U	Degree of consolidation
s'_o	Overburden pressure
s'_p	Reconsolidation pressure (most probable)
OCR	Overconsolidation ratio

Permeability

The following table outlines the terms used to describe the degree of permeability of soil and common soil types associated with the permeability rates:

Permeability (cm/s)	Degree of Permeability	Common Associated Soil Type
$>10^{-1}$	Very High	Clean Gravel
10^{-1} to 10^{-3}	High	Clean Sand, Clean Sand and Gravel
10^{-3} to 10^{-5}	Medium	Fine Sand to Silty Sand
10^{-5} to 10^{-7}	Low	Silt and Clayey Silt (low plasticity)
$<10^{-7}$	Practically Impermeable	Silty Clay (medium to high plasticity)

Rock Coring

Rock Quality Designation (RQD) is an indirect measure of the number of fractures within a rock mass, Deere et al. (1967). It is the sum of sound pieces of rock core equal to or greater than 100 mm recovered from the core run, divided by the total length of the core run, expressed as a percentage. If the core section is broken due to mechanical or handling, the pieces are fitted together and if 100 mm or greater included in the total sum.

RQD is calculated as follows:

$$\text{RQD (\%)} = \frac{\sum \text{Length of core pieces} > 100 \text{ mm} \times 100}{\text{Total length of core run}}$$

The following is the Classification of Rock with Respect to RQD Value:

RQD Classification	RQD Value (%)
Very poor quality	<25
Poor quality	25 to 50
Fair quality	50 to 75
Good quality	75 to 90
Excellent quality	90 to 100

Appendix C Borehole Logs

Project No: 15-1148

Project: Great Lakes Forestry Parking Lot Rehabilitation

Site Location: 1219 Queen Street East, Sault Ste. Marie, Ontario

Client: CIMA Canada Inc.

Logged By: G.Ubaldi

Compiled By: D.A.Mousseau

Reviewed By: J.Black

SUBSURFACE PROFILE					SAMPLE														Remarks									
Well	Strata Plot (m)	Depth (m)	DESCRIPTION	Elevation (m)	Sample Number	Sample Type	Recovery (%)	Blows / 0.3m	Undrained Shear Strength (Cu, kPa)										Water Content Data (%)					Grain Size (%)				
									25	50	75	100	125	150	175	200	10	20	30	40	50	60	70	80	90	Gr	Sa	Si
		0	Geodetic Ground Elevation	0.00																				No Water Encountered				
			100mm Asphalt	-0.10																								
			100mm Granular "A" 150mm Granular "B"	-0.36																								
			Sand & Gravel, Trace Clay, Brown To Dark Brown		1	AS	20																					
		1		-1.01																								
			Sand & Gravel, Trace Silt & Clay, Loose, Dark Brown, Wet		2	SS	50	7																				
		2		-2.13																								
			End of Borehole																									
		3																										

Drilled By: NorthDrilling

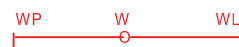
Drill Method: Hollow Stem Auger

Drill Date: November 7, 2015

Sample Type

AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ - Rock Core
W - Water Content
WL - Liquid Limit
WP - Plastic Content
+_s Field Vane, S - Sensitivity
- Lab Vane

w - Wash
○ - SPT(Standard Penetration Test)
○ - DCPT (Dynamic Cone Penetration)
WH - Weight Of Hammer



Datum:

Location: UTM 16T
706887 E
5153594 N

Sheet: 1 of 1

Project No: 15-1148

Project: Great Lakes Forestry Parking Lot Rehabilitation

Site Location: 1219 Queen Street East, Sault Ste. Marie, Ontario

Client: CIMA Canada Inc.

Logged By: G.Ubaldi

Compiled By: D.A.Mousseau

Reviewed By: J.Black

SUBSURFACE PROFILE					SAMPLE														Remarks																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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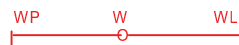
Drill Method: Hollow Stem Auger

Drill Date: November 7, 2015

Sample Type

AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ - Rock Core
W - Water Content
WL - Liquid Limit
WP - Plastic Content
+_s Field Vane, S - Sensitivity
- Lab Vane

w - Wash
○ - SPT (Standard Penetration Test)
○ - DCPT (Dynamic Cone Penetration)
WH - Weight Of Hammer



Datum:

Location: UTM 16T
706952 E
5153496 N

Sheet: 1 of 1

Project No: 15-1148

Project: Great Lakes Forestry Parking Lot Rehabilitation

Site Location: 1219 Queen Street East, Sault Ste. Marie, Ontario

Client: CIMA Canada Inc.

