



Issued for Tender

Foundation Rehabilitation

Ottawa, Ontario
NCC no. DC 1110-22

December 2014

Kwc 1437

Division 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

Section 00 01 10 – Table of Contents..... 2

Division 01 - GENERAL REQUIREMENTS

Section 01 00 01 – General Requirements10
Section 00 21 00 – Allowances 1
Section 01 35 10 – Health and Safety 4

Division 02 - EXISTING CONDITIONS

Section 02 41 13 – Selective Site Demolition 3
Section 02 91 00 – Tree Protection 3

Division 03 – CONCRETE

Section 03 01 30 – Concrete Repairs 2

Division 04 – MASONRY

Section 04 03 06 – Historic-Cleaning Historic Masonry..... 4
Section 04 03 07 – Historic – Masonry Repointing5
Section 04 03 08 – Historic-Mortaring..... 6
Section 04 03 42 – Historic Replacement of Stone6
Section 04 05 10 – Common Works Results for Masonry5

Division 05 – METALS

Section 05 50 00 – Metal Fabrications..... 2

Division 07 - THERMAL AND MOISTURE PROTECTION

Section 07 21 16 – Blanket Insulation..... 2

Division 22 –PLUMBING

Section 22 10 10 – Plumbing Pumps..... 2

Division 31 - EARTHWORK

Section 31 11 00 – Clearing and Grubbing6
Section 31 23 10– Excavating Trenching and Backfilling6
Section 31 23 13 – Rough Grading..... 2
Section 31 23 16 – Rock Removal..... 2

Division 33 – UTILITIES

Section 33 05 13 – Manholes and Catch Basin Structures2
Section 33 46 13 – Foundation Drainage Board2
Section 33 46 16 – Subdrainage Network3

List of drawings:

Architectural

A0 Cover Sheet
A1 Site Plan
A2 Details

Structural

S1 Plan
S2 Section and Details

Mechanical

M1 Mechanical Legend & Specification
M2 Mechanical Plans & Details

Electrical

E1 Elec trical Plan

Civil:

C1 Civil Site Plan

END OF TABLE

Part 1 General

1.1 DESCRIPTION OF THE WORK

- .1 Work includes all labour, services, materials, products, construction machinery and equipment necessary for the work in accordance with or reasonably inferable from the Contract Documents.
- .2 Work of this project generally consists of, but is not limited to: excavation, masonry repair, below grade drainage and insulation work, backfilling and rough grading, selective demolition, concrete work, stair construction and mechanical and electrical work.

1.2 PRE-CONTRACT AWARD CONDITIONS

- .1 Prior to the award of Contract, the Contractor must submit within 10 days of receiving the letter of notification: a site specific health and safety plan, corporate health and safety policy, and all other documents required by the letter of notification (Performance and Labour & Material bonds, insurance certificate, WSIB certificate), and information required for security access application.
- .2 If the requested documentation is not received within 10 business days of receiving the letter of notification, the NCC reserves the right to proceed on to the next lowest compliant bidder.

1.3 ADDENDA

- .1 Answers to questions directed to the NCC Representative and all amendments to the drawings or specifications during the tender period shall be issued in the form of Addenda.
- .2 Addenda form part of the Contract Documents.

1.4 CONTRACT METHOD

- .1 Construct the Work under a single stipulated sum construction contract.

Part 2 Contract Administration

2.1 CONTRACT DOCUMENTS

- .1 All contract documents are complementary. Items indicated in one and not in the other are deemed to be included in the contract work.
- .2 Drawings are intended to convey the scope of work and to indicate general arrangements. Obtain NCC Representative's approval of exact locations before installation.
- .3 Obtain direction from NCC Representative before proceeding if a possible obstacle or interference with an indicated installation is identified.
- .4 When the Contractor encounters an obstacle or interference that could have been reasonably foreseen and the Contractor failed to obtain direction from the NCC Representative in the matter, the NCC Representative may require that the work of the

Contractor be modified in whole or part in response to the obstacle or interference. The Contractor shall assume the costs of additional work arising from such work.

2.2 CODES, STANDARDS AND CONTRACT DOCUMENT CONFLICTS

- .1 Unless otherwise specified or indicated, perform work in accordance with the National Building Code of Canada, current addition, and all applicable provincial or local building codes.
- .2 In the instance of a conflict among building codes, referenced standards and contract documents, the more stringent requirement shall apply.

2.3 TAXES

- .1 Pay all applicable federal, provincial and municipal taxes.

2.4 FEES, PERMITS, CERTIFICATES AND BY-LAWS

- .1 Provide all authorities having jurisdiction with information appropriate to the exercise of their authority to review, approve and inspect. Assume cost of such submissions.
- .2 Pay all applicable fees and obtain all applicable permits and certificates.
- .3 Obtain and pay for the municipal building permit.
- .4 Upon request by the NCC Representative, provide inspection certificates to evidence that work conforms to requirements of the authorities having jurisdiction.

2.5 SUBMITTALS

- .1 Administrative
 - .1 Submit to NCC Representative submittals listed for review. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in the Work.
 - .2 Work affected by submittal shall not proceed until review is complete.
 - .3 Review submittals and stamp all submittals with Contractor's shop drawing stamp prior to submission to NCC Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of the Work and Contract Documents.
 - .4 Verify field measurements and affected adjacent Work are coordinated.
- .2 Shop drawings and product data
 - .1 "Shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data that are to be provided by Contractor to illustrate details of a portion of the Work.
 - .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connection, explanatory notes and other information necessary for completion of Work.
 - .3 Adjustments made on shop drawings by NCC Representative are not intended to change Contract Price.
 - .4 Make changes in shop drawings as NCC Representative may require.
 - .5 Submit four (4) copies, unless indicated otherwise, of shop drawings for each requirement requested in specification Sections and as NCC Representative may reasonably request
 - .6 Submit four (4) copies, unless indicated otherwise, of product data sheets or brochures for requirements requested in Specification Sections and as NCC Representative may reasonably request where shop drawings will not be prepared due to standardized manufacture of product.

- .3 Samples
 - .1 Submit for review, samples as requested in respective Specification Sections and as indicated on the drawings.
 - .2 Deliver samples prepaid to NCC Representative's business address.

2.6 SCHEDULE

- .1 Submit a schedule of work for approval, in a form acceptable to NCC Representative and within five (5) days of award of contract. Show in schedule dates for:
 - .1 shop drawing, material lists and samples submissions;
 - .2 equipment and material delivery;
 - .3 work commencement and completion for each trade as corresponds to each trade section of the Specification;
 - .4 Substantial and final completion date within time period required by Contract Documents.
 - .5 submit updated schedules at each progress meeting and as reasonably requested by the NCC Representative.

2.7 COST BREAKDOWN

- .1 Submit to NCC Representative breakdown of Contract price in detail as directed by NCC Representative. Obtain NCC Representative's approval of same prior to first progress claim submission.
- .2 Approved cost breakdown will be used as basis for progress claim payments.

2.8 PROJECT MEETINGS

- .1 Administrative
 - .1 NCC Representative will schedule and administer regular progress meetings throughout the progress of work, at times, frequency and locations set by the NCC Representative.
 - .2 The NCC Representative will distribute written notice of each meeting in advance of meeting date to Contractor, Consultant, and all other affected parties.
 - .3 The Contractor shall attend.
 - .4 The Contractor shall ensure affected Subcontractors attend.
 - .5 The NCC Representative will record minutes and include significant proceedings and decisions and identify 'action by' parties.
 - .6 The NCC Representative will reproduce and distribute copies of minutes to meeting participants and affected parties not in attendance.

2.9 AS-BUILT DRAWINGS

- .1 NCC Representative will provide two sets of white prints for record drawing purposes.
- .2 Maintain project record drawings and record accurately all deviations from Contract documents as project progresses. Maintain on-going as-built records on site, ready for inspection during the course of the construction.
- .3 Update these drawings daily.
- .4 Record changes in red. Mark on one set of prints and at completion of project and prior to final inspection, neatly transfer notations to second set and submit both sets to NCC Representative.
- .5 Provide a cost for the As-Built Drawings in the Contractor cost breakdown.

2.10 DOCUMENTS REQUIRED ON-SITE

- .1 Maintain at job site, one copy each of following:
 - .1 Contract drawings,
 - .2 Specifications,
 - .3 Addenda,
 - .4 Change orders,
 - .5 Other modifications to Contract,
 - .6 Approved work schedule,
 - .7 Permits ,
 - .8 Field test reports,
 - .9 Reviewed shop drawings.
 - .10 As-built drawings.

2.11 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP

- .1 Use only new materials, unless indicated otherwise.
- .2 Exceed or meet the minimum requirements of standards referenced in the specifications, such as the Canadian Standards Association (CSA), and the National Building Code of Canada (current edition), and of all applicable federal, provincial, and municipal codes. In the case of conflict or discrepancy between these requirements, the most stringent applies.
- .3 Workmanship
 - .1 Workmanship shall be best quality, executed by workers experienced and skilled in respective duties for which they are employed.
 - .2 Employ persons fit for and skilled in their required duties.
 - .3 Assume the costs of redoing work that, in the NCC Representative's opinion, does not meet the specified quality of workmanship.
- .4 Alternatives
 - .1 The NCC Representative will only consider Alternatives
 - .1 for materials, products or processes specified with the term "and/or approved equivalent" applied and;
 - .2 submitted in accordance with the "General Instructions for Tendering"-
 - .2 The NCC Representative will approve alternatives that are in his opinion equal in material content, workmanship and quality to the materials, products or processes identified and at least conformant to the standards specified.
 - .3 Assume the cost of additional work or modifications to the design due to the use of NCC Representative approved alternatives.

2.12 SECURITY CLEARANCE

- .1 In accordance with the Security Policy of the Government of Canada, all persons undertaking work or services at the property covered by this contract must have met the requirements of a Site Access Security Assessment. The Site Access Security Assessment requires disclosure of information concerning:
 - .1 financial information (credit check),
 - .2 education,
 - .3 employment history,
 - .4 personal history and relatives, and
 - .5 criminal record (if any) for which a pardon has not been granted. (Fingerprint impressions may be necessary).
- .2 The NCC reserves the right to refuse access to personnel not passing a Site Access Security Assessment.

- .3 Unless otherwise indicated, access to site (employees, deliveries, visitors, and pick-ups of material etc.) must be coordinated with, and approved by the designated NCC Representative.

2.13 SITE SECURITY

- .1 Where security has been reduced by work of the Contract, provide temporary means to maintain security.
- .2 Cooperate with NCC and Security staff in maintenance of security.

2.14 SECURITY AND CONFIDENTIALITY

- .1 Exercise utmost care to ensure the security of any material prepared or received in handling this project.
- .2 Without the prior written permission of the NCC Representative, do not distribute, publish, display or reproduce any documents, photographs, site plans, maps or information related to the project (or collected during the project), in any medium, including the internet.
- .3 Without the prior written permission of the NCC Representative, do not disclose any documents, photographs, site plans, maps or information related to the project unless such disclosure:
 - .1 Is reasonably required to obtain necessary permits and approvals to perform the work;
 - .2 Is reasonably required to facilitate the contracting and performance of sub-contractors, consultants and other parties involved in completing the contracted work;
 - .3 Is required by law.
- .4 When requested by the NCC, return to the NCC all copies of all site photographs and construction documents, site plans and maps related to the project.
- .5 All the above restrictions apply to all sub-contracts for work and services related to the project.

2.15 RELICS AND ANTIQUITIES

- .1 Protect relics and antiquities, items of historical or scientific interest and similar objects found during the course of work.
- .2 Immediately notify NCC Representative of any findings and await NCC Representative's written instructions before proceeding with work adjacent to findings.
- .3 If any vestiges of early human occupancy of the land are uncovered during construction, suspend construction activity and notify the NCC Representative.
- .4 Relics, antiquities and items of historical or scientific interest shall remain the property of the Crown.

2.16 ENVIRONMENTAL PROTECTION

- .1 Fires
 - .1 Fires and burning of rubbish on site not permitted.
- .2 Disposal of Wastes
 - .1 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

- .3 Drainage
 - .1 Do not pump water containing suspended materials into waterways, sewer or drainage system.
- .4 Tree and Plant Protection
 - .1 Protect trees and plants on site.
- .5 Pollution Control
 - .1 Control emissions from equipment and plant to local authorities emission requirements.
 - .2 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .6 Spills Reporting
 - .1 Prepare an environmental emergency measure plan and post at the place of work indicating:
 - .1 The site's refuelling area.
 - .2 The NCC Environmental Emergency Service telephone number (613) 239-5353. Call immediately in the event of accidental spill of fuel or other pollutant.
 - .2 Assume financial responsibility to clean up effects of spill.

2.17 WASTE DISPOSAL

- .1 Unless otherwise indicated or specified, materials indicated for removal become the Contractor's property and shall be taken from site.
 - .1 Dispose of waste materials in accordance with requirements of authorities having jurisdiction and as described in the Contract Documents.

Part 3 ON-SITE ACTIVITIES

3.1 SIGNS

- .1 Site boards and other advertising are prohibited on this project.
- .2 All signage shall be bilingual in French and English.
- .3 Proposed wording and signage shall be submitted for review and approval by NCC Representative.
- .4 Provide warning signage to clearly identify area under construction and access restrictions (protective gear, sign-in, etc.).

