SPECIFICATION FOR

SOUTH FRONT MASONRY STABILIZATION

HALIFAX CITADEL
NATIONAL HISTORIC SITE OF CANADA
HALIFAX, NOVA SCOTIA

PREPARED BY:

Stantec Consulting Ltd./Parks Canada

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This document is the document referred to as Plans and Specifications and marked "A" in the Articles of Agreement.

SOUTH FRONT MASONRY STABILIZATION, HALIFAX CITADEL

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1. Description of Work .1 Work under this contract covers all materials, labour and equipment required for the restoration and stabilization of wall sections in seven identified areas:

Area 1 – Counterscarp Wall and Musket Gallery
Area 2 – South Interior Courtyard Walls
Area 3 – South Magazine
Area 4 – Escarp Wall
Area 5 – Areaway and Casemates
Area 6 – Cavalier Building
Area 7 – South Ravelin

The Citadel is a historic place and as such must be protected from any damage due to construction activities on the site. Preservation of existing historic fabric shall be given the highest priority during construction related to the protection/ repair of the assets. Any damage which occurs to adjacent assets or surfaces shall be repaired at the Contractor's cost.

The Contractor shall be deemed to have visited the site and examined all assets and to have become fully familiar with all conditions relative to carrying out the work. There shall be no consideration given to claims resulting from the Contractor's failure to carry out sufficient site investigations prior to tendering of the work.

A brief description of the construction of each area, and the scope of work recommended for each area is described below:

Area 1 - Counterscarp Wall and Musket Gallery

The Counterscarp Wall is a 5 to 6 m high masonry gravity retaining wall which incorporates a walking passage (Musketry Gallery) in its structure. The gallery consists of either segmental or continuous arch sections. The counterscarp wall forms the outer wall of the Citadel’s defensive ditch. Sloped grass ramparts (Glacis) extend beyond the counterscarp wall to the surrounding street network.

Repairs include but are not limited to:

- Grouting and repointing of the granite and ironstone veneer sections throughout the wall as required (interior and exterior);
- Replacement of damaged or cracked stones as required (interior and exterior);

- Repair damaged brick archways in the gallery;
- Rebuild upper part of granite wall at southeast corner as indicated;
- Rebuild upper part of ironstone wall near west corner of the West Ravelin as indicated;
- Rebuild interior brick archway at west corner of West Ravelin;
- Rebuild collapsed Musketry Gallery sections east of South Ravelin;
- Rebuild three sections of the Musketry Gallery west of the South Ravelin;
- Lift and reset capstones as required.

Area 2 – South Interior Courtyard Walls

This South Interior Courtyard Walls are gravity retaining wall structures constructed of granite which form the inner wall of the Ramparts. Various underground structures (casemates, demi-casemates, etc.) are constructed beneath the ramparts and are tied into the courtyard walls.

Repairs include but are not limited to:

- Grouting and repointing of the granite veneer sections throughout the wall as required;
- Replacement of damaged or cracked stones as required;
- Repair brick archways in demi-casemates as indicated.
- Repoint/grout interior walls of demi-casemates
- Lift and reset gutterstones and capstones to allow the installation of Blueskin or similar to limit water infiltration;
- Replace damaged or cracked gutterstones and capstones as required;
- Concrete repairs to existing lining in Demi-casemates.
- Repairs to cobblestone swales in the Courtyard.

Area 3 - South Magazine

The South Magazine is a granite walled building with a slate tile roof situated in a small courtyard with free standing walls to the north and east and interior courtyard walls to the west and south.

Repairs include but are not limited to:

- Grouting and repointing of the granite veneer sections throughout the wall as required;
- Replacement of damaged or cracked stones as required;
- Repair demi-casemate arches as required;
- Lift and reset capstones;
- Dismantle and rebuild portions of the west wall above demi-casemates;
- Dismantle and rebuild the north wall adjacent to ramp.

Area 4 - Escarp Wall

The Escarp Wall is a masonry gravity retaining wall structure which retains the outer limit of the ramparts and forms the outer wall of various casemates and sallyports. A major intervention is required at the SE Salient which will require significant temporary support structures.

Repairs include but are not limited to:

- Grouting and repointing of the granite and ironstone veneer sections throughout the wall as required;
- Replacement of damaged or cracked stones as required;
- Rebuild bulging section on the southern end of the Left Face of the Southeast Salient.

Area 5 – Areaway and Casemates

The areaway is an open stairwell in the Southwest Demi-bastion which provides access to two defence casemates:

Repairs include but are not limited to:

- Grouting and repointing of the ironstone veneer sections throughout the walls as required;
- Replacement of damaged or cracked stones as required;
- Dismantle and rebuild the north retaining wall below the stair;

Area 6 – Cavalier Building

The Cavalier Building is a four storey building located in the northern half of the interior courtyard. It is constructed of ironstone masonry units and timber elements. Portions of the roof are cedar shingle, and portions are EPDM.

Repairs include but are not limited to:

- Repairs to the exterior masonry wall surfaces

Area 7 – South Ravelin

The South Ravelin has exterior and interior granite masonry gravity retaining wall structures. The exterior wall faces the ditch. The interior wall makes a small courtyard that houses a small two storey structure. One of the buildings walls (to the north) is integrated with the exterior retaining wall.

Repairs include but are not limited to:

- Grouting and repointing of the granite veneer sections throughout the wall as required;
- Replacement of damaged or cracked stones as required;
- Lift and reset displaced capstones;
- Repair deteriorated chimney on top of building.

2. Documents Required .1 Maintain at job site, one copy each of following:
.1 Contract drawings
.2 Specifications.
.3 Addenda.
.4 Reviewed shop drawings.
.5 Change orders.
.6 Other modifications to Contract.
.7 Field test reports.
.8 Copy of approved work schedule
.9 Manufacturers' installation and application instructions.
.10 Record drawings (kept up to date on a daily basis)
.11 Site Specific Safety Plan

3. Products .1 Contractor's duties:

.1 Order products specified from designated suppliers. Order in quantities and at times compatible with construction schedule and site storage capacity.
.2 Transport, unload and handle at site.
.3 Promptly inspect delivered products, and give written report to the Project Manager on condition of all items received.
.4 Pay demurrage charges.

.5 Install, connect and finish products as specified.

4. Work Schedule

.1 The Contractor is to prepare and submit to the Departmental Representative within five days of notification of award of the Contract five copies of the proposed Construction Schedule for approval by the Departmental Representative. The schedule shall also outline the project cash flow with approximate proposed monthly progress claim amounts.

.2 All work on the interior of the Citadel (i.e. Areas 2, 3, 5 and 6) shall be completed between award and March 31/17. This will require any masonry reconstruction or repointing/grouting work carried out between approximately Oct 31/16 and March 31/17 to be enclosed and heated.

.3 It is intended that all work effecting the South Ditch (i.e. Areas 1 and 4) will be completed between March 31/17 and Oct. 31/17.

.4 All work on the walls in the Parking Lot areas (i.e. walls 1.6, 4.4, 4.5 and 4.6) shall be done outside the normal Park operating season of May 3 to Oct 31.

.5 The Contractor is to comply with the agreed schedule(s) at all times. If, for any reasons, the schedule is not followed, the Contractor is to immediately notify the Departmental Representative of the change and submit a revised Schedule for acceptance.

.6 Interim reviews of work progress based on work Schedule will be conducted as decided by the Departmental Representative and Schedule updated by Contractor as requested by the Departmental Representative.

.7 If required, the Contractor shall increase manpower and equipment and make whatever adjustments are appropriate to ensure that the project is completed on schedule.

5. Contractor's Use of Site .1 The site is located at the Halifax Citadel. Use of the site shall be limited to the approved areas adjacent to the work. Access to these areas will be by the existing perimeter road and ramp into the ditch or through the main gate to the courtyard (main

gate is an arched tunnel approximately 2.28 m wide by 2.2 m high to the spring of the arch). The contractor shall obtain approval from the Departmental Representative regarding acceptable times and usage of the site, roads, etc. Material, equipment and vehicles shall be delivered to site before 0900 hours or after 1800 hours. It shall be the Contractor's responsibility to arrange for all required transportation of men, equipment and materials to the site.

.2 The Park grounds are open year round and is fully open to paying customers between approximately May 3 and Oct. 31. All work areas shall be separated from the public with adequate hoarding or barricades as well as bilingual signage.

.3 Work in the Ditch shall be completed in phases with discrete sections or areas fenced or hoarded off from the public as the work dictates. At no time will the entire south ditch be off limits to visitors. If the active work area is not directly connected to the south end of the parking lot deliveries to/from the active area will take place before 0900 hours or after 1800 hours.

.4 Do not unreasonably encumber site with materials or equipment.

.5 Move stored products or equipment which interfere with operations of Parks Canada.

.6 Obtain and pay for use of additional storage or work areas needed for operations.

.7 Provide all barriers, signs, enclosures, etc. to ensure safety of the public or other parties on the site.

6. Project Manager .1 This will be given at the contract award.

7. Measurement for Payment .1 Much of the work of this contract is covered by unit rates and shall be measured and paid for as described in Section 01 29 01. The quantities for the various items will only become known as the work proceeds. Unit rates provided will apply to greater or lesser quantities as the eventual scope of work dictates.

Cost plus work items approved by the Departmental Representative shall be recorded on daily work sheets which shall show all the hours for equipment and labour applicable to the cost plus items. These sheets shall also contain agreed quantities for materials for each day's work and shall be signed by the Contractor at the close of each day's activities and submitted daily to the Departmental Representative for review and approval.

8. Codes and Standards

.1 Perform work in accordance with latest edition of National Building Code of Canada (NBCC) and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.

.2 Meet or exceed requirements of contract documents, specified standards, codes and referenced documents.

.3 All work shall be carried out in accordance with the Nova Scotia Occupational Health and Safety Act and the Canada Labour Code Part II, and the Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code.

9. Project Meetings

.1 Attend project meetings at times and locations approved by the Departmental Representative.

.2 Notify all parties concerned of meetings.

.3 Parks will record notes of meetings, and distribute to all parties.

10. Setting Out of Work

.1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations required.

.2 Provide devices needed to lay out and construct work.

.3 Supply such devices as straight edges and templates required to facilitate the Project Manager's inspection of work.

.4 Supply stakes and other survey markers required for laying out work.

.5 Do not use spray paint, chalk, etc. that will deface finished, exposed surfaces.

11. Cutting, Fitting and Patching

.1 Execute cutting, fitting and patching required to make work fit properly. Maintain historic fabric at all times. Review items to be cut, fitted, patched, etc. with the Project Manager and obtain approval before proceeding with the work.

.2 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.

.3 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.

.4 Fit work airtight to pipes, sleeves, ducts and conduits.

.5 Halifax Citadel is an historic site and no historically significant aspects shall be altered.

12. Protection

.1 Provide temporary dust screens, barriers, warning signs in locations where work is adjacent to areas used by public or government staff.

.2 A significant quantity of this work will likely be carried out in winter conditions. The contractor is fully responsible to design, construct and maintain adequate enclosures to ensure that all work is carried out in minimum 10 degree C temperatures as specified.

13. National Parks Act

.1 Perform work in accordance with applicable sections of the National Parks Act.

14. Protection of Materials

.1 Store and protect all materials and equipment required in connection with the work until they have been placed in the work and accepted by the Project Manager. Immediately remove rejected materials from the site.

15. Cleaning During Construction

.1 Maintain work area free from accumulations of waste materials and rubbish.

END OF SECTION

PART 1 - GENERAL

1.1 Description

.1 This section covers the measurement of work done for payment purposes, and the scope of the work covered by the pay items in the Unit Price Table.

.2 It is the intention to provide for a finished piece of work, complete in all essentials and details, including all items reasonably inferable from the drawings and specifications.

.3 The aggregate of all unit prices and lump sum payments shall constitute full compensation for the entire work of the Contract, as shown, specified and intended, regardless of any omission in the tender documents of any items which are necessary for the completion of the work including temporary facilities, safety, etc.

.4 Should there be any discrepancy regarding measurement between the Measurement and Payment Section and any other section in the specifications, the Measurement and Payment Section shall overrule the other specification section.

.5 Unless otherwise specified, all materials necessary to complete the items listed in the Unit Price Table and the finished work are to be supplied by the Contractor and the cost of such material is to be included in the Contractor's prices. There will be no measurement for work not authorized, or for work beyond authorized limits as determined by the Departmental Representative.

.6 All unit prices and lump sums shall include all costs applicable to the items, including labour, materials, equipment, transportation, ancillaries and all other applicable and relevant costs as intended and as required to complete the work to the full satisfaction of the Departmental Representative. The unit prices and lump sums indicated shall exclude HST.

.7 All work including shoring, protection measures, etc. required to prevent damage/disturbance to existing structures of any areas damaged as a result of work or access are considered incidental to the work.

.8 Where disposal of excess material or debris is included in an item this shall include disposal off site in an environmentally approved disposal site.

.9 The intent is to cover a range of required repair work as determined by the Departmental Representative on the site under established unit rates. Actual quantities may vary widely depending on the final scope of work and the condition of the various structures.

1.2 Measurement and Payment

.1 General Conditions

There shall be no measurement associated with this item.

Payment will be at the lump sum price bid for Item No. 1 in the Unit Price Table. Payment shall be distributed throughout the duration of the project.

The price shall include all costs associated with mobilizing and demobilizing from the site, general removals, temporary site fencing and hoarding, development and design of wall removals procedures as well as all design associated with any bracing or shoring systems, pedestrian and worker's safety measures and signage, full reinstatement of all disturbed surfaces at completion of the work and provision of all labour, equipment and materials necessary to complete the work as intended but not covered in other pay items.

.2 Escarp Wall Area No. 1

There shall be no measurement associated with this item. Area No. 1 is the proposed bulge removal area at the south end of the Left Face (LF) Southeast Salient (SES).

Payment will be at the lump sum price bid for Item No. 2 in the Unit Price Table.

The price shall include all labour, equipment and materials necessary to complete the **scaffolding**, bracing and shoring to allow the removal and replacement of the bulged section of the wall.

All removal and replacement of veneer and back-up or repointing shall be measured and paid for under the applicable pay items.

.3 Post and Chain

Measurement for this item shall be by the meter of post and chain barrier removed and replaced and installed new as applicable.

Payment shall be at the unit price bid for Items 3a) and 3 b) in the Unit Price Table.

The price shall include all labour, equipment and materials required to remove and dispose of existing barrier components and install replacement or new post and chain perimeter fence as indicated on the drawings or further designated on site. The price shall include excavation and installation of foundation materials, backfill, topsoil and sodding and all other work necessary to provide a completed installation as intended.

.4 Counterscarp Gallery Area No.1

There shall be no measurement associated with this item. Area No. 1 is the 11 sections indicated for repair on the RF SES and LF South Ravelin (SR)

Payment will be at the lump sum price bid for Item No. 4 in the Unit Price Table.

The price shall include all labour, equipment and materials necessary to excavate to expose the back of this wall, bracing and shoring of the overall wall and sections both inside the gallery and on the exterior to stabilize these partially collapsed sections for inspection to determine the scope of work. It is likely that the back walls as well as portions of the side walls and arches will be removed and rebuilt.

All removals and replacement of masonry, repointing and grouting, capstone removals and the post and chain fence shall be measured and paid for separately under the applicable pay items.

The price shall also include all backfilling and restoration of adjacent surfaces after the masonry repairs are complete.

.5 Counterscarp Gallery Area No.2

There shall be no measurement associated with this item. Area No. 2 is the 3 sections indicated for repair on the LF Northwest Demi-Bastion (NWDB).

Payment will be at the lump sum price bid for Item No. 5 in the Unit Price Table.

The price shall include all labour, equipment and materials necessary to excavate to expose the back of this wall, bracing and shoring of the overall wall and sections both inside the gallery and on the exterior to stabilize these partially collapsed sections for inspection to determine the scope of work. It is likely that the back walls as well as portions of the side walls and arches will be removed and rebuilt.

All removals and replacement of masonry, repointing and grouting and capstone removals shall be measured and paid for separately under the applicable pay items.

The price shall also include all backfilling and restoration of adjacent surfaces after the masonry repairs are complete.

.6 South Magazine, North Wall

There shall be no measurement associated with this item.

Payment will be at the lump sum price bid for Item No. 6 in the Unit Price Table.

The price shall include all labour, equipment and materials necessary to setup **scaffolding, enclosures and heat as required** in this area, excavate to expose the back of this wall, bracing and shoring of the overall wall as required, design and installation of the geo-grid stabilization system, perforated drainage piping, connection to adjacent storm sewer infrastructure, supply and placement of all indicated backfill materials and filter fabric, salvaging and replacing the parade material and all other work required to complete the wall repair as intended.

All removals and replacement of masonry, repointing and grouting and capstone removals shall be measured and paid for separately under the applicable pay items.

.7 Areaway Stair Wall

There shall be no measurement associated with this item.

Payment will be at the lump sum price bid for Item No. 7 in the Unit Price Table.

The price shall include all labour, equipment and materials necessary to remove, salvage and reinstall the cast iron railing (Note: the railing posts are believed to be set in lead), granite stair stones, **scaffolding, enclosures and heat as required,** any specialized hoisting equipment needed to carry out the masonry removals and replacement for this wall in this location and any anticipated bracing or shoring required for the main north wall during removal and replacement of the most or all of the stair wall.

All removals and replacement of masonry veneer and back-up, repointing and grouting shall be measured and paid for separately under the applicable pay items.

.8 Scaffolding

Except when mentioned specifically as part of Lump Sum Items Nos 2, 6 and 7, scaffolding will be measured and paid for by the square metre of wall face accessed by scaffolding to carry out repair work including repointing/grouting, veneer and back-up removal and replacement.

Payment will be at the unit price bid for Item No. 8 in the Unit Price Table.

The price shall include all labour, equipment and materials necessary to supply, erect and maintain safe scaffolding access to designated areas of work.

.9 Scaffolding Enclosure

Measurement for this item shall be by the square metre of wall face associated with enclosed scaffolding for heat to allow masonry work to proceed in temperatures below 10 degrees C or to mitigate dust or noise.

Payment will be at the unit price bid for Item No. 9 in the Unit Price Table.

The price shall include all labour, equipment and materials necessary to fully enclose the scaffolding as well as removal and disposal of materials and equipment following completion of the repair work in the designated area.

