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END OF DOCUMENT

Drawings Bound Separately.

<u>Drawing No.</u>	<u>Title</u>
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GENERAL

G - 100	Key Plan
L - 100	Castle Mountain Viewpoint – Rock Wall
L - 200	Hillside Meadows – Boy Scout Cairn and Rock Wall
L - 300	Fireside Day-Use area – Fireplace
L - 400	Norquay Road Viewpoint – Rock Wall
L - 500	224 Banff Avenue (Visitors Center) – Rock Wall
L - 600	117 Beaver Street – Front Entry
L - 700	116 Park Avenue – Rock Wall
L - 800	553 Marmot Street – Rock Walls
L - 801	553 Marmot Street – Details
L - 802	553 Marmot Street – Details
L - 900	Dowling Cairn
L – 1000	Two Jack Lakeside Campground - Fireplace
L – 1100	Minnewanka Loop Viewpoint – Rock Wall

END OF SECTION

1.0 GENERAL

1.1 Related Sections

- | | | |
|----|---|------------------|
| .1 | Environmental Procedures | Section 01 35 43 |
| .2 | Work Restrictions | Section 01 14 00 |
| .3 | Repointing Historic Masonry | Section 04 03 07 |
| .4 | Historic – Replacing of Stone | Section 04 03 42 |
| .5 | Dismantling Stone Masonry | Section 04 03 43 |
| .6 | Masonry Restoration and Cleaning | Section 04 99 20 |
| .7 | Government of Canada, Standard Acquisition Clauses and Conditions (SACC)
Manual R2850D GC 5.10 | |
| .8 | Appendices | |
| .1 | Appendix A – Site Plan/ Location of Work | |
| .2 | Appendix B – Masonry Rock Wall Drawings and Repair Details | |
| .3 | Appendix C – Environmental Best Management Practices for Construction | |
| .4 | Appendix D – Environmental and Access Mitigation Details | |

1.2 Definitions

- | | |
|----|--|
| .1 | Departmental Representative: Within the context of these specifications, this refers to the person exercising the roles and attributes of Canada under the contract. Parks Canada Agency will be fulfilling the role of Departmental Representative for this Contract. |
| .2 | Owner: For the purpose of this Contract, the Owner is the Parks Canada Agency, who operates the site. |
| .3 | Contractor: The contractor to undertake the site management and operation services defined, within the context of these specifications, as the Contractor. |

1.3 Project Location

- | | |
|----|---|
| .1 | There are a number of rock walls / structures in Banff National Park that require replacement, repair and/or re-pointing. The following rock walls / structures have been deemed damaged and will require replacement, repair and/or re-pointing: |
|----|---|

- .1 Castle Mountain Viewpoint (Trans-Canada Highway) masonry rock wall.
- .2 Boy Scout Cairn at Hillside Meadows.
- .3 Fireside DUA Fireplace.
- .4 Norquay Road Green Area masonry rock wall.
- .5 224 Banff Ave, Banff Visitor Center, Masonry wall at sidewalk.
- .6 117 Beaver Street, parks Canada Beaver Apartments, Front entry walls.
- .7 116 Park Ave, driveway Masonry rock wall.
- .8 553 Marmot St, Masonry rock walls.
- .9 Dowling Cairn.
- .10 Two Jack Lakeside Campground Interpretive Area Fireplace.
- .11 Minnewanka Loop Viewpoint Masonry rock wall.
- .2 The objective of this project is to:
 - .1 Replacement, repair and/or re-point, restoration and cleaning where specified, deteriorating rock walls at Parks Canada properties and day use areas as listed above.

1.4 Workmanship and qualifications

- .1 The work is to be completed by masonry contractors specialized in the conservation of historic masonry.

1.5 Project Schedule

- .1 It is imperative that this work be completed by October 31, 2016.
- .2 The contractor is expected to have enough resources to complete the project on time.

1.6 Work Covered by Contract Documents

- .1 Replacement, repair and/or re-point, restoration and cleaning of rock walls to details Major Tasks include:
 - .1 Repair: Remove and clean out loose material until reaching solid material. Rebuild areas of missing stone with matching real stone.
 - .2 Re-pointing and pointing: Refer to all relevant methodology in Section 04 03 07 Re- pointing Historic Masonry.

- .3 Replacement: Replace walls as noted in Appendix B using pre-engineered landscape block wall systems installed as per manufacturer's directions.
 - .4 All rock is to be real stone to match existing used in structures. Samples must be provided for approval prior to installation.
 - .5 Restoration and Cleaning: Refer to all relevant methodology in Section 04 99 20 Masonry Restoration and Cleaning.
 - .6 If required, provide all heating and hoarding required to complete work within project schedule.
- .2 In preparation for and during construction of this project the Contractor must meet the requirements of Section 01 35 43 – Environmental Procedures to ensure the desired minimal adverse effects are achieved. Prior to the commencement of construction the Contractor must provide written confirmation that he has read and understood and will comply with all mitigations of Section 01 35 43 – Environmental Procedures, Appendices C and D. The Departmental Representative and Parks Canada's environmental surveillance officer (ESO) will refer to Section 01 35 43 – Environmental Procedures and Appendices C and D in determining compliance with contract specifications.

1.7 Contract Method

- .1 Work for this contract to be completed under a combined price Contract, per location.

1.8 Work Sequence

- .1 Complete all work by October 31, 2016.
- .2 Work at rock walls to be completed in 10m increments to minimize visitor disruption.

1.9 Contractor Use of Premises

- .1 Contractor has unrestricted use of sites subject to Section 01 14 00 and until the Contract Completion date.
- .2 Notwithstanding SACC R2850D - GC 5.10, the Contractor shall be permitted to occupy sites where he will be working in Banff National Park, free of charge from the date of award of the contract up to and including the completion date of October 31, 2016. The sites to be occupied by the Contractor include all the roads and areas specified in this contract and as directed by the Departmental Representative. (See Appendix A – Site Location Details and Restricted Access Details.
- .3 The Contractor's occupancy of the site will be deemed to have ended, when both of the following conditions are met to the satisfaction of Parks Canada:

- .1 All the work identified under this contract, has been completed.
- .2 All site cleanup and any outstanding deficiencies have been addressed to the satisfaction of the Departmental Representative.
- .4 Contractor shall limit use of premises for Work, for storage, and for access, to allow:
 - .1 Owner occupancy.
 - .2 Work by other Contractors
- .5 Coordinate use of premises under direction of the Departmental Representative.
- .6 The Contractor and any Subcontractors shall obtain a business license from Realty Services in the Banff Park Administration building in Banff town site, prior to commencement of the contract.
- .7 All Contractor's business and private vehicles are required to display a vehicle work pass from Parks Canada. These permits may be obtained free of charge from PCA Environmental Surveillance Officer or as directed by the Departmental Representative.
- .8 At completion of operations condition of existing Work: equal to or better than that which existed before new Work started.

1.10 Warranty

- .1 All work is to be warranted for a period of one year after all deficiencies identified during final inspection have been rectified.

1.11 Documents Required

- .1 Maintain at Job Site, one copy of each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders.
 - .5 Other Modifications to the Contract.
 - .6 Copy of Approved Work Schedule.
 - .7 Health and Safety Plan and Other Safety Related Documents.
 - .8 Other documents as specified.

1.12 Construction Signage

- .1 No signs or advertisements, other than warning signs, are permitted on site.
- .2 Signs and notices for safety and instruction shall be in both official languages. Signs shall be diamond grade and shall conform to CAN3-Z321.

- .3 Maintain approved signs and notices in good condition for duration of project, and dispose of off-site on completion of project or earlier if directed by the Departmental Representative.

2.1 PRODUCTS

2.2 Not Used

3.1 EXECUTION

3.2 Not Used

END OF SECTION

1.0 GENERAL

1.1 Related Requirements

- .1 Special Procedures for Traffic Control Section 01 35 00.06
- .2 Environmental Procedures Section 01 35 43

1.2 Use of Site and Facilities

- .1 The Work Site limits will be specified by Parks Canada and shall only be used for the purposes of the Work. The Work Site will be made available by Parks Canada to the Contractor for its non-exclusive use for the duration of the Work, unless otherwise provided in the Contract Documents.
- .2 Office-tool trailer may be set up at site.
- .3 The Contractor shall keep the Work Site clean and free from accumulation of waste materials and rubbish regardless of source. Snow shall be removed by the Contractor as necessary and at his cost for the performance and inspection of the Work.
- .4 The Contractor shall provide sanitary facilities for work force in accordance with governing regulations and the Environmental Procedures for this project. The Contractor shall post notices and take such precautions as required by local health authorities and keep area and premises in sanitary condition.
- .5 Any damage to the Work Site caused by the Contractor shall be repaired by the Contractor at its expense.
- .6 The Contractor may work from dawn to dusk, Monday to Friday. Except in town of Banff location where work may be done between 7:30 am to 9:00 pm Monday to Friday.

1.3 Work Conducted Over or Adjacent to Waterways

- .1 All components of the Work shall be conducted in accordance with Section 01 35 43 – Environmental Procedures and the Environmental Protection Plan prepared for the project.
- .2 All components of the Work shall be conducted without equipment entering into wetlands, water bodies, or streams without approval from the Departmental Representative.
- .3 Refer to Environmental Procedures Section 01 35 43
- .4 All waste materials from the Work shall be contained and collected in a manner to prevent any contact with the river valleys and waterways. All collected waste materials shall be disposed of in accordance with Section 01 35 43 – Environmental Procedures and the Environmental Assessment (EA) prepared for the project (provided in Appendix E).

- .5 The Contractor is responsible for the development and supply of construction access to the Work as approved by the Departmental Representative.

1.4 Access to Adjacent Properties

- .1 Construction operations shall be conducted so as to cause minimal inconvenience to the public.

1.5 Survey of Existing Property Conditions

- .1 Submission of tender is deemed to be confirmation that the Contractor has inspected the site and is conversant with all conditions affecting execution and completion of Work.
- .2 The Contractor shall regularly monitor the condition of the Work Site and of property on and adjoining the Work Site throughout the construction period, and shall immediately notify the Owner if any deterioration in condition is detected. Such monitoring shall cover all pertinent features and property including, but not limited to, buildings, structures, roads, walls, fences, slopes, sewers, culverts and landscaped areas.

1.6 Protection of Persons and Property

- .1 Comply with all applicable safety regulations of the Workers' Compensation Board of Alberta (WCB) including, but not limited to, WCB's Industrial Health and Safety Regulations, Industrial First Aid Regulations, and Workplace Hazardous Materials Information System Regulations.
- .2 The Contractor shall take all necessary precautions and measures to prevent injury or damage to persons and property on or near the Work Site.
- .3 The Contractor shall promptly take such measures as are required to repair, replace or compensate for any loss or damage caused by the Contractor to any property or, if Parks Canada so directs, shall promptly reimburse to Parks Canada the costs resulting from such loss or damage.

1.7 Use of Public Areas

- .1 Flag persons shall be provided when vehicles are entering or exiting Work Site access points.

- .2 The Contractor shall ensure that its vehicles and equipment do not cause nuisance in public areas. All vehicles and equipment leaving the Work Site and entering public roadways shall be cleaned of mud and dirt clinging to the body and wheels of the vehicle. All vehicles arriving at or leaving the Work Site and transporting materials shall be loaded in a manner which will prevent dropping of materials or debris on the roadways, and where contents may otherwise be blown off during transit such loads shall be covered by tarpaulins or other suitable covers. Spills of materials in public areas shall be removed or cleaned immediately by the Contractor at no cost to the Owner. All activities shall be in accordance with Section 01 35 43 - Environmental Procedures and Appendix C.

1.8 Supervisory Personnel

- .1 In accordance with Government of Canada GC 2.6 R28Z0D, within five Days after award notification, the Contractor shall submit to the Departmental Representative confirmation of the names of the supervisory personnel and other key staff designated for assignment on the Contract.
- .2 The following personnel shall be included in the list:
 - .1 Project Superintendent.
 - .2 Safety Representative.
- .3 The above personnel shall perform the following duties:
 - .1 The Project Superintendent shall be employed full time and shall be present on the Work Site each and every workday that Work is being performed, from the commencement of Work to Total Performance of the Work.
 - .2 The Project Superintendent shall nominate a Deputy Project Superintendent who shall have the authority of the Project Superintendent during the latter's absence.
 - .3 The Safety Representative shall possess safety experience in general construction. Duties shall encompass all matters of safety activities from commencement of Work until the Total Performance of the Work.

1.9 Meetings

- .1 The Work includes attending meetings between the Contractor and the Departmental Representative. The meetings will be called and chaired by the Departmental Representative as required. The Contractor shall be represented at such meetings to the satisfaction of the Departmental Representative.
- .2 The Departmental Representative will schedule an initial meeting to be held on site after award notification. Senior representatives of the Owner, Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors are to be in attendance.

- .3 The Contractor will be requested to assemble his site staff and sub-contractors for an environmental briefing to be conducted by Parks Canada. The briefing shall be of approximately 1 hour in duration and held at initial project start-up. The Contractor shall ensure that all his current project staff is in attendance. The Departmental Representative and the Contractor will co-operate in setting the most appropriate time and place for the briefing. Subsequent to the initial environmental briefing, briefings will be arranged for new staff and sub-contractors showing up at the Work Site.

1.10 Waste Disposal

- .1 All surplus, unsuitable and waste materials shall be removed from the job site to approved sites outside Banff National Park. Refer to Section 01 35 43 – Environmental Procedures and Environmental Protection Plan.
- .2 Deposit of any construction debris into any waterway is strictly forbidden.
- .3 Cost for Waste Disposal described above shall be considered incidental to the Unit Price items and no additional payment will be made except as identified herein.
- .4 Waste Disposal shall be completed in accordance with Section 01 35 43 – Environmental Procedures.

1.11 Work Stoppage

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

2.0 PRODUCTS

2.1 Not Used

3.0 EXECUTION

3.1 Not Used

END OF SECTION

1.0 GENERAL

1.1 Section Includes

- .1 Prime Cost Sum
- .2 Measurement procedures

1.2 References

- .1 General Conditions

1.3 Prime Cost sum

- .1 Included in the Contract price is a total Prime Cost Sum of \$50,000.00
- .2 Do not include in the Prime Cost Sum, additional contingency allowances for products, installation, overhead or profit.
- .3 Prime Cost Sum provided for in the lump sum and unit price table is not a sum due to the contractor. Rather, payment will be made against it for miscellaneous work not included or in addition to the schedule of quantities under the General Conditions of the contract.
- .4 The use of any part of Prime Cost Sum will be on sole discretion of Parks Canada Representative and contractor cannot make any claim if some or the entire Prime Cost Sum amount is deemed unnecessary.
- .5 Such work may include, but not limited to;
 - .1 Load haul and stockpile aggregate materials.
 - .2 Repair, dispose, grade, and cleaning of rock walls to details. Major Tasks include:
 - .1 Repair, remove and clean out loose material until reaching solid material. Rebuild areas of missing stone with matching real stone.
 - .2 Disposal of unsuitable soil
 - .3 Grading of low spots to ensure positive drainage from areas to the vegetated areas
 - .4 Other miscellaneous work as directed by the Parks Canada Representative.
 - .5 Additional topsoil placement, landscape planting, and landscape incidental work as direct by Parks Canada Representative

- .3 The contract Price, and not Prime Cost Sum, includes Contractors overhead and profit in connection with the work.

1.4 Approval Process and Schedule

.1 For any additional works identified by the Parks Canada Representative, the Contractor will submit a Contract Change Notice (CCN) outlining the work to be completed, the cost of work and the impact to the schedule to the Parks Canada Representative. Once the CCN is approved, a Change Order will be required for changing any CCN item against the Prime Cost Sum

.2 The substantial completion date for the project will only be renegotiated to reflect the schedule of the Prime Cost Sum item if the Prime Cost Sum item interferes with the critical path of the project.

1.5 Measurement Procedures

.1 Payment for the Work under the "Lump Sum Price item 12 – Prime Cost Sum" will be made using negotiated rates or by material, labour and equipment rates as per the following.

- .1 Rental rates will be in accordance with current Alberta Roadbuilders force account rates, and will be all inclusive and fully operated. Hourly rental of equipment will be measured in actual working time and necessary travel time within the project limits. Transportation time to and from site to be reimbursed only if equipment is used exclusively for additional work.

2.0 PRODUCTS

2.1 Materials and products used shall be in accordance with the appendix 'B' drawings and details.

3.0 EXECUTION

3.1 Not Used

END OF SECTION

Banff Masonry Walls

1.0 GENERAL

1.1 Related Requirements

- | | | |
|----|--|---------------------|
| .1 | Summary of Work | Section 01 11 00 |
| .2 | Special Procedures for Traffic Control | Section 01 35 00.06 |

1.2 Description

- .1 Payment will be made under “lump sum price item 1 – mobilization/demobilization”
- .2 Mobilization and Demobilization consists of preparatory work and operations including but not limited to, those necessary for the movement of personnel, equipment, camp, buildings, shops, offices, supplies and incidentals to and from the project site.
- .3 Mobilization and Demobilization further consists of all traffic control requirements as provided in Section 01 35 00.06 – Special Procedures for Traffic Control.
- .4 Any protective measures or movement of Contractor trailers necessitated by animal interactions and required by Parks Canada will be paid by the Departmental Representative, and are not to be anticipated in the Lump Sum Contract Price for Mobilization and Demobilization.

2.0 PRODUCTS

2.1 Not Used

3.0 EXECUTION

3.1 Not Used

END OF SECTION

Banff Masonry Walls

1.0 GENERAL

1.1 Related Sections

.1	Summary of Work.	Section 01 11 00
.2	Work Restrictions.	Section 01 14 00
.3	Submittal Procedures.	Section 01 33 00
.4	Environmental Procedures.	Section 01 35 43
.5	Quality Control.	Section 01 45 00
.6	Construction Facilities.	Section 01 52 00
.7	Close out Procedures.	Section 01 77 00
.8	Close out Submittals.	Section 01 78 00

1.2 Measurement Procedures

- .1 This Work shall be incidental to the Contract and will not be measured for payment.

1.3 Coordination

- .1 Perform coordination of progress schedules, Submittals, use of site, temporary utilities, construction facilities, and construction Work, with progress of Work of other Contractors, and Work by Owner, under instructions of the Departmental Representative.

1.4 Construction Organization and StartUp

- .1 Within seven (7) days after award of Contract, request a meeting of Contract Representatives to discuss and resolve administrative procedures and responsibilities. Meeting shall be chaired by the Departmental Representative who will prepare the minutes of the meeting.
- .2 Senior representatives of the Owner, Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors are to be in attendance.
- .3 Agenda to include following:
- .1 Appointment of official representative of participants in Work.
 - .2 Schedule of Work.
 - .3 Schedule of Submittals in accordance with Section 01 3300.