3.2 OWNER OCCUPANCY

- .1 The site and the building will remain occupied during the implementation of the work of this contract. Areas above and adjacent the work will be occupied during the entire construction period.
- .2 Cooperate and cooperate with NCC so as to minimize conflict and impacts to other activities in building.

3.3 CONTRACTOR'S USE OF SITE AND FACILITIES

- .1 NCC Representative will arrange with the Contractor a work schedule and procedures for entry to the property. Do not commence work until these requirements have been confirmed and approved by NCC Representative.

- .2 Do not unreasonably encumber exterior of site with materials or equipment.
- .3 Execute the work with least possible disturbance to the normal use of the site.
- .4 Protect grass, trees and other surfaces on the ground from damage in areas not directly affected by the work. Refer to the "DAMAGES" article below.
- .5 Move stored products or equipment as directed by NCC Representative to ensure public pedestrian access around property.
- .6 Provide for personnel and vehicle access. Maintain safe exiting routes from the site and building at all times.
- .7 Provide 14 days notice to and obtain requisite permissions from the NCC Representative and utility companies of any intended interruption of services. Keep duration of these interruptions to a minimum.
- .8 Park in area designated for Contractor's use unless NCC Representative specifically authorizes other parking arrangements.
- .9 Smoking is prohibited within 50 feet of buildings. A designated smoking area will be identified by the NCC Representative. The Contractor shall ensure adequate sealed cigarette butt disposal.

3.4 PROJECT COORDINATION

- .1 Coordinate progress of the Work, progress schedules, submittals, use of the site, temporary utilities and construction facilities and controls.

3.5 SETTING-OUT OF WORK

- .1 Provide devices needed to lay out and carry out the work. Supply such devices as required to facilitate NCC Representative's inspection of work.

3.6 FIRE SAFETY

- .1 Provide fire extinguishers to protect the work in progress.
- .2 Advise NCC Representative of any work that would impede fire apparatus / personnel response.
- .3 Know the location of nearest fire alarm box and telephone, including the emergency phone number.
- .4 Observe at all times smoking regulations. There is no-smoking in or near the Work. The NCC Representative will designate a smoking area.

3.7 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

- .1 Ins tallation/Removal
 - .1 Provide construction facilities and temporary controls in order to execute work efficiently.
 - .2 Remove from site all such work after use.
- .2 Hoarding
 - .1 Erect hoarding indicated and as necessary to protect building occupants, the public, workers and property from injury or damage.

- .3 Weather Enclosures
 - .1 Provide weathertight closures at openings in floors and roofs where required to protect building components as the work proceeds.
 - .2 Design enclosures to withstand wind pressure.
- .4 Dust Tight Screens
 - .1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, building occupants and public.
 - .2 Maintain and relocate protection until such Work is complete.
- .5 Dewatering
 - .1 Provide temporary drainage and pumping facilities to keep excavations, building and site free from water.
- .6 Site Storage/Loading
 - .1 Confine the Work and operations of employees to limits indicated by Contract Documents and as directed by the NCC Representative. Do not unreasonably encumber premises with Products.
 - .2 Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the Work.
- .7 Ventilation
 - .1 Provide ventilation to prevent accumulation of dust, fumes, mists, vapours, or gases in areas of Work.
 - .2 Provide ventilation through portable fan(s) exhausted to the out of doors to prevent migration of dust and debris within the building.
 - .3 Dispose of exhaust materials in manner that does not contaminate adjacent areas.
 - .4 Continue operation of ventilation and exhaust systems for sufficient time after cessation of operations to ensure removal of pollutants.
- .8 Temporary Telephone
 - .1 Provide and pay for temporary telephone necessary for own use.
- .9 Electricity and Water
 - .1 Existing services required for the work may be used by the Contractor without charge. Ensure capacity is adequate prior to imposing loads. Connect, use, and disconnect at own expense and responsibility. Coordinate with NCC Representative.
 - .2 Provide and pay for temporary service where existing services are unsuitable. Connect, use, and disconnect at own expense and responsibility. Coordinate with NCC Representative.
- .10 Access Equipment
 - .1 Provide all scaffolding, ladders and lifting equipment required for the work.
- .11 Signage
 - .1 Meet with NCC Representative prior to commencement of work to prepare list of signs and other devices required for the project. Signs and notices for safety and instruction shall be in both official languages. Do not post any sign without prior permission of the NCC Representative.
- .12 Temporary Heating
 - .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

- .2 Building electrical supply may be used. Ensure capacity is adequate prior to imposing loads. Connect, use and disconnect at own expense and responsibility. Coordinate with NCC Representative. Owner will pay for Electrical Utility usage costs.

3.8 POWER/EXPLOSIVE ACTUATED FASTENING DEVICES

- .1 Do not employ power guns using explosives without prior written permission of NCC Representative.

3.9 PROTECTION OF WORK AND SITE

- .1 Protect finished work against damage until take-over.
- .2 Protect hard and soft landscaping adjacent to the work from damage unless indicated or described otherwise.
- .3 Protect adjacent building spaces and occupants against spread of dust, harmful vapours, hazardous materials and dirt. Use devices and methods that minimize inconvenience and risk to the occupants.

3.10 CUTTING AND PATCHING

- .1 Do cutting and patching as indicated and as specified.
- .2 In the absence of explicit indication or specification, and as directed by the NCC Representative, do cutting and patching as follows:
 - .1 Perform cutting, fitting, and patching to complete the Work.
 - .2 Remove and replace defective and non-conforming work that is to form the base or substrate for new work.
 - .3 Perform work to avoid damage to other work.
 - .4 Prepare surfaces to receive patching and finishing.
 - .5 Refinish surfaces to match adjacent finishes; for continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit, unless indicated otherwise.
 - .6 Make cuts with clean, true, smooth edges.

3.11 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures, outlets and distribution systems indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures, outlets and distribution systems to minimize interference between systems, to allow access for maintenance and to maximize the usable space.
- .3 Inform the NCC Representative of a conflicting installation. Install as directed
- .4 Inform NCC Representative of impending installation and obtain approval for actual location

3.12 EXISTING SERVICES

- .1 Where work involves disruption of existing services:
 - .1 Execute work at times directed by NCC Representative,
 - .2 Submit schedule to and obtain approval from NCC Representative for any shutdown or closure of active services,
 - .3 Notify NCC Representative at least 14 days before service disruption,
 - .4 Adhere to approved schedule.
- .2 Immediately advise NCC Representative when unknown services encountered.

3.13 DAMAGES

- .1 Restore or replace to their original condition existing public and/or privately owned property, structures, finishes, services, and/or utilities damaged during the execution of the work of this contract, or make adequate compensation to affected parties.
- .2 The terms “restore” and “replace” include labour, equipment and material costs.

3.14 CLEAN-UP

- .1 Provide on-site waste containers for collection of waste materials and debris and locate as directed by NCC Representative. Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .2 At the end of each work period, and more often if directed by the NCC Representative, remove debris from site, neatly stack material for use, and clean up generally. Conduct disposal operations to comply with municipal and site ordinances, anti-pollution laws and as required by the Contract Documents.
- .3 Upon completion, remove temporary protections installed under this contract and remove surplus materials. Make good defects noted at this stage.
- .4 Cleaning during construction
 - .1 Clean-up work area as the work progresses in order to prevent migration of dust and debris.
 - .2 Clean as directed by the NCC Representative.
- .5 Final clean-up
 - .1 For site, broom clean hard landscaped surfaces. Rake clean other landscaped areas. Hose down with water and wash hard landscaped surfaces as directed by NCC Representative.
 - .2 Broom clean all interiors before inspection process.
 - .3 Clean as directed by the NCC Representative.

END OF SECTION

Part 1 General

1.1 CASH ALLOWANCES

- .1 The Contract Price includes cash allowance amounts stated in the Contract Documents.
- .2 Provide invoices, time sheets and other such documentation as may be necessary to substantiate expenditure of cash allowances.
- .3 Include overhead and profit for cash allowance amounts in the Contract Price. No overhead and profit will be paid on the cash allowance amounts.
- .4 When costs under a cash allowance exceed the amount of the allowance, the Contractor will be compensated for any excess incurred and substantiated plus an allowance for overhead and profit as set out in the Contract Documents.
- .5 Include the following cash allowance amounts in the Contract Price:
 - .1 Cost to construct new stair: \$75,000

Part 2 Products (not applicable)

Part 3 Execution (not applicable)

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Health and safety considerations required to ensure that the NCC shows due diligence towards health and safety on construction sites, and meets the requirements laid out in the NCC's *Policy - Occupational Health and Safety for Construction*.

1.2 RELATED SECTIONS

- .1 Section 01 00 01 – General Requirements.

1.3 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Ontario
 - .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. [1990 June 2002].

1.4 SUBMITTALS

- .1 Make submittals in accordance with Section 01 00 01 – General Requirements.
- .2 Submit site-specific Health and Safety Plan prior to Award of Contract. Plan shall include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation.
- .3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to the NCC Representative weekly.
- .4 Submit copies of reports or directions issued by Federal or Provincial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 00 01 – General Requirements.
- .7 The NCC Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor prior to Award of Contract. Revise Plan as appropriate and resubmit prior to Award of Contract.
- .8 The NCC Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.5 FILING OF NOTICE

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

1.6 SAFETY ASSESSMENT

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

1.7 MEETINGS

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

1.8 GENERAL REQUIREMENTS

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

1.9 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.10 COMPLIANCE REQUIREMENTS

- .1 Comply with Ontario Health and Safety Act and Regulations for Construction Projects, R.S.O..

1.11 UNFORSEEN HAZARDS

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

1.12 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have minimum 2 years' site-related working experience specific to activities associated with similar projects.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

- .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
- .5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.13 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 having jurisdiction, and in consultation with NCC Representative.

1.14 CORRECTION OF NON-COMPLIANCE

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

1.15 POWDER ACTUATED DEVICES

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

1.16 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.

1.17 DESIGNATED SUBSTANCES, VOLATILE COMPOUNDS, UNFORESEEN HAZARDS

- .1 Notify NCC Representative 48 hours in advance of work in occupied areas involving designated substances (under applicable provincial legislation), hazardous substances (Canada Labour Code Part II Section 10), and before painting, installing carpet, or using volatile compounds.
- .2 Asbestos: Stop work and notify NCC Representative immediately if a material resembling asbestos is encountered. Do not proceed at such locations without written instructions from the NCC Representative.
- .3 Silica: Use appropriate respiratory protection and ventilation during the demolition and/or modification of structures with products that contain silica. Silica is a crystalline component of concrete and cement. Silica dust is created by blasting, grinding, crushing and sandblasting silica-containing materials.

1.18 BUILDING SMOKING ENVIRONMENT

- .1 Smoking is not permitted in the Building. Obey smoking restrictions on building property.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 00 01 – General Requirements
- .2 Section 02 91 00 – Tree Protection
- .3 Section 31 23 10 – Excavating, Trenching and Backfilling

1.2 REFERENCES

- .1 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Assessment Act (CEAA), 1997, c. 37.
 - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .2 Health Canada – Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .3 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

1.3 DEFINITIONS

- .1 Demolition: rapid destruction of a structure or building following removal of hazardous materials.
- .2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: PCBs, CFCs, HCFCs 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

1.5 STORAGE AND PROTECTION

- .1 Protect existing items designated to remain and items designated for salvage. In the event of damage to such items, immediately replace or make repairs to approval of NCC Representative and at no cost to the NCC Representative.
- .2 Remove and store materials to be salvaged, in manner to prevent damage. Store and protect for maximum preservation of material. Handle salvaged materials as new materials. .
- .3 Waste Management and Disposal
 - .1 Divert excess materials to site approved by NCC Representative.
 - .2 Place materials defined as hazardous or toxic in designated containers.
 - .3 Handle and dispose of hazardous materials in accordance with CPE, TDGA and Regional and Municipal regulations.
 - .4 Label location of salvaged material's storage areas and provide barriers and security devices.
 - .5 Ensure emptied containers are sealed and stored safely.

- .6 Source separate for recycling materials that cannot be salvaged for reuse including wood, metal, concrete and asphalt, and gypsum. Remove materials that cannot be salvaged for reuse or recycling and dispose of in accordance with applicable codes at licensed facilities.

1.6 SITE CONDITIONS

- .1 In all circumstances, ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .2 Do not dispose of waste or volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout the project.
- .3 Do not pump or otherwise dispose of water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
- .4 Control disposal of runoff or water containing suspended materials or other harmful substances in accordance with local authorities.
- .5 Protect vegetation (trees, plants, shrubs and foliage) on site and adjacent properties where indicated.

1.7 REGULATORY AGENCY REQUIREMENTS

- .1 Ensure Work is performed in compliance with applicable Provincial regulations.

PART 2 – PRODUCTS

Not applicable.

PART 3 – EXECUTION

3.1 PREPARATION

- .1 Inspect site with NCC Representative and verify extent and location of items designated for removal, disposal, alternative disposal, salvage and items to remain. Clearly mark items to be cut by tracing a cutting line with paint, including tree root cutting lines, in agreement with the NCC Representative.
- .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 Cleaning: Remove contaminated materials and soil, waste, rubbish, stones, unwanted plant materials, organic debris, concrete, asphalt and other materials that could interfere with surface preparation work and discard in accordance with the laws and regulations in force.