The supply and installing of all heating equipment and the provision of all required electricity and/or fuel as applicable will be included in the price.

.10 Repointing

This item only applies to existing wall areas requiring repointing.

Measurement for repointing surface joints in walls, caps, etc. shall be by the square metre of surface acceptably repointed, as determined by the Departmental Representative.

Payment for repointing joints shall be at the unit prices bid for Item No. 10a or 10b as applicable in the Unit Price Table.

The price shall include the mechanical removal of all material (i.e. raking out the joint to a minimum 25 mm depth or to sound mortar up to a maximum of 75 mm), flushing the cleaned-out joints with water and or air, repointing joints with specified mortar, washing and rinsing surface, clean-up of surrounding areas, measures required to prevent damage to existing brick or stone units, and correcting any damage (if it occurs), removal of all roots and other vegetation from the surrounding surfaces, and all other work necessary to completely repair and protect the designated surfaces as intended.

.11 Grouting

Measurement for this item shall be by the cubic metre of grout placed in the wall. Measurement shall be calculated by theoretical volumes per bag of grout mix placed in the wall. The Contractor shall keep a record of the number of bags used. The theoretical volume shall be established on site prior to any grouting procedures taking place, based on the mix design and a site trial mix of grout (i.e. one bag will produce X cubic metres of grout). This shall be the standard for all grout measurements.

Payment for grouting wall sections shall be at the unit price bid for Item No. 11 in the Unit Price table.

The price shall include submission of proposed grout mixes and methods, temporary support of stone or brick units as required, removing wet sand and deteriorated mortar deeper than 75 mm to a maximum depth of approximately 150 mm, injection and inspection ports on the outside face joints of the walls if applicable, removing veneer units as required, injection of the grout to fill the resulting voids, repair the pointing as required, washing and rinsing to provide a clean finished wall surface all to the full satisfaction of the Departmental Representative and all other work necessary to completely grout the wall. Pointing and/or finishing the joints within 75 mm of the surface is measured and paid for in Item No. 10.

.12 Masonry Anchors

Measurement shall be by each anchor installed in the work.

The price shall include all labour, material and equipment required to supply and install the anchors as instructed on site.

Payment shall be at the unit price bid for Item No. 12 in the Unit Price Table.

.13 Imported Wall Stone

Measurement for this item shall be by the cubic metre of new cut ironstone or granite veneer supplied by the Contractor to match existing.

The volume shall be determined by the Departmental Representative based on actual dimensions of the stone, as incorporated in the finished work. Unused stones shall not be measured.

Payment shall be at the unit rate bid for Item No. 13a or 13b in the Unit Price Table.

The price shall include all costs associated with quarrying, cutting, and transporting the stone to the site as well as all tooling and finishing required to match existing stone on site, removal of any surplus, and all other work necessary to completely repair and protect the asset as intended.

Once on site, handling of new stone and all labour, materials and equipment necessary to incorporate it into the work shall be included in the applicable pay item (i.e. Ironstone Veneer Rebuild).

.14 Remove and Replace Existing Capstones

Measurement shall be the lineal metre of existing capstone removed and replaced.

Payment shall be at the unit price bid for Item No. 14 a) or b) for Parade Wall or Counterscarp wall capstones as applicable in the Unit Price Table. The price shall include extant recording, removal of the capstones and any ramparts within the limits designated on the drawing, transport and temporary stockpiling of capstones, cleaning of capstones, installation of blue skin membrane, reinstallation of capstones and ramparts within the designated limits shown on the drawings.

Any missing capstones would be supplied under Pay Item 13 and installed under this pay item.

.15 Remove and Replace Existing Gutterstones

Measurement shall be the lineal metre of existing gutterstone removed and replaced.

Payment shall be at the unit price bid for Item No. 15 in the Unit Price Table. The price shall include extant recording, removal of the gutterstones and any ramparts within the limits designated on the drawing, transport and temporary stockpiling, cleaning, reinstallation of stones and ramparts within the designated limits shown on the drawings.

.16 Ironstone Veneer - Remove (a) and Rebuild (b)

Measurement for this item shall be by the square metre of front face area, excluding sides, top, etc., of ironstone veneer dismantled or reset, as directed by the Departmental Representative.

Payment shall be at the unit price bid for Item Nos. 16a or 16b in the Unit Price Table.

The price for ironstone veneer removal (16a) shall include temporary shoring and bracing, complete dismantling of the veneer, all handling, stockpiling, extant recording, photography, cleaning of debris, sand and mortar from the stone surface, disposal of waste material as directed.

The price for rebuilding ironstone veneer (16b) shall include handling, resetting, all mortar and pointing, exposing and cleaning the remaining back-up, removal of extant recording markings, washing and cleaning the completed stone face, and any other work necessary to complete the reconstruction of the veneer to the satisfaction of the Agency.

There shall be no measurement for salvaging ironstone from the area for use in rebuilding. This is considered incidental to this item.

.17 Granite Veneer - Remove (a) and Rebuild (b)

Measurement for this item shall be by the square metre of front face area, excluding sides, top, etc., of granite veneer dismantled or reset, as directed by the Departmental Representative.

Payment shall be at the unit price bid for Item Nos. 17a or 17b in the Unit Price Table.

The price for granite veneer removal (17a) shall include temporary shoring and bracing, complete dismantling of the veneer, all handling, stockpiling, extant recording, photography, cleaning of debris, sand and mortar from the stone surface, disposal of waste material as directed.

The price for rebuilding granite veneer (17b) shall include handling, resetting, all mortar and pointing, exposing and cleaning the remaining back-up, removal of extant recording markings, washing and cleaning the completed stone face, and any other work necessary to complete the

reconstruction of the veneer to the satisfaction of the Departmental Representative.

There shall be no measurement for salvaging granite from the area for use in rebuilding. This is considered incidental to this item.

.18 Masonry Back-up - Remove (a) and Rebuild (b)

Measurement for this item shall be by the cubic metre of masonry back-up wall acceptably removed or reset, as directed by the Departmental Representative.

The measurement of volume shall be as determined by the Departmental Representative and shall apply to partial removals of back-up or full depth removals of back-up as the condition of the masonry wall dictates.

Payment shall be at the unit price bid for Item Nos. 18a or 18b in the Unit Price Table.

The price for Back-up Removal (18a) shall include shoring and bracing, removal of deteriorated masonry back-up, cleaning, storage and handling of the stone, pressure washing remaining back-up wall surfaces as required, and removal of all roots and other vegetation from the surrounding surfaces.

The price for Rebuilding Masonry Back-up (18b) shall include resetting the masonry units complete with new mortar as specified and all other work necessary to completely repair and protect the asset as intended.

.19 Brick Arch Repairs

Measurement for this item shall be by the square metre of brick arch repaired.

Payment shall be at the unit rate bid for Item No. 19 a) or b) in the Unit Price Table as applicable for repairs inside the Musketry Gallery or in Demi-casemates.

The price shall include all labour, equipment and materials required to chip out and remove the designated depth of existing brick, install stainless steel ties, cut to suit and install new brick with mortar to finish the arch to match adjacent surfaces. Salvaged brick may be reused as approved by the Departmental Representative.

.20 SES Demi-Casemate Lining Repairs

There shall be no measurement associated with this item.

Payment will be at the lump sum price bid for Item No. 20 in the Unit Price Table.

The price shall include all labour, equipment and materials necessary to remove loose or unsound concrete, cut back corroded reinforcing steel, install suitable anchors into sound concrete and form and place concrete repairs to provide a clean finished appearance with a minimum 50 mm cover to any reinforcing.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Definitions:

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (Gantt chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars.

.3 Baseline: original approved plan (for Project, work package, or activity), plus or minus approved scope changes.

.4 Cash Flow: projection of progress payment requests based on cash loaded construction schedule.

.5 Completion Milestones: they are firstly Interim Certificate Substantial Completion and secondly Final Certificate.

.6 Constraint: applicable restriction or limitation, either internal or external to project, that will affect performance of Project. Factors that affect activities can be scheduled.

.7 Control: process of comparing actual performance with planned performance, analyzing variances, evaluating possible alternatives, and taking appropriate corrective action as needed.

.8 Critical Activity: any activity on a critical path.

.1 Most commonly determined by using critical path method.

.9 Critical Path: sequence of activities that determines duration of Project. Generally, it is the longest path through Project.

.1 Usually defined as those activities with float less than or equal to specified value, often zero.

.10 Critical Path Method (CPM): network analysis technique used to determine the amount of scheduling flexibility (amount of float) on various logical network paths in Project schedule network, and to determine the minimum total Project duration.

.11 Data Date: date through which project status and progress were last determined and reported for analyses, such as scheduling and performance measurements.

.12 Duration: total number of work periods (not including holidays or other non-working periods) required to complete activity or other Project element.

.1 Usually expressed as workdays or work weeks.

.13 Early Finish Date: in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can finish, based on network logic and schedule constraints.

.1 Early finish dates can change as Project progresses and changes are made to Project plan.

.14 Early Start Date: in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can start, based on network logic and schedule constraints.

.1 Early start dates can change as Project progresses and changes are made to Project Plan.

.15 Finish Date: point in time associated with activity's completion.

.1 Usually qualified by one of following: actual, planned, estimated, scheduled, early, late, baseline, target, or current.

.16 Float: amount of time that activity may be delayed from its early start without delaying Project finish date.

.17 Impact Analysis: schedule analysis technique that adds a modeled delay to an accepted construction schedule to determined possible outcome of that delay on project completion.

.18 Lag: modification of logical relationship that directs delay in successor activity.

.19 Late Finish Date (LF): in critical path method, latest possible point in time that activity may be completed without delaying specified milestone (usually Project finish date).

.20 Late Start Date (LS): in critical path method, latest possible point in time that activity may begin without delaying specified milestone (usually Project finish date).

.21 Lead: modification of logical relationship that allows acceleration of successor task.

.22 Logic Diagram: see Project network diagram.

.23 Master Schedule: summary-level schedule that identifies major deliverable; work breakdowns structure and key milestones.

.24 Milestone: significant point or event in Project, usually completion of major deliverable.

.25 Monitoring: capture, analysis, and reporting of Project performance, usually as compared to plan.

.26 Non-Critical Activities: activities which when delayed, do not affect specified Contract duration.

.27 Project Control System: fully computerized system utilizing commercially available software packages.

.28 Project Network Diagram: schematic display of logical relationships of Project activities.

.1 Always drawn from left to right to reflect Project chronology.

.29 Project Plan: formal, approved document used to guide both Project execution and Project control.

.1 Primary uses of Project plan are to document planning assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines.

.2 Project plan may be summary or detailed.

.30 Project Planning: development and maintenance of Project Plan.

.31 Project Planning, Monitoring and Control System: overall system operated to enable monitoring of Project Work in relation to established milestones.

.32 Project Schedule: planned dates for performing activities and planned dates for meeting milestones.

.33 Quantified days duration: working days based on 5 day work week, discounting statutory holidays.

.34 Risk: uncertain event or condition that, if it occurs, has positive or negative effect on Project's objectives.

.35 Start Date: point in time associated with activity's start, usually qualified by one of following: actual, planned, estimated, scheduled, early, late, target, baseline, or current.

.36 Work Breakdown Structure (WBS): deliverable-oriented hierarchical decomposition of Work to be executed by contractor to accomplish project objectives and create required deliverables. It organizes and defines total scope of Project. Each descending level represents an increasingly detailed definition of Project Work. WBS is decomposed into Work packages.

.2 Reference Standards:

.1 Project Management Institute (PMI Standards)

.1 A Guide to the Project Management Body of Knowledge (PMBOK Guide) - Fourth Edition.

.2 Practice Standard for Scheduling - 2011.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Project Meeting:

.1 Meet with Departmental Representative within ten working days of Award of Contract date, to establish Work requirements and approach to project construction operations.

.2 Participate in regular project progress meetings with Departmental Representative specifically intended to discuss update of detailed schedule and contract changes.

.2 Scheduling:

.1 Planning: ensure that planning process is iterative and results in generally top-down processing with more detail being developed as planning progresses, and decisions concerning options and alternatives are made.

.2 Ensure project schedule efficiencies through monitoring of Project in detail to ensure integrity of Critical Path, by comparing actual completions of individual activities with their scheduled completions, and review progress of activities that has started but are not yet completed..

.3 Monitor sufficiently often so that causes of delays can immediately be identified and removed.

.3 Project monitoring and reporting:

.1 Keep team aware of changes to schedule, and possible consequences as project progresses.

.2 Use narrative reports to provide advice on seriousness of difficulties and measures to overcome them.

.3 Begin narrative reporting with statement on general status of Project followed by summarization of delays, potential problems, corrective measures and Project status criticality.

.4 Critical Path Method (CPM) Requirements:

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

.2 Revise Master Schedule and Detail Schedule deemed impractical by Departmental Representative and resubmit for approval.

.3 Change to Contract Duration:

.1 Acceptance of Master Schedule and Detail Schedule showing scheduled Contract duration shorter than specified Contract duration does not constitute change to Contract.

.2 Duration of Contract may only be changed through bilateral Agreement.

.4 Consider Master Schedule and Detail Schedule deemed practical by Departmental Representative, showing Work completed in less than specified Contract duration, to have float.

.5 First Milestone on Master Schedule and Detail Schedule will identify start Milestone with an "ES" constraint date equal to Award of Contract date.

.6 Calculate dates for completion milestones from Plan and Schedule using specified time periods for Contract.

.7 Substantial Completion with "LF" constraint equal to calculated date.

.8 Calculations on updates to be such that if early finish of Interim Certificate falls later than specified Contract duration then float calculation to reflect negative float.

.9 Delays to non-critical activities, those with float may not be basis for time extension.

.10 Do not use float suppression techniques such as software constraints, preferential sequencing, special lead/lag logic restraints, extended activity times imposed dates other than required by Contract.

.11 Allow for and show Master Plan and Detail Schedule adverse weather conditions normally anticipated.

.1 Specified Contract duration has been predicated assuming normal amount of adverse weather conditions.

.12 Provide necessary crews and manpower to meet schedule requirements for performing Work within specified Contract duration.

.1 Simultaneous use of multiple crews on multiple fronts on multiple critical paths may be required.

.13 Arrange participation on and off site of subcontractors and suppliers, as required by Departmental Representative, for purpose of network planning, scheduling, updating and progress monitoring.

.1 Approvals by Departmental Representative of original networks and revisions do not relieve Contractor from duties and responsibilities required by Contract.

.14 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit to Departmental Representative Project Control System for planning, scheduling, monitoring and reporting of project progress.

.3 Submit Project Control System to Departmental Representative for approval.

.1 Failure to comply with each required submission, may result in progress payment being withheld in accordance with Federal Government's GC 5 Terms of Payment.

.4 Include costs for execution, preparation and reproduction of schedule submittals in bid documents.

.5 Submit letter ensuring that schedule has been prepared in co-ordination with major sub-contractors.

.6 Refer to article "PROGRESS MONITORING AND REPORTING" of this specification Section for frequency of Project control system submittals.

.7 Submit impact analysis of schedule for changes that result in extension of contract duration.

.1 Include draft schedule update and report as outlined in article "PROGRESS MONITORING AND REPORTING".

.8 Submit Project planning, monitoring and control system data as required by Departmental Representative in following form.

.1 CD files in original scheduling software containing schedule and cash flow information, labelled with data date, specific update, and person responsible for update.

.2 Master Schedule Bar Chart.

.3 Construction Detail schedule Bar Chart.

.4 Listing of project activities including milestones and logical connectors, networks (sub-networks) from Project start to end. Sort activities by activity identification number and accompany with descriptions. List early and late start and finish dates together with durations, codes and float.

.5 Criticality report listing activities and milestones with up to 5 days total float used as first sort for ready identification of critical paths through entire project. List early and late starts and finishes dates, together with durations, codes and float for critical activities.

.6 Progress report in early start sequence, listing for each trade, activities due to start, within 2 months from monthly update date. List activity identification number, description and duration. Provide columns for entry of actual start and finish dates, duration remaining and remarks concerning action required.

1.4 QUALITY ASSURANCE

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

1.5 WORK BREAKDOWN STRUCTURE (WBS)

.1 Prepare construction Work Breakdown Structure (WBS) within 15 working days of Award of Contract date.

.1 Develop WBS through at least five levels: project, stage, element, sub-element and work package.

1.6 MASTER SCHEDULE

.1 Structure and base CPM construction networks system on WBS coding in order to ensure consistency throughout Project.

.2 Prepare comprehensive construction Master Schedule (CPM logic diagram) and dependent Cash Flow Projection within 15 working days of finalizing Agreement to confirm validity or alternates of identified milestones.

.1 Master Schedule will be used as baseline.

.1 Revise baseline as conditions dictate and as required by Departmental Representative.

.2 Departmental Representative as Project progresses will review and return revised baseline within 5 work days.

.3 Reconcile revisions to Master Schedule and Cash Flow Projections with previous baseline to provide continuous audit trail.

.4 Initial and subsequent Master Schedule will include:

.1 CD containing schedule and cash flow information, clearly labelled with data date, specific update, and person responsible for update.

.2 Bar chart identifying coding, activity durations, early/late and start/finish dates, total float, completion as percentile, current status and budget amounts.

.3 Network diagram showing coding, activity sequencing (logic), total float, early/late dates, current status and durations.

.4 Actual/projected monthly cash flow: expressed annually monthly and shown in both graphical and numerical form.

1.7 DETAIL SCHEDULE

.1 Provide detailed project schedule (CPM logic diagram) within 15 working days of Award of Contract date showing activity sequencing, interdependencies and duration estimates. Include listed activities as follows:

.1 Shop drawings.

.2 Samples.

.3 Approvals.

.4 Procurement.

.5 Construction.

.6 Installation.

.7 Site works.

.8 Testing.

.9 Commissioning and acceptance.

.2 Relate Detail Schedule activities to basic activities and milestones developed and approved in Master Schedule.

.3 Clearly show sequence and interdependence of construction activities and indicate:

.1 Start and completion of all items of Work, their major components, and interim milestone completion dates.

.2 Activities for procurement, delivery, installation and completion of each major piece of equipment, materials and other supplies, including:

.1 Time for submittals, resubmittals and review.