Banff Masonry Walls

- .4 Requirements for temporary facilities, offices, storage sheds, utilities, fences in accordance with Section 01 52 00.
- .5 Site safety and security in accordance with Sections 01 14 00, 01 52 00 and 01 35 43.
- .6 Quality Control in accordance with Section 01 45 00.
- .7 Proposed changes, Change Orders, procedures, approvals required, mark up percentages permitted, time extensions, overtime, and administrative requirements.
- .8 Owner-furnished materials.
- .9 Monthly Progress Claims, administrative procedures, photographs, and holdbacks.
- .10 Close out Procedures and Submittals in accordance with Sections 01 77 00 and 01 78 00.
- .11 Insurances and transcript of policies.
- .12 Other business.
- .4 Comply with Departmental Representative's allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.
- .5 During construction, coordinate use of site and facilities through Departmental Representative's procedures for intra project communications: Submittals, reports and records, schedules, coordination of Drawings, recommendations, and resolution of ambiguities and conflicts.
- .6 Comply with instructions of the Departmental Representative for use of temporary utilities and construction facilities.
- .7 Coordinate field engineering and layout work with the Departmental Representative.

1.5

On Site Documents

- .1 Maintain at job site, one copy each of the following:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders.

Banff Masonry Walls

- .5 Other modifications to Contract.
- .6 Traffic Management Plan.
- .7 Safety Plan.
- .8 WHMIS.
- .9 Environmental Protection Plan.
- .10 Copy of approved Work schedule and most recent updated schedule.
- .11 Notice of Project.
- .12 Labour and Material Bond

1.6 Project Schedules

- .1 Submit preliminary construction progress schedule to Departmental Representative
- .2 During progress of Work revise and resubmit as directed by the Departmental Representative.

1.7 Submittals

- .1 Submit product data to Section 01 33 00 for review for compliance with Contract Documents.
- .2 Submit requests for payment for review, and for transmittal to Departmental Representative. Submit payment requests on last day of the month.
- .3 Submit requests for interpretation of Contract Documents, and obtain instructions through Departmental Representative.
- .4 Process substitutions through Departmental Representative.
- .5 Process change orders through Departmental Representative
- .6 Deliver closeout submittals for review and preliminary inspections, for transmittal to Departmental Representative.

1.8 Closeout Procedures

- .1 Notify Departmental Representative when Work is considered ready for Substantial Performance.
- .2 Accompany Departmental Representative on preliminary inspection to determine items listed for completion or correction.

Banff Masonry Walls

- .3 Comply with Departmental Representative's instructions for correction of items of Work listed in executed Certificate of Substantial Performance.
- .4 Notify Departmental Representative of instructions for completion of items of Work determined in Departmental Representative's final inspection.
- .5 Schedule project meetings at the call of Departmental Representative.
- .6 Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.
- .7 Note that the Departmental Representative will be responsible for preparing agenda for meetings, notification of meeting dates and recording meeting minutes.

2.0 PRODUCTS

- .1 Not used

3.0 EXECUTION

3.1 Not Used

END OF SECTION

1.0 GENERAL

1.1 Related Requirements

- | | | |
|----|--|---------------------|
| .1 | Work Restrictions. | Section 01 14 00 |
| .2 | Special Procedures for Traffic Controls. | Section 01 35 00.06 |
| .3 | Health and Safety Requirements. | Section 01 35 29.06 |
| .4 | Environmental Procedures. | Section 01 35 43 |
| .5 | Quality Controls. | Section 01 45 00 |
| .6 | Closeout Submittals. | Section 01 78 00 |

1.2 Measurement Procedures

- .1 This work shall be incidental to contract and will not be measured for payment.

1.3 References

- .1 Not Used.

1.4 Administrative

- .1 Submit to Departmental Representative Submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by Submittal until review is complete.
- .3 Present Shop Drawings, product data, samples and mock ups in SI Metric units.
- .4 Review Submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each Submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
- .5 Notify Departmental Representative in writing at time of submission, identifying any deviations from requirements of Contract Documents stating reasons for deviations.
- .6 Verify field measurements and affected adjacent Work is consistent.
- .7 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of Submittals.

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

.9 Keep one reviewed copy of each submission on site.

1.5 Mock-Ups

.1 Mock ups may be requested. Approval/acceptance of Mock-up will be required prior to proceeding with Work.

1.6 Certificates and Transcripts

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

1.7 Required Contractor Submittals

.1 General

.1 This Clause identifies the plans, programs, and documentation required prior to mobilization on site and during the construction phase.

.2 Pre-Mobilization Submittals: The Contractor shall not begin any site Work until the Departmental Representative has authorized acceptance of submittals in writing. Submit the following plans and programs to the Departmental Representative for review a minimum of seven (7) days prior to mobilization to the project site:

.1 Project Schedule. Submission shall include both a paper copy of the Schedule and an electronic copy.

.2 List of subcontractors, suppliers and consultants, their role and their key personnel, including names and positions, addresses, telephone and cellular telephone numbers, as requested by Departmental Representative.

.3 Plan describing methods the Contractor will have to meet his responsibilities as the Prime Contractor for Traffic Control in the Work zones

.4 Contractor Chain of Command, listing key Contractor personnel, including for each name, position, qualification, experience, telephone, cellular telephone and numbers. The list shall include the names and telephone/cellular telephone numbers for contact persons who are available on a 24-hour basis in the event of emergencies.

.5 Contractor to confirm, in writing, compliance to Directive 17 (Appendix C) and Section 01 35 43 – Environmental Procedures.

.6 Contractor shall develop an "Emergency Procedures Protocol" in consultation with Parks Canada.

.3 Construction Phase Submittals

.1 Progress Reports that outline the detailed Work (Contractor, subcontractors, suppliers, consultants) completed to date as well as the anticipated Work to be performed for the following week. Also, alternate Work to be identified if Work or a portion of, proposed cannot be done due to weather, equipment breakdown, delays in delivery, etc.

.2 Submit copies of reports or directions issued by Federal and Provincial health and safety inspectors.

.3 Submit copies of incident and accident reports.

.4 Project Completion Submittals

.1 Record Drawings -The Contractor shall submit copies of all Contractor's Drawings revised as necessary to record all as-built changes to the Work and the Contractor shall submit a set of Contract Drawings clearly marked to record as- built changes to the Work.

.5 The Contractor shall not construe the Departmental Representative's authorization of the submittals to imply approval of any particular method or sequence for conducting the Work, or for addressing health and safety concerns. Authorization of the programs shall not relieve the Contractor from the responsibility to conduct the Work in strict accordance with the requirements of Federal or Provincial regulations, this specification, or to adequately protect the health and safety of all workers involved in the project and any members of the public who may be affected by the project. The Contractor shall remain solely responsible for the adequacy and completeness of the programs and work practices, and adherence to them

2.0 PRODUCTS

.1 Not Used

3.0 EXECUTION

.1 Not Used

END OF SECTION

Banff Masonry Walls

1.0 GENERAL

1.1 Related Requirements

- .1 All Division 01, 02 and 03 Sections

1.2 Measurement Procedures

- .1 Cost of Traffic Control shall be considered incidental to "Lump Sum Price Item 1 – Mobilization and Demobilization", and no additional payment will be made for the duration of the Contract.
- .2 Cost of snow removal for Contractor to do the work identified in the Contract while Contractor is on site shall be considered incidental to "Lump Sum Price Item 1 – Mobilization and Demobilization", and no additional payment will be made for the duration of the Contract. This excludes snow removal on Public Roads.

1.3 References

- .1 The Contractor shall provide traffic control in accordance with current edition of:
 - .1 Alberta Transportation – Traffic Accommodation in Work Zones.
 - .2 Manual of Uniform Traffic Control Devices for Canada, (MUTCD) distributed by Transportation Association of Canada.

1.4 Quality Control

- .1 All Quality Control by the Contractor

1.5 General

- .1 The Contractor shall develop and implement a Traffic Management Plan in accordance with the requirements of the current edition of the AT - Traffic Accommodation in Work Zones, except where specified otherwise. The Traffic Management Plan will include plans specific to each detour and access point required for this project.
- .2 The Contractor shall design, supply, erect, move and maintain all traffic control devices, signs, temporary pavement marking, other safety measures and provide staff to ensure safe passage of all traffic from commencement of site work to date of acceptance by the Departmental Representative.
- .3 All traffic and warning signs shall be either bilingual or of a symbolic or pictorial type. If bilingual signs are used, the English and French message shall be of equal letter size and at same elevation, with English on left and French on right. Assistance in translation of construction and warning signs to French may be obtained from Parks Canada.

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- .4 All speed limits, traffic control and warning signs shall have an “NPC” adhesive sticker added to bottom right-hand corner. These stickers will be supplied by Parks Canada following the acceptance by the Departmental Representative of the Contractor’s traffic management plan.
- .5 The Contractor shall coordinate traffic management procedures with other Contractors working in the area.

1.6 Informational and Warning Devices

- .1 Provide and maintain signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.
- .2 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in the Traffic Management Plan submitted by the Contractor and approved by the Departmental Representative.
- .3 Place signs and other devices to standards and in locations recommended in AT - Traffic Accommodation in Work Zones.
- .4 Signs shall be wind resistant.
- .5 As situation on site changes, Contractor to update his Traffic Management Plan outlining signs and other devices required for the project and submit for the approval of the Departmental Representative.
- .6 Continually inspect and maintain traffic control devices in use by:
 - .1 Checking signs daily for legibility, damage, suitability and location.
 - .2 Cleaning, repairing or replacing signs as required ensuring clarity and reflectance.
 - .3 Removing or covering signs which do not apply to conditions existing from day to day or time to time.

1.7 Protection and Maintenance of Traffic

- .1 Protect travelling public from damage to person and property.
- .2 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .3 Maintain access and haul roads as necessary.
- .4 Dust control: adequate to ensure safe operation at all times.
- .5 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations if night work operations required.

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- .6 Provide snow removal during period of Work.
- .7 Verify adequacy of existing roads and allowable load limit on these roads.
Contractor: responsible for repair of damage to roads caused by construction operations.
- .8 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .9 Provide competent flag persons, trained in accordance with, and properly dressed and equipped as specified in, Alberta Transportation - Traffic Accommodation in Work Zones for situations as follows:
 - .1 When vehicles are entering or exiting Worksite accesspoints.
 - .2 When vehicles are entering or exiting gravel pits in the park.
 - .3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.
 - .4 Where temporary protection is required while other traffic control devices are being erected or taken down.
 - .5 For emergency protection when other traffic control devices are not readily available.
 - .6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.
- .10 Delays to public traffic due to contractor's operators: 10 minutes maximum.
- .11 No stoppage of traffic will be allowed for the period commencing at 07:00 a.m. on the day before a Statutory Holiday or long weekend to 7:00 a.m. on the day following a long weekend.
- .12 During hours of darkness, Contractor shall determine requirements but as a minimum, flag-persons shall be additionally equipped with a red signal hand-light of sufficient brightness to be clearly visible to approaching traffic and flagging stations shall be illuminated by overhead lighting. Signs indicating hazardous conditions and signs requiring increased attention shall be marked with flashers.

2.0 PRODUCTS

- .1 Not Used

3.0 EXECUTION

- .1 Not Used

END OF SECTION

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1.0 GENERAL

1.1 Related Sections

- | | | |
|----|--------------------------|------------------|
| .1 | Work Restrictions | Section 01 14 00 |
| .2 | Submittal Procedures | Section 01 33 00 |
| .3 | Environmental Procedures | Section 01 35 43 |
| .4 | Regulatory Requirements | Section 01 41 00 |
| .5 | Hazardous Materials | Section 02 81 01 |

1.2 Measurement Procedures

- .1 This work shall be incidental to contract and will not be measured for payment

1.3 References

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .1 Material Safety Data Sheets (MSDS).
- .3 Province of Alberta.
- .1 Occupational Health and Safety Act, R.S.A. 2000.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit copies of reports or directions issued by Federal or Provincial health and safety inspectors.
- .3 Submit copies of incident and accident reports.
- .4 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
- .5 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.5 Filing of Notice

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

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- .2 Parks Canada recognizes that federal Occupational Health and Safety legislation places specific responsibilities upon Parks Canada as owner of the work place. In order to meet those requirements, Parks Canada has implemented a contractor safety regime to ensure roles and responsibilities assigned under Part II of the Canada Labour Code and the Canada Occupational Health and Safety Regulations are implemented and observed when involving contractor(s) to undertake work in Parks Canada work places, including on Parks Canada property.
- .3 After contract award and prior to commencement of any work under the contract, the Project Manager will hold a health and safety meeting with the Contractor. At this meeting the Contractor is required to complete and sign an Attestation to certify the Contractor will comply with the requirements set out in the Attestation and the terms and conditions of the contract.

1.6 Safety Assessment

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

1.7 Meetings

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

1.8 Regulatory Requirements

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

1.9 Project/Site Conditions

- .1 General requirements
 - .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce the Plan until final demobilization from site. Health and Safety Plan must address projectspecifications

1.10 Responsibility

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

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1.11 Compliance Requirements

- .1 Comply with Occupational Health and Safety Act, General Safety Regulation, Alberta.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.12 Unforeseen Hazards

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

1.13 Health and Safety Co-Ordinator

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have site-related working experience specific to activities associated with earthworks.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.14 Correction of Non-Compliance

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

1.15 Work Stoppage

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

2.0 PRODUCTS

.1 Not Used

3.0 EXECUTION

.1 Not used.

END OF SECTION

1.0 GENERAL

1.1 Related Requirements

- .1 All Divisions 01, 02, 31, 32, and 35 Sections.

1.2 Submittals

- .1 Prior to the commencement of construction the Contractor must provide written confirmation that he has read and understood and will comply with environmental procedures as outlined in this section 01 35 43-Environmental Procedures and Directive 17 (Best Management Practices for Construction Projects in Banff National Park - Appendix C and Environmental and Access Mitigation Details – Appendix D).

1.3 National Park Regulations

- .1 The Contractor shall ensure that all work is performed in accordance with the ordinances, laws, rules and regulations set out in the Canada National Parks Act and Regulations.
- .2 The Contractor and any Sub-Contractors shall obtain a business license from the Parks Canada Administration Office in Banff, prior to commencement of the contract.
- .3 All Contractor vehicles are required to display a vehicle work pass from Parks Canada. These permits may be obtained free of charge from the Departmental Representative, PCA Environmental Officer or at the Park Gate.

1.4 Canadian Environmental Assessment Act (Ceaa)

- .1 Execution of the Work is subject to the provisions within the *Canadian Environmental Assessment Act* (CEAA) Guidelines Order of 2012, subsequent amendments, and Parks Canada's Interim Directive on Implementation of the Canadian Environmental Assessment Act 2012.
- .2 Failure to comply with or observe environmental protection measures as identified in these specifications may result in the Work being suspended pending rectification of the problems.

1.5 Monitoring

- .1 Parks Canada will have an ESO attending the site to monitor the construction activity for conformance with the Environmental Procedures. The ESO or alternate designated Parks Canada staff member will present the "environmental briefing". The ESO's main duties are to monitor the progress of the construction on an on-going basis to ensure compliance with environmental protection measures, and to provide guidance through the Departmental Representative, in the event of unanticipated environmental problems. Although the ESO has

authority to enforce National Parks Act violations, direction to the Contractor will be the duty of the Departmental Representative.

1.6 Construction Site Access and Parking

- .1 In consultation with the Departmental Representative, the Contractor shall formulate an agreement for worker transportation to and from the work sites and where workers shall park their private vehicles. Generally, personal vehicles shall be parked at least 10 metres distance from any watercourse.
- .2 The Contractor shall ensure that the environment beyond the Work limits is not negatively impacted or damaged by workers' vehicles or construction machinery and shall instruct workers so that the "footprint" of the project is kept within defined boundaries.

1.7 Protection of Work Limits

- .1 The Contractor is to prepare an Environmental Protection Plan which details how the Work limits shall be marked and what procedures will be employed to ensure trespass outside these limits does not occur, to the satisfaction of the Departmental Representative and the ESO.

1.8 Erosion Control

- .1 Erosion control measures that prevent sediment from entering any waterway, water body or wetland in the vicinity of the construction site are a critical element of the project and shall be implemented by the Contractor.
- .2 If necessary, on-site sediment control measures shall be constructed and functional prior to initiating activities. The Contractor shall prepare an Erosion Control Plan to the satisfaction of the Departmental Representative and the ESO.
- .3 The regular monitoring and maintenance of all erosion control measures shall be the responsibility of the Contractor. If the design of the control measures is not functioning effectively they are to be repaired. The Departmental Representative and ESO also will monitor erosion control performance.
- .4 The site will be secured against erosion during any periods of construction inactivity or shutdown.

1.9 Pollution Control

- .1 The Contractor shall prevent any deleterious and objectionable materials from entering streams, rivers, wetlands, water bodies or watercourses that would result in damage to aquatic and riparian habitat. Hazardous or toxic products shall be stored no closer than 30 metres from watercourses.
- .2 The containment, storage, security, handling, use, unique spill response requirements and disposal of empty containers, surplus product or waste generated in the use of any hazardous or toxic products shall be in accordance

with all applicable federal and provincial legislation. Hazardous products shall be stored no closer than 100 metres from watercourses.

- .3 The Contractor shall prevent blowing dust and debris by covering and/or providing dust control for temporary roads and on-site work by methods that are approved by the Departmental Representative or ESO.
- .4 The Contractor shall provide spill kits at re-fueling, lubrication, and repair locations that will be capable of dealing with 110% of the largest potential spill and shall be maintained in good working order on the construction site. The ESO and Departmental Representative prior to project start-up must approve these spill kits. The Contractor and site staff shall be informed of the location of the spill response kit(s) and be trained in its use.
- .5 Timely and effective action shall be taken to stop, contain and clean-up all spills as long as the site is safe to enter. The Departmental Representative and the ESO shall be notified immediately of any spill. If not available, Banff Dispatch will be contacted at (403) 762 – 4506. Spill response cards will be distributed during the initial Environmental Briefing with basic instructions and phone numbers.
- .6 In the event of a major spill, all other work shall be stopped and all personnel devoted to spill containment and clean-up.
- .7 The costs involved in a spill incident (the control, clean up, disposal of contaminants and site remediation to pre-spill conditions), shall be the responsibility of the Contractor. The site will be inspected to ensure completion to the expected standard and to the satisfaction of the Departmental Representative and ESO.