3.2 REMOVAL OPERATIONS

- .1 Removal:
 - .1 Remove items as indicated.

- .2 Remove items designated as contaminated or hazardous by authorities having environmental protection jurisdiction off site, taking all necessary safety precautions to minimize hazards during removal and disposal operations.
- .3 Do not disturb items designated to remain in place.
- .5 Square up adjacent surfaces to remain in place by saw cutting or other method approved by NCC Representative;
- .6 Protect adjacent joints and load transfer devices;
- .7 Project underlying and adjacent granular materials.
- .8 Evacuate at least 300 mm below pipe invert, when removing pipes under existing or future pavement area.
- .3 Removal off site
 - .1 Remove demolition waste stored on site to a temporary stockpiling location if such waste interferes with the activities of the NCC Representative or other contractors.
 - .2 Waste material must be hauled to an authorized waste management centre.
- .4 Salvage
 - .1 Dismantle items containing materials to be salvaged and store salvaged materials at the locations indicated.
- .5 Disposal
 - .1 Dispose of materials not designated for salvage or reuse on site at authorized and approved facilities.
- .6 Granular sub-base salvage
 - .1 Salvage granular sub-base of removed items.
- .7 Backfill
 - .1 Backfill hollows caused by removed items as indicated in Section 31 23 10 – Excavating, Trenching and Backfilling.

3.3 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.
- .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.

3.4 CLEANING

- .1 Remove debris, trim surfaces and leave work site clean, upon completion of Work.
- .2 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.

END OF SECTION

1.0 RELATED WORK

- .1 Section 31 11 00 – Clearing and Grubbing
- .2 Section 31 23 10 – Excavating, Trenching and Backfilling

2.0 SCOPE

- .1 The Contractor shall be responsible for erecting and maintaining the tree protection fencing throughout the construction period. The area defined by the tree protection fencing shall be identified as the Tree Protection Area and shall remain off limits for the duration of the Work.
- .2 The Sensitive Work Area as indicated on the contract drawings, is located immediately outside the Tree Protection Area. Any Work undertaken in this area shall follow procedures as specified in subsection 3.0.
- .3 Erect tree protection fencing where indicated on the contract drawings and as specified in these specifications. Review the exact installation locations and extent of the fencing on site with the NCC Representative and NCC consulting certified arborist 2 days prior start of installations.
- .4 Review proposed and anticipated methodology of Work of this Contract with NCC Representative and NCC consulting certified arborist and potential impact or obstruction to the Work by the existing canopy overhang. Establish and perform any required pruning of the canopy to permit Work of this Contract without permanent damage to the tree canopy. Perform pruning as directed by the NCC consulting certified arborist.

3.0 MATERIALS

- .1 Tools: tools used around and within the root zone shall be clean and free of toxic materials. Tools used for pruning of root or canopy branches shall be disinfected with methyl alcohol at 70% (denatured wood alcohol diluted appropriately with water) or chlorox solution.
- .2 Tree Caliper Measurement: For the purpose of sizing trees, the calliper will be determined by a diameter tape measurement of the tree trunk at breast height (dbh) 1.37 meters above grade level.
- .3 Fencing Material: metal grille, minimum height 1800mm, Modu-Loc Omega and/or approved equal.

4.0 RESTRICTIONS

- .1 Any tree damaged by construction activities of this Contract shall be compensated by the Contractor.
- .2 Once installation is accepted, the tree protection fencing may not be moved, removed or temporarily opened for the duration of the Work unless such proposed modification has been reviewed and approved by the NCC Representative.
- .3 Do not disturb or compact grade within the canopy width of existing trees within or outside the Tree Protection or Sensitive Work Areas.
- .4 The following activities are strictly forbidden within the canopy width of existing trees, within or outside the Tree Protection or Sensitive Work Areas:
 - vehicular and equipment traffic
 - dumping and storage of materials (materials, refuse or excavated soils)
 - dumping and storage of poisonous material on or around trees and roots. Poisonous materials include, but are not limited to paint, petroleum products, concrete, stucco mix, dirty water, oil and fuel
 - the use of tree trunks as a backstop, winch support anchorage, temporary power pole, signpost
- .5 Roots larger than 25mm in diameter shall not be prevented.
- .6 Review removal of planting material with NCC Representative.

5.0 UNDERGROUND SERVICES in SENSITIVE WORK AREA

- .1 Underground services shall not pass through or cross the Tree Protection Area.
- .2 Underground services required through the Sensitive Work Area shall be installed using trenchless techniques consisting of boring a tunnel or digging by hand along the route of the underground services. Boreholes should be 120mm – 150mm in diameter and shall be deeper than the main lateral roots. Pipes and cables are to be fed through the boreholes.
- .3 When hand digging, retain as many roots as possible.
- .4 Review the excavation and installation method with the NCC Representative and NCC consulting certified arborist prior to starting the work.
- .5 Trenching through the Sensitive Work Area shall be supervised by NCC consulting certified arborist.
- .6 When tree roots larger than 25mm in diameter are encountered, consult with NCC consulting certified arborist.
- .7 Prune roots that must be removed using a sharp clean tools such as secateurs or landscape handsaw. Make a clean cut and leave as small wound as possible. All root pruning to be supervised by NCC consulting certified arborist.
- .8 Protect and keep roots moist and covered if they are to be left exposed. Protect by covering from frost, remove covering before backfilling.

6.0 RECORDING

- .1 Thoroughly record existing condition of root system uncovered where tunnelling is required or where damage to the root zone will be encountered. Record damage to root zone larger than 25mm in diameter and location.

7.0 PROTECTION

- .1 The following procedures are to be followed for Work within the Sensitive Work Area
 - .1 Root Protection Type 1: Exposed root base from the excavation of the road/pathway shall be protected from repeated compaction by vehicular circulation by the placement of steel plates on a granular base.
 - .2 Root Protection Tpe 2: The protective buffer shall consist of:
 - .1 A minimum depth of 300mm untreated shredded wood chips (Mulch shall be 50mm untreated shredded wood or approved equivalent) spread over the area indicated in the contract drawings. Leave the tree trunks clear of mulch.
 - .2 150mm Granular A to stabilize the steel plates to be positioned on top
- .2 Diseased trees: Disinfection of tools used for pruning shall take place after each cut on diseased trees.

8.0 DAMAGES

- .1 The Contractor is responsible for damage to existing trees identified for preservation as a result of failure to maintain the barriers in good repair or for breach of the barriers by Work of this contract, construction materials or equipment.
- .2 Compensation for damaged trees 100mm and smaller shall consist of the supply, planting and maintenance of nursery stock trees of the same species to those damaged. The size of the replacement trees shall be 75mm cal. For deciduous trees and 1.8m high for coniferous trees.
- .3 For compensation of trees damaged that are larger then 100mm, of uncommon and rare specimen or of heritage and significant value to the Rideau Hall site, the assessed value will be in accordance with the International Society of Arboriculture. Monetary compensation shall be made according to the assessed value of the damaged tree.
- .4 The quantity and location of compensation trees shall be determined by the NCC.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM C109/C109M-13 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50-mm Cube Specimens).

1.2 WASTE MANAGEMENT AND DISPOSAL

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

1.3 ENVIRONMENTAL

- .1 Maintain the repair concrete above 5° C and below 30° C for a minimum of three days after completing the repairs.

Part 2 Products

2.1 MATERIALS

- .1 Bonding agent:
 - .1 Bonding agent: anti corrosive, water based, suited for the proposed application. Bonding agent to be compatible with polymer modified mortar or concrete used to complete the repairs.
- .2 Fast setting polymer modified mortar for concrete repairs:
 - .1 Polymer modified mortar: latex based, pre-packaged, suited for the proposed application and that allows the application of a coating within 3 days of installation. Compressive strength to meet ASTM C-109.
 - .1 Acceptable products:
 - .1 Repair mortars by BASF and/or approved equal.
 - .2 Repair mortars by Euclid Chemical and/or approved equal.
 - .3 Repair mortars by Mapei and/or approved equal.
 - .4 Repair mortars by Sika and/or approved equal.
 - .2 For repairs exceeding a thickness of 50mm, extend fast setting polymer modified mortar using clean 10mm aggregate in accordance with manufacturer's instructions.

Part 3 Execution

3.1 PREPARATION OF SURFACE REPAIRS

- .1 Prior to the start of the work, identify all mechanical and electrical services interfering with the work. Services to be temporarily removed/relocated and reinstated by the Contractor at his own cost. Coordinate all service relocation with the NCC Representative.
- .2 Prepare surface for repair by removing all unsound concrete around corroded reinforcement to a depth of 25mm beyond the bar, where the bond between concrete and reinforcing bar is broken or where removal or deteriorated concrete exposes more than

half the perimeter of the bar or if the bar shows signs of corrosion, and as noted on drawings.

- .3 After acceptance of surface by NCC Representative, grit blast surface including existing reinforcing steel.
- .4 Immediately after grit blasting is completed, the surface will be checked by the NCC Representative for fractured concrete, or loose aggregate. Remove this material using hand tools.

3.2 APPLICATION

- .1 Apply fast setting polymer modified mortar in accordance with manufacturer's instructions and as per the details.

3.3 FINISHES

- .1 Repairs to match existing concrete texture and profile.

3.4 CURING

- .1 Cure and protect fast setting polymer modified mortar as per manufacturer's instructions.
 - .1 Do not use curing compounds where bond is required by subsequent coating.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Definitions:
 - .1 Low-pressure water soaking: less than 350 kPa (50 psi), measured at nozzle tip.
 - .2 Medium-pressure water soaking: minimum 350 kPa (50 psi) and maximum 2700 kPa (400 psi), measured at nozzle tip.
- .2 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals for approval by NCC Representative.
- .2 Provide proposed cleaning method and type of protection from cleaning residue for in-place conditions.
- .3 Samples:
 - .1 Provide samples of cleaning materials for approval of NCC Representative.
 - .2 Demonstrate machinery, tools and nozzles for approval by NCC Representative.
- .4 Test and Evaluation Reports:
 - .1 Provide test results.
 - .1 Provide two copies of test results describing cleaning method, compressor equipment, water pressure at compressor, tools, nozzle size and distance from masonry surface used for cleaning of test patches.
 - .2 Proceed with cleaning upon receiving written approval by NCC Representative, concerning tested cleaning methods.

1.3 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure work is performed in compliance with CEAA Provincial regulations.
- .2 Comply with requirements of Workplace Hazardous Materials Information Sheet (WHMIS).
- .3 Mock-ups:
 - .1 Do mock-ups tests in accordance with requirements of NCC Representative.
 - .2 Notify NCC Representative 48 hours before commencing cleaning of each test patch.
 - .1 Obtain approval from NCC Representative before commencing test.
 - .3 Conduct tests on building to determine effectiveness of low pressure wash cleaning methods.
 - .4 Conduct tests to determine effectiveness of 350 kPa water pressures, four hour time periods, types of nozzles, spraying distances from wall surface.
 - .5 Start with lowest impact tests and stop testing at desired level of cleaning is achieved, stop testing immediately when damage is caused.

- .6 Test pressure at each storey height to determine effect of "line drop" on effectiveness of water jets.
- .7 Test brushing and spraying as alternative to pressure washing. Use method approved by NCC Representative.
- .8 Locate test patches in inconspicuous places directed by NCC Representative.
- .9 Test patches: 2 m².
- .10 Conduct tests to determine best methods of protecting surrounding historic material, openings and plants during test cleaning procedure, and monitor for detrimental effects.
- .11 Do not proceed with work without approval of mock-up.
- .12 Accepted mock-up will demonstrate minimum standard for work. Mock-up may remain as part of finished work.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Packaging Waste Management: remove for reuse by manufacture packaging materials.

1.5 AMBIENT CONDITIONS

- .1 Do not use wet cleaning methods when there is threat of frost.
- .2 Provide shading to wall to avoid cleaning in full, hot sunlight.

Part 2 Products

2.1 MATERIALS

- .1 Use clean potable water free from contaminants.
- .2 Treat water which has high metal content before use in cleaning.
- .3 Use air free from oil or other contaminants.
- .4 Use masking material to approval of NCC Representative.
- .5 Use non-ionic surfactant (detergent) in concentration less than 2% by volume.
- .6 Use Fuller's Earth as poultice medium.
- .7 Use non-ferrous or plastic mesh as support mechanism for poultice.

2.2 TOOLS AND EQUIPMENT

- .1 Use brushes with natural or soft plastic bristles.
 - .2 Use scrapers of wood or plastic.
 - .3 Use water pumps fitted with accurate pressure regulators and gauges capable of being preset and locked at maximum specified levels.
 - .1 Water pumps to have rating of 350 kPa.
 - .4 Use air compressors equipped with on-line oil filters to avoid spraying oil onto masonry.
 - .5 Use gun equipped with pressure gauge at nozzle end.
-

- .6 Use plastic or non-ferrous metal piping and fittings.
- .7 Use nozzles that give nebulized droplet spray. Use nozzles with 12 mm opening.

Part 3 Execution

3.1 SITE VERIFICATION OF CONDITIONS

- .1 Obtain written approval of NCC Representative before cleaning areas of deteriorated masonry.

3.2 PREPARATION

- .1 Protect operatives and other site personnel from hazards.
- .2 Place safety devices and signs near work areas as indicated and directed.
- .3 Seal or repair openings and joints where there is potential risk of water/chemical infiltration.