Logged By: G.Ubaldi

Compiled By: D.A.Mousseau

Reviewed By: J.Black

SUBSURFACE PROFILE					SAMPLE								Remarks																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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Drilled By: NorthDrilling

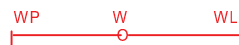
Drill Method: Hollow Stem Auger

Drill Date: November 7, 2015

Sample Type

AS - Auger Sample
SS - Spill Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ - Rock Core
W - Water Content
WL - Liquid Limit
WP - Plastic Content
+s Field Vane, S - Sensitivity
- Lab Vane

w - Wash
○ - SPT(Standard Penetration Test)
○ - DCPT (Dynamic Cone Penetration)
WH - Weight Of Hammer



Datum:

Location: UTM 16T
706892 E
5153476 N

Sheet: 1 of 1



Borehole Log: BH 4

Project No: 15-1148

Project: Great Lakes Forestry Parking Lot Rehabilitation

Site Location: 1219 Queen Street East, Sault Ste. Marie, Ontario

Client: CIMA Canada Inc.

Logged By: G.Ubaldi

Compiled By: D.A.Mousseau

Reviewed By: J.Black

SUBSURFACE PROFILE					SAMPLE														Remarks							
Well	Strata Plot (m)	Depth (m)	DESCRIPTION	Elevation (m)	Sample Number	Sample Type	Recovery (%)	Blows / 0.3m	Undrained Shear Strength (Cu, kPa)										Water Content Data (%)				Grain Size (%)			
																							Standard Penetration Resistance Blows / 0.3m			
									25	50	75	100	125	150	175	200	10	20	30	40	50	60	70	80	90	10
		0	Geodetic Ground Elevation	0.00																			Ground Water Encountered 1.37m-2.13m			
			90mm Asphalt	-0.09	1	AS																				
			Sand & Gravel, Trace Silt, Brown, Moist	-0.25																						
			Sand & Gravel, Trace Silt & Clay, Brown, Moist	-0.97																						
		1		Sand, Fine Grained, Trace Silt, Light Brown, Moist	-1.52	2	SS	100	6																	
			Sand, Trace Silt, Loose, Brown, Wet	-2.13																						
				End of Borehole																						
		3																								

Drilled By: NorthDrilling

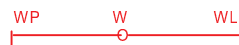
Drill Method: Hollow Stem Auger

Drill Date: November 7, 2015

Sample Type

AS - Auger Sample
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 +s Field Vane, S - Sensitivity
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 ○ - SPT(Standard Penetration Test)
 ○ - DCPT (Dynamic Cone Penetration)
 WH - Weight Of Hammer



Datum:

Location: UTM 16T
 706673 E
 5153440 N

Sheet: 1 of 1

Project No: 15-1148

Project: Great Lakes Forestry Parking Lot Rehabilitation

Site Location: 1219 Queen Street East, Sault Ste. Marie, Ontario

Client: CIMA Canada Inc.

Logged By: G.Ubaldi

Compiled By: D.A.Mousseau

Reviewed By: J.Black

SUBSURFACE PROFILE					SAMPLE														Remarks								
Well	Strata Plot (m)	Depth (m)	DESCRIPTION	Elevation (m)	Sample Number	Sample Type	Recovery (%)	Blows / 0.3m	Undrained Shear Strength (Cu, kPa)										Water Content Data (%)				Grain Size (%)				
									△	25	50	75	100	125	150	175	200	△									
																		Standard Penetration Resistance									
									○ Blows / 0.3m ○																		
									10	20	30	40	50	60	70	80	90	10	20	30	40	50	60	70			
		0	Geodetic Ground Elevation	0.00																			Ground Water Encountered @ 1.52m				
			90mm Asphalt	-0.09	1	AS																					
			Sand & Gravel, Trace Silt, Dark Brown To Light Brown, Moist	-0.30																							
			Sand & Gravel, Trace Silt & Clay, Dark Brown, Moist	-0.51																							
			Sand & Gravel, Black (Coal Like Appearance)																								
			Sand & Gravel, Trace Silt, Brown, Moist	-0.91																							
		1	Sand & Gravel, Trace Silt, Red - Brown, (Possible Sandstone) Moist	-1.52																							
			Silty Sand, Trace Gravel, Trace Clay, Very Loose, Brown, Wet	-2.13	2	SS	75	4	○																		
		2																									
			End of Borehole																								
		3																									