1.10 Equipment Maintenance, Fuelling and Operation

- .1 The Contractor shall ensure that all soil, seeds and any debris attached to construction equipment to be used on the project site shall be removed (e.g. power washing) outside the Banff National Park before delivery to the work site.
- .2 Equipment fueling sites will be identified by the Contractor and approved by the Departmental Representative and the ESO. Except for chain saws, any fueling closer than 100 metres from any streams, wetlands, water bodies or waterways shall require the authorization and oversight of the Departmental Representative.
- .3 Mobile fuel containers (e.g. slip tanks, small fuel carboys) shall remain in the service vehicle at all times. Protection and containment of approved fuel storage sites is addressed in # 4 of Pollution Control above.
- .4 Equipment used on the project shall be fueled with E10, and low sulfur diesel fuels and shall conform to local emission requirements. The Contractor is to ensure that unnecessary idling of vehicles is avoided.

- .5 Oil changes, lubricant changes, greasing and machinery repairs shall be performed at locations approved by the ESO or the Departmental Representative. Waste lubrication products (e.g. oil filters, used containers, used oil, etc.) shall be secured in spill-proof containers and properly recycled or disposed of at an approved facility. No waste petroleum, lubricant products or related materials are to be discarded, buried or disposed of in borrow pits, turnouts, picnic areas, viewpoints, etc. anywhere within Banff National Park.
- .6 The Contractor shall ensure that all equipment is inspected daily for fluid/fuel leaks and maintained in good working order.
- .7 Fuel containers and lubricant products shall be stored only in secure locations specified by the Departmental Representative. Fuel tanks or other potentially deleterious substance containers shall be secured to ensure they are tamperproof and cannot be drained by vandals when left overnight in Banff National Park. Alternatively, the Contractor may hire a security person employed to prevent vandalism.

1.11 Operation of Equipment

- .1 Equipment movements shall be restricted to the 'footprint' of the construction area. The work limits shall be identified by stake and ribbon or other methods approved by the Departmental Representative. Unless authorized by the Departmental Representative, activities beyond the Work limits are not permitted. No machinery will enter, work in or cross over streams, rivers, wetlands, water bodies or watercourses, nor damage aquatic and riparian habitat or trees and plant communities. Some of the construction shall require working close to watercourses or water bodies. In these instances, the Contractor is to describe measures to be employed to ensure fugitive materials (e.g. rocks, soil, branches) and especially deleterious substances (e.g. chemicals) do not enter any watercourses, to the satisfaction of the Departmental Representative and ESO.
- .2 The Contractor shall instruct workers to prevent pushing, placement, raveling, storage or stockpiling of any materials (e.g. slash, rock, fill or topsoil) in the trees bordering the right-of-way or into watercourses or waterbodies.
- .3 When, in the opinion of Parks Canada, negligence on the part of the Contractor results in damage or destruction of vegetation, or other environmental or aesthetic features beyond the designated work area, the Contractor shall be responsible, at his or her expense, for complete restoration including the replacement of trees, shrubs, topsoil, grass, etc. to the satisfaction of the Departmental Representative and ESO.
- .4 Restrict vehicle movements to work limits.
- .5 Workers private vehicles are to remain within the construction footprint.

1.12 Fire Prevention and Control

- .1 A fire extinguisher shall be carried and available for use on each machine and at locations within the plant in the event of fire. Contractor's staff shall receive basic training in early response to wildfire events during the "environmental briefing".
- .2 Construction equipment shall be operated in a manner and with all original manufacturers' safety devices to prevent ignition of flammable materials in the area.
- .3 Care shall be taken while smoking on the construction site to ensure that the accidental ignition of any flammable material is prevented. Fires or burning of waste materials is not permitted.
- .4 In case of fire, the Contractor or worker shall take immediate action to extinguish the fire provided it is safe to do so. The ESO and the Departmental Representative shall be notified of any fire immediately. If not available, Banff Dispatch shall be contacted at (403) 762 – 4506.
- .5 Fires or burning of waste materials is not permitted.

1.13 Wildlife

- .1 During the Environmental Briefing all personnel shall be instructed by the ESO on procedures to follow in the event of wildlife appearance near or within the work site and any other wildlife concerns.
- .2 Construction activities will take place during daylight hours and, and if necessary, the construction activity may be scheduled around important wildlife windows.
- .3 All site workers will observe posted speed limits and avoid or terminate activities on site that attract or disturb wildlife and vacate the area and stay away from the immediate location if bears, cougars, wolves, elk or moose display aggressive behaviour or persistent intrusion. Extra care to control materials that might attract wildlife (e.g. lunches and food scraps) must be exercised at all times. The contractor will ensure that the Work site is properly secured during non-work hours with excavations fenced and covered as required to prevent injury to wildlife.
- .4 Notify the ESO and Departmental Representative immediately about dens, litters, nests, carcasses (road kills), bear activity or encounters on or around the site or crew accommodation. Other wildlife-related encounters are to be reported within 24 hours. If the ESO or Departmental Representative is not available, Banff Dispatch will be contacted at (403) 762 – 4506.

1.14 Relics and Antiquities

- .1 Artifacts, relics, antiquities and items of historical interest such as cornerstones, commemorative plaques, inscribed tablets and similar objects found on the work site shall be reported to the ESO or the Departmental Representative immediately. The Contractor and workers shall wait for instructions before proceeding with their work.
- .2 All historical or archaeological objects found in Banff National Park are protected under the National Parks Act and Regulations and are the property of Parks Canada. The Contractor and workers shall protect any articles found and request direction from the ESO or the Departmental Representative.

1.15 Waste Materials Storage and Removal

- .1 The Contractor and workers shall dispose of hazardous wastes in conformance with the Environmental Contaminants Act and applicable provincial regulations while observing the Code of Good Practice for Management of Hazardous and Toxic Wastes at Federal Establishments.
- .2 All wastes originating from construction, trade, hazardous and domestic sources, shall not be mixed, but will be kept separate
- .3 Construction, trade, hazardous waste and domestic waste materials shall not be burned, buried or discarded at the construction site or elsewhere in Banff National Park. These wastes shall be contained and removed in a timely and approved manner by the Contractor and workers, and disposed of at an appropriate waste landfill site located outside the park. Construction waste storage containers, provided by the Contractor, shall be emptied by the Contractor when 90% full. Waste containers will have lids, and waste loads shall be covered while being transported.
- .4 A concerted effort shall be made by the Contractor and workers to reduce reuse and recycle materials.
- .5 All efforts to prevent wildlife from obtaining food, garbage or other domestic wastes shall be made by the Contractor and contract staff while undertaking their work in Banff National Park. Such wildlife attractants shall not be stored at the work site overnight.
- .6 Lunches, coolers and food products, including waste food products, shall be securely stored away from access by animals. Daily removal of food scraps, food wrappers, pop cans or other attractive products to bear proof containers is mandatory.
- .7 The Contractor and workers shall immediately report any circumstances related to food/garbage (e.g. overflowing container or strong smell) and wildlife to the ESO or the Departmental Representative. If neither can be reached, the Contractor/worker shall immediately contact Banff Dispatch at (403) 762 – 4506 and report the details.

- .8 Sanitary facilities, such as a portable container toilet, shall be provided by the Contractor and maintained in a clean condition.

1.16 Miscellaneous Site Management Contingencies

- .1 If required, a Contractor's office and work headquarters material laydown, equipment parking and storage area will be permitted at the work site.
- .2 The National Park Act regulations prohibit anyone working within Banff National Park from using public campground facilities.
- .3 Removal and storage of snow shall be coordinated with the ESO and the Departmental Representative.
- .4 The Contractor shall control blowing dust and debris generated from the construction site by means such as covering or wetting down dry materials and rubbish. Dust control measures for temporary access roads may also have to be initiated.
- .5 Security services at the construction site may be desirable or necessary during the contract, especially during quiet times. Fuel tanks or other potentially deleterious substance containers must be secured by the Contractor to ensure they are tamperproof and cannot be drained by vandals at his own cost.
- .6 Pets shall not be brought to or maintained at the construction site or worker's camp.

2.0 EXECUTION

2.1 Material Loading, Hauling, Placement and Grade Building

- .1 During grade construction conducted close to any watercourse, water body or wetland methods shall be employed to ensure materials are not pushed, fall or are eroded into the water or wetlands. Generally, work within a 30 metre buffer of waterways or wetlands require the close oversight of the ESO and the Departmental Representative.
- .2 No grade building shall occur outside of the designated area or within 1 metre of the drip line of existing forest. Any material inadvertently falling outside the work limits is to be removed promptly in a manner that does not damage trees or vegetation at that location. Materials shall be placed at storage sites or on the grade without spillage outside the working limits.

2.2 Specific Concerns Relative to Erosion Control and Sedimentation

- .1 The Contractor shall prepare an Erosion and Sedimentation Management Plan for the components of this contract that are undertaken in proximity to watercourses, wetlands or riparian environments. This plan shall be to the satisfaction of the Departmental Representative and ESO.
- .2 An important desired end result is to allow no release into watercourses of sediments in levels that are deleterious to fish or that would harmfully alter, disrupt, or destroy fish habitat. Similarly there is to be no sediment release into areas of vegetation growth or sensitive areas of sediments in levels that would adversely alter growing or hydraulic conditions.

2.3 Cleaning

- .1 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

END OF SECTION

1.0 GENERAL

1.1 Related Sections

.1 Not Used

1.2 References and Codes

.1 Perform Work in accordance with National Building Code of Canada (NBC) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes and referenced documents.

1.3 Canadian Environmental Protection Act

.1 Perform Work in accordance with Canadian Environmental Protection Act.

1.4 National Parks Act

.1 Perform Work in accordance with National Parks Act when projects are located within boundaries of National Park.

2.0 PRODUCTS

.1 Not Used

3.0 EXECUTION

.1 Not Used

END OF SECTION

1.0 GENERAL

1.1 Related Requirements

- .1 All Division 01, 02 and 03 Sections.

1.2 Measurement Procedures

- .1 This work shall be incidental to contract and will not be measured for payment.

1.3 Inspection

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

1.4 Access to Work

- .1 Allow inspection/testing agencies access to Work.

1.5 Rejected Work

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

2.0 PRODUCTS

- .1 Not Used

3.0 EXECUTION

- .1 Not Used

END OF SECTION

1.0 GENERAL

1.1 Related Sections

- .1 Special Procedures for Traffic Control. Section 01 35 00.06
- .2 Environmental Procedures Section 01 35 43

1.2 Submittals

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

1.3 Installation and Removal

- .1 Provide construction facilities in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.4 Sites Storage / Loading

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

1.5 Construction Parking

- .1 Provide and maintain adequate access and parking at the project site in areas approved by the Departmental Representative.
- .2 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

1.6 Equipment, Tool and Materials Storage

- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.7 Sanitary Facilities

- .1 Provide sanitary facilities for work force in accordance with governing regulations, ordinances, the EPP and section 01 35 43 – Environmental Procedures.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.8 Construction Signage

- .1 No other signs or advertisements, other than warning and traffic control signs, are permitted on site.
- .2 Signs and notices for safety and instruction shall be in both official languages. Graphic symbols shall conform to CAN3 Z321.
- .3 Maintain approved signs and notices in good condition for duration of project, and dispose of offsite on completion of project or earlier if directed by Departmental Representative.

1.9 Protection and Maintenance of Traffic

- .1 Provide traffic control measures in accordance with Section 01 35 00.06 – Special Procedures for Traffic Control.

2.0 Measurement Procedures

- .1 This work shall be incidental to the contract and will not be measured for payment.

3.0 PRODUCTS

- .1 Not Used

4.0 EXECUTION

- .1 Not Used

END OF SECTION

Banff Masonry Walls

1.0 GENERAL

1.1 Related Sections

- .1 Quality Control. Section 01 45 00

1.2 References

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

1.3 Quality

- .1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

1.4 Availability

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

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1.5 Storage, Handling and Protection

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

1.6 Transportation

- .1 Pay costs of transportation of products required in performance of Work.

1.7 Manufacturer's Instructions

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

1.8 Quality of Work

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

Banff Masonry Walls

1.9 Co-Ordination

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

1.10 Remedial Work

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

1.11 Existing Utilities

- .1 Protect, relocate or maintain existing active services if present. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

2.0 PRODUCTS

- .1 Not Used

3.0 EXECUTION

- .1 Not Used.

END OF SECTION

1.0 GENERAL

1.1 Related Requirements

- | | | |
|----|--------------------------------------|------------------|
| .1 | Repointing Historic Masonry | Section 04 03 07 |
| .2 | Historic – Replacing Stone | Section 04 03 42 |
| .3 | Historic – Dismantling Stone Masonry | Section 04 03 43 |
| .4 | Masonry Restoration and Cleaning | Section 04 99 20 |

1.2 References

- .1 Canadian Construction Documents Committee (CCDC)
- .2 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions "C", In Effect as Of: May 14, 2004.

1.3 Project Cleanliness

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or Sub-Contractors.
- .2 Remove waste materials from site on a daily regular scheduled time or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
- .3 Dispose of remaining waste materials from site as directed by Departmental Representative or in accordance with Section 01 35 43 Environmental Procedure.
- .4 Clear snow and ice from access to work area and pile snow in designated areas.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. The use of any part of Prime Cost Sum will be on sole discretion of Parks Canada Representative and contractor cannot make any claim if some or the entire Prime Cost Sum amount is deemed unnecessary.
- .6 Provide and use marked separate bins for recycling.
- .7 Provide on-site containers for collection of waste materials and debris.
- .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .9 Provide adequate ventilation during use of volatile or noxious substances.

- .10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.4 Final Cleaning

- .1 [Refer to CCDC 2, GC 3.14].
- .2 When Work is substantially performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .4 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .5 Remove waste products and debris including that caused by Owner or other Contractors.
- .6 Remove remaining waste materials from site and dispose of as directed by Departmental Representative or in accordance with Section 01 35 43 Environmental Procedure. Do not burn waste materials on site, unless approved by Departmental Representative.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .8 Remove stains, spots, marks and dirt from all masonry and stone surfaces, caused by construction activities and clean up.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .11 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .12 Remove dirt and other disfiguration from exterior surfaces.
- .13 Sweep and wash clean paved areas.
- .15 Clean drainage systems.

- .16 Remove snow and ice from access to work areas.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling and disposal as directed by Departmental Representative or in accordance with Section 01 35 43 Environmental Procedure.

2.0 PRODUCTS

2.1 NOT USED

3.0 EXECUTION

3.1 NOT USED

END OF SECTION

1.0 GENERAL

1.1 Precedence

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

1.2 Related Requirements

- .1 Closeout Submittals. Section 01 78 00

1.3 Inspection and Declaration

- .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
- .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
- .2 Request Departmental Representative's Inspection.
- .2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly
- .3 Completion: submit written certificate that following have been performed.
- .1 Work has been completed and inspected for compliance with Contract Documents.
- .2 Defects have been corrected and deficiencies have been completed.
- .3 Work is complete and ready for Final Inspection.
- .4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative, and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

1.4 Measurement Procedures

- .1 This work shall be incidental to the contract and will not be measured for payment.

2.0 PRODUCTS

- .1 Not Used

3.0 EXECUTION

.1 Not Used

END OF SECTION

1.0 GENERAL

1.1 Precedence

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

1.2 Related Requirements

- .1 Submittal Procedures. Section 01 33 00
- .2 Quality Control. Section 01 45 00
- .3 Closeout Procedures. Section 01 77 00

1.3 Recording Actual Site Conditions

- .1 Contractor to provide As-built Drawings to Departmental Representative at project completion.
- .2 Contract Drawings and Shop Drawings: legibly mark each item to record actual construction, including.
 - .1 Field changes of dimension and detail.
 - .2 Changes made by Change Orders.
 - .3 Details not on original Contract Drawings.
 - .4 References to related Shop Drawings and modifications.
- .3 Specifications: legibly mark each item to record actual construction, including
 - .1 Changes made by Addenda and change orders.

1.4 Warranties and Bonds

- .1 All work is to be warrantied for a period of one year after all deficiencies identified during final inspection have been rectified.

1.5 Measurement Procedures

- .1 This work shall be incidental to the contract and will not be measured for payment.

2.0 PRODUCTS

- .1 Not Used

END OF SECTION

1.0 GENERAL

1.1 Related Requirements

- .1 Submittal Procedures. Section 01 33 00
- .2 Common Product Requirements. Section 01 61 00

1.2 References

- .1 Definitions:
 - .1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
 - .2 Hazardous Material: product, substance, or organism used for its original purpose; and is either dangerous goods or material that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
 - .3 Hazardous Waste: hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .2 Reference Standards:
 - .1 Canadian Environmental Protection Act, 1999 (CEPA 1999).
 - .1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).
 - .2 Department of Justice Canada (Jus).
 - .1 Transportation of Dangerous Goods Act, 1992 (TDG Act).
 - .2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001- 286).
 - .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
 - .4 National Research Council Canada Institute for Research in Construction (NRC- IRC).
 - .1 National Fire Code of Canada-2010.

1.3 Delivery, Storage and Handling

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Transport hazardous materials and wastes in accordance with Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
- .4 Storage and Handling Requirements:
 - .1 Co-ordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labelling and storage of materials and wastes.
 - .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
 - .3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada requirements.
 - .4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.
 - .1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.
 - .2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.
 - .5 Transfer flammable and combustible liquids away from open flames or heat-producing devices.
 - .6 Solvents or cleaning agents must be non-flammable or have flash point above 38 degrees C.
 - .7 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.
 - .8 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.
 - .9 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:

- .1 Store hazardous materials and wastes in closed and sealed containers.
- .2 Label containers of hazardous materials and wastes in accordance with WHMIS.
- .3 Store hazardous materials and wastes in containers compatible with that material or waste.
- .4 Segregate incompatible materials and wastes.
- .5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.
- .6 Store hazardous materials and wastes in secure storage area with controlled access.
- .7 Maintain clear egress from storage area.
- .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.
- .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
- .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
- .11 When hazardous waste is generated on site:
 - .1 Co-ordinate transportation and disposal with Departmental Representative.
 - .2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.
 - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
 - .4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material and it is licensed to accept this material.
 - .5 Label container[s] with legible, visible safety marks as prescribed by federal and provincial regulations.
 - .6 Only trained personnel handle, offer for transport, or transport dangerous goods.

- .7 Provide photocopies of shipping documents and waste manifests to Departmental Representative.
- .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to Departmental Representative.
- .9 Report discharge, emission, or escape of hazardous materials immediately to Departmental Representative and appropriate provincial authority. Take reasonable measures to control release.
- .12 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
- .13 Report spills or accidents immediately to Departmental Representative. Submit a written spill report to Departmental Representative within 24 hours of incident.

1.4 Measurement Procedures

- .1 This work shall be incidental to the contract and will not be measured for payment.