3.3 PROTECTION OF IN-PLACE CONDITIONS

- .1 Cover and protect surfaces and non-masonry finishes not to be cleaned.
- .2 Protect vents, windows, and other openings, to prevent water entry.
- .3 Protect adjacent Work from spread of dust and dirt beyond work areas.

3.4 EXECUTION OF CLEANING

- .1 Proceed with cleaning in accordance with written instructions of methods, systems, tools and equipment approved by NCC Representative.
 - .2 Dry brush or scrape accumulations from walls, ledges and cornices.
 - .3 Pre-wet masonry surface when necessary. Work from bottom of wall upwards.
 - .4 Do not exceed maximum pressure at nozzle or have nozzle closer to masonry than approved by NCC Representative at tests.
 - .5 Stop work when cleaning has detrimental effect on surrounding material and plants.
 - .6 Avoid prolonged wetting and excessive water penetration.
 - .1 Protect building envelope from water infiltration.
 - .7 Use brushing and scraping only to supplement water washing.
 - .8 Soften and loosen heavy deposits with prolonged water spray, then brush. Remove thick incrustations with wooden or plastic scrapers.
 - .9 Removal of vegetation or organic growth growing in or on masonry.
 - .1 Soak masonry with low-pressure water.
 - .2 Follow soaking by gentle scrubbing with natural bristle brushes.
 - .10 Low-Pressure Water Soaking:
 - .1 Soak masonry with low-pressure water, for a minimum period of one hour.
 - .2 Work from top of wall downwards.
 - .3 Follow soaking by gentle scrubbing with natural bristle brushes.
-

3.5 CLEANING

- .1 Rinse off masonry to satisfaction of NCC Representative.
- .2 Rinse from bottom to top and from top to bottom.
- .3 Clean up work area as work progresses.
- .4 Upon completion, clean and restore areas used for work to condition equal to that previously existing.

3.6 PROTECTION OF WORK

- .1 Protect finished Work from damage until take-over.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 04 03 08 – Historic – Mortaring.
- .2 Section 04 05 10 – Common Work Results for Masonry.

1.2 REFERENCES

- .1 Definitions:
 - .1 Raking: removal of loose/deteriorated mortar to a depth suitable for repointing until sound mortar, or a depth of 30 mm is reached.
 - .2 Repointing: filling and finishing of masonry joints from which mortar is missing has been raked out or has been omitted.
 - .3 Tooling: finishing of masonry joints using tool to provide final contour.
 - .4 Low-pressure water cleaning: water soaking of masonry using less than 350 kPa water pressure, measured at nozzle tip of hose.
- .2 Reference Standards:
 - .1 CSA International
 - .1 CAN/CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .2 CAN/CSA A179-04(R2009), Mortar and Grout for Unit Masonry.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Samples:
 - .1 Provide labelled samples of materials used on project for approval before work commences.
- .3 Test and Evaluation Reports:
 - .1 Provide certified test reports showing compliance with specified performance characteristics and physical properties.
 - .2 Provide laboratory test reports certifying compliance of mortar ingredients with specifications requirements.

1.4 QUALITY ASSURANCE

- .1 Masonry Contractor:
 - .1 Use single Masonry Contractor for masonry work.
 - .2 Masonry contractor to have ten (10) years experience minimum in historic stone masonry work on projects of similar size and complexity to Work of this Contract.
-

- .3 Masonry contractor to have good level of understanding of structural behaviour of masonry walls when masonry work involves replacing or repairing stones which are part of structural masonry work.
- .2 Masons:
 - .1 Mason to have certificate of qualification with ten (10) years minimum experience in historic stone masonry work.
 - .2 Masons to have proof of license certification for propriety restoration mortars.
- .3 Cement grouting: grouting activities should be undertaken by experienced workers in manipulation and cement grouting methods.
- .4 Obtain approval from NCC Representative for changes to qualified personnel.
- .5 Mock-ups:
 - .1 Construct mock-up in accordance with Section 04 05 10 – Common Work Results for Masonry.
 - .2 Construct mock-up 1200 mm x 1800 mm to demonstrate raking and repointing procedures for the following:
 - .1 Sawcutting joints with power tools, where permitted.
 - .2 Raking out of joints.
 - .3 Backpointing of joints.
 - .4 Finishpointing of joints.
 - .3 Construct mock-up under supervision of NCC Representative to demonstrate a full understanding of specified procedures, techniques and formulations is achieved before work commences.
 - .4 Construct mock-up where directed by NCC Representative.
 - .5 Work not to proceed prior to approval of mock-up. Allow 24 hours for inspection of mock-up by NCC Representative before proceeding with masonry repointing work.
 - .6 Accepted mock-up will demonstrate minimum standard for this work. Mock-up will not remain as part of finished work.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
 - .2 Store cementitious materials and aggregates in accordance with CAN/CSA A23.1.
 - .3 Store lime putty in plastic lined sealed drums.
 - .4 Keep material dry. Protect from weather, freezing and contamination.
 - .5 Ensure that manufacturer's labels and seals are intact upon delivery.
 - .6 Remove rejected or contaminated material from site.
 - .3 Packaging Waste Management: remove for reuse by manufacturer.
-

1.6 AMBIENT CONDITIONS

- .1 Maintain masonry temperature between 5 degrees C and 30 degrees C for duration of work.
- .2 When ambient temperature is below 5 degrees C:
 - .1 Store mortar materials for immediate use within heated enclosure. Allow mortar materials to reach minimum temperature of 5 degrees C before use.
 - .2 Heat and maintain water temperature to minimum of 20 degrees C and maximum of 30 degrees C.
- .3 Do not mix cement with water or with aggregate or with water-aggregate mixtures having higher temperature than 30 degrees C.
- .4 Maintain mortar mix temperature between 5 degrees C and 30 degrees C.

Part 2 Products

2.1 MORTAR

- .1 Mortar: in accordance with Section 04 03 08 - Historic - Mortaring.
- .2 Proportion Specification:
 - .1 In accordance with Section 04 03 08 - Historic - Mortaring.

Part 3 Execution

3.1 SITE VERIFICATION OF CONDITIONS

- .1 Report in writing to NCC Representative areas of deteriorated masonry not previously identified.

3.2 PROTECTION OF IN-PLACE CONDITIONS

- .1 Protection requirements are specified in Section 04 05 10 - Common Work Results for Masonry.

3.3 SPECIAL TECHNIQUES

- .1 Examine mortar joints.
 - .1 Examine horizontal and vertical joints to determine which were struck first and whether they are the same style, as well as aspects of workmanship which establish authenticity of original work.
 - .2 Replicate the style selected by NCC Representative.

3.4 RAKING JOINTS

- .1 Use manual raking tool to obtain clean masonry surfaces.
 - .1 Remove deteriorated and adhered mortar from masonry surfaces to sound mortar for full depth of deteriorated mortar but in no case less than 30 mm deep, leaving square corners and flat surface at back of cut.
 - .2 Clean out voids and cavities encountered.
-

- .2 Remove mortar without chipping, altering or damaging masonry units.
- .3 Clean surfaces of joints by compressed air without damaging texture of exposed joints or masonry units.
- .4 Flush open joints and voids; clean open joints and voids with low pressure water and if not free draining blow clean with compressed air.
- .5 Leave no standing water.

3.5 REPOINTING:

- .1 Dampen joints and porous masonry units.
- .2 Keep masonry damp while pointing is being performed.
- .3 Completely fill joint with mortar.
 - .1 If surface of masonry units has worn rounded edges keep pointing back from surface to keep same width of joint
 - .2 Avoid feather edges.
 - .3 Pack mortar solidly into voids and joints.
- .4 Build-up pointing in layers not exceeding 12 mm in depth.
 - .1 Allow each layer to set before applying subsequent layers.
 - .2 Maintain joint width.
- .5 Tool joints to match existing profile.
 - .1 Tool, compact and finish using jointing tool to force mortar into joint.
- .6 Remove excess mortar from masonry face before it sets.

3.6 PROTECTION DURING CURING PROCESS

- .1 Cover completed and partially completed work not enclosed or sheltered at end of each work day.
 - .1 Membranes should extend to 0.5 m over surface area of work and be tightly installed to prevent finished work from drying out too rapidly.
 - .2 Cover with waterproof tarps to prevent weather from eroding recently repointed material.
 - .1 Maintain tarps in place for minimum of two (2) weeks after repointing.
 - .2 Ensure that bottoms of tarps permit airflow to reach mortar in joints.
 - .3 Anchor coverings securely in position.
 - .4 Damp cure:
 - .1 Provide damp cure for pointing mortars.
 - .2 Install and maintain wetted burlap protection during the curing process:
 - .1 Minimum three (3) days.
 - .3 Wet mist burlap only - ensure no direct spray reaches surface of curing mortar.
 - .4 Shade areas of work from direct sunlight and maintain constant dampness of burlap.
 - .5 Protect from drying winds. Pay particular attention at corners of structure.
-

- .6 Maintain ambient temperature of minimum 5 degrees C after repointing masonry for minimum seven (7) days.

3.7 CLEANING

- .1 Clean surfaces of mortar droppings, stains and other blemishes resulting from work of this contract as work progresses.
- .2 Remove droppings and splashings using clean sponge and water.
- .3 Clean masonry with stiff natural bristle brushes and plain water only if mortar has fully cured.

3.8 PROTECTION OF COMPLETED WORK

- .1 Protect adjacent finished work against damage which may be caused by on-going work.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 04 05 10 – Common Work Results for Masonry.

1.2 ALTERNATES

- .1 Obtain NCC Representative's approval before changing manufacturer's brands or sources of supply of mortar materials during entire contract or other methods of mixing mortar specified elsewhere in this specification.

1.3 REFERENCES

- .1 ASTM International
 - .1 ASTM C144-11, Specification for Aggregate for Masonry Mortar.
 - .2 ASTM C207-06(2011), Specification for Hydrated Lime for Masonry Purposes.
 - .3 ASTM C780-12, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- .2 CSA International
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A179-04(R2009), Mortar and Grout for Unit Masonry.
 - .3 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for mortar and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Prior to mixing or preparation of mortars submit for review to NCC Representative confirmation of source or product data sheet of:
 - .1 Aggregate.
 - .2 Cement.
 - .3 Lime.
 - .4 Premixed products.
- .2 Samples:
 - .1 Provide samples in quantity and size in accordance with CAN/CSA-A179.
- .3 Test reports:
 - .1 Submit test results during site work as directed by NCC Representative as follows:
 - .1 Sieve analysis: sand.
 - .2 Bulking analysis: sand.

- .3 Air content: mortar mix in plastic state.
- .4 Vicat cone penetration: mortar mix.
- .5 Mortar compressive strength: at 7 and 28 days or otherwise required.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Mechanics to have minimum of 5 years experience in lime mortar preparation.
 - .2 Mortar to be mixed by same mechanics throughout project.
- .2 Mock-ups:
 - .1 Construct mock-up in accordance with Section 04 05 10 – Common Work Results for Masonry.
 - .2 Submit methods of reproducing existing mortar colour, texture and pointing types, and samples.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store cementitious materials and aggregates in accordance with CSA A23.1/A23.2.
 - .3 Store lime putty in plastic lined sealed drums.
 - .4 Protect from weather, freezing and contamination.
 - .5 Remove rejected or contaminated material from site.
 - .6 Replace defective or damaged materials with new.

1.7 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Provide weather-tight enclosure to store materials and mix mortars, maintain air temperature above 10 degrees C at all times.
 - .2 Maintain maximum/minimum thermometers and relative humidity gauges on site and in enclosures.
 - .1 Maintain a daily record of temperature and humidity.

Part 2 Products

2.1 MATERIALS

- .1 Water: potable, clean and free from contaminants.
 - .2 Sand: to CAN/CSA-A179. Gradation to ASTM C144. Use well graded aggregate passing 4.75mm down to 150 micron sieve where joints are greater than 6mm. Use aggregate passing 1.18mm down to 300 micron sieve where 6mm thick joints or less are indicated. In the event that the sand does not meet the noted gradation requirements, the contractor will be required to carry out additional sieving to meet the requirements or provide alternate sand.
-

- .3 Portland cement: to CAN/CSA-A3000.
- .4 Masonry cement: to CAN/CSA-A3000.
- .5 Lime:
 - .1 Hydrated, high calcium, Type "N" masons' lime to ASTM C207.
- .6 Colour:
 - .1 Ground coloured natural aggregates or metallic oxide pigments. Use minimum amount necessary.

2.2 MORTAR MIXES

- .1 Bedding and pointing mortar for stonework: type O based on proportion specifications. Range for compressive strength for Limestone: 4 MPa to 7 MPa at 56 days.
 - .1 Limestone: 1:2:6 cement; lime; aggregate mix for severe exposure, such as upper stone details, and for 2m above grade.
 - .2 Limestone: 1:2:8 cement; lime; aggregate mix for all other locations.
 - .3 For all walls adjacent to pathways, footpaths and roadways, for joints to 1200mm above grade, add polymer latex admixture as per manufacturer's instructions.
- .2 Vicat Cone Penetration for Stonework: to ASTM C780.
 - .1 Pointing Mortar: 15-20mm
 - .2 Bedding Mortar: 20-30mm
- .3 Allowable air content for all lime mortars: 8% to 14%.