Ground Water Encountered @ 1.52m

Drilled By: NorthDrilling

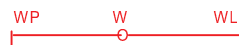
Drill Method: Hollow Stem Auger

Drill Date: November 7, 2015

Sample Type

AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ - Rock Core
W - Water Content
WL - Liquid Limit
WP - Plastic Content
+_s Field Vane, S - Sensitivity
- Lab Vane

w - Wash
○ - SPT(Standard Penetration Test)
○ - DCPT (Dynamic Cone Penetration)
WH - Weight Of Hammer



Datum:

Location: UTM 16T
706720 E
5153464 N

Sheet: 1 of 1



Borehole Log: BH 6

Project No: 15-1148

Project: Great Lakes Forestry Parking Lot Rehabilitation

Site Location: 1219 Queen Street East, Sault Ste. Marie, Ontario

Client: CIMA Canada Inc.

Logged By: G.Ubaldi

Compiled By: D.A.Mousseau

Reviewed By: J.Black

SUBSURFACE PROFILE				SAMPLE				Undrained Shear Strength (Cu, kPa)										Standard Penetration Resistance				Water Content Data (%)										Grain Size (%)				Remarks
Well	Strata Plot (m)	Depth (m)	DESCRIPTION	Elevation (m)	Sample Number	Sample Type	Recovery (%)	Blows / 0.3m	25	50	75	100	125	150	175	200	10	20	30	40	50	60	70	80	90	10	20	30	40	50	60	70	Gr	Sa	Si	Cl
		0	Geodetic Ground Elevation	0.00																																
			100mm Asphalt	-0.10																																
		1	Sand & Gravel, Trace Silt, Dark Brown To Light Brown, Moist	-1.52	1	AS																														
		2	Clay, Trace Sand & Silt, Very Soft, Red-Brown, Wet	-2.13	2	SS	100	1																												
		3	End of Borehole																																	

Ground Water Encountered @ 1.52m

Drilled By: NorthDrilling

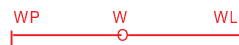
Drill Method: Hollow Stem Auger

Drill Date: November 7, 2015

Sample Type

AS - Auger Sample
SS - Spill Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ - Rock Core
W - Water Content
WL - Liquid Limit
WP - Plastic Content
+s Field Vane, S - Sensitivity
- Lab Vane

w - Wash
○ - SPT(Standard Penetration Test)
○ - DCPT (Dynamic Cone Penetration)
WH - Weight Of Hammer



Datum:

Location: UTM 16T
706700 E
5153539 N

Sheet: 1 of 1

Project No: 15-1148

Project: Great Lakes Forestry Parking Lot Rehabilitation

Site Location: 1219 Queen Street East, Sault Ste. Marie, Ontario

Client: CIMA Canada Inc.

Logged By: G.Ubaldi

Compiled By: D.A.Mousseau

Reviewed By: J.Black

SUBSURFACE PROFILE					SAMPLE														Remarks																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
Well	Strata Plot (m)	Depth (m)	DESCRIPTION	Elevation (m)	Sample Number	Sample Type	Recovery (%)	Blows / 0.3m	Undrained Shear Strength (Cu, kPa)										Water Content Data (%)				Grain Size (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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No Ground Water Encountered

Drilled By: NorthDrilling

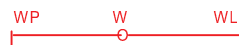
Drill Method: Hollow Stem Auger

Drill Date: November 7, 2015

Sample Type

AS - Auger Sample
SS - Spilt Spoon
TWS - Thin Walled Shelby Tube
BS - Block Sample
NQ - Rock Core
W - Water Content
WL - Liquid Limit
WP - Plastic Content
+s Field Vane, S - Sensitivity
- Lab Vane

w - Wash
○ - SPT(Standard Penetration Test)
○ - DCPT (Dynamic Cone Penetration)
WH - Weight Of Hammer



Datum:

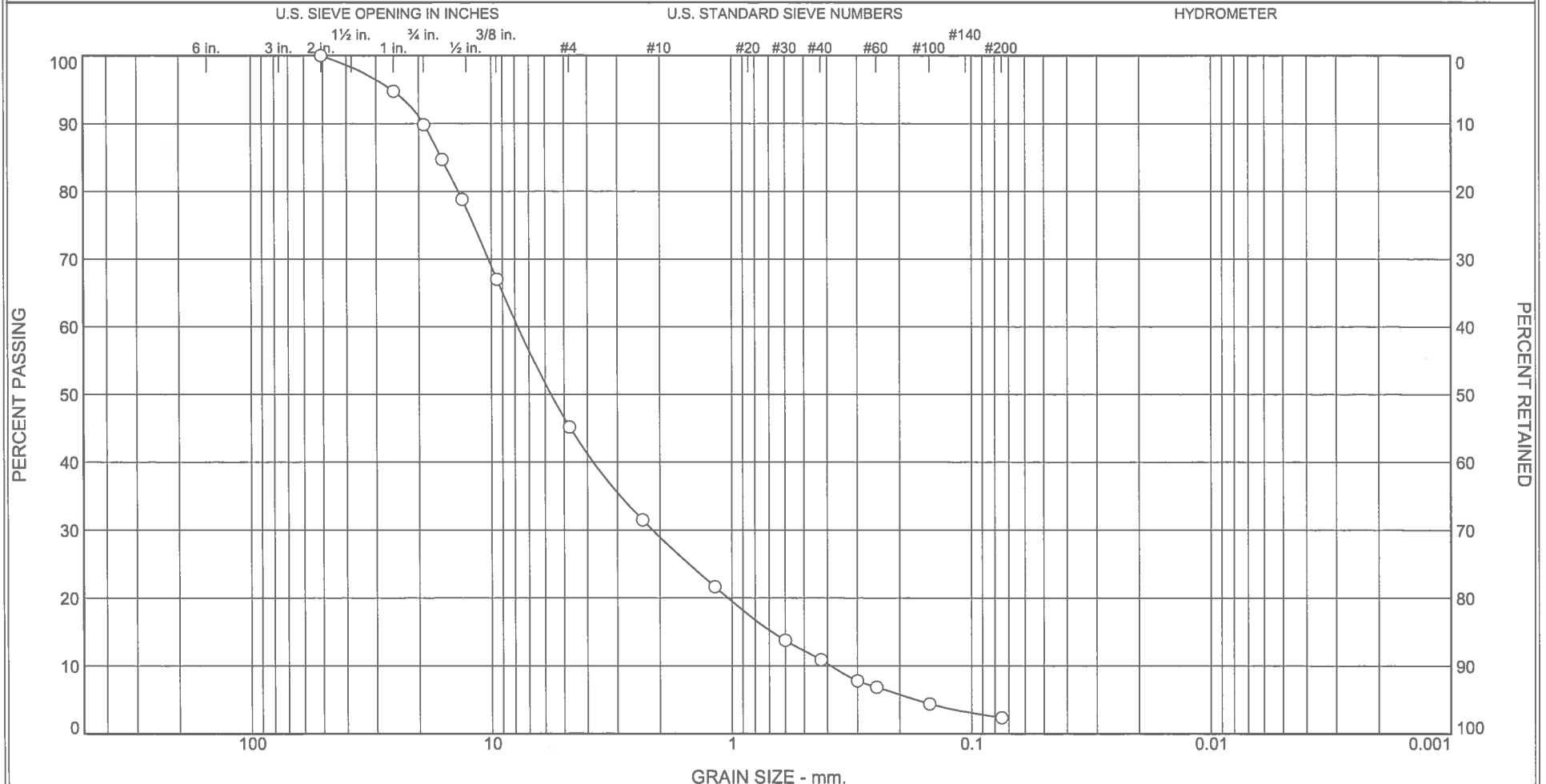
Location: UTM 16T

706752 E
5153503 N

Sheet: 1 of 1


Appendix D Tulloch Laboratory Data

Particle Size Distribution Report



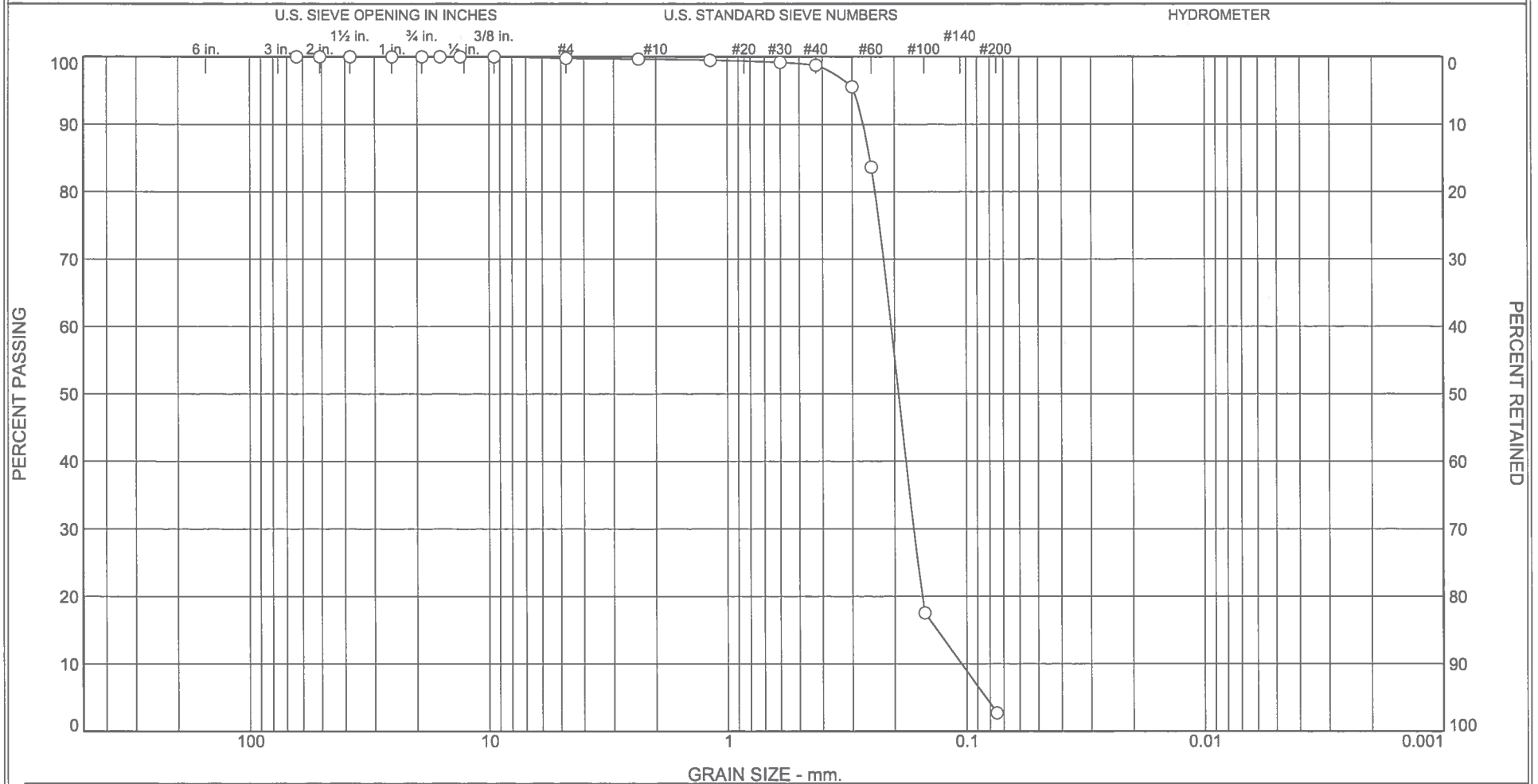
% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.1	44.7	16.2	18.1	8.5	2.4	

Identification			Date Sampled	Date Received	Date Tested
Location: BH 1	Depth: 0.35-0.61m	Sample Number: SA 6714	11/7/15	Nov. 7/15	11/24/15

Client CIMA Canada Inc.			71 Black Road Unit 3 Sault Ste. Marie, ON P6B 0A3	T. 705 949.1457 F. 705 949.9606 TF. 866 806.6602 adam.byers@TULLOCH.ca	○ SA 6714 F.M.=5.20
Project Great Lakes Forestry Complex					
Sault Ste. Marie, ON					
Project No. 15-1148	Figure				


Tested By: J. Draper Checked By: A.Byers

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.2	0.8	96.1	2.7	

Identification			Date Sampled	Date Received	Date Tested
Location: BH 4	Depth: 0.86-1.02m	Sample Number: SA 6713	11/7/15	Nov. 7/15	11/24/15

Client CIMA Canada Inc.		 <div>71 Black Road Unit 3 Sault Ste. Marie, ON P6B 0A3</div> <div>T. 705 949.1457 F. 705 949.9606 TF. 866 806.6602 adam.byers@TULLOCH.ca</div>	○ SA 6713 F.M.=0.89
Project Great Lakes Forestry Complex			
Sault Ste. Marie, ON			
Project No. 15-1148	Figure		

Tested By: J.Draper Checked By: A.Byers