2.0 PRODUCT

2.1 Materials

- .1 Bring on site only quantities hazardous material required to perform Work.
- .2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

3.0 EXECUTION

3.1 Cleaning:

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

END OF SECTION

1.0 GENERAL

1.1 Work Included

- .1 All cast-in-place concrete shown on Drawings.
- .2 Repairing concrete imperfections.
- .3 Finishing formed concrete surfaces.

1.2 Related Work

- .1 Repointing Historic Masonry. Section 04 03 07
- .2 Historic – Replacing Stone Section 04 03 42

1.3 References

- .1 ACI Detailing Manual – 2004.
- .2 ASTM C260-06, "Standard Specification for Air-Entraining Admixtures for Concrete".
- .3 ASTM C494-08, "Standard Specification for Chemical Admixtures for Concrete".
- .4 ASTM C1017-07, "Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete".
- .5 CSA-A23.1-09, "Concrete Materials and Methods of Concrete Construction".
- .6 CSA-A23.2-09, "Methods of Test and Standard Practices for Concrete".
- .7 CSA-A3001-08, "Cementitious Materials for Use in Concrete".
- .8 CSA-G30.18-M92 (R2007). "Billet-Steel Bars for Concrete Reinforcement".
- .9 Reinforcing Steel Institute of Canada, "Reinforcing Steel-Manual of Standard Practice, Fourth Canadian Edition 2004".
- .10 CSA-G30.18-M92 (R2007). "Billet-Steel Bars for Concrete Reinforcement".

1.4 Quality Assurance

- .1 Cast-in-place concrete to conform to CSA-A23.1.
- .2 Testing shall conform to CSA-A23.2.
- .3 These standards shall be available in the Contractor's site office for the use of the Contractor, Subtrades, and Departmental Representative.

- .4 Provide a system of quality control and quality assurance to ensure that the minimum standards specified herein are attained.
- .5 Obtain acceptance of resultant concrete surface finish prior to placing or finishing subsequent concrete.

1.5 Submittals for Review

- .1 Submit concrete mix proportions or product data sheets (if applicable) in accordance with Division 01 and Table 5 in CSA-A23.1 Alternate 1.
- .2 At the request of the Departmental Representative, submit a letter, signed and sealed by a Professional Engineer registered in the Province of Alberta, stating that all concrete supplied meets the project specifications and requirements of CSA-A23.1.
- .3 Submit proposed source of aggregates, including results of petrographic examination indicating petrographic number (PN) and ironstone content for each coarse aggregate proposed for use, which will include evidence that aggregates are not susceptible to alkali-aggregate reactions. Petrographic analysis shall be performed by an experienced qualified petrographer of a CSA certified laboratory. The analysis of the aggregates shall be current and fully represent the material to be used in production. Sampling and testing shall have been done no more than ninety (90) days prior to concrete production. Refer to 2.1.5 for ironstone and coal/lignite limits

1.6 Inspection and Testing

- .1 Notify Departmental Representative at least 24 hours before complete formwork and concrete reinforcement will be ready for inspection.
- .2 Allow ample time for inspection and corrective work, if required, before scheduling concrete placement.
- .3 Concrete sampling, inspection and testing is to be performed by an Inspection and Testing Firm appointed and paid by the Department Representative.
- .4 Provide free access to all portions of work and cooperate with appointed firm.
- .5 Submit proposed mix design of each class of concrete to Departmental Representative for review prior to commencement of work.
- .6 Tests of cement and aggregates may be performed to ensure conformance with requirements stated herein.
- .7 Notify Inspection and Testing Firm before placing concrete, in ample time to permit scheduling.
- .8 One (1) set of concrete test cylinders will be taken for every 50 to 100 m³ or less of each class of concrete placed each day.

- .9 A set of test cylinders will consist of:
 - .1 Three (3) cylinders, unless noted otherwise. One (1) cylinder will be tested at 7 days, and two (2) cylinders will be tested at 28 days.
 - .2 One (1) additional test cylinder will be taken during cold weather concreting, and be cured on job site under the same conditions as concrete it represents. The field cylinders will be tested at 28 days.
- .10 One slump test and one air content test will be taken for each set of test cylinders taken.
- .11 Additional slump tests may be taken as necessary to verify quality of concrete.
- .12 Concrete for the test cylinders, slump and air tests will be taken from the discharge point closest to the point of final deposit in the form in order to best represent the in situ conditions. These samples will not be taken from the first or last portions of concrete discharged from the delivery truck.
- .13 Testing of concrete will be performed in accordance with CAN/CSA-A23.2. Test results will be issued to Contractor and Departmental Representative.
- .14 Pay costs for retesting required due to defective materials or workmanship.
- .15 Contractor may arrange and pay for additional tests for use as evidence to expedite construction.

1.7 Measurement Procedures

- .1 This work shall be incidental to the contract and will not be measured for payment.

2.0 PRODUCTS

2.1 Concrete Materials

- .1 Portland cement: to CSA-A3000, Type GU.
- .2 Supplementary cementing materials (SCM): to CSA-A23.1, Type F, CI, or CH flyash. A maximum of 25% flyash shall be permitted for concrete with exposure class Class C-1 and C-2 when exposed to freezing and thawing.
- .3 Water: to CSA-A23.1.
- .4 Aggregates: to CSA-A23.1. Coarse aggregates to be normal density. Ironstone content shall not exceed one percent (1.0%) for coarse aggregate and one point five percent (1.5%) for fine aggregate. Coal and lignite content shall not exceed 0.1% for coarse aggregate and 0.5% for fine aggregate.
- .5 Air entraining admixture: to ASTM C260. Notwithstanding tabulated concrete properties in Section 2.2 below, air may be deleted for interior slab work.

- .6 Chemical admixtures: to ASTM C494/C494M. Admixtures containing chlorides are not permitted.
- .7 Bonding agent: 100% Acrylic high strength.
- .8 Superplasticizers: to ASTM C1017/1017M.
- .9 Ensure that no aggregates are used which may undergo volume change due to alkali reactivity, moisture retention or other causes. Confirm suitability of aggregate with a petrographic analysis as directed by Departmental Representative.

2.2 Concrete Mixes

- .1 Pay all costs for mix design. Submit design of a proven mix to Inspection and Testing Firm and Departmental Representative for review.
- .2 Do not change concrete mix without prior approval of Departmental Representative. Should change in material source be proposed, submit new mix designs to be reviewed by Departmental Representative.
- .3 Use accelerating admixtures in cold weather only when approved by Departmental Representative. If approved, the use of admixtures will not relax cold weather placement requirements. Do not use calcium chloride.
- .4 Use set-retarding admixtures during hot weather only when approved by Departmental Representative.
- .5 All admixtures are subject to the approval of the Departmental Representative. List all proposed admixtures in mix design submission. Do not change or add admixtures to approved design mixes without Departmental Representative's approval.
- .6 Concrete delivered to Site must be accompanied by a delivery slip in accordance with CAN/CSA-A23.1.
- .7 Provide concrete mixed in accordance with requirements of CSA-A23.1 to give the following properties:

Location	CSA Exposure Class	Cement Type	Minimum Compressive Strength (MPa)	Max w/c Ratio	Max Aggregate (mm)	Air Content (%)
Chimney Cap	F-2	GU	25 @ 28 Days	0.55	20	4-7

2.3 Premixed Concrete

- .1 Alternatively to Section 2.2, premixed concrete may be used pending approval of the Departmental Representative. Premixed concrete to be mixed, installed, and cured according to the manufacturer's recommendations and CSA A23.1.
- .2 Premixed concrete to satisfy the concrete properties shown in Section 2.2.
- .3 Submit premixed concrete data sheets for review and approval by the Departmental Representative prior to commencing Work.
- .4 Testing requirements for premixed concrete may be negated pending review and approval by the Departmental Representative.

2.4 Reinforcing Materials

- .1 Reinforcing Steel: 400 MPa yield grade; deformed billet steel bars conforming to CSA-G30.18; plain finish.
- .2 Tie Wire: minimum 1.6 mm annealed type, or patented system approved by Departmental Representative.
- .3 Chairs, Bolsters, Bar Supports, Spacers: adequately sized for strength and support of reinforcing steel during construction.

3.0 EXECUTION

3.1 Examination

- .1 Before starting this work, examine work done by others which affects this work.
- .2 Notify the Departmental Representative of any conditions which would prejudice proper completion of this work.
- .3 Commencement of work implies acceptance of existing conditions.

3.2 Reinforcing Fabrication

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1 and Drawings.
- .2 Locate reinforcing splices not indicated on Drawings at points of minimum stress.
- .3 All bending shall be done cold with a suitable machine accurately producing all lengths, depths and radii shown on the bending details.
- .4 Bars shall not be bent or straightened in a manner that will injure the material and any bars with kinks or bends not shown on the Drawings shall not be used.
- .5 After initial fabrication, reinforcing steel shall not be re-bent or straightened unless so indicated on the Drawings.

- .6 Do not field bend reinforcement unless authorized in writing by the Departmental Representative.
- .7 Heating of reinforcing steel will not be permitted.

3.3

Reinforcing Installation

- .1 Place reinforcing steel in accordance with CSA-A23.1 and Drawings.
- .2 When specifically requested, obtain Departmental Representative's approval of reinforcing steel and position before placing concrete.
- .3 Reinforcement shall be free from loose rust, scale, grease, clay, or other coatings which will destroy or reduce concrete bond.
- .4 Concrete cover shall be as specified on the Drawings, or if not specified, in accordance with CSA-A23.1.
- .5 Reinforcement shall be adequately secured in position by approved chairs, support bars, and spacers.
- .6 Reinforcement shall be tied with wire ties at bar intersections to ensure that displacement outside the allowable tolerances will not occur. Tack welding of bars is not permitted.
- .7 Necessary splices shall be lapped not less than 24 bar diameters unless noted otherwise, and be in accordance with CSA-A23.3.
- .8 Revise, reseal, and correct improperly positioned reinforcing prior to placing concrete to the satisfaction of the Department Representative.
- .9 Provide horizontal "L" shaped corner bars of same cross-sectional area and spacing as horizontal bars around corners.
- .10 Do not drive or force reinforcement into fresh concrete.
- .11 Prior to closing forms and placing concrete, obtain Departmental Representative's acceptance of completed installation of reinforcement. Review in-place and instructions resulting from such review will take precedence over previous instructions or reviews.

3.4

Placing Concrete

- .1 Place concrete in accordance with requirements of CSA-A23.1 and as indicated on drawings.
- .2 Immediately before concrete is placed, all forms shall be carefully inspected to ensure that they are properly placed, sufficiently rigid and tight, and that all reinforcing steel is in the correct position and secured against movement during

the placing operation. All forms shall be thoroughly cleaned and all debris, snow, ice or other foreign material removed. Chemicals shall not be used to remove ice or hardened concrete from the forms. All forms shall be thoroughly soaked with water except in freezing weather.

- .3 Handling equipment shall be kept free from hardened concrete or foreign material, and cleaned at frequent intervals.
- .4 Notify Departmental Representative and Inspection and Testing Firm minimum 24 hours prior to commencement of concrete operations.
- .5 Ensure all anchors, seats, plates and other items to be cast into concrete are securely placed, and will not interfere with concrete placement.
- .6 Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent the separation or loss of the ingredients. Concrete shall be deposited in the forms as nearly as practicable in its final position to avoid rehandling or flowing. Vibrators shall not be used to move concrete. Under no circumstances shall the concrete which has partially hardened by deposited in the forms.
- .7 When concrete is started, it shall be carried on as a continuous operation until the placing of the section is completed. When shown on the Drawings, concrete shall be placed in the sections indicated and according to the sequence given.
- .8 Maintain accurate records of cast-in-place concrete items. Record date, location of pour, quantity, air temperature and test samples taken.
- .9 Ensure reinforcement, inserts, embedded parts, formed expansion and control joints and heating pipes are not disturbed during concrete placement.
- .10 Prepare set concrete by removing all laitance and loose materials and applying bonding agent. Apply bonding agent in accordance with manufacturer's recommendations.
- .11 Place concrete continuously between present construction and control joints.
- .12 Vibrate concrete using the appropriate size equipment as placing proceeds in strict accordance with CSA-A23.1. Check frequency and amplitude of vibrations prior to use. Provide additional standby vibrators in the event of equipment failure.
- .13 Where bonding a topping to previously placed substrate concrete is required, ensure that the substrate concrete surface is rough, clean and free of oil, grease, laitance and loose material such as dust and debris. Thoroughly clean the substrate and place the bonding agent to substrate immediately prior to placing the topping in accordance with the manufacturer's recommendations.
- .14 Where placing operations would involve dropping the concrete more than 1.5 meters, it shall be placed through "canvas elephant trunks" or galvanized iron

chutes. Concrete levels shall not be raised at a rate greater than that for which proper vibration may be affected.

- .15 The concrete surfaces shall be protected from rain until the final set occurs.
- .16 A minimum of 72 hours shall elapse between adjacent pours separated by construction joints or expansion joints.
- .17 Honeycombing or embedded debris in concrete is not acceptable.
- .18 Remove and replace defective concrete in accordance with Clause 3.16 of this Section.

3.5 Construction Joints

- .1 Joints not indicated on the Drawings shall be located so as to least impair the strength of the structure. The location of these joints shall be subject to the prior approval of the Departmental Representative. Joints shall be in accordance with CSA-A23.1, or as indicated on Drawings or direct by the Departmental Representative.
- .2 Construction joints shall be completed as follows:
 - .1 Reinforcement continuous through the joint.
 - .2 Roughen surface to a minimum 5 mm amplitude by sandblasting and/or high pressure water blasting.
- .3 The surface of hardened concrete shall be roughened and thoroughly cleaned of foreign matter and laitance, and shall be thoroughly wetted with water but not saturated and the forms re-tightened against the face of the hardened concrete before depositing additional concrete. Epoxy bonding agents may be required as directed by the Departmental Representative.

3.6 Cold and Hot Weather Concreting

- .1 Conform to requirements of CSA-A23.1.
- .2 Refer to Division 01 for temporary enclosure and heating requirements.
- .3 Protect slabs being finished during drying conditions above 25°C and/or during high winds with moisture retention film.

3.7 Concrete Protection for Reinforcement

- .1 Ensure reinforcement is placed to provide minimum concrete cover in accordance with CSA-A23.1 or as shown on Drawings.

3.8 Screeding

- .1 Screed in accordance with CSA-A23.1. Screed level, maintain a straightedge value of ± 3 mm in 3m.

3.9 Conduits and Pipes

- .1 Conduit and pipe embedded in concrete shall be of a material not harmful to the concrete and shall:
 - .1 Not displace more than 4% of the area of the cross section of a column on which stress is calculated, including the area of concrete displaced by the bending of the conduit or exit path of the conduit out of the column.
 - .2 Not exceed one-third the solid portion of the slab thickness.
 - .3 Not be spaced closer than three diameters on centre.
 - .4 Have a concrete covering of not less than 25 mm.
 - .5 Be so installed that it will not require cutting, bending or displacement of the reinforcement or impair the structural strength of the system.

3.10 Install Items Specified Under Other Sections

- .1 Install hangers, sleeves, anchors, etc. specified under other Sections.
- .2 Pour concrete after other trades have satisfactorily installed their materials.
- .3 Do not eliminate or displace reinforcement to accommodate hardware. If hangers, inserts, anchors, etc. cannot be located as specified obtain approval of all modifications from Departmental Representative before placing concrete.

3.11 Curing and Protection

- .1 Cure and protect freshly placed concrete in accordance with CSA-A23.1 and this specification.
- .2 Cure concrete and concrete toppings by maintaining concrete surfaces continuously moist at a minimum temperature of 10°C for the minimum length of time as specified in CSA A23.1.
- .3 Cure concrete slab and concrete toppings by one of the following methods:
 - .1 Ponding or continuous sprinkling.
 - .2 Absorptive fabric covered with polyethylene and kept continuously moist.
- .4 During hot weather provide additional initial curing for concrete slabs in accordance with recommendations of ACI 305R.

- .1 Keep surface moist by fogging until bleeding has stopped if rate of evaporation exceeds rate of bleeding.
- .2 Apply evaporation retardant if rapid drying ambient conditions exist.
- .5 Curing compounds may be used on non-watertight walls except as noted. Contractor to submit proposed application procedure for review.
 - .1 Apply compound immediately after removal of forms.
 - .2 Apply compound with roller, brush, or airless sprayer in accordance with manufacturer's instructions.
 - .3 Submit proof of compound compatibility with subsequent coatings and membranes.
 - .4 Submit procedure for removing curing compound where subsequent coating or membranes are not compatible with curing compound.
- .6 Curing compounds may not be used for floor slabs, toppings, architectural concrete or surfaces to receive bonded toppings.

3.12 Frost Protection

- .1 After concrete curing process is completed, provide continuous protection for slabs and foundations on ground to prevent subgrade below from freezing during cold weather. Provide heated enclosures, insulation, etc., as required.
- .2 All concrete poured shall be hoarded and heated to protect the work during freezing conditions. The cost of this shall be included in the Contractor's tender cost.

3.13 Formed Concrete

- .1 Inspect concrete surfaces immediately upon removal of forms.
- .2 Treat imperfections in formed surfaces in accordance with CSA-A23.1 and to Departmental Representative's approval.
- .3 Modify or replace concrete not conforming to qualities, lines, details and elevations specified herein or indicated on Drawings.

3.14 Finishing Formed Surfaces

- .1 Finish all exposed formed concrete surfaces with sack rubbed finish conforming to CSA-A23.1.
- .2 Fill all surface voids wider than 0.5mm and deeper than 1.0mm for all exposed wall surfaces. Surface voids shall be filled with patching mortar in accordance with the manufacturer's instructions.

- .3 Inspect concrete surfaces immediately upon removal of all formwork.
- .4 Patch imperfections when concrete is green.
- .5 Remove all exposed metal form ties, nails and wires, break off fins and remove all loose concrete.
- .6 Thoroughly wet all form tie pockets and patch with patching mortar followed by proper curing.
- .7 Chip away honeycombed and other defective surfaces to depth of not less than 25mm with the edges perpendicular to the surface. Thoroughly wet and patch with patching mortar followed by proper curing.
- .8 Finish edges of chimney cap to a smooth radius.