2.3 COLOURED MORTAR

- .1 Maintain one mortar mixer exclusively for coloured mortar.

2.4 ALLOWABLE TOLERANCES

- .1 If mortar fails to meet the 7 day compressive strength requirements, but meets the 28 day compressive strength requirement, it is acceptable. If mortar fails to meet the 7 day compressive strength requirement, but its strength at 7 days exceeds two thirds of the value required for the 7 day strength, contractor may elect to continue work at his own risk while awaiting the results of the 28 day tests, or to take down the work affected.

Part 3 Execution

3.1 GENERAL PREPARATIONS

- .1 Traditional Mortar:
 - .1 Prepare measuring boxes to ensure accurate proportioning of materials.
 - .2 Maintain separate measuring boxes for each component.
 - .3 Ensure sand is tested and volume corrected for bulking.
 - .4 Ensure air entraining agent is available together with a graduated container for accurate volume measurements.
 - .5 Ensure testing equipment is ready and in working order.
-

- .6 Apply Vicat cone test to ensure desirable performance of the mortar and record results.
- .2 Premixed Mortar:
 - .1 Follow manufacturer's written instructions.
 - .2 Whole bag has to be prepared.
 - .3 Apply Vicat cone test to ensure desirable performance of the mortar and record results.

3.2 BULKING OF SAND

- .1 Test sand for bulking:
 - .1 At start of work.
 - .2 After each new delivery of sand.
 - .3 After severe change in weather.
- .2 Test and adjust sand quantities for bulking:
 - .1 Obtain sample of sand which accurately reflects average condition of pile of damp sand, as follows:
 - .1 Take 4 shovels full of sand, each from a different level of the pile, and mix thoroughly.
 - .2 Place sand in a conical pile and divide into 4 quarters with a board. Remove 2 opposite quarters from pile, and combine remaining 2 quarters and mix thoroughly.
 - .3 Repeat quartering and mixing procedure until a sample of size required for testing remains.
 - .2 Fill a 1-litre capacity jar, about two-thirds full with damp sand to be tested. Drop sand in loosely. Do not pack it in. Level off surface, measure depth of damp sand (D).
 - .1 Carefully empty sand into another container, and half fill first container with water.
 - .2 Pour back about half of test sample of sand slowly into water so it is entirely saturated. Rod it thoroughly to remove air.
 - .3 Add rest of sand, rodding again to remove air and level off surface. Measure depth of saturated sand (S), which will be less than depth of damp sand.
 - .4 Calculate percentage bulking using formula: $[(D-S) \times 100\%]/S =$ percentage bulking; where D = depth of damp sand, and S = depth of saturated sand.
 - .3 Increase volume of sand by percentage bulking shown in test.

3.3 PREPARATION OF MORTAR

- .1 Lime-Cement Mortar:
 - .1 Prepare measuring boxes to ensure accurate proportioning of dry lime putty and sand.
 - .2 Mix dry lime and sand thoroughly in spiral-blade mechanical mixer for minimum 3 minutes. Do not add water. No spots or streaks of lime to remain upon completion of mixing.
-

- .3 Add water as required.

3.4 PREPARATION OF LIME-SAND ROUGHAGE (COARSE STUFF)

- .1 Store lime sand roughage in air-tight plastic bins.
- .2 Keep prepared material from freezing. Discard frozen material.
- .3 Maintain measuring containers for correct quantity of materials for use in batches.
- .4 Thoroughly clean mortar boards, measuring boxes and mixers between batches.

3.5 MIXING

- .1 General:
 - .1 Use batching box.
 - .2 Follow proper batching procedure.
 - .3 Monitor mixing time.
- .2 Mortar:
 - .1 Mix Characteristics:
 - .1 Pointing mortar: slightly stiffer than bedding mortar with a consistency such that the mortar can be hand-formed into a stiff ball.
 - .2 Record amount of water required to reach this consistency and use for subsequent mixes.
 - .2 Prepare only enough mortar to be used within two hours. Do not retemper mortar beyond this time.
- .3 Follow manufacturer instructions when premixed mortar is used.
- .4 Contractor to appoint 1 individual to mix mortar for duration of project. If this individual must be changed, mortar mixing must cease until new individual is trained, and mortar mix is tested.

3.6 CONSTRUCTION

- .1 Do masonry mortar and grout work in accordance with CAN/CSA-A179 except where specified otherwise.

3.7 CLEANING

- .1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .2 Remove droppings and splashings using clean sponge and water.
- .3 Clean masonry with low pressure clean water and soft natural bristle brush.

3.8 PROTECTION OF COMPLETED WORK

- .1 Cover completed and partially completed work not enclosed or sheltered at end of each work day.
- .2 Enclose and protect work using wetted burlap.
- .3 Cover with waterproof tarps to prevent weather from eroding recently laid material.
 - .1 Maintain tarps in place for minimum of 3 days after laying.

- .2 Ensure that bottoms of tarps permit airflow to reach mortar in joints.
- .4 Anchor coverings securely in position.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 04 03 07 - Historic - Masonry Repointing and Repair.
- .2 Section 04 05 10 – Common Work Results for Masonry.

1.2 STONE AVAILABILITY

- .1 Confirm in writing at time of Bid closing, that sufficient quantity of stone type included in the bid submission is available to complete the requirements of the project.

1.3 PRICE AND PAYMENT

- .1 Unit Prices
 - .1 Provide unit prices for each of the repairs identified on the drawings. The unit price for each repair will include all costs necessary to complete the specific repair.
 - .2 For assumed stone sizes, see Drawings.
- .2 Measurement and Payment
 - .1 Payment for this work will be on an area basis and will include all costs associated with supplying materials, and executing work as described herein and reflected in the contract.
 - .2 The work for stone replacement will be based on the actual quantities measured on site by the NCC Representative.

1.4 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C568-03, Specification for Limestone Dimension Stone.

1.5 SHOP DRAWINGS

- .1 Submit shop drawings for all new stone required. Refer to drawings for locations.
- .2 Drawings shall show all details for size, section, bedding, jointing, anchor or tying system and finish of stone. All dimensions must be based on accurate site measurements.

1.6 SAMPLES

- .1 Submit samples of new stones for approval, prior to purchase of stone.
- .2 Samples from designated quarry: submit samples of replacement stones. Submit 2 sets of stone as follows:
 - .1 Select samples from currently worked bed of quarry and accompanied by quarry certification.
 - .2 Submit 2 samples, each 300x300x75mm.

- .3 Samples should be representative of the full range of colour, visible markings, and finish to be supplied for the entire project. Indicate quarry bed or direction of bedding on samples.

1.7 MOCK-UPS

- .1 Construct mock-up in accordance with Section 04 05 10 – Common Work Results for Masonry.
- .2 Allow forty eight hours for inspection of mock-up by NCC Representative, before proceeding with replacement work.
- .3 When accepted, mock-up may remain as part of finished work.

1.8 QUALITY ASSURANCE

- .1 The qualifications of the stone masons working on replacement of stone, must be in accordance with Section 04 05 10 – Common Work Results for Masonry.
- .2 Make mason's workshop accessible to NCC Representative for inspection of current work-in-progress.
- .3 Employ workers specially trained and experienced in this type of work.
- .4 Submit certified test reports on replacement stone in accordance with Section 04 05 10 – Common Work Results for Masonry.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Deliver finished stone to site in substantial, purpose made containers, packed to avoid chipping damage or soiling from any means.
- .2 Label each container to clearly indicate contents and location on building.
- .3 Indicate on each stone quarry bed or direction of bedding and location of stone on building, referenced to shop drawings. Mark stones where not exposed with permanent markers.
- .4 Avoid excessive handling, and protect against chipping, damage, soiling or staining.
- .5 Damaged stone, and stone that is repaired prior to reaching site, will be rejected.

Part 2 Products

2.1 MATERIALS

- .1 New Stone: Stone to have similar mechanical and aesthetic properties to existing. Select the best quality stone, of uniform colour, texture, and strength, free from holes, shakes, cracks or other defects. Obtain approval from the NCC Representative of stone sample prior to purchasing the stone. New Limestone to be Type II, medium density or better, to ASTM C568.
 - .1 Champlain Limestone: Colour to match existing, to be approved by NCC Representative.

2.2 ANCHORAGE

- .1 Dowels: stainless steel type 304.

2.3 STONE CUTTING

- .1 Cut stone to shape and dimensions obtained from accurate measurements and profiles taken from existing stone.
- .2 Ensure survey information is typical by taking profiles adjacent to location where new stone is to be set.
- .3 Dress exposed faces true, make beds and joints same thickness as existing, but not to exceed 6 mm thickness, and at right angles to face.
- .4 Execute moulded work from full size details. Make exposed arises in true alignment and ease slightly to prevent snipping.
- .5 Cut stones for anchors, cramps, dowels and support systems. Provide lewis pin and clamp holes in pieces which cannot be manually handled. Do not cut holes in exposed surfaces.

2.4 TOLERANCES

- .1 Fabrication tolerances shall not exceed.
 - .1 1.5 mm± on any dimension.
 - .2 1.5 mm± deviation from square.
 - .3 1.0 mm± deviation from flat surface on any exposed face.
- .2 Face bedded stone will be rejected.

2.5 BEDDING OF STONE

- .1 All stone shall be supplied to be laid on its natural quarry bed.

2.6 FINISHES

- .1 Dress exposed surfaces to follow existing profiles as follows:
 - .1 All finishes to match existing to approval of NCC Representative, unless otherwise noted.

2.7 FABRICATION OF REPLACEMENT STONE

- .1 Record profile of existing stone.
 - .2 Cut and carve new stone to follow existing profile.
 - .3 Obtain approval of new carved stone by NCC Representative prior to installation.
 - .4 For all replacement stone required for repair or replacement on the existing wall, use the salvaged limestone.
-

2.8 SOURCE QUALITY CONTROL

- .1 Prepare mock-up of tooling of stone face, to be approved on site by the NCC Representative prior to commencement of the stone fabrication.

Part 3 Execution

3.1 PREPARATION

- .1 Prevent absorption of ground water and exposure to rain. Rest stones in their natural bedding during weathering.
- .2 Move and lift stone units using means to prevent damage. Submit stone units dropped or impacted to NCC Representative for inspection and approval. Do not make holes or indentations for Lewises or dogs on face or top side of stone.
- .3 Indicate bedding planes of stone units. Duplicate bedding marks on usable pieces of cut stone.
- .4 Place safety devices and signs near work area, as directed.
- .5 Install shoring and supports as required.
- .6 Cover adjacent fragile surfaces.
- .7 Repoint backup masonry, install anchors and install mortar in collar joint as per Section 04 03 07 - Historic-Masonry Repointing.

3.2 REMOVAL OF EXISTING STONE

- .1 Remove existing deteriorated stone after obtaining approval from NCC Representative.
 - .2 Record photographically from all aspects, those areas allocated for dismantling, prior to start of work.
 - .3 Using elevation drawings, accurately number each stone to be removed, and record its position. Numbering must correspond to the shop drawings.
 - .4 Where existing stone to be reset, mark stone on face, before removal, using marking product which can be completely erased when required, without damaging masonry unit.
 - .5 Use approved methods to loosen stones which will cause no damage either to stones or to other architectural elements.
 - .6 Do not use circular millstone or saw, pneumatic chisel, steel tools exerting concentrated pressure on edge of stone. Obtain NCC Representative's approval for use of power tools before commencing work.
 - .7 Loosen wet masonry only when temperature is above freezing point.
-

- .8 Place detached stones on wood surfaces during handling. Prevent contact with metal or vegetation.
- .9 Clean stone by wet scrubbing with vegetable fibre brush unless otherwise instructed by NCC Representative. Do not use high pressure water jet.
- .10 For stones to be reset, remove excess mortar by chisel.

3.3 CUTTING/SIZING OF STONE

- .1 Use calipers, squares and levels to measure hole for new stone. Allow for mortar joints of 6 mm thickness maximum. Where existing joints are narrower, confirm joint thickness with NCC Representative prior to cutting stone.
- .2 Provide 1:10 slope on top of stone unit, sloping down to front face.

3.4 MOVING STONES

- .1 Use Lewises to lift stones to working level.
- .2 Move stones horizontally in wheelbarrows or on sleds.
- .3 Move large stones using a minimum of two (2) nylon belts, properly spaced to provide a safe and even bearing on the stone.
- .4 Slide stones into place on wood ramps.

3.5 INSERTING NEW STONE

- .1 Clean stone by washing with water and natural fibre brush before laying.
 - .2 Dampen surfaces of slot and apply mortar.
 - .3 Prepare and rebuild backup masonry wall in accordance with Section 04 03 07 – Historic – Masonry Repointing.
 - .4 Lay heavy stones and projecting stones after mortar in courses below has hardened sufficiently to support weight.
 - .5 Prop and anchor projecting stones until wall above is set.
 - .6 Set large stones on water soaked softwood wedges to support stone in proper alignment until mortar has set. Remove wedges when dry, do not break off.
 - .7 Insert and compress firm mortar to within 30mm of pointing surface. Allow mortar to set 24 hours.
 - .8 Remove mortar droppings from face of stone before mortar is set. Sponge stone free of mortar along joints as work progresses.
 - .9 Use stainless steel anchors to fix stone face plates as indicated. Provide minimum of two anchors per stone.
 - .10 Install anchors, dowels and cramps.
-

- .11 Set stones plumb, true, level in full bed of mortar with vertical joints flushed full except where otherwise specified. Completely fill anchor, dowel and lifting holes and voids left by removed edges.
- .12 Limestone must be laid in its natural bed, unless noted.
- .13 Grout solid all voids behind stone using specified grout.