.2 Time for fabrication and delivery of manufactured products for Work.

.3 Interdependence of procurement and construction activities.

.3 Include sufficient detail to assure adequate planning and execution of Work. Activities should generally range in duration from 3 to 15 workdays each.

.4 Provide level of detail for project activities such that sequence and interdependency of Contract tasks are demonstrated and allow co-ordination and control of project activities. Show continuous flow from left to right.

.5 Ensure activities with no float are calculated and clearly indicated on logical CPM construction network system as being, whenever possible, continuous series of activities throughout length of Project to form "Critical Path". Increased number of critical activities is seen as indication of increased risk.

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

1.8 REVIEW OF THE CONSTRUCTION DETAIL SCHEDULE

.1 Allow 5 work days for review by Departmental Representative of proposed construction Detail Schedule.

.2 Upon receipt of reviewed Detail Schedule make necessary revisions and resubmit to Departmental Representative for review within 5 work days.

.3 Promptly provide additional information to validate practicability of Detail Schedule as required by Departmental Representative.

.4 Submittal of Detail Schedule indicates that it meets Contract requirements and will be executed generally in sequence.

1.9 COMPLIANCE WITH DETAIL SCHEDULE

.1 Comply with reviewed Detail Schedule.

.2 Proceed with significant changes and deviations from scheduled sequence of activities that cause delay, only after written receipt of approval by Departmental Representative.

.3 Identify activities that are behind schedule and causing delay. Provide measures to regain slippage.

.1 Corrective measures may include:

.1 Increase of personnel on site for effected activities or work package.

.2 Increase in materials or equipment.

.3 Overtime work or Additional work shifts.

.4 Submit to Departmental Representative, justification, project schedule data and supporting evidence for approval of extension to Contract completion date or interim milestone date when required. Include as part of supporting evidence:

.1 Written submission of proof of delay based on revised activity logic, duration and costs, showing time impact analysis illustrating influence of each change or delay relative to approved contract schedule.

.2 Prepared schedule indicating how change will be incorporated into the overall logic diagram. Demonstrate perceived impact based on date of occurrence of change and include status of construction at that time.

.3 Other supporting evidence requested by Departmental Representative.

.4 Do not assume approval of Contract extension prior to receipt of written approval from Departmental Representative.

.5 In event of Contract extension, display in Detail Schedule that scheduled float time available for work involved has been used in full without jeopardizing earned float.

.1 Departmental Representative will determine and advise Contractor number of allowable days for extension of Contract based on project schedule updates for period in question, and other factual information.

.2 Construction delays affecting project schedule will not constitute justification for extension of contract completion date.

1.10 PROGRESS MONITORING AND REPORTING

.1 On ongoing basis, Detail Schedule on job site must show "Progress to Date". Arrange participation on and off site of subcontractors and suppliers, as, and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Inspect Work with Departmental Representative at least once monthly to establish progress on each current activity shown on applicable networks.

.2 Update and reissue project Work Breakdown Structure and relevant coding structures as project develops and changes.

.3 Perform Detail Schedule update bi-weekly. Update to reflect activities completed to date, activities in progress, logic and duration changes.

.4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.

.5 Submit to Departmental Representative copies of updated Detail Schedule.

.6 Requirements for monthly progress monitoring and reporting are basis for progress payment request.

.7 Submit monthly written report based on Detail Schedule, showing Work to date performed, comparing Work progress to planned, and presenting current forecasts. Report must summarize progress, defining problem areas and anticipated delays with respect to Work schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate any potential delay. Include in report:

.1 Description of progress made.

.2 Pending items and status of: permits, shop drawings, change orders, possible time extensions,.

.3 Status of Contract completion date and milestones.

.4 Current and anticipated problem areas, potential delays and corrective measures.

.5 Review of progress and status of Critical Path activities.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 General

.1 This section specifies general requirements and procedures for Contractor's submissions of shop drawings, product data, samples and mock-ups to the Departmental Representative for review. Additional specific requirements for submissions are specified in individual sections of the various Divisions covered by this specification.

.2 Do not proceed with work until relevant submissions are reviewed by the Departmental Representative.

.3 Present shop drawings, product data, samples and mock-ups in Metric units.

.4 Contractor's responsibility for errors and omissions in submission is not relieved by the Departmental Representative's review of submissions.

.5 Notify the Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.6 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by the Departmental Representative's review of submission.

.7 Make changes in submissions which the Departmental Representative may require consistent with Contract Documents and resubmit as directed by the Departmental Representative.

.8 Notify the Departmental Representative, in writing, when resubmitting, of any revisions other than those requested by the Departmental Representative.

1.2 Shop Drawings Review

.1 The review of shop drawings by the Departmental Representative or by Public Works and Government Services Canada is for the sole purpose of ascertaining conformance with the general concept. This review shall not mean that the Departmental Representative or Public Works and Government Services Canada approves the

detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and contract documents. Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all sub-trades.

1.3 Submission Requirements

.1 Coordinate each submission with required work and Contract Documents. Individual submissions will not be reviewed until all related information is available.

.2 Allow five working days for the Departmental Representative's review of each submission.

.3 Accompany submissions with transmittal letter, in duplicate, containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.4 Submissions shall include:
- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- **.4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.**
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.

.2 Layout, showing dimensions, including identified field dimensions, and clearances.
.3 Setting or erection details.
.4 Capacities.
.5 Performance characteristics.
.6 Standards.
.7 Operating weight.
.8 Wiring diagrams.
.9 Single line and schematic diagrams.
.10 Relationship to adjacent work.

.6 Stamp of Professional Engineer registered or licensed in the Province of Nova Scotia for drawings with engineering content.

.5 After the Departmental Representative's review, distribute copies.

1.4 Shop Drawings

.1 Shop drawings: original drawings, or modified standard drawings provided by Contractor, to illustrate details of portions of work, which are specified to project requirements.

.2 Maximum sheet size: 760 x 1,070.

.3 Submit shop drawings as follows:
.1 Number Contractor requires for distribution plus 3 copies which will be retained by the Departmental Representative.

.4 Cross-reference shop drawing information to applicable portions of Contract Documents.

1.5 Product Data

.1 Product data: manufacturer's catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products.

.2 Submit 5 copies of product data.

.3 Sheet size: 8 1/2" x 11", maximum of 3 modules.

.4 Delete information not applicable to project.

.5 Supplement standard information to provide details applicable to project.

.6 Cross-reference product data information to applicable portions of Contract Documents.

1.6 Samples

.1 Samples: examples of materials, equipment, quality, finishes, workmanship.

.2 Where colour, pattern or texture is criterion, submit full range of samples.

.3 Reviewed and accepted samples will become standard of workmanship and material against which installed work will be verified.

1.7 Mock-ups

.1 Mock-ups: field-erected example of work complete with specified materials and workmanship.

.2 Erect mock-ups at locations acceptable to the Departmental Representative.

.3 Review and accepted mock-ups will become standards of workmanship and material against which installed work will be verified.

END OF SECTION

1.1 SUBMITTALS

.1 Submit to Departmental Representative copies of the following documents, including updates:
- .1 Site Specific Health and Safety Plan.
- .2 Building Permit, compliance certificates and other permits obtained.
- .3 Reports or directions issued by Federal, Provincial or other authority having jurisdiction.
- .4 Accident or Incident Reports.
- .5 MSDS data sheets.
- .6 Name of Contractor's Representative designated to perform health and safety supervision on site.

1.2 COMPLIANCE REQUIREMENTS

.1 Comply with the Occupational Health and Safety Act for the Province of Nova Scotia, and the Regulations made pursuant to the Act.

.2 Comply with Canada Labour Code Part II, and the Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code.

.3 Observe and enforce construction safety measures required by:
- .1 National Building Code of Canada;
- .2 Provincial Worker's Compensation Board;
- .3 Municipal statutes and ordinances.

.4 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

.5 A copy of the Canada Labour Code Part II may be obtained by contacting:

Canadian Government Publishing
Public Works & Government Services Canada
Ottawa, Ontario, K1A 0S9
Tel: (819) 956-4800 (1-800-635-7943)
Publication No. L31-85/2000 E or F)

.6 Maintain Workers Compensation Coverage for duration of Contract. Submit Letter of Good Standing to Departmental Representative upon request.

1.3 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, of property and for protection of persons, and public, circulating adjacent to work operations to extent that they may be affected by conduct of the Work.

.2 Enforce compliance by all workers, sub-contractors and other persons granted access to work site with safety requirements of Contract Documents, applicable Federal, Provincial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.4 SITE CONTROL AND ACCESS

.1 Control work site and entry points to construction areas.
.1 Delineate and isolate construction areas from other areas of site by use of appropriate means.
.2 Post notices and signage at entry points and at other strategic locations identifying entrance onto site to be restricted to authorized persons only.
.3 Signage must be professionally made, bilingual in both official languages or display internationally understood graphic symbols.

.2 Approve and grant access to site only to workers and authorized persons.
.1 Immediately stop non-authorized persons from circulating in construction areas and remove from site.

.2 Provide site safety orientation to all persons before granting access. Advise of site conditions, hazards and mandatory safety rules to be observed on site.

.3 Secure site at night time to extent required to protect against unauthorized entry.

.4 Ensure persons granted access to site wear appropriate personal protective equipment (PPE) suitable to work and site conditions.

.1 Provide such PPE to authorized persons who require access to perform inspections or other approved purposes.

1.5 PROTECTION

.1 Carry out work placing emphasis on health and safety of the Public, Facility personnel, construction workers and protection of the environment.

.2 Erect safety barricades, lights and signage on site to effectively delineate work areas, protect pedestrian and vehicular traffic around and adjacent to work and to create a safe working environment.

.3 Should unforeseen or peculiar safety related hazard or condition become evident during performance of work, immediately take measures to rectify the situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

1.6 FILING OF NOTICE

.1 File Notice of Project and other Notices with Provincial authorities prior to commencement of Work.

1.7 PERMITS

.1 Post on site applicable permits, licences, compliance certificates, etc.

.2 Where particular permit or compliance certificate cannot be obtained at the required stage of work, notify Departmental Representative in writing and obtain his/her approval to proceed before carrying out that portion of work.

1.8 HAZARD ASSESSMENTS

.1 Conduct site specific health and safety hazard assessment before commencing project and during course of the work. Identify risks and hazards resulting from site conditions, weather conditions and work operations.

.1 Perform on-going assessments addressing new risks and hazards as work progresses

.2 Also, conduct assessment when the scope of work has been changed by Change Order and when potential hazard or weakness in current health and safety practices are identified by Departmental Representative or by an authorized safety Representative.

.2 Record results in writing and address in Health and Safety Plan.

.3 Keep copy of all assessments on site.

1.9 PROJECT/SITE CONDITIONS

.1 The following are known or potential project related health, environmental and safety hazards at site which must be properly managed if encountered during course of work:

.1 Existing hazardous products stored and used by Facility personnel are:

.1 The North Ravelin houses an active powder magazine for the Historic Weapons Program at the Halifax Citadel. No entry into or onto the Ravelin is permitted.

.2 Existing hazardous or contaminated building materials on site are:

.1 N/A

.3 Safety hazards due to existing site conditions and conduct of work inside operational Facility are:

.1 The mortar in the outer 600-900 mm (or more) of these masonry gravity retaining wall structures has deteriorated to wet sand and this section of the walls should be considered to have little or no stability.

.2 The structural stability of the masonry gravity retaining walls and archways cannot be confirmed in the areas requiring replacement.

.3 The potential for unexploded ordnance (UXO) exist onsite. The Contractor shall stop work immediately and notify Departmental Representative if any unexploded ordnance is encountered.
.4 As removals progress the ability of these gravity structure(s) to support imposed loads from the retained soil decreases and could result in local or global failure of the existing wall and arch structures.

.2 Above list shall not be construed as being complete and inclusive of potential health, and safety hazards encountered during work. Include above items into hazard assessment process.

.3 Obtain from Departmental Representative, copy of MSDS Data sheets for existing hazardous products stored on site or used by Facility personnel.

1.10 HEALTH AND SAFETY MEETINGS

.1 Attend pre-construction health and safety meeting conducted by Departmental Representative. Have following persons in attendance:
.1 Site Superintendent.
.2 Contractor's designated Health and Safety Site Supervisor.
.3 Departmental Representative will advise of date, time and location.

.2 Conduct health and safety meetings and tool box briefings on site. Hold on a regular and pre-scheduled basis during entire work in accordance with requirements and frequency as stipulated in provincial occupational health and safety regulations.
.1 Keep workers informed of potential hazards and provide safe work practices and procedures to be followed.
.2 Take written minutes and post on site.

1.11 HEALTH AND SAFETY PLAN

.1 Develop written site-specific Project Health and Safety Plan, based on hazard assessments, prior to commencement of work.
.1 Submit copy to Departmental Representative within 14 calendar days of acceptance of bid.
.2 Submit updates as work progresses.

.2 Health and Safety Plan shall contain three (3) parts with following information:

.1 Part 1 - Hazards: List of individual health risks and safety hazards identified by hazard assessment process.

.2 Part 2 - Safety Measures: engineering controls, personal protective equipment and safe work practises used to mitigate hazards and risks listed in Part 1 of Plan.

.3 Part 3a: Emergency Response: standard operating procedures, evacuation measures and emergency response in the occurrence of an accident, incident or emergency.

.1 Include response to all hazards listed in Part 1 of Plan.

.2 Evacuation measures to complement the Facility's existing Emergency Response and Evacuation Plan. Obtain pertinent information from Departmental Representative.

.3 List names and telephone numbers of officials to contact including:

.1 General Contractor and all Subcontractors.

.2 Federal and Provincial Departments as stipulated by laws and regulations and local emergency resource organizations, as needed based on nature of emergency or accident.

.3 Officials from site Facility management. Departmental Representative will provide list.

.4 Part 3b - Site Communications:

.1 Procedures used on site to share work related safety issues between workers, subcontractors, and General Contractor.

.2 List of critical tasks and work activities, to be communicated with the Facility Manager, which has risk of affecting tenant operations, or endangering health and safety of Facility personnel and the general public. Develop list in consultation with the Departmental Representative.

.3 Prepare Health and Safety Plan in a three column format,

addressing the three parts specified above, as follows:

Column 1	Column 2	Column 3
Part 1	Part 2	Part 3a/3b
Identified Hazards	Safety Measures	Emergency Response & Site Communications

.4 Develop Plan in collaboration with subcontractors. Address work activities of all trades. Revise and update Plan as Sub-contractors arrive on site.

.5 Implement and enforce compliance with requirements of Plan for full duration of work to final completion and demobilization from site.

.6 As work progresses, review and update Plan. Address additional health risks and safety hazards identified by on-going hazard assessments.

.7 Post copy of Plan, and updates, on site.

.8 Submission of the Health and Safety Plan, and updates, to the Departmental Representative is for review and information purposes only. Departmental Representative's receipt, review and any comments made of the Plan shall not be construed to imply approval in part or in whole of such Plan by Departmental Representative and shall not be interpreted as a warranty of being complete and accurate or as a confirmation that all health and safety requirements of the Work have been addressed and that it is legislative compliant. Furthermore, Departmental Representative's review of the Plan shall not relieve the Contractor of any of his legal obligations for Occupational Health and Safety provisions specified as part of the Work and those required by provincial legislation.

1.12 SAFETY SUPERVISION AND INSPECTIONS

.1 Designate one person to be present on site at all times, responsible for supervising health and safety of the Work.
.1 Person to be competent in Occupational Health and Construction Safety as defined in the Provincial Occupational

Health and Safety Act.

.2 Assign responsibility, obligation and authority to such designated person to stop work as deemed necessary for reasons of health and safety.

.3 Conduct regularly scheduled safety inspections of work site on a minimum [bi-weekly] basis.
.1 Note deficiencies and remedial action taken in a log book or diary.

.4 Keep inspection reports on site.

1.13 TRAINING

.1 Ensure that all workers and other persons granted access to site are competently trained and knowledgeable on:
.1 Safe use of tools and equipment.
.2 How to wear and use personal protective equipment (PPE).
.3 Safe work practices and procedures to be followed in carrying out work.
.4 Site conditions and minimum safety rules to be observed on site, as given at site orientation session.

1.14 MINIMUM SITE SAFETY RULES

.1 Notwithstanding the requirement to abide by federal and provincial health and safety regulations, the following safety rules shall be considered minimum requirements to be obeyed by all persons granted site access:
.1 Wear personnel protective equipment (PPE) appropriate to function and task on site; the minimum requirements being hard hat, safety footware and eye protection.
.2 Immediately report unsafe activity or condition at site, near-miss accident, injury and damage.
.3 Maintain site in tidy condition.
.4 Obey warning signs and safety tags.

.2 Brief workers on site safety rules and on disciplinary measures to be taken by Departmental Representative for violation or non compliance of such rules. Post rules on site.

1.15 ACCIDENT REPORTING	.1	Investigate and report the following incidents and accidents: .1 Those as required by Provincial Occupational Safety and Health Act and Regulations. .2 Injury requiring medical aid as defined in the Canadian Dictionary of Safety Terms-1987, published by the Canadian Society of Safety Engineers (C.S.S.E)as follows: .1 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred. .3 Property damage in excess of $5000.00, .4 Interruption to Facility operations with potential loss to a Federal Dept. in excess of $5000.00, .5 Those which require notification to Workers Compensation Board or other regulatory agencies as stipulated by applicable law or regulations.
	.2	Send written report to Departmental Representative for all above cases.
1.16 TOOLS AND EQUIPMENT SAFETY	.1	Routinely check and maintain tools, equipment and machinery for safe operation.
	.2	Conduct checks as part of site safety inspections. When requested, submit proof that checks and maintenance have been carried out.
	.3	Tag and immediately remove from site items found faulty or defective.
1.17 HAZARDOUS PRODUCTS	.1	Comply with requirements of Workplace Hazardous Materials Information System (WHMIS).
	.2	Keep MSDS data sheets for all products delivered to site. Post on site. Submit copy to Departmental Representative upon receipt.
1.18 POWDER ACTUATED DEVICES	.1	Use powder actuated fastening devices only after receipt of written permission from Departmental Representative.

1.19 CONFINED SPACES

.1 Carry out work in confined spaces in compliance with:
.1 Provincial Occupational Safety and Health Regulations and;
.2 Canada Occupational Safety and Health Regulations (COSH) made under the Canada Labour Code - Part II.