3.15 Defective Concrete

- .1 Concrete not meeting the requirements of the Specifications and Drawings shall be considered defective concrete.
- .2 Concrete not conforming to the lines, detail and grade specified herein or as shown on the Drawings shall be modified or replaced at the Contractor's expense and to the satisfaction of the Departmental Representative. Finished lines, dimensions and surfaces shall be correct and true within tolerances specified herein and in the Formwork Section of these Specifications.
- .3 Concrete not properly placed resulting in excessive honeycombing, and all honeycombing and other defects in critical areas of stress shall be repaired or replaced at the Contractor's expense and to the satisfaction of the Departmental Representative.
- .4 To conform to the strength requirements, the average of all tests shall exceed the specified strength. When five or more tests of the same class of concrete are available, the average of any five consecutive tests shall be equal to, or greater than the specified strength, and no strength test shall fall more than 3.5 MPa below the specified strength. If any of the criteria of the above clause are not met, the Departmental Representative shall have the right to require one or more of the following:
 - .1 Changes in mix proportions for the remainder of the work.
 - .2 Cores drilled and tested from the areas in question as directed by the Departmental Representative and in accordance with CSA-A23.2. The test results shall be indicative of the strength of the in-place concrete.
 - .3 Load testing of the structural elements. The changes in the mix proportions and the testing shall be at the Contractor's expense.

- .5 Concrete failing to meet the strength requirements of this specification shall be strengthened or replaced at the Contractor's expense and the satisfaction of the Departmental Representative.

3.16 Patching

- .1 Allow Departmental Representative to inspect concrete surfaces immediately upon removal of all formwork.
- .2 Patch imperfections when concrete is green.
- .3 Remove all exposed metal form ties, nails and wires, break off fins and remove all loose concrete.
- .4 Thoroughly wet all form tie pockets and patch with patching mortar followed by proper curing.
- .5 Chip away honeycombed and other defective surfaces to depth of not less than 25mm with the edges perpendicular to the surface. Thoroughly wet and patch with patching mortar followed by proper curing.

3.17 Clean-Up

- .1 At completion of work, remove from site all debris, excess materials and equipment.

END OF SECTION

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1.0 GENERAL

1.1 Scope of Work Includes

- .1 Remove mortar from stones and reinstall.
- .2 Repoint new and salvaged stone that has been reinstalled on walls.
- .3 Mortar to be of intermediate strength - designation 'iii'. Joints to match existing; deep recessed concave joint.

1.2 Related Work

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

1.3 Qualification

- .1 The Work of this section shall be executed under the continuous supervision and of the identified supervising stone mason. All work to be done by skilled and experienced trades personnel specializing in the type of work specified.

1.4 Samples

- .1 Clearly labeled samples of all materials to be used in the Work shall be submitted for approval to the Departmental Representative before work starts.
- .2 The approved samples shall become the standard materials used on the job. Substitutions shall not be permitted without written approval from the Departmental Representative.

1.5 Storage and Handling of Materials

- .1 Store cementitious materials in accordance with CSA A5. Store aggregates in accordance with CSA A23
- .2 All materials are to be kept dry and protected from weather and contamination. Masonry units are to be stacked on pallets.
- .3 Manufacturer's labels and seals must be intact upon delivery.
- .4 Any material that has deteriorated or has been contaminated shall not be incorporated into the Work, and must be removed from the site.
- .5 Environmental Requirements
- .6 All materials must be kept above 4oC (40oF).

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- .7 No mortar may be placed when the temperature is below 0°C (32°F), or below 4°C (40°F) and falling. Repointing must not be done at temperatures above 27°C (80°F) unless shade and water-misted burlap is provided over new Work.
- .8 All Work must be suspended during frosty weather unless a heated enclosure is provided. Work should not be done in full sun at temperatures above 27°C unless shading of the wall is provided and the masonry wall temperature is kept below this point. Burlap sacking and water misting may be necessary to control evaporation. High temperatures can cause flash setting of cements and rapid evaporation of water in the mix, leading to lack of development of final strength by the cement.
- .9 All newly laid masonry mortar shall be protected against freezing until it is set and dry.
- .10 The initial set of lime putty takes at least three days; mortar should be allowed to dry out slowly after this time. Enclosure and temporary heating may be required to prevent freezing.

1.6 Protection

- .1 All methods of enclosure and protection shall be to the approval of the Departmental Representative.
- .2 Newly laid mortar shall be protected from excessive exposure to rain and full sunlight until the surface is thumb-print hardened.
- .3 Provide and maintain protection for masonry walls at all times when work is suspended to prevent water from entering partially re-pointed masonry.
- .4 Protection shall consist of non-staining plastic sheets, tarpaulins or burlap, secured to prevent lifting in high winds.
- .5 All workmen must be protected from the effects of dust during cutting-out operations.
- .6 The contractor shall ensure that all workmen wear adequate, approved protective equipment during these operations and as required at other times.

1.7 Existing Conditions

- .1 The contractor shall report to the Departmental Representative in writing all areas of severely deteriorated masonry revealed during the Work, and shall await instruction regarding repair or replacement of masonry units.

1.8 Construction Waste Management and Disposal

- .1 Separate and recycle waste materials in accordance with the Departmental Representative instructions.

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1.9 Measurement Procedures

- .1 This work shall be incidental to the contract and will not be measured for payment.

2.0 PRODUCTS

2.1 Water

- .1 Water shall be potable and free from contamination.

2.2 Cement

- .1 Cement shall be white Portland cement.
- .2 Low-alkali cement is preferred. Gray Portland cement, though less expensive, is not suitable for use on historic masonry because of the high content of soluble salts that cause staining, efflorescence and crystallization stresses in weak masonry, salts such as sodium and calcium sulphates and hydroxides, and sodium silicates. Gray Portland cement that includes hydrated lime and cement in a pre-mixed state may be suitable, provided that the ratio of mix constituents conform generally to those established in Table 3.4. Its use is suggested where excessive moisture in masonry is a problem.

2.3 Lime

- .1 Hydrated lime to ASTM C207-79 (1984).
- .2 Lime putty slaked from fresh quicklime produces a superior, stronger mortar with greater plasticity and workability than putty run from hydrated lime (CSAA82).

2.4 PIGMENT

- .1 Use pigments only as required to match the colour of existing mortar. Ideally the colour of the mortar should be achieved through matching the colour of the sand aggregate.
- .2 Pigments shall be dry, powdered, inorganic pigments, such as manufactured by Northern Pigment Ltd., Toronto, Ontario acceptable alternate.
- .3 Pigments have traditionally been made by heating various natural earth and metal oxide compounds to achieve various colours. Ochre, sienna and umber are examples of natural earth pigments. Yellow, brown and red tones are produced by heating iron oxides. Most pigments tend to fade under UV exposure.

2.5 Aggregate

- .1 Aggregate shall be well-graded washed sand matching the texture and range of sizes found in the mortar to be matched. The colour of the sand shall be an

exact match of the original; a blending of sands may be required where appropriate. The colour of the mortar should ideally be achieved through the sand only.

- .2 The sand should contain a full range of sizes from fine to quite coarse. Asphalt sand is a readily available grade that gives such a range. Brick sand is generally too homogeneous in grade size. The addition of pigments for special effects is normally restricted to tuck pointing, sand being the general colouring agent.

2.6 Bonding Agent

- .1 Bonding agents should be used with caution: synthetic admixtures can cause the formation of soluble salts, and increased shrinkage through the added water. Utilize pure acrylics such as Acryl 60 (Thorosystems Ltd.) or equivalent. Polyvinyl acetate (PVA) type, which breakdown under ultraviolet exposure, is not acceptable.

2.7 Power Equipment

- .1 Where allowed, a power reciprocating masonry saw may be used to remove the existing mortar joint. Acceptable equipment includes: Arbortech AS170.

3.0 EXECUTION

3.1 Preparation of Hydrated Lime

- .1 Putty can be made from hydrated mason's lime by adding dry bagged hydrated lime to water. The mass is stirred and hoed to form a thick cream. Allow to stand at least 24 hours before use - preferably longer.
- .2 Hydrated limes are produced from quicklime by the addition of a limited amount of water. The resulting dry powder is bagged. Dolomitic Finishing Hydrated Limes (Type S) develop superior plasticity than Mason's (Type N) Hydrated Limes. It is very important that quicklimes be fully slaked, as any unslaked particles will subsequently expand and disturb the rest of the work. It is for this reason that all putty be allowed to temper for at least two weeks before use.

3.2 PREPARATION OF ROUGHAGE

- .1 If the contractor desires, the lime and aggregate may be pre-mixed to produce what is known as roughage or coarse-stuff. This compound may be stored indefinitely if kept sealed from air and kept from freezing.
- .2 Lime hardens slowly through the absorption of carbon dioxide (carbonation), in contrast to hydraulic cements that set quickly through a reaction with water.
- .3 The sand and lime should be accurately proportioned using measuring boxes constructed to contain the exact volume of each ingredient required to make one batch. These materials are to be thoroughly mixed in a mechanical mixer for about ten minutes, then stored in plastic-lined drums and sealed until required.

- .4 When required for use the correct portion of gauging cement should be added, and the mix worked up as specified and used immediately.
- .5 As the strength and colour of even slightly different mixes varies dramatically, accurate portioning is a strict requirement of this specification.

3.3 Cement Gauging of Mortars

- .1 The addition of hydraulic cements to lime and aggregate mixes must be done immediately before the use of the mortar.
- .2 All mortar must be used within two hours of gauging; do not re-temper mortars after this time has elapsed.
- .3 All batching is to be done with wooden boxes or plastic pails of known volume to ensure standardization and conformity of measurement. Shovel measurement of materials is not permitted. Boxes should be of such a size that a batch sufficient for one mixer load is measured out.
- .4 Initially, mortars should be mixed for five minutes without cement or the addition of water. Careful addition of a small amount of water should produce a mortar that is just wet enough to hang on a trowel. Excess water creates a shrinkage problem, and water content in excess of 5% will retard carbonation significantly.
- .5 Cement should be added and mixed for about two minutes before use.
- .6 The amount of water required should be recorded and added at the start of mixing for future batches.
- .7 Mortars must be mixed a total of at least 10 minutes before using to improve wear-ability, increase air entrainment and plasticity, and ensure thorough mixing.
- .8 All mixing boards and mechanical mixing machines must be cleaned between batches.
- .9 Strict control must be exercised so that masons refrain from using too wet a mix. The addition of water does improve workability but does so at the sacrifice of mechanical strength and the increase in final shrinkage. Mortars must be just damp enough to hang on a trowel. Only water lost through evaporation should be replaced at the mortar-board by the mason; a spray bottle of water is used for this purpose.

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3.4 Mix Formulae

.1 (The appropriate mix formula to be selected by the Minister.)

Mortar Designation	Cement: Lime Aggregate	Masonry Material	SELECTED EXPOSURE		
			Sheltered	Moderate	Severe
ii	1:1/2:4-4 1/2	Highly durable: granite, hard brick, etc.	iv	iii	ii
iii	1:1:5-6				
iv	1:2:8-9	Moderately durable: stones, bricks, etc.	v	iv	iii
v	1:2:10-12				
vi	0:2:5	Poor durable: soft brick, friable stone, etc.	vi	v	iv

- .2 The mix recommendations are conservative; old, valuable masonry should be re-pointed with a mix one grade weaker than that shown.
- .3 For repointing of smooth, hard materials such as polished granite the mix water should be replaced with a 1:1 bonding agent: water solution, to improve edge adhesion.
- .4 Addition of a bonding agent is not recommended for softer masonry as the strength of the mix is increased substantially and an excessive concentration of salts may be formed in the mortar.
- .5 These formulae are based upon the use of lime putty and white Portland cement. The use of lime-based mortars requires considerable skill on behalf of the mason to produce first-class work.
- .6 Lime-based mortars are extremely slow-setting, progressively developing strength over several months. The initial set of the lime takes about three days under good conditions.
- .7 The small amount of white Portland cement provides a fast initial set to the mix; it requires however, a moist cure for about two days to achieve a reasonable strength. After this time the masonry should be kept quite dry, to assist in the carbonation of the lime.

- .8 Carbonation requires the entry of carbon dioxide gas in air to enter the mass through the porous structure of the mortar and masonry. Heavy buildups of mortar should be avoided if possible; where deep, thick joints are necessary the backup mortar should be mixed with an aggregate of broken, porous brick chips or other suitable material to aid in the aeration of the mass. They should be added to the mix just before placement. The presence of large amounts of water in the masonry hinders carbonation by filling the pores and preventing access of carbon dioxide to the interior.

3.5 Colouring of Mortars

- .1 If it is necessary to match existing coloured mortar, samples of freshly-broken mortar from the original masonry pointing must be obtained.
- .2 All matching must be done with un-weathered samples of mortar to determine the exact colour used. Final shading to match adjacent weathered mortar can be obtained by using less colourant in many instances. Soiled mortar should not be used as a match, because if the soiled mortar is cleaned at a later date, any new repairs will show up as dirty. The overall colour of mortars should come from the aggregate, not the binder. As mortars weather, the aggregate is gradually exposed and etched, and becomes the principal element affecting the overall colour.
- .3 A test patty of mortar must be prepared, accurately proportioned to represent the final mix formula and amount of pigment.
- .4 The final colour of the patty must be determined only when it is dry. Accelerated drying of the sample can be accomplished by drying the patty in an oven or over a hot-plate.
- .5 No more than 10% by volume of pigment shall be added to mortars.
- .6 Once proportions are determined, careful control during mixing is vital to ensure quality control. A measuring box should be made to hold the specified amount of pigment for each mortar batch.
- .7 Suitable pigments to obtain certain colours are suggested below. The exact amount of each pigment to match existing samples must be determined by experiments.
- | | | |
|----|-----------------|----------------------------|
| .1 | Yellow-Beige | Sienna |
| .2 | Brown-Beige | Brown Umber |
| .3 | Red-Terra-Cotta | Burnt Sienna - Brown Umber |
| .4 | Limestone | Bone Black - Brown Umber |
| .5 | Gray Sandstone | Green Umber |

3.6 Method of Cutting-Out

- .1 All cutting-out is to be done by skilled mechanics under the direction of a competent mason experienced in this type of work.
- .2 A great deal of damage can be done to masonry in a short period of time by inexperienced workmen. Often this damage is irreparable, resulting in the loss of historic material. The use of students and untrained laborers for this operation is not acceptable.
- .3 All cutting-out of joints is to be done with hammer and chisel, unless otherwise specified herein.
- .4 Cutting out of head joints is to be by hand only. Power chisels, power saws and angle grinders are not acceptable. Head joints rarely cut out properly with power saws, and often the adjacent units are badly chopped or cut. All pricing of work should be based upon hand cutting for head joints.
- .5 Cutting out of horizontal joints may be completed with reciprocating saws and angle grinding wheels under the following conditions:
 - .1 All work is to be done under the direct supervision of the foreman.
 - .2 Angle grinders may be used only to score one cut in each joint at the centre of the joint; the cut is to be no more than one half the width of the joint, and cut to the full depth of the joint required.
 - .3 The face edges of the stone are to be cleaned up on the bench after the stone is removed from the wall.
- .6 It is practically impossible to remove hard Portland cement-based mortars from masonry by hand-chiseling, but with care a satisfactory result can be achieved with mechanical cutting equipment as an aid. Great care must be taken so as not to damage masonry units adjacent to joints.

3.7 Repointing

- .1 Immediately before repointing operations commence, the area to be pointed is to be thoroughly flushed with water to remove all dust and to wet the surface well until suction is controlled and the surface stays wet.
- .2 Pointing is to be built up in layers not exceeding 12 mm in depth; the bottom layers must be allowed to set before subsequent layers of mortar are applied.
- .3 After the final layer of mortar has set the joint is to be tooled lightly to give the final required form. Do not overwork the face of the joint. Head joints must be tooled first.
- .4 All masons are to use identical jointing tools.

- .5 Joints are to be tooled behind the face of the masonry units to match the weathered joints.
- .6 It is strongly recommended that joints be matched with a slightly recessed joint, tooled flat or slightly concave. This allows the front edge of the masonry units to stand clear of the jointing mortar, and not be covered with excess mortar. The matching of adjacent mortar is easier using this method of finishing the joints, and it offers the additional benefit of relieving the stress on the outer edges of the masonry units. Stipple the joint with a stiff brush to give a textured, weathered appearance; this compacts the joint and removes laitance (the superficial accumulation of fine particles).
- .7 All excess mortar must be removed from the face of the masonry before it sets, and the jointing neatly finished as specified.
- .8 Several types of tooled finishes are possible:
 - .1 Struck-flush - this is formed as the work proceeds by pressing with the trowel the wet mortar that protrudes beyond the face, flat and flush with the wall. The edges are then neatly trimmed.
 - .2 Flat-jointed - as above, but with the addition of a semi-circular groove run along the centre of the joint with a finishing tool and straight-edge. Sometimes called grapevine jointing.
 - .3 Keyed/Concave - struck flush, then finished with a curved tool slightly wider than the joint, forming a dense concave joint.
 - .4 Recessed - formed by raking back the mortar about 10 mm to give an even shadow line.
 - .5 V-joint - struck flush, then finished with a v-shaped tool run along the face edges of the units.
 - .6 Raised - formed to protrude beyond the face of the unit, occasionally beveled top and bottom to form an inverted "V".
 - .7 Tuck-pointed - consists of filling a previously raked-out joint flush with mortar and evening out any irregularities in the masonry. The entire face of the wall is rubbed with a soft flat brick after being coloured with brick dust to hide the wet joints. White lime putty is pressed against the joint in straight lines with a jointer template run on a straight-edge. Before the edges are removed the putty edge is trimmed with a 'Frenchman', a knife-like tool with a bent edge. A raised white joint about 6 mm wide and 2 mm thick is left on the face of the work. Variations on this theme are numerous.
 - .8 Bastard tuck-pointing - a ridge about 6 mm wide and 2 mm deep is formed directly on the flush joint. In historical practice this was often painted later in black or white when set.

3.8 CLEAN UP

- .1 Excess mortar shall be immediately removed from adjacent surfaces.
- .2 As work proceeds clean all masonry with a fibre-bristle brush or plastic brush. Do not use a metal brush at any time.
- .3 Wash down the completed sections of wall from top to bottom as the pointing has hardened. Allow three days for the initial hardening of the mortar.

END OF SECTION

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1.0 GENERAL

1.1 Related Requirements

- | | | |
|----|----------------------------------|------------------|
| .1 | Repointing historic masonry. | Section 04 03 07 |
| .2 | Masonry Restoration and Cleaning | Section 04 03 20 |
| .3 | Historic Dismantling of Stone | Section 04 03 43 |

1.2 Price and Payment Procedures

- .1 Measurement for payment for this work will be on Per stone basis and will include costs associated with supplying materials, 300 mm of core material, repointing and executing work as described herein and reflected in Unit Rate Contract.