3.6 PROTECTION

- .1 Cover top of completed and partially completed wall, not enclosed or sheltered, with weatherproof coverings at end of each working day. Drape cover over wall and extend 0.5 m down both sides. Anchor securely in position. Prevent finished work from curing too quickly.
- .2 Protect adjacent work from marking or damage due to work.
- .3 Provide temporary bracing of masonry work during erection until permanent structure provides adequate bracing.

3.7 FILLING JOINTS/POINTING

- .1 Fill joints and point: in accordance with Section 04 03 07 - Historic - Masonry Repointing.
- .2 Keep new mortar moist for 3 days to cure.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 04 03 07 – Historic- Masonry Repointing and Repair.
- .2 Section 04 03 08 – Historic - Mortaring.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CAN/CSA-A371-04, Masonry Construction for Buildings.

1.3 SUBMITTALS

- .1 Product Data.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
- .2 Shop Drawings.
 - .1 Where existing masonry becomes laterally unsupported during construction, provide shop drawings for temporary bracing, stamped by a Professional Engineer registered in the Province of Ontario.
- .3 Samples.
 - .1 Submit samples.
 - .1 One of each type of masonry anchor proposed for use.
 - .2 One of each type of Restoration mortar.
 - .3 One sample of stone to be used to replace existing stone, where stone has not been salvaged from site.
 - .4 One sample of each type of masonry accessory specified.
 - .2 Submit samples to be tested to laboratories employing technicians certified/trained in procedures for testing masonry units.
 - .3 The approved samples denote the standard material to be used.
- .4 Manufacturer's Instructions.
 - .1 Submit manufacturer's installation instructions.
- .5 Masonry Contractor Qualifications.
 - .1 Submit resumes of principal stone mason and site superintendent engaged by the Masonry Contractor.

1.4 QUALITY ASSURANCE

- .1 Test Reports.
 - .1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.
 - .2 Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specification requirements.
 - .3 For stone replacement units, submit test reports confirming compressive strength, density and porosity, to requirements set out in referenced CSA and ASTM Standards.
-

- .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
 - .3 Mock-ups.
 - .1 Construct mock-up panel of exterior masonry wall construction 1200 x 1800 mm minimum showing masonry colours and textures, use of anchors, repair mortars, jointing, mortar, tooling, workmanship and cleaning procedures.
 - .2 For repointing, mock-up must include samples of saw-cut joints, raked joints, backpointed joints, and finishpointed joints, for both horizontal and vertical joints.
 - .3 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
 - .4 Construct mock-up where directed.
 - .5 Allow 48 hours for inspection of mock-up by NCC Representative before proceeding with work.
 - .6 When accepted by NCC Representative, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.
 - .7 Start work only upon receipt of written approval of the mock-up by the NCC Representative.
 - .4 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.
 - .5 The principal stone mason and site superintendent, engaged by the Masonry Contractor, must have experience with historic masonry similar to this project and demonstrate an ability to pass a hands-on test of skills, if so administered by the NCC Representative. The NCC Representative has the right to reject either of these individuals, if their qualifications cannot be substantiated. The NCC Representative also has the right to reject any mason who does not demonstrate the appropriate abilities or experience on the following tasks:
 - .1 Raking joints by hand.
 - .2 Cutting stone.
 - .3 Carving stone.
 - .4 Dutchman repairs.
 - .5 Pinning techniques.
 - .6 Restoration mortar repairs: repairs involving proprietary stone restoration mortar shall be carried out by persons who have successfully completed the manufacturer's training course and have been certified by the manufacturer for the type of work required. Provide proof of accreditation by the manufacturer before work begins.
 - .7 Historical repointing.
 - .6 All masons employed on this project must demonstrate the ability to reproduce the mock up standards.
 - .7 All masons employed on this project throughout the course of the project must meet the above requirements. Where, during the course of the project, masons leave the work force, all replacement masons must also meet requirements.
-

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, handle and protect materials in accordance with manufacturer's requirements.
- .2 Deliver materials to job site in dry condition.
- .3 Storage and Protection.
 - .1 Keep materials dry until use.
 - .2 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material for recycling in accordance with local collection services.
- .3 Unused metal materials are to be diverted from landfill to a metal recycling facility as approved by NCC Representative.
- .4 Unused or damaged masonry materials must be diverted from landfill to a local facility as approved by NCC Representative.

1.7 SITE CONDITIONS

- .1 Site Environmental Requirements.
 - .1 Cold weather requirements: Supplement Clause 6.7.2 of CAN/CSA A371 with following requirements:
 - .1 Maintain temperature of mortar between 5°C and 30°C until batch is used or becomes stable.
 - .2 Maintain ambient temperature between 5°C and 30°C and protect site from wind chill.
 - .3 Cover mortar less than 7 days old with tarpaulins when temperature is forecast to fall below 5°C, and insulated tarpaulins when temperature is forecast to fall below 0°C.
 - .4 Provide heating of masonry work when air temperature falls below 5°C.
 - .5 Maintain mean temperature of masonry above 0°C for a minimum of 7 days, after mortar is installed.
 - .6 Do not repoint if the temperature is forecast to drop below -7°C in the following 24 hours.
 - .7 Any unheated section of wall must be preheated in it's enclosure for a minimum period of 72 hours above 10°C, before any mortar is applied.
 - .2 Hot weather requirements.
 - .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
 - .2 Protect masonry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.

- .1 Spray the mortar surface at intervals to keep it moist, for a minimum of three days after installation.
- .3 Maintain minimum/maximum thermometers and relative humidity gauges on site and maintain a daily record of temperature and humidity.

1.8 PERFORMANCE

- .1 The following will be considered deficiencies in the work in addition to any failure to meet other provisions of these specifications:
 - .1 Mortar shrinkage cracks between units.
 - .2 Unfilled joints.
 - .3 Spalling of units or joints.
 - .4 Poor colour or texture blending of joints or units.
 - .5 Dusting, efflorescence of joints or units.
 - .6 Surface discolouration, discoloration, variance of colour or crumbling of mortar.
 - .7 Failure of anchors of built-in items.
 - .8 Sloppy fitting, or otherwise poor workmanship in leveling, bedding or jointing of units.
 - .9 Failure to match adjacent work or failure to match control test area.
 - .10 Failure to adequately cure the mortar.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Masonry materials are specified in Related Sections.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

- .1 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.
- .2 Bracing must be approved by NCC Representative.
- .3 Winter Heating
 - .1 Maintain ambient humidity levels.
 - .2 The use of open flame to provide heating is strictly forbidden.

3.3 INSTALLATION

- .1 Do masonry work in accordance with CAN/CSA A371 except where specified otherwise.

3.4 CONSTRUCTION

- .1 Jointing: For joint finishing, see Section 04 03 07 – Historic – Masonry Repointing and Repair.

3.5 SITE TOLERANCES

- .1 Tolerances: Conform to Clause 6.2 of CAN/CSA A371, unless otherwise noted.

3.6 FIELD QUALITY CONTROL

- .1 Inspection and testing will be carried out by Testing Laboratory designated by NCC Representative.
- .2 Owner will pay costs for testing.

3.7 CLEANING

- .1 Perform cleaning after installation and when mortar has fully cured, to remove construction dust and accumulated environmental soiling.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.8 PROTECTION

- .1 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

END OF SECTION

PART 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A307-02, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .2 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .3 CSA W59-13, Welded Steel Construction (Metal Arc Welding).

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
- .2 Shop Drawings
 - .1 Submit shop drawings.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.3 QUALITY ASSURANCE

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

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Divert unused metal materials from landfill to metal recycling facility approved by NCC Representative.

PART 2 Products

2.1 MATERIALS

- .1 Galvanized steel plate, thickness as shown on drawings. Chequer plate finish.
 - .2 Galvanized steel prefabricated angles: sizes and thicknesses as shown on drawings.
 - .3 Welding materials: to CSA W59.
 - .4 Welding electrodes: to CSA W48 Series.
 - .5 Bolts and anchor bolts: to ASTM A307.
-

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Where possible, fit and shop assemble work, ready for erection.
- .3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

PART 3 Execution

3.1 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to NCC Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Make field connections with bolts to CAN/CSA-S16.1, or weld.
- .6 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .7 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 CLEANING

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

3.3 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Read and be governed by conditions of the contract and sections of Division 1.
- .2 Section 31 23 10- Excavating, Trenching and Backfilling

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM E136-11, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees, C.
 - .2 ASTM C665-11, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .3 ASTM E84-12, Standard Practice for Surface Burning Characteristics of Building Materials.
 - .4 ASTM C423-09a, Standard Test Method for Sound Absorption Coefficients by the Reverberation Room Method.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10 Method of Test for Surface for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S114-05 Standard Method of Test for Determination of Non-Combustibility in Building Materials.
 - .3 CAN/ULC-S702-09 Mineral Fiber Thermal Insulation for Buildings.
 - .4 CAN/ULC-S129-06 Standard Method of Test for Smoulder Resistance of Insulation (Basket Method).

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

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

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

- .2 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

Part 2 Products

2.1 INSULATION

- .1 Batt thermal insulation, chemically inert, non-combustible mineral fibre (stone wool) type: to CAN/ULC S702.
 - .1 Thickness: two layers 60mm, RSI 1.76 each layer.
 - .2 Based on "Roxul Drainboard" Insulation by Roxul Inc and/or approved equal.

2.2 ACCESSORIES

- .1 As recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .2 Install insulation as recommended by manufacturer. Do not tear or cut vapour barrier.
- .3 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .4 Do not enclose insulation until it has been inspected and approved by NCC Representative.

3.3 SCHEDULE

- .1 Batt thermal insulation: install at exterior wall assemblies as indicated.
- .2 sound and fire insulation: install in floor and partition assemblies as indicated

3.4 CLEANING

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 33 46 16 – Subgrade Drainage Network.

1.2 REFERENCES

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

1.3 SUBMITTALS

- .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
 - .2 Submit shop drawings to indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled.
 - .2 Wiring and schematic diagrams.
 - .3 Dimensions and recommended installation.
 - .4 Pump performance and efficiency curves.
 - .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .4 Instructions: submit manufacturer's installation instructions.
 - .5 Manufacturers' Field Reports: manufacturers' field reports specified.
- Closeout submittals: submit maintenance and engineering data for incorporation into manual.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling.
- .3 Divert unused metal materials from landfill to metal recycling facility as approved by NCC Representative.
- .4 Divert unused aggregate materials from landfill to quarry facility for reuse as approved by NCC Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

2.2 PREPACKAGE SUMP PUMP SUBMERSIBLE

- .1 Package to include:
 - .1 450mm diameter polyethylene sump pit and cover with gasket and hardware - Radon Ready.
 - .2 Pre-assembled with 38mm Schedule 40 PVC discharge pipe.
 - .3 Molded pump support platform raises pump off bottom of pit and helps secure pump during shipping.
 - .4 100mm diameter inlet hub with rubber grommet seal.
- .2 Capacity: 2 L/s at 2.3m head.
- .3 Motor: 1/3 hp hermetically sealed, with automatic overload protection.
- .4 Acceptable pump product and/or approved equal shall be:
 - .1 Liberty Pumps SPAC Series;
 - .2 Pentair Pre-Plumbed Sump Basin Package.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Remove concrete floor slab on grade with enough clearance for installation of pit.
- .2 Make piping and electrical connections to pump and motor assembly and controls as indicated.
- .3 Ensure pump and motor assembly do not support piping.
- .4 Align vertical pit mounted pump assembly after mounting and securing cover plate.
- .5 Place 150 mm sand under sump pit tank.
- .6 Discharge piping to be installed through foundation wall. Wall to be cored and subsequently sealed, to the approval of the NCC Representative. Procedure and detail to be provided prior to installation.

3.3 START-UP

- .1 Follow manufacturer's instructions for start-up and testing.

3.4 REPORTS

- .1 Provide Manufacturer's data to be included in operation manual.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED SECTIONS

- .1 Section 02 91 00 – Tree Protection
- .2 Section 31 23 10 – Excavation, Trenching and Backfilling.

1.2 REFERENCES

- .1 U.S. Environmental Protection Agency (EPA) / Office of Water
- .2 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- .3 Comply with regulations of the Canadian Food Inspection Agency concerning the removal and disposal of wood and residue from regulated species.

1.3 DEFINITIONS

- .1 Clearing isolated trees consists of cutting off to not more than specified height above ground level of designated trees and disposing of felled trees and debris.
- .2 Grubbing consists of excavation and disposal of stumps and roots, boulders and rock fragments of specified size to not less than a specified depth below existing ground surface.

1.4 QUALITY CONTROL

- .1 Take the necessary health and safety precautions in accordance with Health and Safety Requirements.

1.5 QUALIFICATIONS AND EQUIPMENT

- .1 Work of this contract is to be performed by professional tree workers who, through related training and on-the-job experience, are familiar with the techniques and hazards of the work including trimming, maintenance repairs and removal. Familiarity with equipment required to perform this work is essential.