.2 Conduct hazard assessment and address in Safety Plan before entering confined space.

.3 Provide and maintain equipment and PPE as required for the safety and emergency evacuation of persons entering confined spaces.

.4 Provide training to persons who will be entering and to those persons who will be assisting in the confined space entry process. Training to be specialized instructions beyond (basic confined space entry information) as required to suit type and conditions of confined space.

.5 Safety for Inspectors:
.1 Upon request, provide PPE and training to Departmental Representative and to other authorized persons, for the purpose of entering confined space to conduct inspections.
.2 Be responsible for the efficacy of the equipment and safety of such persons during their entry and occupancy in the confined space.

1.20 POSTING OF DOCUMENTS

.1 Post on site safety documentation as stipulated by Authorities having jurisdiction and as specified herein. Place in a common visible location.

1.21 SITE RECORDS

.1 Maintain on site a copy of all health and safety documentation and reports specified to be produced as part of the work and received from authorities having jurisdiction.

.2 Upon request, make available to Departmental Representative and to other authorized safety representative for review. Provide copy when directed by Departmental Representative.

END OF SECTION

1. Fires

.1 Fires and burning of rubbish on site shall not be permitted.

2. Disposal of Wastes

.1 Do not bury rubbish and waste materials on site.

.2 Do not dispose of waste or volatile materials, such as mineral spirits, oil, paint thinner or herbicides into waterways, storm or sanitary sewers or onto the ground.

.3 The Contractor shall be fully responsible for safe disposal off the site in an environmentally acceptable manner and in accordance with all applicable regulations.

3. Drainage

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

4. Pollution Control

.1 Maintain temporary erosion and pollution control features installed under this contract.

.2 Control emissions from equipment to local authorities emission requirements.

.3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

.4 Clean up and remove all blown, excavated or imported material, material packaging, general equipment maintenance containers, general working debris, etc., to the designated dump site from the site daily.

END OF SECTION

1. General

.1 Provide construction digital photographs in accordance with procedures and submission requirements specified in this Section.

2. Construction

.1 Frequency as follows:
- .1 Preconstruction photos to be taken prior to starting any work.
- .2 Progress photos with monthly progress claim.
- .3 Final photos showing the completed work. These shall be taken in favourable lighting and weather conditions and shall be free of any ongoing construction activities, equipment or materials.

.2 Each submission of photos shall consist of ten photographs. Vantage points for each submission of photos shall be reviewed and approved by the Departmental Representative prior to each submission.

3. Digital Files

.1 Submit all original digital files on DVD with each submission. Each file to be named to include descriptive information, location and date taken. Resolution to be no less than the largest, most detailed picture available from a 7.0 megapixel digital camera.

END OF SECTION

1. Related Requirements
Specified Elsewhere

.1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by the Departmental Representative are specified under various sections.

2. Appointment and Payment

.1 The Contractor shall be fully responsible to pay for services of testing laboratory under the testing allowance (Pay Item No. 21 in Unit Price Table) except for the following which shall be the Contractor's responsibility.

.1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.

.2 Inspection and testing performed exclusively for Contractor's convenience.

.3 Mill tests, certificates of compliance, mix designs, etc.

.4 Tests specified to be carried out by Contractor.

.5 Material testing includes, but is not limited to grout, mortar, concrete (strength, slump, air-content), backfill compaction, etc.

.2 Where tests or inspections by designated testing laboratory reveal work not in accordance with contract requirements, Contractor shall pay costs for additional tests or inspection as the Departmental Representative may require to verify acceptability of corrected work.

.3 The Contractor will be reimbursed for the actual cost of testing (supported by invoices). The Departmental Representative will select the testing company.

3. Contractor's Responsibilities

.1 Furnish labour and facilities to:

.1 Provide access to work to be inspected and tested.
.2 Facilitate inspection and tests.
.3 Make good work disturbed by inspection and test.

.2 Notify the Departmental Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

.3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.4 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by the Departmental Representative.

.5 Arrange to have copies of all test reports sent directly to the Project Manager by testing company.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-94, Stipulated Price Contract.

1.2 INSPECTION

.1 Refer to CCDC 2, GC 2.3.

.2 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.3 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.

.4 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.5 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.3 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the Contractor.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

1.4 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.5 PROCEDURES

.1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

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

1.6 REJECTED WORK

.1 Refer to CCDC, GC 2.4.

.2 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.3 Make good other Contractor's work damaged by such removals or replacements promptly.

.4 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Independent Inspection Agency.

1.7 REPORTS

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

.2 Provide copies to subcontractor of work being inspected or tested.

1.8 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

1.9 MOCK-UPS

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.

.2 Construct in locations acceptable to Departmental Representative.

.3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.

.6 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative.

.7 Mock-ups may remain as part of Work.

.8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.10 MILL TESTS

.1 Submit mill test certificates as requested.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1. Access

.1 Provide and maintain adequate access to project site.

.2 Build and maintain temporary roads when approved or directed.

.3 Use existing roads/paths for access to project site, storage areas or work areas, maintain such roads/paths for duration of contract and make good damage resulting from Contractor's use of roads/paths to Owner's satisfaction.

.4 Contractor shall accommodate and permit authorized Parks Canada Agency (PCA) employees and the Departmental Representative on the site.

2. Contractor's Site Office

.1 Provide office heated to 20^{o}C, lighted 750 Lx and ventilated, of sufficient size to accommodate site meetings and furnished with large drawing laydown table and telephone (cellular if required).

3. Storage Sheds

.1 Provide adequate weathertight sheds with raised floors, for storage of materials, tools and equipment which are subject to damage by weather.

4. Sanitary Facilities

.1 The Contractor shall provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

5. Water Supply

.1 Arrange, pay for and maintain temporary potable water/mix water supply in accordance with governing regulations and ordinances.

6. Power

.1 Arrange, pay for and maintain temporary electrical power supply as required in accordance with governing regulations and ordinances.

7. Signs and Notices

.1 Signs and notices for safety or instruction to be in English and French languages, or commonly understood graphic symbols.

.2 Supply all labour, materials and equipment as required to install the furnished signs.

8. Scaffolding

.1 Construct and maintain scaffolding in rigid, secure and safe manner.

.2 Erect scaffolding independent of walls. Remove promptly when no longer required. Refer to Section 01 35 28 - Safety Requirements.

.3 Provide fully enclosed scaffolding for work during cold temperatures (below 5 deg C).

.4 In conformance with Province of Nova Scotia regulations

9. Removal of Temporary Facilities

.1 Remove temporary facilities from site when directed by the Departmental Representative.

.2 If project is closed down at end of construction season keep temporary facilities operational until close down or removal is approved by the Departmental Representative.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.

.2 Canadian Standards Association (CSA International)

.1 CSA-O121-M1978(R2003), Douglas Fir Plywood.

.3 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as Of: May 14, 2004.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.3 HOARDING

.1 Erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA O121.

.2 Apply plywood panels vertically flush and butt jointed.

.3 Provide one lockable truck entrance gate and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.

.4 Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.

.5 Paint public side of site enclosure in selected colours with one coat primer to CAN/CGSB 1.189 and one coat exterior paint to CGSB 1.59. Maintain public side of enclosure in clean condition.

.6 Erect temporary site enclosure using new 1.2 m high snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 m on centre. Provide one lockable truck gate. Maintain fence in good repair.

.7 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.4 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.

.2 Provide as required by governing authorities.

1.5 WEATHER ENCLOSURES

.1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

.3 Design enclosures to withstand wind pressure and snow loading.

1.6 DUST TIGHT SCREENS

.1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

.2 Maintain and relocate protection until such work is complete.

1.7 ACCESS TO SITE

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

1.8 PUBLIC TRAFFIC FLOW

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

1.9 FIRE ROUTES

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

1.10 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.11 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.

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

1.12 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1. General

.1 Use new material and equipment unless otherwise specified.

.2 Within 7 days of written request by the Project Manager, submit following information for materials and equipment proposed for supply:
- .1 name and address of manufacturer,
- .2 trade name, model and catalogue number,
- .3 performance, descriptive and test data,
- .4 manufacturer's installation or application instructions,
- .5 evidence of arrangements to procure.

.3 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.

.4 Use products of one manufacturer for material and equipment of same type or classification unless otherwise specified.

2. Manufacturer's Instructions

.1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.

.2 Notify the Agency in writing of any conflict between these specifications and manufacturer's instructions. The Departmental Representative will designate which document is to be followed.

3. Delivery and Storage

.1 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact.

.2 Prevent damage, adulteration and soiling of material and equipment during delivery, handling and storage. Immediately remove rejected material and equipment from site.

.3 Store material and equipment in accordance with supplier's instructions.

.4 Touch-up damaged factory finished surfaces to the Owners' satisfaction. Use primer or enamel to match original. Do not paint over name plates.

4. Substitution

.1 Proposals for substitution may be made in accordance with Instructions To Tenders, Item 7, standard PWGSC documents. Such requests must include statements of respective costs of items originally specified and proposed substitutions.

.2 Proposals will be considered by the Agency if:
- .1 Products selected by tenderer from those specified, are not available, or
- .2 Delivery date of products selected from those specified would unduly delay completion of Contract, or
- .3 Alternative products to those specified, which are brought to attention of and considered by the Agency as equivalent to those specified and will result in credit to Contract amount.

.3 Should proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on project. Pay for design or drawing changes required as result of substitution.

.4 Amounts of all credits arising from approval of substitutions will be determined by the Departmental Representative and Contract price will be reduced accordingly. No substitutions will be permitted without prior written approval of the Project Manager.

5. Construction Equipment and Plant

.1 On request, prove to the satisfaction of the Project Manager that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.

.2 Maintain construction equipment and plant in good operating order.

END OF SECTION

1. Record Drawings

.1 The Departmental Representative will provide two sets of white prints for record drawing purposes.

.2 Maintain project record drawings and record accurately significant deviations from Contract documents caused by site conditions and changes ordered by the Departmental Representative.

.3 Mark changes in red coloured ink.

.4 Changes shall be marked on a daily basis.

.5 The marked up set of drawings shall be made available for the Departmental Representative's review. The Contractor shall make the drawings available when requested.

.6 Record following information:
- .1 Field changes of dimensions and details.
- .2 Changes made by Change Order or Field Order.
- .3 As found conditions.

.7 At completion of project and prior to final inspection, neatly transfer notations to second set and submit both sets to the Departmental Representative.

END OF SECTION

1. General

.1 Conduct cleaning and disposal operations to comply with local ordinances and antipollution laws.

.2 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.3 Provide adequate ventilation during use of volatile or noxious substances.

2. Materials

.1 Use only cleaning materials recommended by manufacturer for surface to be cleaned, and as recommended by cleaning material manufacturer.

3. Cleaning During Construction

.1 Provide on site, dump containers for collection of waste materials, and debris.

.2 Dispose of waste materials, and debris legally off site. No on site disposal is permitted.

.3 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet surfaces nor contaminate building systems or be hazardous to the public visiting the site.

4. Final Cleaning

.1 Broom clean stone, concrete, top of walls and other hard surfaces.

.2 Rake clean other surfaces of the grounds, ramparts, etc.

.3 Dispose of all debris, legally, off the site.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:

.1 Convene meeting one week prior to contract completion with Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:

.1 Verify Project requirements.

.2 Review warranty requirements and installation instructions.

.2 Departmental Representative to establish communication procedures for:

.1 Notifying construction warranty defects.

.2 Determine priorities for type of defects.

.3 Determine reasonable response time.

.3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.

.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of operating and maintenance manuals in English.

.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source and quality of products supplied.

1.3 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings.

.1 Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab.

.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide 1:1 scaled CAD files in dwg format on CD.

1.4 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;

.1 Date of submission; names.

.2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.

.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data.

.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.5 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, at site for Departmental Representative one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

.5 Reviewed shop drawings, product data, and samples.

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction.

.1 Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.

.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.

.1 Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to established datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

.6 Other Documents: maintain inspection certifications and field test records, required by individual specifications sections.

.7 Provide digital photos, if requested, for site records.

1.7 FINAL SURVEY

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

1.8 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.

.1 Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: as specified in individual specifications sections.

1.9 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Submit warranty management plan to Departmental Representative approval.

.3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.

.6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

.4 Verify that documents are in proper form, contain full information, and are notarized.

.5 Co-execute submittals when required.

.6 Retain warranties and bonds until time specified for submittal.

.7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.8 Respond in timely manner to oral or written notification of required construction warranty repair work.

.9 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA O86, Engineering Design in Wood.

.3 CSA O121, Douglas Fir Plywood.

.4 CSA O141, Soft Wood Lumber.

.5 CSA O153, Poplar Plywood.

.6 CSA S269.3, Concrete Formwork.

1.2 SUBMITTALS

.1 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA S269.3, for formwork drawings.

.2 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.

.3 Indicate sequence of erection and removal of formwork/falsework.

.4 Each shop drawing submission shall bear stamp and signature of qualified professional engineer licensed in Province of Newfoundland and Labrador, Canada.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA O121, CSA 0141, CSA 0151 and CSA 0153.

.2 For concrete with special architectural features, use formwork materials to CSA A23.1/A23.2.

.2 Form ties:

.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.

.2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

.3 Form liner:

.1 Plywood: medium density overlay Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151, T and G thickness as indicated.

.4 Form release agent: chemically active release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps, non-toxic, biodegradable. To have no adverse effect on paint adhesives, waterproofing or other treatments specified for application to concrete. No mineral oil non-drying ingredients.

.5 Falsework materials: to CSA S269.1.

.6 Sealant: to Section 07 92 00 - Joint Sealing.

Part 3 EXECUTION

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Fabricate and erect falsework in accordance with CSA S269.1.

.3 Do not place shores and mud sills on frozen ground.

.4 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.5 Fabricate and erect formwork in accordance with CAN/CSA S269.3, to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1/A23.2.

.6 Align form joints and make watertight. Keep form joints to minimum.

.7 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.

.8 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

.9 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.10 Construct forms for architectural concrete, and place ties as indicated and/or as directed. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Ensure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.12 Coat formwork with form release agent before reinforcement, anchors or other accessories are placed, unless soaking with water during hot weather is acceptable. Do not coat plywood forms pre-coated with a chemical release agent.

.13 Prior to concrete pour, review and correct, as necessary the tolerances and alignment of the formwork and embedded or partially embedded parts.

.14 Clean formwork in accordance with CSA A23.1/A23.2, before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Leave formwork in place until the concrete has achieved 70% of the 28-day compressive strength. Additional cylinders to be cast for the purpose of testing to ensure 70% of the compressive strength has been achieved.

.2 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.3 Be responsible for the safety of the structure, both before and after removal of the forms, until concrete has reached its specified 28-day strength.

.4 Re-use formwork and falsework subject to requirements of CSA A23.1A23.2.

.5 Check concrete formwork for alignment and levels prior to the placing of concrete in these forms. Check formwork for alignment and levels during and immediately after each concrete pour.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Concrete Institute (ACI)

.1 ACI SP-66: ACI Detailing Manual, 2004.

.2 ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A185/A185M, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.2 ASTM A123/A123M-13, Standard Specification for Zinc (Hot-Dipped Galvanized coatings on Iron and Steel Products.

.3 Canadian Standards Association (CSA)

.1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A23.3-14, Design of Concrete Structures.

.3 CAN/CSA G30.18-09 (R2014), Carbon-Steel Bars for Concrete Reinforcement

.4 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel /Structural Quality Steel.

.5 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel

.1 Reinforcing steel - Manual of Standard Practice, 4th Canadian Edition by the Reinforcing Steel Institute of Canada.

1.2 SUBMITTALS

.1 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada . ACI 315, Details and Detailing of Concrete Reinforcement.

.2 Detail lap lengths and bar development lengths to CSA A23.3, unless otherwise indicated. Provide Class B tension lap splice unless indicated otherwise.

.3 Reinforcement drawings to indicate the location of all concrete cold joints.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Engineering Consultant.

.2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA G30.18, unless indicated otherwise.

.3 Cold-drawn annealed steel wire ties: to ASTM A497/A497M.

.4 Welded steel wire fabric: to ASTM A185/A185M. Provide in flat sheets only.

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

.6 Mechanical splices: subject to approval of Engineering Consultant.

.7 Plain round bars: to CSA G40.20/G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA A23.1, A23.2, ACI SP-66 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.2 Obtain Engineering Consultant's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Engineering Consultant, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Engineering Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to commencing reinforcing work.

.2 Upon request inform Engineering Consultant of proposed source of material to be supplied.

Part 3 EXECUTION

3.1 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Engineering Consultant.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

.1 Examine formwork to confirm that it has been completed and adequately braced in place before starting formwork placing.

.2 Clean all reinforcing of mill scale, oil, grease or other deleterious material before and after placement.

.3 Secure reinforcing steel rigidly in position with annealed wire or use approved clips to intersections supported on chairs.

.4 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA A23.1/A23.2. Ensure reinforcing position and cover is maintained during pour.

.5 Prior to placing concrete, obtain Engineering Consultant's approval of reinforcing material and placement.

.6 Ensure cover to reinforcement is maintained during concrete pour.

3.3 SHOP DRAWINGS

.1 Reinforcing shop drawings must indicate the location of all concrete pour joints.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM)

- .1 ASTM C171, Standard Specification for Sheet Materials for Curing Concrete
- .2 ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.
- .3 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
- .4 ASTM C827/C827M, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
- .5 ASTM D1751, Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .6 ASTM E1745, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

.2 Canadian Standards Association (CSA)

- .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CAN/CSA A23.2, Methods of Test for Concrete.
- .3 CSA A23.3-14, Design of Concrete Structures.
- .4 CAN3-A266.4, Guidelines for the Use of Admixtures in concrete.
- .5 CAN/CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .6 CSA A3001, Cementitious Materials for Use in Concrete.

1.2 ACRONYMS AND TYPES

.1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).

- .1 Type GU or GUb - General use cement.

1.3 SUBMITTALS

.1 At least 4 weeks prior to commencing work, inform Departmental Representative of proposed source of aggregates and provide access for sampling.