1.3 REFERENCES

- .1 Definitions:
- .1 Lewis: instrument inserted at top of stone as means of attachment in raising and lowering. Holds stone by means of keys or wedges fitted to dovetailed recess.
 - .2 Dogs: metal appliance for securing parts or members together by means of one or more projecting teeth or bent portions, lug, cramp.
 - .3 Fabricator: company having sufficient capacity to quarry, cut, and deliver stonework on schedule.
 - .4 Installer: company or person specializing in commercial stone work [with 10 years [documented] experience]. Employ skilled stone masons on site to do necessary field cutting as stones are set.
- .2 Reference Standards:
- .3 ASTM International
- .1 ASTM C 503-08a, Standard Specification for Rundle Dimension Stone.
 - .2 ASTM C 568-15, Standard Specification for Limestone Dimension Stone.
 - .3 ASTM C 615-11, Standard Specification for Granite Dimension Stone.

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1.4 Administrative Requirements

.1 Pre-installation meetings:

- .1 Masons employed on this project must attend orientation session provided free-of-charge by Departmental Representative. Session date will be confirmed during the Start-up Meeting.

1.5 Action and Informational Submittals

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

.2 Shop Drawings:

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in the province of Alberta, Canada.

- .2 Submit shop drawings describing method of stone replacement, including removal, shoring and erection.

.3 Samples:

- .1 Submit samples of replacement stones [not less than [60] days before masonry work begins].

- .1 Two of each type of masonry unit specified: sandstone, limestone, Rundle stone, above grade stone, below grade stone and coping stone.

- .2 Submit [one] of each type of masonry reinforcement and tie proposed for use.

- .3 Submit as required for testing purposes.

- .2 Submit samples from original quarry of replacement stones from quarry supplying original stone as follows:

- .1 Four: representing full range of colour, pattern and inclusions.

- .2 One: sized and dressed to match existing stone units.

- .3 Five: 150 mm x 100 mm x 50 mm for compressive strength test to ASTM C 170.

- .4 One: [150 mm x 150 mm x 12 mm] for porosity test to ASTM C 97.

- .5 Select samples from currently worked bed of quarry and accompanied by quarry certification.

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- .4 Submit samples from substitute quarry of replacement stones from quarry having similar stone as original quarry. Submit 4 sets of stones as follows:
 - .1 Four: representing full range of colour, pattern and inclusions.
 - .2 One stone[s] sized and dressed to match existing stone units.
 - .3 Ten stones cut [150 mm x 100 mm x 50 mm] for compressive strength test to ASTM C 170.
 - .4 Two stones cut [150 mm x 100 mm x 12 mm] for porosity tests to ASTM C 97.
 - .5 Five stones cut [150 mm x 100 mm x 25 mm] for accelerated weathering tests.
 - .6 Select samples from currently worked bed of quarry and accompanied by quarry certification.
- .5 Submit samples of used or previously quarried stone. Make supply of stone accessible to Departmental Representative. Departmental Representative to select number of stones for sampling and request sizing and dressing according to requirements.
 - .1 Provide mortar samples in quantity and size specified in CAN/CSA A179.

1.6 Close Out Submittals

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

1.7 Quality Assurance

- .1 Allow Departmental Representative access to mason's workshop for inspection of current work-in-progress.
- .2 Qualifications:
 - .1 Execute work by personnel experienced in preservation of historic masonry.
 - .2 Masons engaged by Masonry Contractor to have minimum of 20 years experience with historic masonry.
 - .3 Departmental Representative has right to reject masons who do not demonstrate appropriate abilities or experience. Refer to Section 01 61 00 - Common Product Requirements.

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- .4 Masons employed on this project throughout course of project must meet above requirements. Where, during course of project, masons leave work force, replacement masons must also meet requirements.

.3 Mock-ups:

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct mock-up 2 m² minimum of stonework to be refaced with specified materials and methods.
- .3 Use existing stonework when constructing job mock-up, where existing stone work is available.
- .4 Construct mock-up where directed by Departmental Representative.
- .5 Notify Departmental Representative minimum of [24] hours prior to construction of mock-up.
- .6 Work not to proceed prior to approval of mock-up. Allow [24] hours for inspection of mock-up by Departmental Representative before proceeding with stone repair work.
- .7 Perform mock-up of masonry cleaning with low pressure 1 to 3 bar/15 to 45 psi clean water and soft natural bristle brush.
- .8 When accepted, mock-up will demonstrate minimum standard for this work.
- .9 Retain mock-up as part of finished work .

1.8 Delivery Storage and Handling

- .1 Deliver, store and handle materials in accordance with Section [01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

2.0 PRODUCTS

2.1 Materials

- .1 Obtain new stone from a single quarry source acceptable to Departmental Representative.

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- .1 Ensure single quarry source has resources to provide materials of consistent quality and matching existing stone.
- .2 Limestone: to ASTM C 568, category II - Medium Density, colour and texture to match approved sample.
- .3 Sandstone: to ASTM C 616, class II - Quartzitic Sandstone, colour and texture to match approved sample.
- .4 Field stone: [angularly and round shaped split and natural round faced field stone of full colour range with maximum single stone face of [0.2] m² and predominance of stones measuring not less than [300] mm across.

2.2 Stone Characteristics

- .1 Sandstone:
 - .1 Stratification: low, bedding plane to within 15% of the horizontal trim of work.
 - .2 Density: [2.6].
 - .3 Cold water absorption: [0.69].
 - .4 Hot water absorption: [0.72].
 - .5 Compressive strength: [101.8] MPa.
- .2 Limestone:
 - .1 Stratification: low, bedding plane to within 15% of the horizontal trim of work.
 - .2 Density: [2.6].
 - .3 Cold water absorption: [0.69].
 - .4 Hot water absorption: [0.72].
 - .5 Compressive strength: [101.8] MPa.
- .3 Rundle Stone:
 - .1 Stratification: low, bedding plane to within 15% of the horizontal trim of work.
 - .2 Density: [2.6].
 - .3 Cold water absorption: [0.69].
 - .4 Hot water absorption: [0.72].

- .5 Compressive strength: [101.8] MPa.

2.3 Stone Fabrication

- .1 Cut stone to shape and dimensions and full to square with joints as indicated.
 - .1 Dress exposed faces true.
 - .2 Cut stone for caps and copingsto lay on its natural quarry bed].
- .2 Execute profiled work from full size details and templates.
 - .1 Make exposed arises in true alignment and ease slightly to prevent snipping.
- .3 Back-check stone contacting structural members as indicated.
 - .1 Allow minimum of [25] mm clearance between back of stone and steel and concrete structural members.
 - .2 Shape beds of stone resting on structural work to fit supports.
- .4 Cut stones for anchors, cramps, dowels and support systems.
 - .1 Provide Lewis pin and clamp holes in pieces which can not be manually lifted.
 - .2 Do not cut holes in exposed surfaces.
- .5 Finish exposed faces and edges of stones to comply with requirements indicated for finish and to match approved samples and field-constructed mock-up.

2.4 Fabrication Tolerances

- .1 Fabricate limestone dimension stone to the following tolerances:
 - .1 Unit Length: plus or minus [3] mm.
 - .2 Unit Height: plus or minus [3] mm.
 - .3 Deviation from Square: plus or minus [3] mm, with measurement taken using the longest edge as the base.
 - .4 Bed Depth: plus or minus [3] mm.

2.5 Existing Stone

- .1 Use hard, sound, and clean existing stone salvaged on site and or supplied by Departmental Representative only with Departmental Representative's

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2.6

Mortar

- .1 Obtain mortar ingredients of uniform quality and from a single manufacturer, source or producer.
- .2 Proportion Specification:
 - .1 In accordance with CAN/CSA A179.
- .3 Property Specification:
- .4 Pointing mortar: Type 'S' Mortar.
 - .1 Mortar compressive strength at 7 days: minimum 9.0 MPa, maximum 14.5 MPa.
 - .2 Mortar compressive strength at 28 days: minimum 14.5 MPa, maximum 18.7 MPa.
 - .3 Air entrainment: 8-19%.
 - .4 Flexural bond strength: minimum 0.8 MPa.
- .5 Exterior walls: Type 'S' Mortar.
 - .1 Bedding mortar: Type 'S' Mortar
 - .1 Mortar compressive strength at 7 days: minimum 9.0 MPa, maximum 14.5 MPa.
 - .2 Mortar compressive strength at 28 days: minimum 14.5 MPa, maximum 18.7 MPa.
 - .3 Air entrainment: 8-19%.
 - .4 Flexural bond strength: minimum 0.8 MPa.

3.0

EXECUTION

3.1

Site Verification of Conditions

- .1 Report to Departmental Representative areas of deteriorated masonry not previously identified.
- .2 Obtain Departmental Representative's approval and instructions for repair and replacement of masonry units before proceeding with repair work.
- .3 Stop work in that area and report to Departmental Representative immediately any evidence of hazardous materials.

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3.2 Preparation

- .1 Move and lift stone units using means to prevent damage. Submit stone units dropped or impacted to Departmental Representative for inspection and approval. Do not make holes or indentations for Lewises or dogs on face or top side of stone.
- .2 Indicate bedding planes of stone units. Duplicate bedding marks on usable pieces of cut stone.

3.3 Protection of In-Place Conditions

- .1 Protect adjacent plant material and fragile surfaces.

3.4 Resetting

- .1 Fix dislodged masonry units in correct location with water soaked hardwood wedges and or firm mortar.
- .2 Insert and compress firm mortar to within [50] mm of pointing surface. Allow mortar to set [24] hours. Damp cure required for minimum 2 days before pointing.
- .3 Pull out wood wedges when dried and shrunken and fill voids with mortar.
- .4 Point to surface in two layers.

3.5 Stone Removal

- .1 Stone removal in accordance with [Section 04 03 43 - Historic - Dismantling Stone Masonry].
- .2 Remove loose material from deteriorated stones. Create level surface 50 mm from masonry face for setting of stone face plates .
- .3 Clean dust, mortar and stone fragments from slot.

3.6 Parking Joints

- .1 Use manual raking tool to obtain clean masonry surfaces.
 - .1 Remove deteriorated and adhered mortar from masonry surfaces to full depth of deteriorated mortar but in no case less than 20 mm leaving square corners and flat surface at back of cut.
 - .2 Clean out voids and cavities encountered
- .2 Remove mortar without chipping, altering or damaging masonry units.

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

3.7 Moving Stones

- .1 Use Lewises or dogs to lift stones to working level.
- .2 Move stones horizontally in wheelbarrows.
- .3 Slide stones into place on wood ramp].
- .4 Protect edges of stone from damage when hoisting and lifting from position. Use separators or wood shims to isolate units from hoisting belts.
- .1 Incorporate only undamaged stone in Work.

3.8 Stone Replacement

- .1 CAN/CSA A-371.
- .2 Install masonry ties and connectors in accordance with CAN/CSA A-370 and CAN/CSA A-371 unless indicated otherwise. Prior to placing mortar, obtain approval of Departmental Representative of placement of ties and connectors.
- .3 Co-ordinate bond pattern, coursing height and joint width with existing brickwork in area selected by the Departmental Representative.
- .4 Clean dust and stone fragments from slot. Before proceeding with Work, inspect cleaned surface with Departmental Representative.
- .5 Dampen slot's surfaces before applying mortar.
- .6 Apply mortar and lay stones.
 - .1 Lay stones on full beds of mortar.
 - .2 Fill vertical joints buttered and placed full in face, and at vertical joint between wythes.
 - .3 Lay stones and tool joints in one operation, tooling with a round jointer to provide smooth joints compressed uniformly concave.
 - .4 Rake bedding mortar back to a minimum depth of 25 mm and make ready for pointing with pointing mortar in separate operation.

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- .1 Provide minimum 3-day damp cure to bedding mortar prior to pointing.
- .7 Apply pointing mortar:
 - .1 Fill raked joints with pointing mortar.
- .8 Finish joints to match those of existing stonework, in area identified by Departmental Representative.
- .9 Keep new mortar damp for 2 days at a minimum temperature of 15 degrees C.
- .10 . Clean finished stonework as work progresses.
 - .1 Remove mortar splashings on exposed stonework.
 - .2 Leave no mortar on face of bricks.
- .11 Remove mortar staining before it sets.
- .12 Clean masonry with clean water and soft bristle brush only.
- .13 Inspect finished stone work with Departmental Representative.

3.9 Inserting Replacement Stone

- .1 Clean stone by washing with water and natural fibre brush before laying.
- .2 Dampen surfaces of slot and apply bedding mortar.
- .3 Lay heavy stones and projecting stones after mortar in courses below has hardened sufficiently to support weight.
- .4 Prop and anchor projecting stones until wall above is set.
- .5 Set large stones on water soaked softwood wedges to support stone in proper alignment until mortar has set. Remove wedges when dry, do not break off.
- .6 Remove mortar dropping from face of stone before mortar is set. Sponge stone free of mortar along joints as work progresses.
- .7 Install anchors, dowels and cramps. Use non-corrosive anchors to fix stone face plates.
- .8 Set stones to match alignment of adjacent stones in full bed of mortar with vertical joints buttered and placed full except where otherwise specified. Completely fill anchor, dowel and lifting holes and voids left by removed edges .

3.10 Filling Joints / Pointing

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- .1 Fill joints and point: in accordance with Section [04 03 07 - Historic - Masonry Repointing].
- .2 Joint preparation:
 - .1 Rake out joints to 20 mm depth before bedding or mortar sets.
 - .2 Leave stone surfaces clean.
 - .3 Ensure back of joint is vertical, uniform and ready for pointing.

3.11 Repointing

- .1 Do pointing work in accordance with Section [04 03 07 - Historic - Masonry Repointing].
- .2 Dampen joints [and porous masonry units].
- .3 Keep masonry damp during performance of pointing.
- .4 Maintain masonry temperature between 10 degrees C and 25 degrees C for duration of the Work.
 - .1 Completely fill joint with mortar.
- .5 Masonry units with worn rounded edges: maintain joint width by pointing back from exterior face.
- .6 Avoid feather edges.
- .7 Pack mortar solidly into voids and joints.
- .8 Build-up pointing in layers not exceeding [12] mm in depth.
 - .1 Allow each layer to set before applying subsequent layers.
 - .2 Maintain joint width.
- .9 Tool and finish joints to match existing profile.
- .10 Remove excess mortar from masonry face before it sets

3.12 Protection of Work

- .1 Cover completed and partially completed work not enclosed or sheltered at end of each work day.
 - .1 Extend membranes 0.5 m beyond surface area of work.
 - .1 Prevent finished work from drying out too rapidly.

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- .2 Cover with waterproof tarps to prevent weather from eroding recently repointed material.
 - .1 tarps in place for minimum of 2 weeks after repointing.
 - .2 Ensure that bottoms of tarps permit airflow to reach mortar in joints.
- .3 Anchor coverings securely in position.
- .4 Damp cure:
 - .1 Provide damp cure for pointing mortars.
 - .2 .1 Install and maintain wetted burlap protection during the curing process:
 - .1 Minimum 3 days.
 - .3 Wet mist burlap only - ensure no direct spray reaches surface of curing mortar.
 - .4 Shade areas of work from direct sunlight and maintain constant dampness of burlap.
- .5 Protect from drying winds. Pay particular attention at corners.
- .6 Maintain ambient temperature of minimum 10 degrees C after repointing masonry for:
 - .1 Minimum 7 days in summer.
 - .2 Minimum [30] days in cold weather conditions using dry heated enclosures.

3.13 Cleaning

- .1 Confirm acceptance of mock-up cleaning operations to demonstration from Departmental Representative before starting cleaning work.
- .2 Clean stone work surfaces after repairs have been completed and mortar has set.
- .3 Clean stone surfaces of adhesive or mortar residue resulting from work performed without damaging stone or joints.
- .4 Clear site of debris, surplus material and equipment, leaving work area in clean and safe condition.

3.14 Protection of Work

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- .1 Cover top of completed and partially completed wall, not enclosed or sheltered, with weatherproof coverings at end of each working day.
 - .1 Drape cover over wall and extend [0.5] m down both sides.
 - .2 Anchor securely in position.
 - .3 Prevent finished work from curing too quickly
- .2 Protect adjacent work from marking or damage due to work.
- .3 Protect adjacent finished work against damage which may be caused by on-going work.

3.15 Stone Schedule

- .1 Refer to drawing package – Appendix 'A' for Stone schedule

END OF SECTION

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1.0 GENERAL

1.1 Related Requirements

- | | | |
|----|-----------------------------------|------------------|
| .1 | Hazardous materials. | Section 02 81 01 |
| .2 | Repointing Historic masonry. | Section 04 03 07 |
| .3 | Masonry Restoration and Cleaning. | Section 04 01 20 |
| .4 | Historic Replacement of Stone. | Section 04 03 42 |

1.2 Administrative Requirements

- .1 Conduct a pre-dismantling meeting with Departmental Representative and Consultant to verify project requirements, equipment, procedures and assigned storage areas.

1.3 Action and Informational Submittals

- .1 Provide submittals in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta of Canada.
- .3 Site Quality Control Submittals:
- .1 Provide up-to-date copies of stone location recording system chart or card index, as well as chronological information concerning each numbered unit (individual cards of units), when requested.

1.4 Closeout Submittals

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals. Include:
- .1 Photographically record stonework to be dismantled and rebuilt.
- .2 Record drawings of layout of stored stones.

1.5 Quality Assurance

- .1 Qualifications:
- .1 Masonry Contractor:
- .2 .1 Work of this Section: executed by contractor specializing in historic stone conservation work, using similar stone dismantling techniques, and with a minimum 10 year record of successful performance.

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- .3
 - .2 Foreperson:
 - .1 Provide competent trade foreperson specializing in type of work required.
 - .2 Experience: minimum 10 years successful experience in deconstruction of historic stone masonry. Must be present on site throughout Work.
 - .3 Dismantlers:
 - .4 Experience: minimum 5 year record of successful masonry dismantling.
- .5 Mock-ups:
 - .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
 - .2 Perform mock-up 2 m x 2 m to demonstrate dismantling procedures for each type of above grade, exterior, bearing wall, non-bearing wall masonry condition specified in locations designated by Departmental Representative.
 - .3 Notify Departmental Representative minimum of 24 hours prior to construction of mock-up.
 - .4 Perform mock-up under supervision of Departmental Representative and Consultant to demonstrate a full understanding of specified procedures and techniques is achieved before work commences.
 - .5 Perform mock-up where directed by Departmental Representative.
 - .6 Work not to proceed prior to approval of mock-up. Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with masonry dismantling work.
 - .7 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.

1.6 Delivery Storage and Handling

- .1 Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Protect and store stones to facilitate their resetting.
 - .1 Store dismantled masonry units on wood platforms or pallets, protected from exposure to water, elements, and potential mechanical damage fully covered under polyethylene.
 - .2 Submit storage and identification system to Departmental Representative for review and approval.

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1.7 Ambient Conditions

- .1 Loosen wet masonry only when temperature is above 5 degrees C.
- .2 In temperature 5 degrees C and below:
 - .1 Keep stones dry.
 - .2 Protect wet stones from freezing.