The minimum standards in regard to personnel qualifications that are acceptable for work on this contract are:

I. Class A Tree Climber - Minimum five (5) years' experience in climbing, rigging and large tree removals. ISA Certified Arborist.

II. Class B Tree Climber - Minimum three (3) years' experience in climbing, rigging and tree removals. ISA Certified Arborist.

III. Ground person - Minimum certified chainsaw operator

- .2 Prior to commencement of work on site, the Contractor shall provide a list of personnel to the NCC Representative indicating experience and qualifications. Amendments to and updating of this list shall be submitted to the NCC Representative for approval. Any employee not on the list and reporting to work may, at the discretion of the NCC Representative, not be accepted and asked to leave.

- .3 Work Crews: Each work crew shall include a minimum of three persons comprised of:
- One (1) Class "A" Climber
 - One (1) Class "B" Climber
 - One (1) Ground Person
- One of the above crew members shall be appointed as working foreman.
- Partial crews will not be accepted.
- .4 Equipment for each crew shall include:
- One (1) truck with aerial device (minimum 17 m reach and 340° rotation) and enclosed box (at least 10 m³ capacity), or
 - One (1) chip truck 1 ¾ tonne or better with enclosed box (commercial 2.4 m (8 feet) box.
 - Chipper that can accommodate a 30 cm diameter wood
- .5 Number of crews: The number of crews provided shall be adequate to perform this work within the allotted schedule.

1.6 EQUIPMENT AND TOOL INVENTORY

- .1 All equipment and tools necessary to perform the work shall be supplied by the contractor. This will include but not be limited to:
- Saws- pole saws/ bypass cutter (with extensions), chainsaws (size appropriate given material size), hand saws, also cleaning solutions for tools for disease management (see Part 3, section 3.4 of this specification).
 - Climbing equipment- all ropes, friction devices, climbing saddles, ladders, etc.
 - Rigging Equipment- ropes, port a wrap (or other lowering device), blocks, pulleys, slings, etc.
 - Traffic control equipment- pylons/ cones, portable signage for roadway/ sidewalk approach, etc.

1.7 VEHICLES

- .1 Fuelling to be done off site before working hours and/or after working hours. All repairs to be done off site. All fluid leaking/dripping from equipment is not permitted and vehicles and equipment will be removed from the site immediately. All small equipment such as chainsaw, pruning pole, hand saw will be sharpened off site prior to the hours of work.
- .2 All vehicles used by the contractor shall display the company name prominently and have a flashing roof light.

1.8 COMMUNICATION

- .1 Contractor shall identify the level of authority of his personnel. The site crew shall have a communication device in order to permit the NCC representative to communicate with them at all time during the working hours and during emergency operation.

1.9 HOURS OF WORK

- .1 The normal working hours shall be from 7 am to 3:30 pm daily Monday to Friday excluding Statutory Holidays.

1.10 HEALTH AND SAFETY

- .1 Comply with all applicable health and safety legislation and regulations, including but not limited to:
- Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
 - Ontario Occupational Health and Safety Act and Regulations
 - Canadian Standards Association (CSA)
 - Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - Canada Labour Code, Canada Occupational Safety and Health Regulations
 - Worker's Compensation Act of the Province of Ontario
 - Acts and regulations that may be applicable to the workplace for work of this contract

1.11 ENVIRONMENTAL REQUIREMENTS

- .1 At the start of the contract, review with NCC Representative the general methodology, approach and sequencing of work of this contract.
- Identify the work sites: describe the work activities, identifying the products, tools, equipment and machinery proposed for the work activities
 - Identify potential risks, negative impacts and/or disruptions to services or operations on the site resulting from carrying the work activities
 - Describe proposed mitigation measures to be put into effect to minimize and/or prevent negative impacts
 - Provide modifications and/or amend proposed work methodology to satisfy NCC Representative.
- .2 Plant Protection: Protect trees not designated for removal, plant material and pathways adjacent to and within the area of work.
- .3 Control emissions from equipment, tools and vehicles utilised for work of this contract. Maintain these to a minimum. Ensure emissions are within local authorities requirements.
- .4 Ensure that work activities generating noise pollution are carried out within the hours permissible by governing local authorities and as approved by NCC Engineer.
- .5 The Contractor shall protect natural environment from leakage of fuels, oils and other such substances detrimental to the environment, from faulty equipment, tools, machinery and vehicles utilised for work of this contract. This shall include delivery and waste removal vehicles.
- .6 The Contractor shall be responsible for all costs associated for the cleaning and/or decontamination of any such spillage resulting from the work of this contract on the site.
- .7 Sustainable Approach: In carrying work of this contract, the Contractor is to utilise materials, products, fuel and equipment least detrimental to the environment.

1.12 STORAGE AND PROTECTION

- .1 Prevent damage to trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances and root systems of trees which are to remain.
- .2 Repair any damaged items to approval of NCC Representative as applicable.
- .3 Replace any trees designated to remain, if damaged, as directed by NCC Representative.

1.13 TRAFFIC CONTROL

- .1 Should traffic control be required, it shall be done in coordination with on-site RCMP. The NCC field manual of traffic control shall also be used. All signs used for traffic control shall be bilingual. Safety vests shall be worn when possible conflict between vehicles, employees and the general public exists.

1.14 WASTE MANAGEMENT AND DISPOSAL

- .1 Salvage felled material that could be processed into sawlogs, pulpwood, bars, poles, crosspieces or marketable fire wood.
- .2 Stockpile these materials at a location adjacent to worksite.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Backfill materials
- .2 Fill: free of debris, waste, roots, wood, plant material, contaminated soft particles and harmful or deleterious materials.
- .3 Backfill removed and stored for reuse.

PART 3 – EXECUTION

3.1 PREPARATION

- .1 Inspect site and verify with NCC Representative items designated to remain.
- .2 Notify utility authorities before starting grubbing work.
- .3 Keep roads, access lanes and sidewalks free of dirt and debris.
- .4 Tree Tags: The contractor shall remove all identification tags located on trees prior to removal. Tags are to be turned in daily to the NCC Representative.

3.2 UTILITIES

- .1 Work of this contract may occur near and/or above utilities lines, such as but not restricted to Hydro, Cable, etc.
- Note specifically the location of wires associated with overhead lighting and sound in the skating rink area.
 - There are numerous underground services located within the area of work. The Contractor will be made aware of the location of the services. Care must be taken to avoid damage to these services during stump removal procedures.
 - The Contractor will also be informed of the location of underground security wiring in the area of work. The Contractor must avoid driving and parking heavy equipment in these locations.

3.3 USE OF CLIMBING SPURS:

- .1 Unless otherwise instructed, climbing spurs or irons are not approved for use on live trees. These can only be used on dead trees or for tree removal.

3.4 DISINFECTION:

- .1 Tools are to be disinfected with methyl alcohol at 70% (denatured wood alcohol diluted appropriately with water) or chlorox solution prior to commencing work on each tree. Disinfection to take place after each cut on diseased trees as per the direction of the NCC Representative. If/when the contractor identifies a tree as diseased, he must notify the NCC Representative immediately.

3.5 COMPLIANCE

- .1 Manufacturer's instructions: comply with manufacturer's requirements, recommendations and written specifications, including all available technical bulletins, product handling, storage and installation instructions and product data sheets.

3.6 TREE AND STUMP REMOVAL - SPECIAL INSTRUCTIONS

- .1 The contractor must arrive on site each day without any branches or wood chips in the truck.
- .2 The contractor will be expected to comply with all regulations set forth by the Canadian Food Inspection Agency regarding the management of other controlled materials such as Ash (*fraxinus* spp.). The contractor is responsible for the payment of any associated fees for disposal of trimmings, branches, brush chips and bark, and wood material.
- .3 Contractor is to be aware that elm wood removal shall be done separately from other wood. Elm wood shall be destroyed, buried or burnt at a location off site, in compliance with local bylaws, at the contractor's expense, as soon as possible after removal. It shall not be made available for firewood. The Contractor shall follow all regulations by the Canadian Food Inspection Agency.

3.7 TREE REMOVAL

- .1 Trees shall be removed leaving a stump no higher than 6" (15 cm). If a situation dictates that a higher stump must be left, approval must be sought from the NCC technical Representative. Foreign objects may be encountered in some trees..

3.8 GRUBBING

- .1 Where grubbing is indicated, grub out stumps and roots more than 7.0 cm in diameter, tangled roots and designated stumps.
- .2 Remove stumps and roots to not less than 600 mm below ground surface.
- .3 Unless instructed otherwise by NCC Representative or on drawings, area to be backfilled with topsoil and seeded with a Parkmix grass seed.

3.9 CLEAN-UP AND DISPOSAL

- .1 All trimmings and debris resulting from the work herein specified shall be removed from the work site at the end of each working day.
- .2 Broken branches of adjacent trees, shrubs or valuable undergrowth shall receive the proper corrective treatment recognized for these conditions.
- .3 The removal and transportation of the above trimmings and debris shall be done in such a manner as to leave public thoroughfares clean and free of debris and all local by-laws are adhered to concerning the transportation of loose material.
- .4 All disposal fees associated with this contract are the responsibility of the contractor.

3.10 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for immediate grading operations and stripping of topsoil to approval of NCC Representative.

3.11 CLEANING

- .1 Once installation and performance control work is complete, remove surplus materials, waste and equipment off site.

END OF SECTION

1 General

1.1 RELATED SECTIONS

- .1 Read and be governed by conditions of the contract and sections of Division 1.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C 117-95, Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C 136-01, Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D 422-63 (2002), Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D 698-00a, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D 1557-02, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .6 ASTM D 4318-00, Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA)
 - .1 CSA-A23.1-00, Concrete Materials and Methods of Concrete Construction.
- .4 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 1004 (March 1993).
 - .2 OPSS 1010 (March 1993).

1.3 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: any solid material in excess of 0.25 m³ and which cannot be removed by means of duty mechanical excavating equipment having a 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in work.
- .3 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .4 Waste material: excavated material unsuitable for use in work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.
- .6 Unsuitable materials:
 - .1 Weak and compressible materials under excavated areas.
 - .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 D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: 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.

1.4 QUALITY ASSURANCE

- .1 Submit design and supporting data at least 2 weeks prior to commencing Work.
- .2 Design and supporting data submitted to bear stamp and signature of qualified professional Representative registered or licensed in Provinces of Ontario, Canada.
- .3 Keep design and supporting data on site.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Collect and separate plastic, paper packaging and corrugated cardboard.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Ensure emptied containers are sealed and stored safely.

1.6 PROTECTION OF EXISTING FEATURES

- .1 Existing buried utilities and structures:
 - .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .2 Prior to commencing excavation work, notify applicable NCC Representative or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during work.
 - .3 Comply with all requirements of authorities having jurisdiction when working in the vicinity of existing utilities. Temporary support of underground services, where required, are to be in accordance with respective authority having jurisdiction.
 - .4 Confirm locations of buried utilities by careful test excavations.
 - .5 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .6 Where unknown utility lines or structures exist in area of excavation, obtain direction of NCC Representative before removing or rerouting.
 - .7 Record location of maintained, re-routed and abandoned underground lines.
- .2 Existing buildings and surface features:
 - .1 Conduct, with NCC 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 to approval of NCC Representative.

1.7 TYPE OF EXCAVATION

- .1 Rock excavation
 - .1 Obtain approval from NCC Representative to use machinery to excavate rock.
 - .2 Notify Representative if actual elevation varies from that assumed.

- .2 Common excavation
 - .1 Assume all excavation on this project is common excavation with the exception of the above rock excavation. All common excavation to be conducted by hand shovel, excavation machinery is not per permitted.

1.8 SHORING, BRACING, AND UNDERPINNING

- .1 Protect existing features in accordance with Health and Safety Requirements and applicable local regulations.
- .2 Engage services of qualified professional Representative who is registered or licensed in province of Ontario to design and inspect shoring, bracing and underpinning required for work.
- .3 Submit design and supporting data at least 2 weeks prior to commencing work.
- .4 Design and supporting data submitted to bear stamp and signature of qualified professional Representative registered or licensed in province of Ontario.
- .5 Professional Representative responsible for design of temporary structures to submit proof of insurance coverage for professional liability except where Representative is employee of contractor, in which case contractor shall submit proof that work by professional Representative is included in contractor's insurance coverage.

1.9 TESTS AND INSPECTIONS

- .1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by NCC Representative.
- .2 Not later than one week before backfilling or filling, provide to designated testing agency, 23 kg sample of fill material proposed for use.
- .3 Do not begin backfilling or filling operations until material has been approved for use by NCC Representative.
- .4 Not later than 48 hours before backfilling or filling with approved material, notify NCC Representative so that compaction tests can be carried out by designated testing agency.

2 Products

2.1 MATERIALS

- .1 Type 1 Granular base: granular 'A' to OPSS 1010.
- .2 Type 2 fill: properties to the following requirements:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.

- .3 Imported fill: material obtained from off-site sources free of construction debris, with no stones or rubble larger than 100 mm, approved for use by NCC Representative.

3 Execution

3.1 SITE PREPARATION

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

3.2 STRIPPING OF TOPSOIL

- .1 Strip topsoil to depth of 150-200mm. Do not mix topsoil with subsoil.
- .2 Dispose of unused topsoil to location off site.