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

.3 Certificates:

.1 Minimum 4 weeks prior to starting concrete work submit to Departmental Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:

- .1 Portland cement.
- .2 Blended hydraulic cement.
- .3 Supplementary cementing materials.
- .4 Grout.
- .5 Mix Design – c/w Professional Engineer's Stamp
  - .1 Cement type
  - .2 Minimum Compressive Strength at 28 days
  - .3 Class of exposure
  - .4 Nominal size of coarse aggregate
  - .5 Air content
  - .6 Slump at time and point of discharge
- .6 Admixtures.
- .7 Aggregates.
- .8 Water.
- .9 Waterstops.
- .10 Waterstop joints.
- .11 Joint filler.

.2 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA A23.1/A23.2.

.3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA A23.1/A23.2.

1.4 SOURCE QUALITY CONTROL

.1 Have all concrete produced and delivered by a ready-mix plant that is a member of the Atlantic Provinces Ready Mixed Concrete Association (APRMCA) and holds a current "Certificate of Ready Mixed Concrete Production Facilities" issued by the Association. Submit a copy of this certificate to the Engineering Consultant for approval.

1.5 QUALITY ASSURANCE

.1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures in accordance with Section 01 45 00 - Quality Control for Departmental Representative's approval for following items:

- .1 Falsework erection.
- .2 Hot weather concrete.
- .3 Cold weather concrete.
- .4 Curing.

.5 Finishes.

.6 Formwork removal.

.7 Joints.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.

.1 Modifications to maximum time limit must be agreed by Departmental Representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Departmental Representative.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

.3 Waste Management and Disposal:

.1 Divert unused concrete materials from landfill to local facility approved by Departmental Representative.

.2 Provide an appropriate area on the job site where concrete trucks can be safely washed.

.3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by the Departmental Representative.

.4 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.5 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial and National regulations.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Portland cement: to CSA A3001, Type GU.

.2 Water: to CSA A23.1.

.3 Aggregates: to CSA A23.1.

.4 Coarse aggregates to be normal density to CSA A23.1/A23.2.

.5 Admixtures:

.1 Air entraining admixture: to ASTM C260.

.2 Chemical admixtures: to ASTM C494, Concrete Mix Design Engineer to approve accelerating or set retarding admixtures during cold and hot weather placing.

.6 Non premixed dry pack grout: composition of non-metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 50 MPa at 28 days.

.7 Ribbed waterstops: extruded PVC of sizes indicated shop welded corner and intersecting pieces.

.1 Tensile strength: to ASTM D412, method A, Die "C".

.2 Elongation: to ASTM D412, method A, Die "C", minimum 275%.

.3 Tear resistance: to ASTM D624, method A, Die "B".

.8 Premoulded joint fillers:

.1 Bituminous impregnated fiber board: to ASTM D1751.

.2 Closed-cell polyethylene joint filler/isolation board c/w peel-off strip.

.9 Polyethylene film: minimum mm thickness to ASTM C171.

.10 Bonding adhesive: as approved by Departmental Representative.

2.2 MIXES

.1 Proportion normal density concrete in accordance with CSA A23.1/A23.2, Alternative 1 to give following quality and yield for all concrete.

.1 Use: Slabs

.1 Exposure Classification: F-2

.2 Cement: Type Gu

.3 Compressive Strength: minimum 30 MPa at 28 days

.4 Air Content: 4-7%

.5 Slump at Discharge: 75+/-25 mm without the use of superplasticizer, 150+/-25 mm with the use of superplasticizer

.6 Curing: Type 1, minimum 10 Degree C for minimum 3 days

.7 Maximum Aggregate Size: 20 mm

.2 Chemical admixtures: admixtures in accordance with ASTM C494.

.3 Mix design to be based on trial mixes designed and tested by a qualified Professional Engineer licensed to practice in the Province of Nova Scotia. Mix design to be submitted and reviewed by Engineering Consultant prior to usage.

Part 3 EXECUTION

3.1 PREPARATION

.1 Obtain Engineering Consultant's approval before placing concrete. Provide 48 hours notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.4 Pumping of concrete is permitted only after approval of equipment and mix.

.5 Ensure reinforcement and inserts are not disturbed during concrete placement.

.6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 When required, provide a structurally adequate weatherproof enclosure. Confirm enclosure ventilation requirements are suitable for worker health and safety due to carbon monoxide emissions from fuel based heating sources and potential adverse effects of carbon dioxide exposure to the surface of fresh concrete.

.8 Monitor concrete temperature and moisture evaporation rates and provide appropriate hot weather protection as defined in CSA A23.1. Maintain records of all measurements during hot weather periods. Implement approved procedures as specified by the concrete mix design engineer for the dissipation of the heat of hydration from the curing of the monolithic concrete mass in order to avoid the surface cracking or other deterious effects.

.9 Protect previous Work from staining.

.10 Clean and remove stains prior to application of concrete finishes.

.11 Maintain accurate records of placed concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.12 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 CONSTRUCTION

.1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.

.2 Anchor bolts.

.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

.2 With approval of Departmental Representative, grout anchor bolts in preformed holes or holes drilled after concrete has set.

.3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

.4 Set bolts and fill holes with shrinkage compensating grout.

.5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.

.3 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.

.4 Finishing.

.1 Finish concrete in accordance with CSA A23.1/A23.2.

.2 Use procedures acceptable to Departmental Representative or those noted in CSA A23.1/A23.2, to remove excess bleed water. Ensure surface is not damaged.

.3 Wet cure using polyethylene sheets placed over sufficiently hardened concrete to prevent damage. Overlap adjacent edges 150 mm and tightly seal with sand on wood planks. Weigh sheets down to maintain close contact with concrete during the entire curing period.

.4 Where burlap is used for moist curing, place two pre-wetted layers on concrete surface and keep continuously wet during curing period.

.5 Provide swirl-trowelled finish for exterior walks, ramps, pads.

.6 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.

.7 Use curing compounds compatible with applied finish on concrete surfaces. Curing compounds are not permitted for interior slabs on grade.

.8 Cut back form ties and plug openings in a manner acceptable to the Engineering Consultant.

.9 Repair holes and surface defects with an approved concrete repair mortar system and to the satisfaction of the Departmental Representative.

.10 Confirm all exposed concrete has been neatly formed, 45 degree bevelled, 25mm (03 10 00 - Concrete Forming and Accessories).

.5 Waterstops.

.1 Install waterstops to provide continuous water seal.

.2 Do not distort or pierce waterstop in such a way as to hamper performance.

.3 Do not displace reinforcement when installing waterstops.

.4 Use equipment to manufacturer's requirements to field splice waterstops.

.5 Tie waterstops rigidly in place.

.6 Use only straight heat sealed butt joints in field.

.7 Use factory welded corners and intersections unless otherwise approved by Engineering Consultant.

.6 Joint Fillers and Sealants.

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.

.2 When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.3 Locate and form, isolation, construction and expansion joints as indicated. Install joint filler.

.4 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

.7 Dampproof membrane.

.1 Install dampproof membrane under concrete slabs-on-grade inside building.

.2 Lap dampproof membrane minimum 150 mm at joints and seal.

.3 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.

3.3 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a third-party Testing Laboratory in accordance with CSA A23.1/A23.2, and Section 01 45 00 - Quality Control.

.2 Contractor will pay for costs of tests as specified in Section 01 41 00 - Payment Procedures for Testing Laboratory Services. Costs of retesting due to deficient work will be paid for by contractor, by credit change order.

.3 Concrete testing based on representative compressive strength of concrete cylinders cured at 7, 14, 28 and 56 days. If contractor wants to strip formwork early, they must pay for additional cylinders to be cast and testing for same, to ensure the required strength has been achieved.

.4 Testing Laboratory will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.5 Non-destructive Methods for Testing Concrete shall be in accordance with CSA A23.1/A23.2.

.6 Provide Certificate of Field Quality Inspection and Testing to Departmental Representative for inclusion in Final Submittals.

.7 Inspection or testing will not augment or replace Contractor quality control nor relieve the Contractor of his contractual responsibility.

END OF SECTION

PART 1 - GENERAL

1.1 Scope

.1 The work of this section includes the furnishing of all labour, tools, equipment and materials required for the removal of existing stone veneer and back-up wall etc. and all extant recording as required for the correct reconstruction of the various masonry elements.

1.2 Precautions

.1 Take precautions necessary to protect stones and facilitate their resetting.

.2 Protect adjacent existing features. Any damage shall be corrected at the Contractor's expense.

1.3 Extant Recording

.1 The Contractor shall be responsible for extant recording all stone masonry veneer areas, capstones and gutterstones to be removed and reset.

.2 Prior to any removals the Contractor shall carry out the following work:

.1 Survey, measure and record the existing dimensions (lengths, heights, elevations, etc.) of the masonry elements at intervals close enough to establish control lines to be used in the reconstruction. The contractor shall submit the proposed control for review, obtain approval, and establish the control in the field prior to starting removals.

.2 Photograph each area of wall to be removed at close range so that individual stones can be easily identified. Establish location grid, photo targets, labels or similar so that a systematic easily referenced photographic record of the walls (before construction) is obtained. Submit digital copies of all photos, ID numbers and location sketches as required.

.3 Produce sketches of each area and identify each stone with a number. Entire removal to be labelled with a logical numbering/lettering sequence.

.4 Establish vertical control elevations (i.e. top of a particular course of stone) to allow proper reconstruction. Maximum spacing 2.0 m.

.3 Mark the following:
- .1 Stones and other elements or components to show identity and position as they are removed.
- .2 Mark on face which will not be visible in the completed work.
- .3 Use paint or other suitable material to ensure markings will remain legible for reconstruction

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 General

.1 Carry out removal work in sections of no more than 10 to 15 m at a time. Refer to Section 31 03 31 for bracing requirements. Work can be carried out at more than one location at a time provided that they are separated by at least 10m.

.2 In wall sections indicated for removal and reconstruction it is the contractor's responsibility to ensure the stability of the remaining wall sections at all times.

.3 For sections of bulged Escarp wall it is intended that the top several courses and the capstone will be adequately shored by the contractor to remain in place at all times (i.e. no rampart removals are to be carried out). The upper levels of shoring should include provisions to guard against the potential of sod/soil from the ramparts falling into the work area.

4. As removal work in the bulged areas proceeds the overall stability of the wall in that area is decreased. The contractor's work methods shall limit the extent of removals and/or introduce shoring methods to carry out the required work in a safe manner.

.3 Total depth of removals shall not exceed 600 mm from the original face without specific shoring methods submitted by the contractor and accepted by the Departmental Representative.

.4 In sections requiring arch repairs, the Contractor shall complete the arch repair work prior to undertaking any veneer removals.

.5 Record and report to the Departmental Representative site conditions not described in contract.

3.2 Temporary Marking

.1 Mark stone on face before removal using:
- .1 Ball-point pen on diachylon, glued to stone.
- .2 Waxless chalk directly on stone.
- .3 Other as approved.

.2 Mark stones on face which will be concealed in the finished work.

.3 Use numbering, marking, and positioning system developed by Contractor and approved by the Departmental Representative.

.4 Ensure that temporary marking will be resistant to weather, handling, and cleaning until final marking of stones.

3.3 Support

.1 Construct shoring, cradling, and other temporary framing work needed to support structure, or parts of it, adjacent structures and ramparts during removal operations and in anticipation of resetting, if structure is not to be completely dismantled.

.2 Provide bracing for the adjacent wall sections to remain capable of resisting all loads as determined by the contractor's methods and procedures.

.3 Do bracing and shoring in accordance with Section 31 03 31.

3.4 Loosening Stones/Brick

.1 Loosen stones using approved methods which will cause no damage either to adjacent areas to remain or to other architectural elements.

.2 Do not use circular millstone or saw, pneumatic chisel or hammer, steel tools exerting concentrated pressure on edge of stone.

.3 When temperature is below freezing point, do not attempt to loosen wet masonry.

3.5 Handling

.1 Place detached stones on to wood surfaces during handling. Prevent contact with metal.

.2 When stones are lowered to ground, place them directly on wooden platform that will be used for transport or storage.

.3 Transport and keep stones on wooden platforms.

.4 Ensure that sharp edges of masonry units do not come into contact with any hard object.

.5 Do not place directly on ground or vegetation.

.6 In freezing weather, keep dry so that they are not soaked with water.

.7 Protect wet stones/brick from freezing.

.8 Cracked or damaged stones shall be repaired with epoxy and reinforcing as applicable.

3.6 Temporary Storage

.1 Ensure that stones are accessible and easily removed and placed so as to be located quickly when required.

3.7 Cleaning

.1 Do cleaning operations at above freezing temperature. After cleaning, protect wet stones/brick against freezing until dry.

.2 Unless otherwise permitted by the Departmental Representative clean stones/brick by wet scrubbing with vegetable fibre brush. Do not use high pressure water jet.

.3 Removal of excess mortar may be done with pneumatic chisel, provided faces and edges are not damaged.

.4 Drying process of stones may be accelerated by fans or unit heaters.

3.8 Final Marking

.1 Do final marking after cleaning, on surface that supports good adhesion and legibility and will not be visible after resetting.

.2 Do marking in colour and dimensions to be legible from distance of 2 m.

.3 Ensure that product used will not affect mortar to stone adhesion when resetting.

.4 Ensure that product used for marking will survive storage until resetting of stone.

END OF SECTION

PART 1 - GENERAL

1.1 Summary

.1 This Section describes the general standards, requirements, and procedures for the required masonry work including:
- .1 Reconstruction of veneer and backup.
- .2 Repointing.
- .3 Grouting.
- .4 Parging.
- .5 Curing.

1.2 References

.1 CSA A179-Latest: Mortar and Grout for Unit Masonry.

.2 CAN3-A371-Latest: Masonry Construction for Buildings.

.3 CAN3-A370-Latest: Connectors for Masonry.

1.3 Job Mock-up

.1 Construct mock-up showing finished pointing as requested: 1 m².

.2 Other mock-ups as requested.

.3 Allow 24 hours for inspection of finished mock-up by Departmental Representative. Do not proceed with work until approval has been obtained.

.4 Mock-ups shall be repeated until results are obtained to the satisfaction of the Departmental Representative.

.5 Accepted samples and mock-ups shall form the minimum standard for products, method and quality of work to be performed throughout the project, and thereby be considered acceptable.

1.4 Qualifications

.1 Provide competent trade foreperson, well skilled and experienced in the specialized type of work required, for continuous supervision.

.2 Provide specialized skilled and competent tradespeople who shall have had considerable demonstrated experience in this type of work.

.3 Submit, if requested, a detailed list of projects and experience relating to any of the above workers.

1.5 Product Delivery, Storage and Handling

.1 Deliver materials to job site in dry condition.

.2 Store all materials on pallets held off the ground by means of planks or timber skids and protect with waterproof non-staining covers.

.3 Maintain all materials in dry condition until use, except where specified otherwise.

1.6 Environmental Requirements

.1 Cold Weather Requirements:

.1 No masonry work shall be carried out when air temperatures fall below 10°C unless the following provisions are made.

.2 When air temperatures fall below 10°C provide a weather-tight, heated enclosure in which to carry out work, store all materials and mix mortars, and, in which the air temperature is maintained above 10°C. at all times.

.3 Maintain these conditions for a minimum 3 weeks following completion of any masonry work.

.4 Do not remove heat or enclosure where masonry is not thoroughly dried out. Request and obtain permission of Departmental Representative before removing heat or enclosure.

.5 Maintain minimum/maximum thermometers and relative humidity gauges on site and in all enclosures and maintain a daily record of temperature and humidity.

.2 Hot Weather Requirements:

.1 When wall surfaces or ambient temperatures reach 25°C protect new work from rapid drying by providing burlap and plastic protection kept misted as necessary to control drying and shrinkage.

.3 Transportation, Use and Disposal of Chemical Materials:

.1 Comply with the requirements of the following Federal and all Provincial Legislation related to the transportation, use and disposal of all chemical type of materials and all revisions and other relevant legislation as applicable to this work:

.1 Federal Transportation of Dangerous Goods Act.

.4 Removal of Existing Pointing Mortar:

.1 Attention is drawn to the fact that significant quantities of silica exist in the existing pointing mortar, classifying it as a hazardous material.

.2 The Contractor shall be responsible for all testing of the existing mortar and to determine the requirements for its containment, collection, safe removal and the health and safety of the building occupants, site operatives, visitors and other trades.

.3 The Contractor shall comply with current and proposed legislation to provide protective clothing, breathing apparatus, and all other necessary measures. The Contractor shall ensure all operatives are fully informed of the hazards, and trained in required procedures, prior to commencing work.

.4 The Contractor shall ensure that their operatives wear and maintain this equipment and follow all necessary procedures at all times when involved with such hazards.

.5 The Contractor shall be responsible for the containment of all existing mortar waste on the scaffold lift where removed and shall be responsible for its removal from each scaffold lift and the ground level on a minimum daily basis.

1.7 Protection

.1 Keep masonry dry using waterproof, non-staining coverings that fully protect new work from wind-driven rain, until masonry work is fully complete and protected by flashings or other permanent construction.

.2 All completed or existing work shall be protected at all times from damage, marking and mortar droppings. Maintain non-staining coverings until completion of work.

.3 Provide temporary bracing of masonry work as required during and after erection until permanent lateral support is in place.

1.8 Access

.1 Access to all surfaces to be provided by scaffolding to enable proper work supervision and inspection to be carried out.

PART 2 – PRODUCTS

2.1 Materials

.1 Materials are specified in Sections 04 05 12 and 04 21 13.

PART 3 – EXECUTION

3.1 Preparation

.1 Seal and protect all openings and adjacent areas to prevent damage and the spread of construction dust, water or other materials onto adjacent areas.

.2 Note that the site will continue to operate and that artefacts, furnishings and museum exhibits are intolerant of dust and moisture. Take all necessary measures to prevent contamination of all such areas on site.

3.2 Workmanship

.1 Do masonry work in accordance with CAN3-A371 except where specified otherwise.

.2 Build masonry plumb, level and true to line, with vertical joints in alignment.

.3 Lay out coursing and bond to minimize cutting of masonry units on face.

.4 Mortar colour to match existing original mortar colour as identified by Departmental Representative, and in accordance with other specification Sections.

3.3 Repointing

.1 Cutting-out of Joints:

.1 Cut out joints to make them free of deteriorated and loose mortar, dirt and other undesirable material.

.2 Do not cut out adjacent joints to remain as directed; leave them in their present state.