1.8 Measurement Procedures

- .1 This work shall be incidental to the contract and will not be measured for payment.

2.0 PRODUCTS

- .1 Not Used

3.0 EXECUTION

3.1 Examination

- .1 Examine masonry, staging and storage areas and notify Departmental Representative in writing of conditions detrimental to acceptable and timely completion of Work.

3.2 Site Verification of Conditions

- .1 Report in writing, to Departmental Representative areas of deteriorated stone not identified in the documents. Obtain Departmental Representative's approval and instructions for repair of stone before proceeding.
- .2 Stop work in that area and report to Departmental Representative immediately any evidence of hazardous materials.

3.3 Preparation

- .1 Remove deteriorated portions of stones using low impact removal methods until sound surface is reached.
- .2 Remove deteriorated portions of stones by cutting, scraping and / or chiselling. Use least invasive method of removal while performing this task.
- .3 Obtain Departmental Representative's approval for alternative methodology and tools to be employed before commencing the work.
- .4 .4 Clean stone surface of dust and stone chips.

3.4 Protection

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- .1 Prevent damage to building, fencing, trees, landscaping, natural features, bench marks, pavement and utility lines which are to remain. Make good damage incurred.
- .2 Protect surrounding components from damage during work.
- .3 Make good damage to historic fabric.
- .4 Obtain Departmental Representative's approval for repair methodology.

3.5

Special Techniques

- .1 Before dismantling stones, indicate dimensions of each stone in removal area on a drawing or chart or index card].
- .2 Temporary Marking and Recording:
 - .1 Mark stone, on face, before removal using marking product which can be completely erased when required without damaging masonry unit:
 - .1 Ball-point pen on diachylon, attached to stone.
 - .2 Waxless chalk directly on stone.
- .3 Tracking relocated stones and other masonry units:
 - .1 Use numbering, marking, and positioning system shown on drawings.
- .4 Mark/Identify:
 - .1 Stones and other elements or components to show identity and position.
 - .2 Wood platforms or other equipment used to transport and store stones.
 - .3 Work and storage areas.
 - .4 Location from which stones are removed on drawings, chart or card-index.
- .5 Stone location recording system.
 - .1 Prepare chart or card index to:
- .6 Help locate stones or units when necessary.
- .7 To manage availability of platforms.
- .8 To manage work and storage areas.
 - .1 Keep chart or card index up-to-date and, if required, produce copy every day.

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- .9 Ensure that temporary marking will remain in use resistant to weather, handling and cleaning until final marking of stones.
- .10 Remove markings and adhesive without damaging units:
 - .1 Brush with vegetable fibre brush: either dry or with water.
 - .2 Use no solvent, acid or other chemical product

3.6 Structural Support

- .1 Construct shoring and cradling, and other temporary framing work needed to support structure, or parts of it, during removal operations and in anticipation of resetting, if structure is not to be completely dismantled, according to approved shop drawings.

3.7 Method for Loosening Stones

- .1 Use approved methods to loosen stones which will cause no damage either to stones or to other architectural elements.
- .2 Use hand tools only.
- .3 Obtain Departmental Representative's approval for use of power tools before commencing work.

3.8 Dismantling and Moving Stone

- .1 Avoid damaging arrises of stone when removing mortar and freeing up.
- .2 Remove excess mortar using hand tools.
- .3 Use wood wedges where required to remove or dislocate stone.
 - .1 Use flat pry bars protected with impact absorbing protection (burlap, cardboard).
- .4 Use nylon hoisting belts. Use minimum 2 belts per stone.
- .5 Protect stone from damage when hoisting and lifting from position.
 - .1 Use separators or wood shims to isolate units from hoisting belts.
- .6 Where damage occurs to stone, report to Departmental Representative and repair stone in accordance with specified procedures.
- .7 Make good damage incurred at no additional cost to Contract.
- .8 Obtain review and approval of repaired damage by Departmental Representative.

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3.9 Handling

- .1 Usage of Lewis bolts for handling stone is permitted.
- .2 Place detached stones on wood surfaces during handling. Prevent contact with metal.
- .3 When stones are lowered to ground, place directly on wooden platform used for transport or storage.
- .4 Transport and keep stones on [wooden platforms].
- .5 Ensure that sharp edges of stones do not come into contact with hard objects.

3.10 Temporary Storage Staging Area

- .1 Place stones in designated area of site for cleaning, detailed inspection and for final marking, before storage.
- .2 Make stones accessible and retrievable when required.

3.11 Cleaning

- .1 Do cleaning operations at above freezing temperature.
 - .1 After cleaning, protect wet stones against freezing until dry.
- .2 Clean stones by wet scrubbing with vegetable fibre brush unless otherwise instructed by Departmental Representative.
 - .1 Do not use high pressure water jet.
- .3 Use chemical cleaning methods only with prior written approval of Departmental Representative.

3.12 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. Dimensions: legible from distance of 2 metres.
- .3 Ensure that marking product used will not affect mortar to stone adhesion when resetting.
- .4 Ensure marking product used will survive storage until resetting of stone.

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3.13 Final Storage

- .1 When stones are placed under shelter:
 - .1 Design and ventilate shelter to keep condensation from forming on internal surfaces.
 - .2 Lay out storage so that each stone will have its numbered face visible, and be accessible or removable without having to move adjacent stones.
 - .3 Show layout of stones to be stored on record drawing.
 - .4 Store rubble stone in a [wood box].

END OF SECTION

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1.0 GENERAL

1.1 Description:

.1 Provide maintenance and restoration of Natural Stone masonry as indicated and in compliance with Contract Documents.

.1 Section includes Natural Stone masonry restoration and cleaning as follows:

.1 Unused anchor removal.

.2 Repairing Natural Stone, including replacing units.

.3 Painting steel uncovered during the work.

.4 Re-anchoring veneers.

.5 Repointing joints.

.6 Preliminary cleaning, including removing plant growth.

.7 Cleaning exposed Natural Stone surfaces.

.2 Owner-Furnished Material: Natural Stone from existing structures.

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

.1 C5: Standard Specification for Quicklime for Structural Purposes

.2 C114: Standard Test Methods for Chemical Analysis of Hydraulic Cement

.3 C144: Standard Specification for Aggregate for Masonry Mortar.

.4 C150: Standard Specification for Portland Cement.

.5 C207: Standard Specification for Hydrated Lime for Masonry Purposes.

.6 C212: Standard Specification for Structural Clay Facing Tile.

.7 C270: Standard Specification for Mortar for Unit Masonry.

.8 C295: Standard Guide for Petrographic Examination of Aggregates for Concrete

.9 C1330: Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid- Applied Sealants

.10 C1489: Standard Specification for Lime Putty for Structural Purposes

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- .1 A82. A179.A3001. The Society for Protective Coatings (SSPC):
 - .1 SP2: Hand Tool Cleaning
 - .2 SP3: Power Tool Cleaning
 - .3 SP6: Commercial Blast Cleaning
 - .4 Paint 20: Zinc-Rich Coating Type I Inorganic and Type II Organic
 - .5 Paint 29: Zinc Dust Sacrificial Primer, Performance-Based

1.2 Definitions

- .1 Very Low-Pressure Spray: Under 100 psi (690 kPa).
- .2 Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).
- .3 Medium-Pressure Spray: 400 to 800 psi (2,750 to 5510 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).
- .4 High-Pressure Spray: 800 to 1200 psi (5,510 to 8250 kPa); 4 to 6 gpm (0.25 to 0.4 L/s)
- .5 Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.3 Allowances

- .1 Allowances for Natural Stone restoration and cleaning are specified below.
 - .1 Perform Natural Stone restoration and cleaning work under quantity allowances and only as authorized. Authorized work includes restoration and Cleaning of Dowling Cairn (complete cairn), Boy Scout Cairn at Hillside Meadows (Complete cairn, including walls adjacent to Cairn), Two Jack lakeside Campground Interpretative area fireplace, Fireside DUA Fireplace, work authorized in writing by **Departmental Representative**
 - .2 Notify **Landscape Architect Weekly** of extent of work performed that is attributable to quantity allowances.
 - .3 Perform work that exceeds quantity allowances only as authorized by Change Orders, Authorized by the Departmental Representative
- .2 Remove unused anchors as part of replacement of Natural Stone.

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- .3 Remove and replace Natural Stone as part of specific line items within the schedule of quantities.
- .4 Patch mortar as part of "Re-point Loose Cement" line item within the schedule of quantities.
- .5 Clean natural stone, including preliminary and final cleaning, as part of Natural Stone cleaning allowance.
- .6 Repoint masonry as part of "Re-point Loose Cement" line item within schedule of quantities.

1.4 Unit Prices

- .1 Work of this Section is affected by unit prices specified in the Schedule of Quantities.
 - .1 Unit prices apply to authorized work covered by Schedule of Quantities.
 - .2 Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.5 Pre-Construction Testing

- .1 Preconstruction Testing Service: Departmental Representative will engage a qualified testing agency to perform pre-construction testing on Natural Stone as follows.
 - .1 Provide test specimens of each Natural Stone type and representative of proposed materials and construction.
 - .2 Existing Mortar: Test according to ASTM C295 , modified as agreed by testing service and Departmental Representative for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength. Use X-ray diffraction, infrared spectroscopy, and differential thermal analysis to supplement microscopically methods. Carefully remove existing mortar from within joints at three locations designated by Testing Service.
 - .3 Temporary Patch: As recommended by Testing Service, provide temporary materials at locations from which existing samples were taken.

1.6 Submittals

- .1 Submit the following Shop Drawings in accordance with Section 01 3300.

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- .2 Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.
- .3 Shop Drawings: For the following:
 - .1 Provisions for expansion joints or other sealant joints.
 - .2 Provisions for flashing and weep holes.
 - .3 Replacement and repair anchors. Include details of anchors within individual masonry units, with locations of anchors and dimensions of holes and recesses in units required for anchors.
- .4 Samples for Initial Selection: For the following:
 - .1 Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches (150 mm) long by 1/2-inch (13 mm) wide, set in aluminum or plastic channels.
 - .1 Have each set contain a close range of at least three samples of different mixes of colored sands and cements that produce a mortar matching the cleaned masonry when cured and dry.
 - .2 Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.
 - .5 Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.
 - .1 Have each set contain a close range of at least three samples of different mixes of patching compound that matches the variations in existing masonry when cured and dry.
 - .6 Include similar Samples of accessories involving selection.
 - .7 Samples for Verification: For the following:
 - .1 Each type of Natural Stone to be used for replacing existing units. Include sets of Samples to show the full range of shape, and texture to be expected.
 - .1 For each Natural Stone type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.
 - .2 Each type of sand used for pointing mortar; minimum 1 pound (0.5 kg) of each in plastic screw-top jars.

- .1 For blended sands, provide Samples of each component and blend.
- .2 Identify sources, both supplier and quarry, of each type of sand.
- .3 Each type, and texture of pointing mortar in the form of sample mortar strips, 6 inches (150 mm) long by 1/2-inch (13 mm) wide, set in aluminum or plastic channels.
 - .1 Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
- .8 Accessories: Each type of anchor, accessory, and miscellaneous support.
- .9 Qualification Data: For Restoration Specialists including field supervisors and restoration workers, chemical-cleaner manufacturer and testing service].
- .10 Preconstruction Test Reports: For existing and replacement] masonry units.
- .11 Quality-Control Program.
- .12 Restoration Program.
- .13 Cleaning Program.

1.7 Quality Assurance

- .1 Restoration Specialist Qualifications: Engage an experienced masonry restoration and cleaning firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience installing standard unit masonry is not sufficient experience for masonry restoration work.
 - .1 At Contractor's option, work may be divided between two specialist firms: one for cleaning work and one for repair work.
 - .2 Field Supervision: Restoration Specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress. Supervisors shall not be changed during Project except for causes beyond the control of Restoration Specialist firm.
 - .3 Restoration Worker Qualifications: Persons who are experienced and specialize in restoration work of types they will be performing.
- .2 Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with

successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.

- .3 Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.
- .4 Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage due to worker fatigue.
- .5 Restoration Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration work including protection of surrounding materials and Project site.
 - .1 Include methods for keeping pointing mortar damp during curing period.
 - .2 If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.
- .6 Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.
 - .1 If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.

- .7 Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet (6m) away by Departmental Representative and Landscape Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.
- .8 Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.
 - .1 Natural Stone Repair: Prepare sample areas for each type of Natural Stone indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than 2 adjacent whole units or approximately 48 inches (1200 mm) in least dimension. Erect sample areas in existing walls unless otherwise indicated, to demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
 - .1 Replacement:
 - .1 Two Natural Stone units replaced.
 - .2 Re-anchoring Veneers: Install three masonry repair anchors in mockup wall assembly of each anchor type required.
 - .3 Patching: Three small holes as directed for each type of Natural Stone material indicated to be patched, so as to leave no evidence of repair.
 - .4 Widening Joints: Widen a joint in two separate locations as directed
 - .2 Repointing: Rake out joints in 2 separate areas, as indicated for each type of repointing required and repoint one of the areas.
 - .3 Cleaning: Clean an area approximately 25 square feet (2.3 sq. m) for each type of Natural Stone and surface condition.
 - .1 Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not use cleaners and methods known to have deleterious effect.
 - .2 Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.
- .9 Acceptance of mockups does not constitute acceptance of deviations from the Contract Documents contained in mockups unless Departmental Representative specifically approves such deviations in writing.

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- .10 Review methods and procedures related to Natural Stone restoration and cleaning including, but not limited to, the following:
 - .1 Construction schedule. Verify availability of materials, Restoration Specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - .2 Materials, material application, sequencing, tolerances, and required clearances.

1.8 Delivery Storage and Handling

- .1 Deliver Natural Stone units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons
- .2 Deliver other materials to Project site in manufacturer's original and unopened containers, with manufacturer's name and type of products.
- .3 Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- .4 Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- .5 Store lime putty covered with water in sealed containers.
- .6 Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.9 Project/Site Conditions

- .1 Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.
- .2 Repair Natural Stone units and repoint mortar joints only when air temperature is between 40 and 90 degrees F (4 and 32 degrees C) and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.
- .3 Cold-Weather Requirements: Comply with the following procedures for Natural Stone repair and mortar-joint pointing unless otherwise indicated:
 - .1 When air temperature is below 40 degrees F (4 degrees C), heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 degrees F (4 and 49 degrees C).

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- .2 When mean daily air temperature is below 40 degrees F (4 degrees C), provide enclosure and heat to maintain temperatures above 32 degrees F (0 degrees C) within the enclosure for 7 days after repair and pointing.
- .4 Hot-Weather Requirements: Protect Natural Stone repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 degrees F (32 degrees C) and above unless otherwise indicated.
- .5 For manufactured repair materials, perform work within the environmental limits set by each manufacturer.
- .6 Clean Natural Stone surfaces only when air temperature is 40 degrees F (4 degrees C) and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.10 Coordination

- .1 Coordinate masonry restoration and cleaning with public circulation patterns at Project site. Some work is near public circulation patterns. Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.11 Sequencing and Scheduling

- .1 Order replacement materials at earliest possible date to avoid delaying completion of the Work.
- .2 Order sand for pointing mortar immediately after acceptance of mockups. Take delivery of and store at Project site a sufficient quantity to complete Project.
- .3 Perform Natural Stone restoration work in the following sequence:
 - .1 Remove plant growth.
 - .2 Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 - .3 Remove paint.
 - .4 Clean Natural Stone surfaces.
 - .1 Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to Natural Stone repairs along joints.
 - .2 Repair Natural Stone elements, including replacing existing natural stone with new natural stone materials.

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- .3 Rake out mortar from joints to be repointed.
- .4 Point mortar joints.
- .5 After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
- .6 Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
- .7 Remove paint.
- .8 Clean masonry surfaces.

2.0 PRODUCTS

2.1 Natural Stone Materials

- .1 Natural Stone: Provide Natural Stone as directed for each site where required to complete Natural Stone restoration work.
 - .1 Provide Natural Stone with colors, variation within units, surface texture, size, and shape to match existing natural stone and with physical properties similar to that of the existing Natural Stone elements.
 - .2 Provide Natural Stone units with colors, variation within units, surface texture, and physical properties to match sample. Match existing Natural Stone units in size and shape.
 - .1 For Departmental Representative's sample that exhibits a range of colours or variation within units, provide Natural Stone that proportionally matches that range rather than Natural Stone that matches an individual within that range.

2.2 Mortar Materials

- .1 Portland Cement: ASTM C150, Type I or Type II , white or gray or both where required for color matching of exposed mortar.
 - .1 Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114 .
- .2 Hydrated Lime: ASTM C207, Type S.
- .3 Factory-Prepared Lime Putty: ASTM C1489.
- .4 Quicklime: ASTM C5, pulverized lime.
- .5 Mortar Sand: ASTM C144 unless otherwise indicated.

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- .1 Provide natural sand or ground marble, granite, or other sound stone of necessary to produce required mortar
- .2 For pointing mortar, provide sand with rounded edges.
- .3 Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
 - .1 Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.
 - .2 Water: Potable.

2.3 Cleaning Materials

- .1 Water Potable.
- .2 Hot Water: Water heated to a temperature of 140 to 160 degrees F (60 to 71 degrees C).
- .3 Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups (0.5 L) of tetra-sodium polyphosphate, 1/2 cup (125 mL) of laundry detergent, and 20 quarts (20 L) of hot water for every 5 gallons (20 L) of solution required.
- .4 Job-Mixed Mildew, and Algae Remover: Solution prepared by mixing 2 cups (0.5 L) of tetra sodium polyphosphate, 5 quarts (5 L) of 5 percent sodium hypochlorite (bleach), and 15 quarts (15 L) of hot water for every 5 gallons (20 L) of solution required.
- .5 Nonacidic Gel Cleaner: Manufacturer's standard gel formulation, with pH between 6 and 9 that contains detergents with chelating agents and is specifically formulated for cleaning masonry surfaces.
- .6 Products:
 - .1 Price Research, Ltd.; Price Marble Cleaner-Gel.
 - .2 PROSOCO; Sure Klean 942 Limestone and Marble Cleaner.
- .7 Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mould, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.