3.3 STOCKPILING

- .1 Stockpile good quality topsoil as approved by NCC Representative in Rideau Hall compost area or as directed. Stockpile height not to exceed 2 m.
- .2 Poor quality topsoil and subsoil shall not be stockpiled.
- .3 Stockpile fill materials in areas designated by Representative. Stockpile granular materials in manner to prevent segregation.
- .4 Protect fill materials from contamination.

3.4 SHORING, BRACING, AND UNDERPINNING

- .1 Construct temporary works to depths, heights and locations as required to execute the work.
- .2 During backfill operation:
 - .1 Unless otherwise as indicated or as directed by NCC Representative, remove shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
- .3 Remove excess materials from site upon completion of substructure construction:

3.5 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off.
- .3 Dispose of water in manner not detrimental to public and private property, or any portion of work completed or under construction.

3.6 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 All common excavation to be conducted by hand shovel, excavation machinery is not permitted.

- .3 Dispose of surplus and unsuitable excavated material off site.
- .4 Do not obstruct flow of surface drainage or natural watercourses.
- .5 Excavation must not interfere with normal 45° splay of bearing from bottom of any footing.
- .6 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .7 Protect excavations from freezing.
- .8 Keep excavations clean, free of standing water.
- .9 Where soil is subject to significant volume change due to change in moisture content, cover and protect to NCC Representative's approval.
- .10 Excavate as required to carry out work, in all materials met. Do not disturb soil or rock below bearing surfaces. Notify NCC Representative when excavations are complete. If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work. Excavation taken below depths shown without Representative's written authorization to be filled with Granular 'A' compacted as per pipe bedding requirements.
- .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify NCC Representative when bottom of excavation is reached.
- .13 Obtain NCC Representative's approval of completed excavation.
- .14 Remove unsuitable material from trench bottom to extent and depth as directed by Representative.
- .15 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
 - .2 Fill under pavement with Type 2 fill compacted to at least 95% Standard Proctor Density.
 - .3 Fill under other areas with Type 2 fill compacted to not less than 95% of corrected maximum dry density.
- .16 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Representative.

3.7 ROCK EXCAVATION

- .1 Blasting is not permitted.
- .2 Obtain approval from NCC Representative to use machinery to excavate rock.

3.8 FILL TYPES AND COMPACTION

- .1 Use fill of types as indicated or specified below. Compaction densities are percentages of maximum densities obtained from Standard Proctor maximum dry density.
 - .1 Exterior side of perimeter walls: use Type 1 fill to subgrade level. Compact to 95%.

- .2 Pavement areas: use Type 2 to underside of base course and Type 1 for base course. Compact to 98%.

3.9 BACKFILLING

- .1 Do not proceed with backfilling operations until 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 to 95% of maximum proctor dry density before placing succeeding layer.
- .5 Backfill around installations.
 - .1 Place bedding and surround material as specified.
 - .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.
 - .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.
 - .7 Install drainage system in backfill as indicated.

3.10 RESTORATION

- .1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Representative.
- .3 Clean and reinstate areas affected by Work as directed by NCC Representative.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED SECTIONS

- .1 Section 31 11 00 Clearing and Grubbing
- .2 Section 31 23 10 – Excavating, Trenching and Backfilling

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D698 91(1998), Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN m/m). Existing conditions.
- .2 Refer to de-watering paragraph in Section 31 23 10 Excavating, Trenching and Backfilling.

1.3 PROTECTION

- .1 Protect trees, fencing, landscaping, natural features, hard coverings, buried or exposed utility lines to remain in place in accordance with instructions of NCC Representative. Unless otherwise instructed, repair damaged features and restore to original or better condition.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Fill: Type 2, to limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1
- .2 Backfill: Type 1, to OPSS 1010.
- .3 Fill from excavation or grading work may be used on site as backfill if approved by NCC Representative.

PART 3 – EXECUTION

3.1 GRADING

- .1 Rough grade to levels, contours and profiles indicated, given the type of surface treatment.
- .2 Rough grade to depths required to establish subgrade level under finished surfaces as shown in construction details.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Before placing backfill material, work soil surface to 150 mm. To facilitate bonding, keep backfill materials and existing surface at approximately same moisture level.
- .6 Compact disturbed surfaces and filled surfaces to the maximum dry density specified in ASTM D698, i.e.:
 - .1 85% under landscaping.

- .2 95% under paved surfaces and trails.
- .7 Do not disturb existing soil in protection zones of trees or shrubs to remain except where necessary for shrub and perennial planting beds, to a maximum of 100 mm in existing soil.

3.2 TESTING

- .1 Compaction inspections and testing to be performed by laboratory designated by NCC. Contractor shall pay testing costs.

3.3 SURPLUS MATERIALS

- .1 Remove surplus materials and material unsuitable for backfilling, grading or landscaping off site.

END OF SECTION

PART 1 General

1.1 RELATED WORKS

- .1 Section 31 23 10 - Excavating, Trenching and Backfilling

1.2 DEFINITION

- .1 Rock: any solid material in excess of 1.00 m³ and which cannot be removed by means of mechanical excavating equipment having a 0.95 to 1.15 m bucket. Frozen material not classified as rock.

1.3 SCOPE

- .1 Work includes hoe-ramming and/or line drilling to remove rock encountered in the course of the work. Provide all material and equipment required for rock removal.

1.4 PROTECTION

- .1 Rock blasting will not be permitted. Rock shall be removed by hoe-ramming and/or line drilling.
- .2 Prevent damage to surroundings and injury to persons.

1.5 PAYMENT

- .1 Payment at the Contract price per cubic metre of rock removed.

1.6 MEASUREMENT

- .1 Measurement for payment will be based on the rock removed given the theoretical trench width, the existing top of rock elevation (as measured in the field) and the theoretical bottom of trench elevation. No payment will be made for rock removal in excess of the theoretical dimensions listed above.

PART 2 Products

2.1 NOT USED

- .1 Not Used.

PART 3 Execution

3.1 ROCK REMOVAL

- .1 Remove rock to alignments, profiles, and cross sections to facilitate the work.
- .2 Explosive blasting is not permitted.
- .3 Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak, and to avoid damage to adjacent structures.
- .4 Excavate rock to horizontal surfaces not exceeding slope of 1v:5h, approximately 10 degrees.

- .5 Scale, pressure wash and broom clean rock surfaces which are to bond to concrete.
- .6 Excavate trenches to lines and grades to minimum of 300 mm below pipe invert indicated. Provide recesses for bell and spigot pipe to ensure bearing will occur uniformly along barrel of pipe.
- .7 Cut trenches to widths required for the work.
- .8 Use pre-shearing, cushion or other smooth wall drilling techniques unless specified otherwise or directed by Engineer.
- .9 Remove boulders and fragments which may slide or roll into excavated areas.
- .10 Correct unauthorized rock removal at no extra cost, in accordance with backfilling requirements specified in Section 31 23 10 - Excavating, Trenching and Backfilling.

3.2 RO CK DISPOSAL

- .1 Dispose of surplus removed rock off site or as indicated.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 10 - Excavating Trenching and Backfilling
- .2 Section 33 46 16- Subgrade Drainage Network.

1.2 REFERENCES

- .1 ASTM A48/A48M, Standard Specification for Gray Iron Castings.
- .2 ASTM C139, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
- .3 CAN/CSA-A23.1-/A23.2-, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .4 CAN/CSA-A3000-, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-, Cementitious Materials for Use in Concrete.
 - .2 CSA-A3002-, Masonry and Mortar Cement.
- .5 CAN/CSA-A165 Series-, CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
- .6 CAN/CSA-G30.18-, Billet Steel Bars for Concrete Reinforcement.

1.3 SUBMITTALS

- .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling.
- .3 Divert unused metal materials from landfill to metal recycling facility as approved by NCC Representative.
- .4 Divert unused aggregate materials from landfill to quarry facility for reuse as approved by NCC Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

- .1 Precast catch basin sections: to ASTM C139.
 - .1 600mm x 600mm square Catch Basin as per OPSD 705.010.
- .2 Granular bedding and backfill: in accordance with Section 31 23 10- Excavating Trenching and Backfilling.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXCAVATION AND BACKFILL

- .1 Excavate and backfill in accordance with Section 31 23 10 - Excavating Trenching and Backfilling

3.3 INSTALLATION

- .1 Construct units in accordance with details indicated, plumb and true to alignment and grade.
- .2 Cast bottom slabs directly on undisturbed ground.
- .3 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 rubber ring gaskets.
 - .3 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
- .4 Compact granular backfill to 95% maximum dry density to ASTM D698.
- .5 Set frame and cover to required elevation.
- .6 Clean unit of debris and foreign materials.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Read and be governed by conditions of the contract and sections of Division 1.
- .2 Section 07 21 16 – Blanket Insulation
- .3 Section 31 23 10 – Excavating Trenching and Backfilling

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM D1621-10 Standard Test Method for Compressive Properties of rigid Cellular Plastics.
 - .2 ASTM Standard Test Methods for Water Permeability of Geotextiles by Permittivity

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for drainage material and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

1.5 SITE CONDITIONS

- .1 Known underground utility lines and buried objects are as indicated on plans.

Part 2 Products

2.1 DRAINAGE BOARD

- .1 High density polyethylene core with a geotextile bonded to core: acceptable product "Delta-Drain" and/or approved equal.
- .2 Termination Bar: "Delta-Flash" and/or approved equal.
- .3 Fastener: "Delta-Fastner" and/or approved equal.

2.2 BACKFILL MATERIAL

- .1 In accordance with Section 31 23 10 - Excavating, Trenching and Backfilling

Part 3 Execution

3.1 EXAMINATION

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

3.2 DRAINAGE BOARD INSTALLATION

- .1 Install drainage board to face of foundation wall as indicated.
- .2 Install flashing bar at top of drainage board and secure to foundation wall.
- .3 Secure drainage board in place.
- .4 Follow manufacturers printed installation procedures and requirements.

3.3 CLEANING

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 22 10 10 – Plumbing Pumps
- .2 Section 31 23 10- Excavating Trenching and Backfilling.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM D 698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
 - .2 Ontario Provincial Standard Specification (OPSS)
 - .1 OPSS 405 – Construction Specification for Pipe Subdrains
 - .2 OPSS 1860 – Material Specification for Geotextiles

1.3 SUBMITTALS

- .1 Inform Engineer of proposed source of bedding and filter materials and provide access for sampling at least 4 weeks prior to commencing work.
- .2 Submit manufacturer's test data and certification that drain pipe materials meet requirements of this Section at least 4 weeks prior to beginning Work.
- .3 Certification to be marked on pipe.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling.
- .3 Divert unused metal materials from landfill to metal recycling facility as approved by NCC Representative.
- .4 Divert unused aggregate materials from landfill to quarry facility for reuse as approved by NCC Representative.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

- .1 Clear stone bedding and pipe surround in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling.
- .2 Heavy Duty, perforated or non-perforated, corrugated, high density polyethylene (HDPE) pipe with smooth inner wall. Perforated pipe shall have geotextile filter sock. Pipe shall be manufactured from

high density polyethylene resin which shall meet or exceed the requirements of ASTM D3350 Cell Class 424420C. Minimum strength 320kPa. Shall be able to withstand depth of bury of 9m.

Acceptable piping product and/or approved equal shall be:

- .1 Solflo Max manufactured by Soleno;
 - .2 Boss 2000 manufactured by Armtec;
 - .3 Challenger 2000 manufactured by Ideal.
- .3 Geotextile filter sock: In accordance with OPSS 1860.

Part 3 Execution

3.1 TRENCHING

- .1 Do excavating, trenching, and backfilling in accordance with Section 31 23 10 - Excavating Trenching and Backfilling.
- .2 Place bedding and filter material after approval of excavation and/or trench by NCC Representative.

3.2 BEDDING

- .1 Place 100 mm layer of bedding material and compact to minimum 95% of maximum density to ASTM D 698.

3.3 INSTALLATION OF PIPE SUB-DRAINS AND DRAINAGE PIPING

- .1 Lay pipe drains on prepared bed, true to line and grade with inverts smooth and free of sags or high points.
 - .1 Ensure barrel of each pipe is in contact with bed throughout full length.
 - .2 Begin laying at outlet and proceed in upstream direction.
 - .3 Lay perforated pipes with perforations downwards.
 - .4 Lay bell and spigot pipe with bell ends facing upstream.
 - .1 Do not mortar joints.
 - .5 Cover joints of bell and spigot pipe with two-ply tar paper strips not less than 150 mm wide.
 - .1 Use strips of sufficient length to permit ends to be laid flat on bedding and turned outward on either side of pipe for a minimum distance of 75 mm.
 - .6 Make joints tight in accordance with manufacturer's instructions.
 - .7 Make watertight connections to existing drains, new or existing manholes and catch basins where indicated or as directed by NCC Representative.
 - .8 Plug open upstream ends of pipes with watertight concrete, steel or wood bulkheads.
 - .9 Wrap or sleeve perforated pipe with geotextile filter as indicated.

- .10 Backfill remainder of trench to Section 31 23 10 - Excavating Trenching and Backfilling as directed by Engineer.
- .11 Do not place bedding surround and backfill materials in frozen condition.
- .12 Protect sub-drains against flotation during installation.
- .13 Install "Y" connections to surface as indicated.

END OF SECTION