.3 All cutting-out is to be done with hand tools, which may include hacksaw blades, plugging chisels, quirks or other flat-bladed chisels or mini-grinders. Obtain written approval for use of any other equipment before commencing work. Take precautions not to cause damage to masonry units. Pneumatic chisels or hammers will not be considered.

.4 Clean joints to full height of joint and to min. depth of no less than 25 mm or to sound material up to a max. depth of 75 mm. Clean out voids and cavities encountered.

.5 Clean, by compressed air, surfaces of joints to remove dust and fine particles, without damaging texture of exposed joints.

.6 Flush open joints and voids; clean open joints and voids with low pressure water and if not free-draining blow clean with compressed air.

.7 If unsound material continues beyond a depth of 75 mm refer to grouting section.

.2 Repointing:

.1 Immediately before repointing joints, thoroughly dampen until suction is controlled and the surface stays wet. Leave no standing water.

.2 Completely fill joints with mortar, building up pointing in layers not exceeding 13 mm in depth. Allow the inner layers to set before subsequent layers of mortar are applied.

.3 Place mortar in the joints using slicks of an appropriate size to fit into the joint width. Pick mortar up on the slick and place it in the back of the joint; do not push mortar into the joint off a board.

.4 Bring the mortar flush to the face of the masonry units, removing all excess mortar from the face of the masonry before it sets and leaving a neat, even joint. Do not bring mortar forward to spread onto the face of any stone. Do not create feather edges.

.5 Finishing the joint: when the face of the mortar has taken an initial set, but not sooner or later, finish the face of the joint by tamping firmly with a stiff, bristle-type churn brush to compact the mortar and leave a fine, neat, open texture over the face of the

mortar. Do not sweep or drag the brush across the joint to leave horizontal marks. Note: the purpose of finishing joints in this way is to provide a good evaporating texture. Timing is critical, as brush tamping too soon produces too heavy a texture and disrupts the mortar; brushing too late has no effect on well-cured mortar. Stop pointing operations each day early enough to permit the mortar to reach its initial set for finishing.

.6 Remove excess mortar and mortar droppings from masonry face before they set.

3.4 Grouting

.1 The following outlines minimum requirements only and shall be adjusted, modified or added to by the Contractor as required to achieve the objectives of the grouting operation (i.e. completely solidify outer portion of the wall and rebond all veneer). Grouting is intended to be carried out only up to approximately 150-200 mm from the face of the wall. Deeper removals would undermine the veneer and require that it be removed and reset. Atmospheric grouting will be considered.

.1 All joints within the area to be grouted will be raked out to expose deteriorated mortar and sand, etc., behind surface pointing.

.2 Loose sand, deteriorated mortar will be removed from the bed, joints and from behind the stones by use of a high-pressure water blast directed into the joints and beds. This will be accomplished by means of a special nozzle which will allow the entire force of the blast to be directed into the joint. Wood wedges or similar shims will be used to maintain the existing joint spacing and to prevent shifting of the masonry units while the sand and deteriorated mortar is removed. Flushing shall be repeated until the water running from the joints is clear or as directed on site by the Departmental Representative.

.3 Remove and replace veneer units as required to access and flush out material from areas behind the veneer.

.4 When the entire area to be grouted has been adequately flushed and all sand/material removed

by the above method, the joints shall be face pointed and grout injection ports located in the joints at a maximum 1,000 horizontal and 500 vertical centres.

.5 A sketch elevation of the wall showing the location of the grout ports and a numbering scheme will be prepared and provided to the Departmental Representative. The Contractor shall prepare a table and keep track of the volume of injected grout at each port. The table shall include the port number, the volume of grout injected at each port, maximum pressure used at the port, and a column for comments. The table shall be completed by the Contractor and submitted after each day of grouting.

.6 Grouting of the wall will begin at the bottom using a single grout line with a cut-off valve and pressure gauge. The grout shall be injected into one port at a time and the record table filled out with the applicable values. Grouting shall proceed until grout exits from adjacent ports or an inlet pressure of 20 to 30 psi is reached.

.7 Following completion of the grouting, the grout ports shall be cut off behind the mortar (minimum 6 mm.) or removed from the wall and finish pointed.

.8 Units which have been removed to access sand and loose mortar behind adjacent stones shall be replaced in the wall and shimmed to provide a uniform joint spacing, face pointed and grouted as outlined above.

.9 Extreme care shall be used in drilling holes in the outer face of the wall. It is imperative that the hole be located exactly at the T-joint and that the corners of the existing stone units are not damaged.

3.5 Laying Stones

.1 The Contractor shall refer to the extant recordings for the wall section to be reset. Establish horizontal and vertical control in accordance with extant survey prior to resetting stones.

.2 All stones shall be thoroughly cleaned, on all sides before setting in their designated location on the wall face.

.3 All stones shall be carefully laid, closely fitted and accurately set to the required lines and levels. Each stone shall be placed exactly in its original location relative to those stones which surround it. Close and continuous reference to the extant recording photos and sketches is required in this procedure.

.4 Thickness of mortar joints shall match existing adjacent work as directed on site by the Departmental Representative.

.5 Stones shall be set in full mortar beds, except as otherwise specified, with all joints flush filled. All bed and vertical joints in wall shall be as required to maintain each stone in its original location and to match existing and surrounding joints. Support stones with stainless steel rods. After mortar has set remove rods and point.

.6 Incidental cutting, (such as shortening the depth of the stones), shall be carried out by skilled craftsmen.

.7 Stonework shall not be carried up more than two courses in advance of backfilling the void between the stone face wall and the back-up wall. The void shall be completely filled with carefully laid masonry units and mortar to the Departmental Representative's satisfaction.

.8 All stones shall be set on stainless steel rods, during placement. Rods shall not be removed until the mortar bed has sufficiently set.

.9 Install stainless steel anchors for selected veneer wall stones as shown on the drawings.

.10 Remove all mortar droppings from exposed surfaces of stone as work progresses. On completion of the work, clean all masonry surfaces and other work smeared or stained by masonry work to the satisfaction of the Departmental Representative. Provide adequate protection for other work during the cleaning operation.

.11 Point up all recesses formed by rods and other areas to provide a completed job.

.12 Wash all completed masonry surfaces the same day as they are completed.

3.6 Parging

.1 Remove all existing loose parging.

.2 Review the condition of the brick back-up with the Departmental Representative after all parging is removed.

.3 Do not proceed with new parging until condition of back-up is reviewed and accepted. Replace designated areas with new brick.

.4 Apply parging mortar (bond coat and topping) in neat manner to blend to surrounding parged areas. Review desired finish and obtain approval before starting work.

3.7 Curing of Masonry

.1 The curing of all masonry requires special attention. Freshly placed mortar is to be protected from premature drying and excessively hot or cold temperatures for the time necessary for hydration and proper hardening. It is to be protected from harmful effects of sunshine, wind, temperature, water and mechanical shock.

.2 Curing will continuously follow the masonry operation. Masonry is to be kept moist for three days and at a temperature at least 10 degrees C. Mortar shall be lightly misted for three days to maintain the mortar in a damp condition. To further aid curing the burlap should be kept moist throughout this period and covered with polyethylene sheet to retard its rapid drying in hot or windy conditions. Burlap and polyethylene sheet should be kept from touching the masonry but secured not more than 50mm from the face of the masonry.

.3 During the curing period the masonry is to be protected from damage by mechanical disturbances particularly load stresses, heavy shock and excessive vibration. All finished masonry surfaces are to be protected from damaged caused by construction equipment, materials or methods, inclement weather or running water. Self-supported structures are not to be loaded in such a way as to overstress the masonry.

.4 Contractor to propose suitable measures and obtain approval prior to proceeding.

3.8 Clean-up

.1 Wash newly completed masonry with soft fibre brushes and clean water as soon as possible to prevent mortar from staining finished surfaces, etc.

.2 On completion of the work under this section, all surplus materials, plant, tools, equipment and debris shall be removed and the site left in a clean and tidy condition, to the full satisfaction of the Departmental Representative.

3.9 Testing

.1 Testing will be carried out by Testing Laboratory designated by the Departmental Representative.

END OF SECTION

PART 1 – GENERAL

1.1 Summary

.1 This Section described the preparation and supply of mortar for all masonry work.

1.2 References

.1 CSA A179.M (R2014), Mortar and Group for Unit Masonry.

.2 CSA A82.56M (1976), Aggregates for Masonry Mortar.

.3 CAN/CSA-A5-M, Portland Cement.

.4 ASTM C207 (2011), Hydrated Lime for Masonry Purposes.

1.3 Design Performance Requirements

.1 The following pre-construction testing is required to ensure mortar/grout meets the performance criteria:

- .1 Mortar compressive strength: minimum 10 MPa, maximum 15 MPa at 28 days.
- .2 Grout compressive strength: minimum 6.0 MPa, maximum 10 MPa at 28 days.
- .3 Air content of plastic mixes: not less than 10%, nor more than 15%.
- .4 Vicat Cone penetration of mortar mix in plastic state: not less than 22 mm, nor more than 28 mm for pointing mortar.
- .5 Bulking analysis of proposed sand(s) used in mixes.

.2 Mix design & pre-construction testing to be at the Contractor's cost.

1.4 Testing Standards

.1 CSA A179-14 Mortar and Grout for Unit Masonry for cube strength.

.2 ASTM C780 Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry, for Vicat Cone test.

.3 Measurement of air content: use air meter made by Technical Innovations, Cleveland, Ohio, USA. Follow manufacturer's instructions.

1.5 Test Reports Following Commencement of Work

.1 Submit test reports on the following at the intervals indicated:

.1 Bulking analysis of sand following any new delivery of sand, following any change in environmental conditions, or when requested by the Departmental Representative.
.2 Air content of mortar mix at discretion of the Departmental Representative.
.3 Vicat cone penetration on every batch for the first three days and thereafter at the discretion of the Departmental Representative.

1.6 Quality Assurance

.1 The mixing of mortars shall only be done by mechanics having a minimum of 3 years experience in the preparation of cement-lime mortars.

PART 2 – PRODUCTS

2.1 Materials

.1 Water:
.1 Clean and free from contaminants.

.2 Aggregates:
.1 Sand: to CAN/CSA-A179., Aggregates for Masonry Mortar, sharp, screened and washed pit sand, free of any organic material. Grading and colour to approval of Departmental Representative as follows:
.2 Provide custom-blended sand conforming to the following sieve analysis for mortar parging and for mortar joints in excess of 10 mm in width.

Sieve Size	% By Weight Passing Each Sieve	% By Weight Retained on Each Sieve
No. 4 (4.75 mm)	100	0
No. 8	90	10
No. 16 (1.18 mm)	70	20
No. 30 (600 µm)	50	20
No. 50 (300 µm)	30	20
No. 100 (150 µm)	15	15
No. 200 (75 µm)	0	15

.3 Provide custom blended sand conforming to the following sieve analysis for joints less than 10 mm in width.

Sieve Size	% By Weight Passing Each Sieve	% By Weight Retained on Each Sieve
No. 4 (4.75 mm)	100	0
No. 8	100	0
No. 16 (1.18 mm)	80	20
No. 30 (600 µm)	55	25
No. 50 (300 µm)	30	25
No. 100 (150 µm)	15	15
No. 200 (75 µm)	0	15

.4 Where a standard sand falls outside the above analysis, blend and screen to meet the above requirements.

.5 Standard of acceptance for bedding and pointing mortars for brick and sandstone, subject to blending: Shubenacadie sand.

.6 Aggregate for repointing limestone Coat of Arms to match colour of aggregate in existing limestone pointing mortar.

.3 Lime:

.1 Hydrated Lime, Type SA, to ASTM C207-06, Type SA lime contains air entraining agent.

.4 Cement:

.1 Non-staining, white Portland Cement to CAN/CSA-A3000

.2 Masonry Cement may be used if approved by the Departmental Representative.

.5 Admixtures for Colour:

.1 Inorganic pigment, dry powder, mineral oxide type. Standard of acceptance: Elementis Pigments Inc., Toronto, ON.

2.2 Sources

.1 Use same manufacturer brands and suppliers for sources of mortar materials and entire project.

2.3 Equipment

.1 Mortars are to be prepared in a mechanical paddle mixer.

2.4 Mixes

.1 Mortar for pointing and bedding: Type N mortar: 1:1:6, Portland:lime:sand or 1:3, masonry:sand should be used as a starting point. The contractor shall submit the proposed mix design including technical information on the proposed components with detailed test results meeting the Design Performance Requirements outlined in 1.3 above. Use aggregate grading specified for mortar joint width.

.2 Mortar for parging : all as above but using coarser aggregate and consideration of improved bonding characteristics.

.3 Pointing and parging mortars may require the addition of pigment in order to match existing mortar on site. Pigment shall not exceed 2% of the binder content by volume.

.4 Grout Mix: The ratio of grout materials shall be proposed by the Contractor to produce a flow of 10 to 15 seconds. Submit test results for up to three trial grout mixes meeting the Design Performance Requirements outlined in 1.3 above. The Contractor should monitor the effectiveness of the grouting and make adjustments with the Project Manager's approval to the mix to achieve the maximum penetration and infilling of the voids in the wall. The grout used should be as permeable as possible to water vapour to match the original mortar as closely as possible.

PART 3 – EXECUTION

3.1 Preparation of Mortars

.1 Bulking of Sand and Aggregates:
- .1 Bulking is the increase in volume of dry sand when it becomes damp.
- .2 Damp sand can occupy as much as one-third more volume than either dry or saturated sand.

.3 Damp sand may be used if its volume is adjusted for bulking. Obtain acceptance of Departmental Representative of bulked sand volume. The Departmental Representative reserves the right to reject sand if bulked volumes are excessive.

.2 Test and Adjustment of Sand Quantities for Bulking:

.1 Test sand to be used in mortar for bulking at the start of the work, after each new delivery of sand and after any severe change in weather.

.2 Obtain a sample of sand which accurately reflects the average condition of the pile of damp sane, by the following methods:

i) Take 4 shovelfuls of sand, each from a different level of the pile, and mix thoroughly;

ii) Place this sand in a conical pile and divide into 4 quarters with a board. Remove 2 opposite quarters from the pile, and combine the 2 remaining quarters and mix thoroughly;

iii) Repeat this quarterly and mixing procedure until a sample of the size required for testing remains.

.3 Fill a 1-litre capacity jar, about two-thirds full with the damp sand to be tested. Drop the sand in loosely. Do not pack it in. Level off the surface, then measure the depth of the damp sand (D).

.4 Empty the sand into another container, being careful not to lose any, and half fill the first container with water.

.5 Pour back about half of the test sample of sand slowly into the water so that it is entirely saturated. Rod it thoroughly to remove any air.

.6 Add the rest of the sand, rodding again to remove, and level off the surface. Measure the depth of the saturated sand (S), which will be less than the depth of the damp sand.

.7 Calculate the percentage bulking, using formula: [(D-S) x 100%]/S = percentage bulking; where D = depth of damp sand, and S = depth of saturated sand.

.8 When batching the sand for use in mortar, increase the volume of the sand used by the percentage bulking shown in the test. For example, if the mortar mix is a standard 1:1:6 mix requiring 6 parts of sand and the percentage bulking is found to be 20%, the volume of sand used in the mortar should be: (6 x 120)/100 = 7.2 parts. To adjust for bulking, the actual mortar mix will therefore be 1:1:7.2 when this same damp sand is being used.

.3 Preparation of Cement-Lime-Sand Mixes:

.1 Prepare measuring boxes to ensure accurate proportioning of mortar ingredients.

.2 Introduce approximately 75% of the total volume of water into the mixer, followed by 50% of the sand and all of the dry hydrated lime and any pigment. Mix for approximately 3 minutes or until the materials are thoroughly blended and no particles of white lime are apparent in the mix.

.3 Let stand for 5 minutes.

.4 Add the full volume of Portland cement, the remainder of the sand and water. Mix for further 3-5 minutes until thoroughly blended and mortar has reached consistency determined by Vicat Cone penetration testing. For parging mortar, add fibre reinforcing at final mixing. Add at rate of 1 litre container of fibre reinforcing to 20 litres of mortar. Distribute evenly through mix.

.5 Add just sufficient water to obtain workable consistency for setting units. Avoid too wet a mix which stains the face of the work. Vicat Cone penetration may be slightly greater for bedding mixes, but should not exceed maximum value specified by more than 20%. Record water quantities and use for subsequent mixes to help ensure uniformity of all subsequent mixes.

.6 Use all mixes within two hours. Do not re-temper.

END OF SECTION

PART 1 – GENERAL

1.1 Summary

.1 This Section describes the requirements for any replacement brick or stone units required to reface the casemates walls, gallery arch sections as well as chimney repairs and replacements.

1.2 References

.1 Burned clay brick (solid masonry units made from clay or shale) for use as facing brick to chimneys to ASTM C 216-Latest.

1.3 Submittals

.1 Brick:

.1 Submit a sample of each brick type for approval prior to ordering.

.2 Samples shall be full size and of full colour range and texture to be supplied for the entire project.

.3 Submit the following technical data with samples:

.1 Name, address and location of manufacturer of new brick.

.2 Full technical data on the characteristics of the brick to include: compressive strength, initial rate of absorption, 24 hour water absorption and saturation coefficient, in accordance with CAN3-A82.2-M78.

.4 Brick shall match the existing in size and physical properties. The contractor shall salvage a brick from the site and submit it for all the tests outlined in 1.3.1.3.2 above. A report comparing the existing brick to the proposed brick shall be submitted to PCA with the request for approval. This testing is at the Contractors cost.

.2 Stone:

.1 Submit samples of proposed stone for approval of colour, grain size and texture as well as tooled finishes. New stone to match existing as closely as possible.

1.4 Delivery Storage and Handling

.1 Deliver clay products to site on pallets, packaged to avoid chipping, damage or soiling from any means.

.2 Store clay products on site on pallets, clear of the ground, protected from precipitation, soiling and damage by non-staining tarpaulins.

.3 Take delivery of, handle and store as described above, bricks supplied by Owner.

PART 2 – PRODUCTS

2.1 Materials

.1 Brick: The Contractor shall determine quantities of bricks that are required to replace deteriorated units for use as facing bricks in the gallery arch sections indicated or as required. Match existing brick dimensions as closely as possible.