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- .1 Diedrich Technologies Inc.; Diedrich 910PM Polished Marble Cleaner.
- .2 Dominion Restoration Products, Inc.; Bio-Cleanse.
- .3 Dumond Chemicals, Inc.; Safe n' Easy Architectural Cleaner/Restorer.
- .4 Price Research, Ltd.; Price Non-Acid Masonry Cleaner.
- .5 PROSOCO; Enviro Klean 2010 All Surface Cleaner.
- .8 Mild Acidic Cleaner: Manufacturer's standard mildly acidic cleaner containing no muriatic (hydrochloric), hydrofluoric, or sulfuric acid; or ammonium bifluoride or chlorine bleaches.
- .9 Products:
 - .1 ABR Products, Inc.; X-190 Limestone & Concrete Cleaner.
 - .2 Diedrich Technologies Inc.; Envirorestore 100.
 - .3 Dominion Restoration Products, Inc.; DR-60 Stone and Masonry Cleaner.
 - .4 PROSOCO; Enviro Klean BioWash.
- .10 Acidic Cleaner: Manufacturer's standard acidic masonry cleaner composed of hydrofluoric acid or ammonium bifluoride blended with other acids, detergents, wetting agents, and inhibitors.
- .11 Products:
 - .1 ABR Products, Inc.; 801 Heavy Duty Masonry Cleaner.
 - .2 Diedrich Technologies Inc.; Diedrich 101 Masonry Restorer Dumond Chemicals, Inc.; Safe n' Easy Heavy Duty Restoration Cleaner.
 - .3 EaCo Chem, Inc.; GS-Restoration Hydro clean, Hydro chemical Techniques, Inc.; Hydro clean Brick, Granite, Sandstone and Terra Cotta Cleaner (HT-626).
 - .4 Price Research, Ltd.; Price Restoration Cleaner.
 - .5 PROSOCO; Enviro Klean Restoration Cleaner, Sure Klean Restoration Cleaner or Sure Klean Heavy-Duty Restoration Cleaner.

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- .12 Two-Part Chemical Cleaner: Manufacturer's standard system consisting of potassium or sodium hydroxide-based, alkaline prewash cleaner and acidic after wash cleaner that does not contain hydrofluoric acid.
 - .1 ABR Products, Inc.; 500 Limestone Prewash Cleaner followed by 500 Limestone After wash.
 - .2 Diedrich Technologies Inc.; Diedrich 808 Limestone Pre-Wash, followed by 707N Limestone Neutralizer After-Rinse.
 - .3 PROSOCO; Enviro Klean BioKlean followed by Sure Klean Limestone & Masonry After wash

2.4 Accessory Materials

- .1 Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.
- .2 Products:
 - .1 ABR Products, Inc.; Rubber Mask.
 - .2 Price Research, Ltd.; Price Mask.
 - .3 PROSOCO; Sure Klean Strippable Masking.
- .3 Setting Buttons: Resilient plastic buttons, non-staining to masonry, sized to suit joint thicknesses and bed depths of masonry units without intruding into required depths of pointing materials.
- .4 Masking Tape: Non-staining, non-absorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.
- .6 Miscellaneous Products: Select materials and methods of use based on the following, subject to acceptance of a mockup:
 - .1 Previous effectiveness in performing the work involved.
 - .2 Little possibility of damaging exposed surfaces.
 - .3 Consistency of each application.
 - .4 Uniformity of the resulting overall appearance.
 - .5 Do not use products or tools that could do the following:

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- .1 Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
- .2 Leave a residue on surfaces.

2.5 Mortar Mixes

- .1 Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C5 and manufacturer's written instructions.
- .2 Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
 - .1 Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not re-temper or use partially hardened material.
- .3 Colored Mortar: Produce mortar of required by using specified ingredients. Do not alter specified proportions without Departmental Representative's acceptance.
 - .1 Mortar Pigments: Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.
- .4 Do not use admixtures in mortar unless otherwise indicated.
- .5 Mortar Proportions: Mix mortar materials in the following proportions:
 - .1 Pointing Mortar for Natural Stone: 1 part Portland Cement, 2 parts lime, and 6 parts sand.
 - .1 Add mortar pigments to produce mortar colors required.

2.6 Rebuilding (Setting) Mortar

- .1 Same as pointing mortar 2.07

2.7 Chemical Cleaning Solutions:

- .1 Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical-cleaner manufacturer.

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3.0 EXECUTION

3.1 Restoration Specialists

- .1 Restoration Specialist Firms: Subject to compliance with requirements,

3.2 PROTECTION:

- .1 Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from Natural Stone restoration work.

- .1 Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

- .2 Comply with chemical-cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical-cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

- .1 Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.

- .2 Keep wall wet below area being cleaned to prevent streaking from runoff.

- .3 Do not clean Natural Stone during winds of sufficient force to spread cleaning solutions to unprotected surfaces.

- .4 Neutralize and collect alkaline and acid wastes for disposal off Parks Canada property.

- .5 Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

- .3 Prevent mortar from staining face of surrounding Natural Stone and other surfaces.

- .1 Cover sills, ledges, and projections to protect from mortar droppings.

- .2 Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.

- .3 Immediately remove mortar in contact with exposed masonry and other surfaces.
- .4 Clean mortar splatters from scaffolding at end of each day.

3.3 Natural Stone Removal and Replacement

- .1 At locations indicated, remove Natural Stones that are damaged, spalled, or deteriorated or are to be reused. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
 - .1 When removing stones, remove material from of stone and work toward outside edges.
- .2 Support and protect remaining stone that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- .3 Notify Departmental Representative of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing stone backup, rotted wood, rusted metal, and other deteriorated items.
- .4 Remove in an undamaged condition as many whole stones as possible.
 - .1 Remove mortar, loose particles, and soil from stone by cleaning with hand chisels, brushes, and water.
 - .2 Remove sealants by cutting close to Natural Stone with utility knife and cleaning with solvents.
 - .3 Store stone for reuse. Store off ground, on skids, and protected from weather.
 - .4 Deliver cleaned Stone not required for reuse to Departmental Representative unless otherwise indicated.
- .5 Clean Stones surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
- .6 Replace removed damaged Natural Stone with other removed Natural Stone /Salvaged Natural Stone in good quality, where possible, or with new Natural Stone material matching existing Natural Stone, including size. Do not use broken units unless they can be cut to usable size.
- .7 Install replacement Natural Stone units into bonding and coursing pattern of existing Natural Stone. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
 - .1 Maintain joint width for replacement units to match existing joints.

- .2 Use setting buttons or shims to set units accurately spaced with uniform joints.
- .8 Lay replacement Natural Stone with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding Stones that have ASTM C67 initial rates of absorption (suction) of more than 30 g/30 square inches per minute (30 g/194 sq. cm per min.). Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
- .1 Tool exposed mortar joints in repaired areas to match joints of surrounding existing Stonework.
- .2 Rake out mortar used for laying Natural Stone before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing Natural Stone, and at same time as repointing of surrounding structure.
- .3 When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.4 Widening Joints

- .1 Do not widen a joint, except where required by Departmental Representative
- .2 Location Guideline: Where an existing Natural Stone abuts another or the joint is less than 1/8-inch (3 mm), widen the joint for length indicated and to depth required for repointing after obtaining Departmental Representative's acceptance.
- .3 Carefully perform widening by cutting, grinding, routing, or filing procedures demonstrated in the mockup for the Departmental Representative.
- .4 Widen joint to width equal to or less than predominant width of other joints on building. Make sides of widened joint uniform and parallel. Ensure that edges of units along widened joint are in alignment with joint edges at unaltered joints.

3.5 Cleaning Natural Stone, General

- .1 Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.
- .2 Use only those cleaning methods indicated for Natural Stone.
 - .1 Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural brushes will resist chemical cleaner being used.

- .2 Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage Natural Stone.
 - .1 Equip units with pressure gauges.
- .3 For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
- .4 For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
- .5 For high-pressure water-spray application, use fan-shaped spray tip that disperses water at an angle of at least 40 degrees.
- .6 For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 degrees F (60 and 71 degrees C) at flow rates indicated.
- .7 For steam application, use steam generator capable of delivering live steam at nozzle.
- .3 Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.
- .4 Water Application Methods:
 - .1 Water-Soak Application: Soak Natural Stone surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
 - .2 Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches (150 mm) from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.
- .5 Steam Cleaning: Apply steam to masonry surfaces at the very low pressures indicated for each type of masonry material. Hold nozzle at least 6 inches (150 mm) from surface of masonry and apply steam in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.
- .6 Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray at pressures exceeding 50 psi (345 kPa). Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.

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- .7 Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
 - .1 Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.
- .8 After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.6 Preliminary Cleaning

- .1 Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from Natural Stone surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing too dry as long as possible before removal. Remove loose soil and debris from open stone joints to whatever depth they occur.
- .2 Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.
 - .1 Carefully remove heavy accumulations of material from surface of Natural Stone with a sharp chisel. Do not scratch or chip stone surface.
 - .2 Remove paint and calking with alkaline paint remover.
 - .1 Comply with requirements in "Paint Removal" Article.
 - .2 Repeat application up to two times if needed.
- .3 Remove asphalt and tar with solvent-type paint remover.
- .4 Comply with requirements in "Paint Removal" Article.
 - .1 Apply paint remover only to asphalt and tar by brush without prewetting.
 - .2 Allow paint remover to remain on surface for 10 to 30 minutes.
 - .3 Repeat application if needed.

3.7 Cleaning Natural Stone Work

- .1 Cold-Water Soak:
 - .1 Apply cold water by intermittent spraying to keep surface moist.
 - .2 Use perforated hoses or other means that will apply a fine water mist to entire surface being cleaned.

- .3 Apply water in cycles with at least 30 minutes between cycles.
- .4 Continue spraying until surface encrustation has softened sufficiently to permit its removal by water wash, as indicated by cleaning tests.
- .5 Continue spraying for 72 hours.
- .6 Remove soil and softened surface encrustation from stone with cold water applied by low-pressure spray.
- .2 Cold-Water Wash: Use cold water applied by medium pressure spray.
- .3 Hot-Water Wash: Use hot water applied by medium pressure spray.
- .4 Steam Cleaning: Apply steam at very low pressures not exceeding 30 psi (207 kPa) Remove dirt softened by steam with wood scrapers, stiff-nylon or stiff-brushes, or cold-water wash, as indicated by cleaning tests.
- .5 Detergent Cleaning:
 - .1 Wet masonry with cold water applied by low-pressure spray.
 - .2 Scrub Natural Stone with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that Natural Stone surface remains wet.
 - .3 Rinse with cold water applied by medium pressure spray to remove detergent solution and soil.
 - .4 Repeat cleaning procedure above where required to produce cleaning effect established by mockup.
- .6 Mold / Mildew, and Algae Removal:
 - .1 Wet stone with cold water applied by low-pressure spray.
 - .2 Apply mildew, and algae remover by brush or low-pressure spray.
 - .3 Scrub stone with medium-soft brushes until mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mildew, and algae remover often to ensure that adequate fresh cleaner is used and that Natural Stone surface remains wet.
 - .4 Rinse with cold water applied by medium pressure spray to remove mildew, and algae remover and soil.

- .5 Repeat cleaning procedure above where required to produce cleaning effect established by mockup.
- .7 Nonacidic Gel Chemical Cleaning:
 - .1 Wet Stone with cold water applied by low-pressure spray.
 - .2 Apply nonacidic gel cleaner in 1/8-inch (3-mm) thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively so area will be uniformly covered with fresh cleaner and dwell time will be uniform throughout area being cleaned.
- .8 Let cleaner remain on surface for period indicated below:
 - .1 As recommended by chemical-cleaner manufacturer.
 - .2 As established by mockup.
 - .1 Remove bulk of nonacidic gel cleaner by squeegeeing into containers for disposal.
 - .2 Rinse with cold water applied by medium pressure spray to remove chemicals and soil.
 - .3 Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.
- .9 Nonacidic Liquid Chemical Cleaning:
 - .1 Wet Natural Stone with cold water applied by low-pressure spray.
 - .2 Apply cleaner to Natural Stone in two applications by brush or low-pressure spray. Let cleaner remain on surface for period indicated below:
 - .1 As recommended by chemical-cleaner manufacturer.
 - .2 As established by mockup.
 - .3 Two to three minutes.
 - .3 Rinse with cold water applied by medium pressure spray to remove chemicals and soil.
 - .4 Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

- .10 Mild Acidic / Acidic Chemical Cleaning:
 - .1 Wet Natural Stone with cold water applied by low-pressure spray.
 - .2 Apply cleaner to Natural Stone in two applications by brush or low-pressure spray. Let cleaner remain on surface for period indicated below:
 - .1 As recommended by chemical-cleaner manufacturer.
 - .2 As established by mockup.
 - .3 Two to three minutes.
 - .3 Rinse with cold water applied by medium pressure spray to remove chemicals and soil.
 - .4 Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use a steam cleaning.

3.8 Cleaning Brownstone Terra Cotta

- .1 Cold-Water Soak:
 - .1 Apply cold water by intermittent spraying to keep surface moist.
 - .2 Use perforated hoses or other means that will apply a fine water mist to entire surface being cleaned.
 - .3 Apply water in cycles with at least **30 minutes** between cycles.
 - .4 Continue spraying until surface encrustation has softened sufficiently to permit its removal by water wash, as indicated by cleaning tests.
 - .5 Continue spraying for 72 hours.
 - .6 Remove soil and softened surface encrustation from Natural Stone with cold water applied by low-pressure spray.
- .2 Cold-Water Wash: Use cold water applied by medium pressure spray.
- .3 Hot-Water Wash: Use hot water applied by medium pressure spray.
- .4 Steam Cleaning: Apply steam at very low pressures not exceeding 30 psi (207 kPa). Remove dirt softened by steam with wood scrapers, stiff-nylon or -brushes, or cold-water wash, as indicated by cleaning tests.
- .5 Detergent Cleaning:

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- .1 Wet Natural Stone with cold water applied by low-pressure spray.
 - .2 Scrub Stone with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that masonry surface remains wet.
 - .3 Rinse with cold water applied by medium pressure spray to remove detergent solution and soil.
 - .4 Repeat cleaning procedure above where required to produce cleaning effect established by mockup.
- .6 Mildew, and Algae Removal:
- .1 Wet Natural Stone with cold water applied by low-pressure spray.
 - .2 Apply mildew, and algae remover by brush or low-pressure spray.
 - .3 Scrub masonry with medium-soft brushes until mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mildew, and algae remover often to ensure that adequate fresh cleaner is used and that Natural Stone surface remains wet.
 - .4 Rinse with cold water applied by medium pressure spray to remove mildew, and algae remover and soil.
 - .5 Repeat cleaning procedure above where required to produce cleaning effect established by mockup.
- .7 Nonacidic Gel Chemical Cleaning:
- .1 Wet masonry with cold water applied by low-pressure spray.
 - .2 Apply nonacidic gel cleaner in 1/8-inch (3 mm) thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively so area will be uniformly covered with fresh cleaner and dwell time will be uniform throughout area being cleaned.
 - .3 Let cleaner remain on surface for period indicated below:
 - .1 As recommended by chemical-cleaner manufacturer.
 - .2 As established by mockup.
 - .4 Remove bulk of nonacidic gel cleaner by squeegeeing into containers for disposal.

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- .5 Rinse with cold water applied by medium pressure spray to remove chemicals and soil.
- .6 Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.
- .8 Nonacidic Liquid Chemical Cleaning:
 - .1 Wet Natural Stone with cold water applied by low-pressure spray.
 - .2 Apply cleaner to Natural Stone in two applications, by brush or low-pressure spray. Let cleaner remain on surface for period indicated below:
 - .1 As recommended by chemical-cleaner manufacturer.
 - .2 As established by mockup.
 - .3 Two to three minutes.
 - .3 Rinse with cold water applied by medium pressure spray to remove chemicals and soil.
 - .4 Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.
- .9 Mild Acidic / Acidic Chemical Cleaning:
 - .1 Wet masonry with cold water applied by low-pressure spray.
 - .2 Apply cleaner to Natural Stone in two applications by brush or low-pressure spray. Let cleaner remain on surface for period indicated below:
 - .1 As recommended by chemical-cleaner manufacturer.
 - .2 As established by mockup.
 - .3 Two to three minutes.
 - .3 Rinse with cold water applied by medium pressure spray to remove chemicals and soil.
 - .4 Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use a steam cleaning.

3.9 Repointing Natural Stone

- .1 Rake out and repoint joints to the following extent:
 - .1 All joints in areas indicated.
 - .2 Joints where mortar is missing or where they contain holes.
 - .3 Cracked joints where cracks can be penetrated at least 1/4-inch (6 mm) by a knife blade 0.027 inch (0.7 mm) thick.
 - .4 Cracked joints where cracks are 1/8-inch (3 mm) or more in width and of any depth.
 - .5 Joints where they sound hollow when tapped by metal object.
 - .6 Joints where they are worn back 1/4-inch (6 mm) or more from surface.
 - .7 Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.
 - .8 Joints where they have been filled with substances other than mortar.
 - .9 Joints indicated as sealant-filled joints.
- .2 Do not rake out and repoint joints where not required.
- .3 Rake out joints as follows, according to procedures demonstrated in mock-up:
 - .1 Remove mortar from joints to depth of 2 times joint width, but not less than ½ inch (13 mm) or not less than that required to expose sound, unweathered mortar.
 - .2 Remove mortar from Natural Stone surfaces within raked-out joints to provide reveals with square backs and to expose Natural Stone for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
 - .3 Do not spall edges of Natural Stone or widen joints. Replace or patch damaged Natural Stones as recommended by Departmental Representative.
 - .1 Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Departmental Representative's written acceptance based on Departmental Representative quality-control program.
 - .2 Cut out of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand

with chisel and resilient mallet. Strictly adhere to Departmental Representative quality-control program.

- .4 Notify Departmental Representative of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- .5 Pointing with Mortar:
 - .1 Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
 - .2 Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8-inch (9 mm) until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
 - .3 After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8-inch (9 mm). Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing Natural Stone has worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed Natural Stone surfaces or to feather edge the mortar.
 - .4 When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in Departmental Representative mockup. Remove excess mortar from edge of joint by brushing.
 - .5 Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours including weekends and holidays.
 - .1 Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
 - .2 Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
 - .6 Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.
- .6 Where repointing work precedes cleaning of existing Natural Stone, allow mortar to harden at least 30 days before beginning cleaning work.

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3.10 Final Cleaning

- .1 After mortar has fully hardened, thoroughly clean exposed Natural Stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or brushes, and clean water, spray applied at low pressure.
 - .1 Do not use metal scrapers or brushes.
 - .2 Do not use acidic or alkaline cleaners.
- .2 Wash adjacent woodwork and other surfaces other than Natural Stone. Use detergent and soft brushes or cloths.
- .3 Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

3.11 Field Quality Control

- .1 Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare test reports. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.
- .2 Departmental Representative's Project Representatives: Departmental Representative will assign Project representatives to help carry out Departmental Representative's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Departmental Representative's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.
- .3 Notify Departmental Representative's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Departmental Representative's Project representatives have had reasonable opportunity to make inspections and observations of Work areas at lift device or scaffold location.

3.12 Closeout Activities:

- .1 Provide in accordance with Section 01 77 00

END OF SECTION