.2 Stone: Supplied to closely match adjacent stone in all respects including tooled surfaces.

END OF SECTION

PART 1 - GENERAL

1.1 Scope

.1 The work of this section includes but is not necessarily limited to supply of all labour, material and equipment necessary for the supply, installation and painting of the following items as indicated on the drawings:

- .1 Structural steel required for temporary bracing and shoring.
- .2 Elements of the post and chain fence.
- .3 Other miscellaneous fabrications, anchors, etc. as required to complete the installation as indicated.

1.2 Reference Standards

.1 Do welding work in accordance with CSA W59-M1989 unless specified otherwise.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00.

.2 Do not proceed with work until relevant submissions are reviewed by the Departmental Representative.

PART 2 - PRODUCTS

2.1 Materials

.1 Fence Posts: Clean, sound, peeled, pressure treated local spruce or pine. To be 125 dia. ∀ 10 mm straight and free from splits or knots larger than 12 mm.

.2 Chain: to match existing or 6.3 mm Dom Chain grade 30 regular link. Prime and paint black.

.3 Steel sections and plates: to CAN3-G40.21-M92, Grade 350W.

.4 Pressure treatment to CSA-080-C1.

.5 Welding materials: to CSA W59-M89.

.6 Bolts and anchor bolts: to ASTM A307-82a galvanized or stainless steel where indicated.

.7 Galvanizing: hot dipped galvanizing with zinc coating of 600g/m^2.

.8 Primer: Alkyd primer, Kem Kromik universal metal primer - B50Z series by Sherwin Williams or approved equal.

.9 Finish paint; two coats gloss alkyd black enamel. Industrial enamel B54Z by Sherwin Williams or approved equal.

.10 Concrete/masonry anchors: Galvanized Hilti KB or approved equal.

.11 Grout: non-shrink capable of developing compressive strength of 55 MPa at 28 days.

2.2 Fabrication

.1 Build work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Fabricate items from steel unless otherwise noted.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure welds are continuous for length of each joint.

2.3 Shop Painting

.1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7° C.

.3 Clean surfaces to be field welded; do not paint.

PART 3 - EXECUTION

3.1 Erection

.1 Erect work square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.2 Provide suitable means of anchorage acceptable to the Departmental Representative, such as dowels, anchor clips, bar anchors, expansion bolts and shields, toggles.

.3 Make field connections with bolts or weld in accordance with reviewed shop drawings.

.4 Provide items for casting into concrete or building into masonry complete with setting templates to appropriate trades.

.5 Touch-up field welds, bolts and burnt or scratched surfaces after completion of erection with primer.

.6 Touch-up galvanized surfaces where burned by field welding with primer and field applied spray galvanizing.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute/National Particleboard Association (ANSI/NPA)

.1 ANSI/NPA A208.1-2009, Particleboard.

.2 ASTM International

.1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealled) by the Hot-Dip Process.

.3 ASTM C578-11a, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

.4 ASTM C1289-11, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

.5 ASTM C1396/C1396M-11, Standard Specification for Gypsum Board.

.6 ASTM D1761-06, Standard Test Methods for Mechanical Fasteners in Wood.

.7 ASTM D5055-11, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

.8 ASTM D5456-11, Standard Specification for Evaluation of Structural Composite Lumber Products.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-11.3-M87, Hardboard.

.2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.3 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction and amendment.

.4 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.

.4 CSA International

.1 CAN/CSA-A123.2-03(R2008), Asphalt Coated Roofing Sheets.

.2 CAN/CSA-A247-M86(R1996), Insulating Fiberboard.

.3 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.4 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).

.5 CSA O121-08, Douglas Fir Plywood.

.6 CAN/CSA O122-06(R2011), Structural Glued-Laminated Timber.

.7 CSA O141-05(R2009), Softwood Lumber.

.8 CSA O151-09, Canadian Softwood Plywood.

.9 CSA O153-M1980(R2008), Poplar Plywood.

.10 CSA O325-07, Construction Sheathing.

.11 CSA O437 Series-93(R2011), Standards on OSB and Waferboard.

.12 CAN/CSA-Z809-08, Sustainable Forest Management.

.5 Forest Stewardship Council (FSC)

.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.6 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2010.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.

.4 Sustainable Design Submittals:

.1 Construction Waste Management:

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

1.3 QUALITY ASSURANCE

.1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

1.4 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials off ground and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wood from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 FRAMING STRUCTURAL AND PANEL MATERIALS

.1 Description:

.1 Sustainability Characteristics:

.1 Lumber, CAN/CSA-Z809 or FSC or SFI certified.

.2 Plywood. urea-formaldehyde free, CAN/CSA-Z809 or FSC or SFI certified.

.2 Lumber: softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:

.1 CSA O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.3 Structural Composite Lumber (SCL) in accordance with ASTM D5456.

.4 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:

.1 Board sizes: "Standard" or better grade.

.2 Dimension sizes: "Standard" light framing or better grade.

.3 Post and timbers sizes: "Standard" or better grade.

.5 Plywood, OSB and wood based composite panels: to CSA O325.

.6 Douglas fir plywood (DFP): to CSA O121, standard construction.

.7 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.8 Poplar plywood (PP): to CSA O153, standard construction.

.9 Interior mat-formed wood particleboard: to ANSI/NPA 208.1.

.10 Mat-formed structural panelboards (OSB wafer): to CAN O437.

.11 Insulating fiberboard sheathing: to CAN/CSA-A247.

.12 Glass fibre board sheathing: non-structural, rigid, faced, fiberglass, insulating exterior sheathing board.

.13 Expanded polystyrene sheathing: to ASTM C578.

.14 Gypsum sheathing: to ASTM C1396/C1396M.

2.2 ACCESSORIES

.1 Nails, spikes and staples: to CSA B111.

.2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.3 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.

.4 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, sheet metal, fibre, formed to prevent dishing. Bell or cup shapes not acceptable.

.5 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, extruded 6063-T6 aluminum alloy type approved by Departmental Representative.

.6 Fastener Finishes:

.1 Galvanizing: to ASTM A123/A123M, use galvanized fasteners for exterior work and interior highly humid areas.

Part 3 Execution

3.1 EXAMINATION

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

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Treat surfaces of material with wood preservative, before installation.

.2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.

.3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

3.3 INSTALLATION

.1 Install members true to line, levels and elevations, square and plumb.

.2 Construct continuous members from pieces of longest practical length.

.3 Install spanning members with "crown-edge" up.

.4 Select exposed framing for appearance. Install lumber materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.

.5 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding electrical equipment mounting boards, and other work as required.

.6 Install furring to support siding applied vertically where there is no blocking and where sheathing is not suitable for direct nailing.

.1 Align and plumb faces of furring and blocking to tolerance of 1:600.

.7 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.8 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.

.9 Install sleepers as indicated.

.10 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

.11 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.12 Countersink bolts where necessary to provide clearance for other work.

.13 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

3.4 CLEANING

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

.1 Leave Work area clean at end of each day.

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

.3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by rough carpentry installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

.1 ASTM C919-[08], Standard Practice for Use of Sealants in Acoustical Applications.

.2 General Services Administration (GSA) - Federal Specifications (FS)

.1 FS-SS-S-200-[E(2)1993], Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Manufacturer's product to describe:

.1 Caulking compound.

.2 Primers.

.3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

.3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 28 Safety Requirements and 01 35 43 - Environmental Procedures.

.3 Samples:

.1 Submit 2 samples of each type of material and colour.

.2 Cured samples of exposed sealants for each colour where required to match adjacent material.

.4 Manufacturer's Instructions:

.1 Submit instructions to include installation instructions for each product used.

.5 Sustainable Design Submittals:

.1 Construction Waste Management:

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

1.3 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect joint sealants from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.5 SITE CONDITIONS

.1 Ambient Conditions:

.1 Proceed with installation of joint sealants only when:

.1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.

.2 Joint substrates are dry.

.3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.2 Joint-Width Conditions:

.1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Health Canada.

.2 Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

Part 2 Products

2.1 SEALANT MATERIALS

.1 Sealants and Caulking compounds must:

.1 Meet or exceed all applicable governmental and industrial safety and performance standards; and

.2 Be manufactured and transported in such a manner that all steps fo the process, including the disposal of waste products arising therefrom, will meet the requirements of all applicable governmental acts, by laws and regulations including, for facilities located in Canada, the Fisheries Act and the Canadian Environmental Protection Act (CEPA).

.2 Sealant and caulking compounds must not be formulated or manufactured with: aromatic solvents, fibrous talc or asbestos, formaldehyde, halogenated solvents, mecury, lead, cadium, hexavalent chromium, barium or their compounds, except barium sulphate.

.3 Sealant and caulking compounds must no contain a total of volatile organic compound (VOC's) in excess of 5% by height as calculated from records of the amounts of constituents used to make the product.

.4 Sealant and caulking compounds must be accompanied by detailed instructions for proper application so as to minimize health concerns and maximize performance, and information describing proper disposal methods.

.5 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.6 When low toxicity caulks are not possible, confine usage to areas which off-gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off-gas time.

.7 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Polysulphide Sealant (two component)

.1 Conform to ASTM C920, Standard Specification for Elastomeric Joint Sealants – Type M, Grade NS, Class 25

.2 Polyurethane Self-Leveling Sealant

.1 Conform to ASTM C920, Standard Specification for Elastomeric Joint Sealants – Type S, Grade P, Class 25

.3 Polyurethane Non-Sag Sealant

.1 Conform to ASTM C920, Standard Specification for Elastomeric Joint Sealants – Type S, Grade NS

.4 Polyisobutylene tape (butyl tape).

.5 Preformed Compressible and Non-Compressible back-up materials.

.1 Polyethylene, Urethane, Neoprene or Vinyl Foam.

.1 Extruded closed cell foam backer rod.

.2 Size: oversize 30 to 50 %.

.2 Neoprene or Butyl Rubber.

.1 Round solid rod, Shore A hardness 70.

.3 High Density Foam.

.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m^3 density, or neoprene foam backer, size as recommended by manufacturer.

.4 Bond Breaker Tape.

.1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 JOINT CLEANER

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

.2 Primer: in accordance with sealant manufacturer's written recommendations.

Part 3 Execution

3.1 EXAMINATION

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

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative].

3.2 SURFACE PREPARATION

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

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.4 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

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

3.6 APPLICATION

.1 Sealant:

.1 Apply sealant in accordance with manufacturer's written instructions.

.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.

.3 Apply sealant in continuous beads.

.4 Apply sealant using gun with proper size nozzle.

.5 Use sufficient pressure to fill voids and joints solid.

.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.

.7 Tool exposed surfaces before skinning begins to give slightly concave shape.

.8 Remove excess compound promptly as work progresses and upon completion.

.2 Curing:

.1 Cure sealants in accordance with sealant manufacturer's instructions.

.2 Do not cover up sealants until proper curing has taken place.

3.7 CLEANING

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

.1 Leave Work area clean at end of each day.

.2 Clean adjacent surfaces immediately.

.3 Remove excess and droppings, using recommended cleaners as work progresses.

.4 Remove masking tape after initial set of sealant.

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

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

3.8 PROTECTION

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

.2 Repair damage to adjacent materials caused by joint sealants installation.

END OF SECTION

PART 1 - GENERAL

1.1 Description

.1 Work covered under this section includes but is not necessarily limited to provision of labour, material and equipment necessary to brace and shore the escarp, counterscarp, interior courtyard, south magazine ramp, southwest areaway and casemate walls as well as any other structures to ensure their stability during the stabilization work.

.2 It is noted that the veneer and outer backup is already considered unstable and hazardous in some areas. While the overall wall stability appears to be adequate at present its load carrying capacity decreases as the removals proceed and the Contractors proposed methods, bracing and shoring shall address the safe conduct of the work.

.3 The bulge at the Southeast Salient Escarp wall will require a significant intervention. The proposed bracing methods are intended to leave the upper courses, capstone and ramparts undisturbed. Shoring indicated on the drawings is conceptual only.

.4 **It shall be the Contractor's responsibility to maintain the structural stability of the walls at all times.** Specific requirements will vary depending on the Contractor's proposed work methods and schedule. Based on the approved work methods and an independent inspection of the structure the Contractor shall assess the need for any bracing and shoring and detailed methods and submit shop drawings as applicable.

.5 The Contractor shall pay all costs relative to inspections, shoring, design, etc. The costs shall be considered incidental to the work and shall be paid for in Pay Item No. 1 General Conditions.

1.2 Definitions

.1 Bracing: temporary support installed in excavation or structure to increase rigidity in both longitudinal and transverse axes and thus stabilize against deformations/ movement.

.2 Shoring: temporary support installed in an excavation or structure to relieve vertical and/or horizontal loads to permit alterations or repairs to foundation, walls or main supporting elements.

1.3 Source Quality

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: by grade mark in accordance with applicable CSA standards.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00.

.2 Shop drawings to indicate shop and erection details.

.3 Shop drawings shall be stamped by a Registered Professional Engineer permitted to practice in the Province of Nova Scotia.

1.5 Storage

.1 Store materials in dry area, supported off ground.

PART 2 - PRODUCTS

2.1 Materials

.1 Structural members: solid timber, Group C, structural No. 1 grade.

.2 Structural steel members: to CSA G40.21-M92, grade 350, Type W.

.3 Plywood: Douglas Fir plywood to CSA 0141-05 (R2014).

.4 Steel connections: steel gusset plates, angles, to CSA G40.21-M92, Grade 300, Type W.

.5 Nails: to CAN/CSA-2406-92, galvanized.

.6 Bolts: lag screws, nuts and washers to CSA-086.1- 94, galvanized.

.7 High-tensile bolts: to ASTM A325M-86.

.8 Welding materials: CSA W59-M1989 (R2001).

PART 3 - EXECUTION

3.1 Inspection

.1 Before work is begun, inspect conditions upon which this work depends for damage and weakness and inform the Departmental Representative in writing of conditions not discussed in contract.

3.2 Preparation

.1 Locate bracing in strategic areas along the walls to stabilize them and allow safe vehicular/equipment movement.

.2 Braces shall be anchored into the ground by positive means.

.3 Care shall be taken by the Contractor not to damage veneer stone. Any damages shall be corrected by the Contractor at the Contractor's expense.

.4 Location of bracing to be determined by the Contractor but shall generally be located at uniform spacing (i.e. 8 to 16 ft centres).

3.3 Installation

.1 Erect structural timber to CSA-086.1-2014.

.2 Erect structural steel work to CAN/CSA-S16.(R2007) and CAN/CSA-S136-07 (R2012).

.3 Weld to CSA W59-M1989 (R2001).

.4 Obtain approval from the Departmental Representative before execution, if alteration to bracing and shoring system is found to be necessary.

3.4 Bracing of Walls

.1 Install packing behind wall pieces to compensate for unevenness of wall surfaces.

.2 Install and use bracing system to stabilize deformations, as requested by the Departmental Representative.

3.5 Maintenance

.1 Maintain effectiveness of system by making adjustments, replacing or repairing damaged and weakened elements of system until notified by the Departmental Representative.

3.6 Responsibility

.1 Failure of a wall section or excessive rotation due to a lack of adequate bracing during construction shall be corrected at the Contractor's expense. The Departmental Representative accepts no responsibility for the extent or design of the bracing. It is the Contractor's responsibility to ensure that it is adequate.

END OF SECTION

PART 1 - GENERAL

1.1 Source Approval

.1 Inform the Departmental Representative of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.

.2 If, in opinion of the Departmental Representative materials from the proposed source do not meet, or cannot reasonably be processed to meet specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

.3 Should a change of material source be proposed during work, advise the Departmental Representative four weeks in advance of proposed change to allow sampling and testing.

.4 Acceptance of a material at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

1.2 Production Sampling

.1 Provide the Departmental Representative with a gradation curve of proposed aggregate. Contractor to be responsible for cost of initial gradation curve.

.2 Aggregate will be subject to continual sampling by the Departmental Representative during production.

.3 Provide the Departmental Representative with ready access to source and processed material for purpose of sampling and testing.

.4 Contractor to bear the cost of sampling and testing of aggregates which fail to meet specified requirements.

PART 2 - PRODUCTS

2.1 Materials

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material or other deleterious substances.

.2 Flat and elongated particles are those whose greatest dimension exceeds five times their least dimensions.

.3 Fine aggregates satisfying requirements of applicable section shall be one, or a blend of following:
- .1 Natural sand.
- .2 Manufactured sand.
- .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.4 Coarse aggregates satisfying requirements of applicable section shall be one of or blend of the following:
- .1 Crushed rock.
- .2 Gravel and crushed gravel composed of naturally formed particles of stone.
- .3 Light weight aggregate, including slab and expanded shale.

PART 3 - EXECUTION

3.1 Processing

.1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

.2 Blend aggregates if required to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by the Departmental Representative.

.3 Wash aggregates, if required to meet specifications. Use only equipment approved by the Departmental Representative.

.4 When operating in stratified deposits use excavation equipment and methods that will produce uniform, homogeneous aggregate.

3.2 Handling

.1 Handle and transport aggregates to avoid segregation, contamination and degradation.

3.3 Stockpiling

.1 Stockpile aggregates in sufficient quantities to meet project schedules but so as not to encumber the site.

.2 Stockpiling sites shall be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

.3 Separate different aggregates by substantial dividers or stockpile far enough apart to prevent intermixing.

.4 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by the Departmental Representative within 48 hours of rejection.

.5 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

.6 Coning of piles or spilling of material over edges of pile will not be permitted.

.7 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.4 Stockpile Clean Up

.1 Leave aggregate stockpile site in a tidy, well drained condition, free of standing surface water.

.2 Leave any unused aggregates in neat compact stockpiles as directed by the Departmental Representative.

END OF SECTION

PART 1 - GENERAL

1.1 Scope

.1 Work covered under this section includes but is not necessarily limited to provision of labour, material and equipment necessary to excavate, trench, backfill and compact to allow repair or placement of drainage lines, installation of gabion walls, regrading, drainage features, trenches, etc., as shown on the drawings. Work shall include but not necessarily be limited to:

- .1 Excavation for walls, drainage trenches and all associated work.
- .2 Backfilling, placement and compaction of granular fill and gravels as required on the drawings and in the specification.
- .3 Importation of granular fill.
- .4 Removal of all unsuitable or excess material, and disposal as directed by the Departmental Representative.
- .5 Fills.
- .6 All testing of fill material and compaction as identified in specification.
- .7 All other excavation, trenching and backfilling as required to complete the work indicated or specified to the full satisfaction of the Departmental Representative.

1.2 Protection of Existing Features

.1 Conduct, with the Departmental Representative, condition survey of existing features which are designated for removal and items to remain.

.2 Prevent movement, settlement or damage to adjacent structures, services, and parts of existing structures to remain. Provide bracing and shoring as required. In event of damage, immediately replace such items or make repairs to approval of the Departmental Representative at Contractor's cost.

.3 Relics and antiquities and items of historical or scientific interest found on site, shall remain property of Parks Canada. Protect such articles and request directives from the Departmental Representative.

.4 Give immediate notice to the Departmental Representative if evidence of archaeological finds are encountered during construction, and await his written instructions before proceeding with work in this area.

.5 An archaeologist, representing Parks Canada, may be present during excavation work. Archaeologist has authority to stop work when excavation uncovers archaeological resources.

.6 Suspend excavation so that appropriate recording and removal of archaeological resources can be completed. Provide labour assistance as necessary to the archaeologist during removal and recording of archaeological resources. There will be no additional payment to the Contractor as a result of this provision of labour assistance and work suspension.

.7 Any other aspects of the work that might involve disturbance of existing surfaces, grade, walls, etc. may also be subject to archaeological surveillance.

.8 Existing buried utilities and structures:

.1 Prior to commencing any excavation work, notify the Departmental Representative, establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during work.

.2 Confirm locations of buried utilities by careful test excavations.

.3 Maintain and protect from damage utilities and structures encountered. Obtain direction of the Departmental Representative before moving or disturbing utilities or structures.

.9 Prevent damage to existing structures, vents, foundations, walls, stairs, etc. and any other existing feature to remain.

.10 Conduct with the Departmental Representative a condition survey of existing structures, features, etc. which may be affected by the work.

.11 Protect existing surface features which may be affected by work from damage while work is in progress and repair damage resulting from work.

.12 Make good any damage to approval of the Departmental Representative.

1.3 Samples

.1 At least 4 weeks prior to commencing work, inform the Departmental Representative of proposed source of fill materials and provide access for sampling.

.2 Submit 150 lb samples of type of material specified to designated testing company as requested by the Departmental Representative.

.3 Submit samples in accordance with Section 01 33 00.

PART 2 - PRODUCTS

2.1 Materials

.1 Gravels to the minimum requirements of the NSTIR Standard Specifications: clean, hard, durable crushed gravel or stone, free from shale, clay, friable materials, organic matter and other deleterious substances and graded within the following limits when tested to ASTM C136-83 and ASTM C117-80 and giving a smooth curve without sharp breaks when plotted on a semilog chart:

.1 Type 2

ASTM Sieve Designation (υm)	% Passing
28,000	100
14,000	50 - 85
5,000	30 - 70
160	0 - 10
80	0 - 5

.2 Surge:

ASTM Sieve Designation (υm)	% Passing
112,000	100
14,000	not more than 50
80	not more than 10

.2 25 mm clear stone with 90% passing the 25 mm sieve and 85% retained on the 14,000 υm sieve.

.3 25 mm diameter washed natural stone (river or beach stone). 100% passing the 25 mm sieve and not more than 5% passing the 8 mm sieve.

.4 Site Fill: selected material from excavation or other sources, approved by the Departmental Representative for use intended, unfrozen and free from rocks larger than 150 mm, cinders, ashes, sods, refuse or other deleterious materials.

.5 Imported Granular Fill: granular fill, well graded with less than 15% passing the 80 um sieve.

2.2 Filter Fabric

.1 In accordance with Section 31 32 21.

PART 3 - EXECUTION

3.1 Site Preparation

.1 Remove obstructions from surfaces to be excavated.

.2 Strip topsoil from within limits of excavation and stockpile as directed by the Departmental Representative for respreading after backfilling.

3.2 Stockpiling

.1 Stockpile fill materials on site in approved areas. Reinstate surfaces to original state leaving no evidence of stockpiling. Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination and from getting wet. Protect material from moisture and do not allow moisture content to increase above optimum which will adversely affect compactability. Work materials during dry weather because wet conditions may result in softening of material.

3.3 Dewatering

.1 Keep excavations free of water while work is in progress.

.2 Dispose of water in a manner not detrimental to public and private property, or any portion of work completed or under construction and to the Departmental Representative's approval.

.3 Submit for the Departmental Representative's approval details of proposed dewatering methods.

.4 Softening of excavated surfaces due to standing water (ground or surface) shall be prevented. Soft spots due to lack of dewatering shall be excavated out and replaced with surge at the Contractor's expense.

3.4 Excavation

.1 Excavate to lines, grades and dimensions as indicated on drawings or agreed on site. Remove soft and unsuitable material and replace with granular fill.

.2 Dispose of surplus and unsuitable excavated material in approved location as directed by the Departmental Representative.

.3 Do not obstruct flow of surface drainage or natural watercourses.

.4 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter. Compact excavated surfaces.

.5 Notify the Departmental Representative when soil at bottom of excavation appears unsuitable and proceed as directed by the Departmental Representative.

.6 Obtain the Departmental Representative's approval of completed excavation.

.7 Remove unsuitable material from trench bottom to extent and depth directed by the Departmental Representative.

3.5 Fill Types and Compaction

.1 Use fill as specified below. Unless otherwise specified, compact to following densities:
- .1 All Gravels: 98% standard proctor dry density.
- .2 Site Fill and Granular Fill: 98% standard proctor dry density.

3.6 Backfilling

.1 Do not proceed with backfilling operations until the Departmental Representative has inspected and approved installations.

.2 Areas to be backfilled to be free from debris, snow, ice, water or frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Backfilling around installations, manholes, etc.
- .1 Place material by hand under, around and over drain pipes until 300 mm of cover is provided. Dumping material directly on drain pipes will not be permitted.

.5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.6 Hand tamp clear stone in drainage trenches.

3.7 Restoration

.1 Upon completion of work, remove surplus materials and debris, trim slopes, and correct defects noted by the Departmental Representative.

.2 Replace topsoil as directed by the Departmental Representative.

.3 Clean and reinstate areas affected by work as directed by the Departmental Representative.

3.8 Surplus Materials

.1 Remove surplus material from site as directed by the Departmental Representative.

.2 Remove material undesirable for fill, grading or landscaping from site as directed by the Departmental Representative.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

.1 ASTM D1248-05, Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable.

.2 ASTM D4101-10, Standard Specification for Polypropylene Injection and Extrusion Materials.

.3 ASTM D4218-96(R2008), Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds By the Muffle-Furnace Technique.

.4 ASTM D5262-07, Standard Test Method for Evaluating the Unconfined Tension Creep Behaviour of Geosynthetics.

.5 ASTM D6637-10, Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Samples:

.1 Submit samples 4 weeks prior to beginning Work.

.1 One 3 m length from full roll width of geogrid material.

.3 Certificates:

.1 Submit copies of mill test data and certificate 4 weeks prior to start of Work.

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 During delivery and storage, protect geogrids from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIAL

.1 Geogrid: open grid polymer having biaxial orientation, free of striations, roughness, pinholes, blisters, undispersed raw materials or any sign of contamination by foreign matter.

.1 Roll width: 1.33 m minimum.

.2 Roll length: 61 m minimum.

.3 Rib thickness: [_____] mm minimum.

.4 Junction thickness: [_____] mm minimum.

.5 Aperture size:

.1 Machine direction: [_____] mm.

.2 Cross machine direction: [_____] mm.

.6 Polymer: high density polyethylene: to ASTM D1248 with inhibitors added to resist deterioration by ultra-violet and heat exposure.

.2 Geogrid physical properties:

.1 Peak tensile strength: to [ASTM D6637].

.1 Machine direction: minimum [_____] N/mm.

.2 Cross machine direction: minimum [_____] N/mm.

.2 Tensile secant modulus at 2% elongation: to ASTM D6637.

.3 Tensile creep strength: to [ASTM D5262], minimum [_____] N/mm.

.4 Rigid geogrid junction strength and efficiency: to [GRI GG2].

.1 Strength: minimum [_____] N/mm.

.2 Efficiency: minimum [_____]%.

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 soil stabilization installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff, according to requirements of authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 INSTALLATION

.1 Place geogrid material by unrolling onto graded surface in manner and locations indicated and retain in position in accordance with manufacturer's written recommendations.

.2 Place geogrid on sloping surfaces in one continuous length from toe of slope to upper extent of geogrid.

.3 Overlap each successive strip of geogrid 600 mm over previously laid strip.

.4 Join successive strips of geogrid as recommended by manufacturer.

.5 Protect geogrid from displacement, damage or deterioration before and during placement of overlay soil layers.

.6 After installation, cover with overlay layer within 10 days of placement.

.7 Replace damaged or deteriorated geogrid to approval of Departmental Representative.

.8 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.

3.4 CLEANING

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

.1 Leave Work area clean at end of each day.

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

.3 Waste Management: separate waste materials for reuse, recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

3.5 PROTECTION

.1 Vehicular traffic not permitted directly on geogrid.

END OF SECTION

PART 1 - GENERAL

1.1 Samples

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

.2 Submit samples to the Departmental Representative at least 4 weeks prior to commencing work.

1.2 Mill Certificates

.1 At least 4 weeks prior to start of work, furnish the Departmental Representative with copies of mill test data and certificate that geotextile delivered to job site meets requirements of this section.

1.3 Delivery and Storage

.1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

PART 2 - PRODUCTS

2.1 Materials

.1 Geotextile: Terrafix 240R non-woven needle punched synthetic fibre fabric, supplied in rolls composed of 100% by mass of polyester or approved equal.

.2 Seams: lapped in accordance with manufacturer's recommendations.

PART 3 - EXECUTION

3.1 Installation

.1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with weights.

.2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

.4 Overlap each successive strip of geotextile 600 mm over previously laid strip.

.5 Protect geotextile material from displacement and damage until and during placement of additional material layers.

.6 After installation, cover with overlying layer before the end of working day.

.7 Replace damaged or deteriorated geotextile.

3.2 Protection

.1 Do not permit passage of any vehicle directly on geotextile at any time.

END OF SECTION

PART 1 - GENERAL

1.1 Scope

.1 Work covered under this section includes but is not necessarily limited to provision of labour, material and equipment necessary for final grading and placement of topsoil and finish grading. Work shall include but not necessarily be limited to:

- .1 provision of suitably conditioned topsoil.
- .2 grading related to finish slopes as indicated on the drawings.
- .3 Other areas as indicated or as required to reinstate disturbed areas.

1.2 Protection

.1 Prevent damage to bench marks, existing structures, walls, gun positions, racer stones, concrete aprons, etc. Make good any damage at Contractor's cost.

1.3 Source of Topsoil

.1 Topsoil may be obtained from on site. Strip topsoil and stockpile separately prior to excavating or regrading in any areas. Locate stockpiles as directed on site. Cover stockpiles to protect the topsoil from becoming wet.

.2 Rototill topsoil thoroughly before stripping and remove all rocks debris, etc., larger than 25 mm.

1.4 Scheduling of Work

.1 Schedule placing of topsoil and finish grading to permit sodding operations under optimum conditions.

.2 The finished surfaces rely on an established grass surface for erosion protection and stability. It is the Contractor's responsibility to protect the surfaces from becoming saturated and slipping, eroding or from other damage until the interim certificate of completion is issued. Any damage which occurs prior to final acceptance shall be repaired at the Contractor's cost.

PART 2 - PRODUCTS

2.1 Materials

.1 Fill material: in accordance with Excavation, Trenching and Backfilling.

.2 Obtain approval of excavated or graded material used as fill for grading work. Protect approved material from

contamination or from becoming wet, soft and unsuitable for use in the work.

PART 3 - EXECUTION

3.1 Preparation of Existing Grade

.1 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage. Remove soil contaminated with toxic materials. Dispose of removed materials as directed by the Departmental Representative.

.2 Remove surface debris, roots, vegetation, branches and stones in excess of 25 mm diameter.

3.2 Grading

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.

.2 Rough grade to dimensions shown on drawings.

.3 Compact filled and disturbed areas to 98% Standard Proctor Dry Density.

.4 Finished grade shall provide positive drainage to catchbasins or other approved areas.

3.3 Testing

.1 Inspection and testing of soil compaction will be carried out by designated testing laboratory. Payment will be under the Testing Allowance.

3.4 Surplus Material

.1 Dispose of surplus material not required as directed by the Departmental Representative.

.2 Remove materials unsuitable for fill, grading or landscaping from site as directed by the Departmental Representative.

3.5 Spreading of Topsoil/Planting Soil

.1 Spread topsoil (50 mm min. thickness) after the Departmental Representative has inspected and approved subgrade.

.2 Spread topsoil with adequate moisture in uniform layers over approved, unfrozen subgrade, where sodding or seeding is indicated.

.3 For sodded areas keep topsoil below finished grade as indicated.

.4 Apply topsoil as indicated.

.5 The Departmental Representative may adjust the thickness of topsoil to be spread depending on the quantity available on site.

3.6 Finish Grading

.1 Fine grade and loosen topsoil. Eliminate rough spots and low areas to ensure positive drainage.

.2 Roll to consolidate topsoil for areas to be sodded leaving surface smooth, uniform, firm against deep foot printing, and with a fine loose texture to approval of the Departmental Representative.

.3 The Contractor shall be fully responsible to grade, regrade as required to ensure that all surfaces are maintained until the 12 month warranty period has expired.

3.7 Restoration of Stockpile Sites

.1 Restore stockpile sites acceptable to the Departmental Representative.

3.8 Sodding

.1 Sodding shall be in accordance with Section 32 92 23.

3.9 Protection

.1 Provide tarps etc. as the Contractor deems necessary to protect finished slopes from saturation and failure due to heavy rains. Damaged slopes shall be repaired at the Contractor's cost.

END OF SECTION

PART 1 - GENERAL

1.1 Description

This section includes but is not necessarily limited to provision of labour, material, and equipment necessary to sod designated areas around assets, as specified, indicated on the drawings or as required to reinstate damaged areas.

1.2 Source Quality Control

.1 Obtain the Departmental Representative's approval of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization.

.3 Provide written confirmation that sod of the required dimensions and thicknesses will be supplied and used in the work.

1.3 Scheduling

.1 Schedule sod laying to coincide with topsoil operations.

.2 Schedule all work to take place in optimum weather conditions.

1.4 Payment

.1 There shall be no payment for sodded areas until the areas are well established and accepted by the Departmental Representative. All maintenance, repair, etc., required up to final acceptance shall be carried out at the Contractors cost.

PART 2 - PRODUCTS

2.1 Materials

.1 Sod

.1 Pasture sod shall be certified #1 cultivated grass sod grown and classified in conformity to standards of the Canadian Sod Growers Association and the Canadian Atlantic Nursery Trades Association and comply with standards outlined in Guide Specifications for Nursery Stock (Section 17) published by the Canadian Nursery Trades Association.

.2 Cut sod sizes:

.1 Standard sod: 900 x 450 x 38.

.2 The sod shall have at least 2 years growth at the time of cutting with strong fibrous roots, no stones or bare spots. Sods shall be cut to a uniform thickness.

.3 Wooden pegs: 50 x 12 x 600 long.

.4 Water: free of impurities that could inhibit germination and growth.

.5 Fertilizer: fertilizer shall be commercial, synthetic, slow release type.

PART 3 - EXECUTION

3.1 Procedure

.1 General: Areas indicated on the drawings shall be sodded.

.2 Sodding

.1 Obtain the Departmental Representative's approval of sod at source.

.2 Schedule deliveries of sod such that storage at the job site is kept to a minimum. Sods shall be delivered, unloaded and stored on pallets.

Deliver sod to site within 24 hours of being lifted and lay sod within 36 hours of being lifted. Do not deliver small, irregular or broken pieces of sod.

During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling. During dry weather, protect sod from drying and water sod as necessary to insure its vitality and prevent dropping of soil in handling. Sod which dries out will be rejected. Schedule sod laying to coincide with topsoil operations.

.3 Obtain the Departmental Representative's approval of topsoil grade and depth before starting sodding. Minimum topsoil thickness shall be 50 mm.

.4 Place sod during growing season. Sodding during freezing temperatures, or over frozen soil is not acceptable.

.5 Lay sod sections at right angles to slopes and secure with wooden pegs. Place pegs to prevent shifting of soil, drive pegs flush with top of sod soil.

.6 Butt new sod flush against existing along a well defined neatly cut line.

.7 Provide close contact between sod and soil by means of light roller. Heavy rolling to correct irregularities in grade is not permitted.

.8 Water immediately after sod laying to obtain moisture penetration through sod into top 50 mm of top soil.

.9 On slopes steeper than 3:1 secure sod with wooden pegs. Place pegs to prevent shifting sod and drive pegs flush with top of sod. Number and spacing of pegs to be determined by the Contractor. Pegs must be sufficient to secure all sods in place, without open joints, until they have rooted and are accepted.

.10 Provide adequate protection of sodded areas against erosion and mechanical damage. Remove protection after sod areas have been accepted. Assume full responsibility for condition of sodded areas until the warranty period has expired. Repair defective sod and slopes as required at Contractor's expense.

.11 Provide erosion protection as required.

.12 Cut grass first time when it reaches height of 50 mm. Remove clippings that could smother grassed areas. At no time shall the grass be allowed to reach a height greater than 150 mm.

.13 Fertilize areas one month after sodding. Spread evenly and water well. Postpone fertilizing until next spring if application falls within four week period to accepted end of growth season in locality.

3.2 Acceptance

.1 Sodded areas will be accepted at final inspection provided that:

.1 Areas are properly established at required grades free of low spots, rutting, eroding, gulleys, etc.

.2 Areas are free of bare or dead spots, and weeds.

.3 No surface soil is visible when grass has been cut to height of 50 mm.

.4 Areas have been cut at least twice.

.5 Areas have been fertilized.

.6 Areas completed in Fall will be accepted the following Spring, one month after start of growing season provided acceptance conditions are fulfilled.

.7 Payment for sodded areas shall only be made following acceptance by the Departmental Representative.

END OF SECTION