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PROJECT MANUAL  
Issued for Construction

Lower Fort Garry National Historic Site  
Conservation of Buildings and Grounds

Saint Andrews, MB

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Date: 2018-04-27

Client Project No. 1603  
Project No. 189-00014-00

Set No:



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**Part 1 General**

**1.1 REFERENCES**

- .1 Canada's Historic Places
  - .1 Standards and Guidelines for the Conservation of Historic Places in Canada

**1.2 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises restoration and rehabilitation work to various buildings at Lower Fort Garry National Historic Site, and site rehabilitation work.
- .2 Following buildings are included in the rehabilitation work:
  - .1 Big House.
  - .2 Fur Loft.
  - .3 Museum.
  - .4 Men's House.
  - .5 Warehouse.
  - .6 Farm Manager's House (also called Fraser House).
  - .7 Ross Cottage.
  - .8 Doctor's Office.
  - .9 Administration Building (Simkin House)
  - .10 Large Storage Building.
  - .11 Picnic Shelter.

**1.3 CONTRACT METHOD**

- .1 Construct Work under single, stipulated price contract.

**1.4 WORK SEQUENCE**

- .1 Sequence and schedule Work to accommodate operational use and occupancy of the site as follows:
- .2 Historic Buildings:
  - .1 Big House, Ross Cottage, Farm Manager's House, Blacksmith Shop will remain open for public and interpretive use until July 3, 2018. Minimize impact of ongoing construction activities to these areas until July 3, 2018.
- .3 Historic grounds outside of the south fort walls will remain open and untouched by construction activities, for public and interpretive use until July 3, 2018.
  - .1 Ensure grounds remain accessible for interpretive programming from May 1, 2018 to September 3, 2018.
  - .2 Fence off construction areas at Ross Cottage and Farm Manager's House to allow public access in surrounding areas.
- .4 Co-operate with Departmental Representative in scheduling operations to minimize conflict and to facilitate usage.

- .5 Refer to Section 01 14 00 – Work Restrictions, Article “Migratory Birds, and Species at Risk” for additional work restrictions.
- .6 Stipulated time for completion: Achieve Substantial Performance including correction of defects and deficiencies by December 21, 2018.

## **1.5 HISTORICAL/ARCHAEOLOGICAL FEATURES, PREVIOUS USES**

- .1 Lower Fort Garry National Historic Site (NHS) is a former Hudson’s Bay Company trading post located next to the Red River near the town of Selkirk, MB. It was designated a National Historic site in 1950 for its significances as the place where Treaty Number 1 was made between the Ojibway and Swampy Cree of Manitoba and the Crown, for its assemblage of fur trade structures which represent a significant example of early stone architecture and for the role the fort played as a supply centre for the fur trade of Western Canada.
- .2 The Fort is comprised of six designated buildings, two of which are designated “classified” heritage property by the Federal Heritage Building Review Office (FHBRO):
  - .1 Fur loft and Sale shop 1831
  - .2 The Big House 1832,
- .3 Four of the six buildings are designated “recognized” heritage property by the Federal Heritage Building Review Office (FHBRO):
  - .1 Southwest Bastion 1841
  - .2 Men’s House 1854
  - .3 Warehouse 1838
  - .4 Museum Building (reconstructed)
- .4 One building within the walls of the Fort is a non-designated historic structure (Doctor’s Office 1885).
- .5 Each of the three remaining Bastions contains a small building.
  - .1 The Northwest and Northeast bastions are historic, and the Southeast is contemporary, housing the public washrooms for the site.
- .6 Outside the Fort walls are three non-designated buildings:
  - .1 Ross Cottage
  - .2 Farm Manager’s House (Fraser House)
  - .3 Blacksmith Shop

## **1.6 HERITAGE CONSERVATION MINIMAL INTERVENTION APPROACH**

- .1 Considerations of conservation are guided by a minimal intervention approach and advocate the maintenance and repair of elements instead of their replacement. Twelve specific standards will be followed as outlined in the Standards and Guidelines for the Conservation of Historic Places in Canada:
  - .1 Standard No. 1 - Conserve the heritage value of a historic place. Do not remove, replace, or substantially alter its intact or repairable character-defining elements. Do not move a part of a historic place if its current location is a character-defining element.
  - .2 Standard No. 2 - Conserve changes to a historic place which, over time, have become character-defining elements in their own right.

- .3 Standard No. 3 - Conserve heritage value by adopting an approach calling for minimal intervention.
- .4 Standard No. 6 - Protect and, if necessary, stabilize a historic place until any subsequent intervention is undertaken. Protect and preserve archaeological resources in place. Where there is potential for disturbance of archaeological resources, take mitigation measures to limit damage and loss of information.
- .5 Standard No. 7 - Evaluate the existing condition of character-defining elements to determine the appropriate intervention needed. Use the gentlest means possible for any intervention. Respect heritage value when undertaking an intervention.
- .6 Standard No. 8 - Maintain character-defining elements on an ongoing basis. Repair character-defining elements by reinforcing their materials using recognized conservation methods. Replace in kind any extensively deteriorated or missing parts of character-defining elements, where there are surviving prototypes.
- .7 Standard No. 9 - Make any intervention needed to preserve character-defining elements physically and visually compatible with the historic place, and identifiable upon close inspection. Document any intervention for future reference.
- .8 Standard No. 10 - Repair rather than replace character-defining elements. Where character-defining elements are too severely deteriorated to repair, and where sufficient physical evidence exists, replace them with new elements that match the forms, materials and detailing of sound versions of the same elements. Where there is insufficient physical evidence, make the form, material and detailing of the new elements compatible with the character of the historic place.
- .9 Standard No. 11 - Conserve the heritage value and character-defining elements when creating any new additions to a historic place or any related new construction. Make the new work physically and visually compatible with, subordinate to and distinguishable from the historic place.
- .10 Standard No. 12 - Create any new additions or related new construction so that the essential form and integrity of a historic place will not be impaired if the new work is removed in the future.
- .11 Standard No. 13 - Repair rather than replace character-defining elements from the restoration period. Where character-defining elements are too severely deteriorated to repair and where sufficient physical evidence exists, replace them with new elements that match the forms, materials and detailing of sound versions of the same elements.
- .12 Standard No. 14 - Replace missing features from the restoration period with new features whose forms, materials and detailing are based on sufficient physical, documentary and/or oral evidence.

#### **1.7 CONTRACTOR USE OF PREMISES**

- .1 Limit use of premises for Work, storage and for access to allow for staff and public usage specified in Article "Work Sequencing", and as shown on Drawings.
- .2 Entire site is an archeologically sensitive zone. Refer to Section 01 14 00 - Work Restrictions for access and egress requirements.
- .3 Co-ordinate use of premises under direction of Departmental Representative, and as indicated on Drawings.
- .4 Only hand excavation of earth is permitted, and only with Departmental Representative's prior consent, and a complete archeological review.

**1.8 PARKS CANADA OCCUPANCY**

- .1 Parks Canada will occupy and use the Visitor Centre during entire construction period for execution of normal operations.

**1.9 EXISTING SERVICES**

- .1 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions to a minimum.
- .2 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .3 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .4 Provide temporary services when directed by Departmental Representative to maintain critical building systems.
- .5 Where unknown services are encountered, immediately advise Departmental Representative, and confirm findings in writing.
- .6 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .7 Record locations of maintained, re-routed and abandoned service lines.

**1.10 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each document as follows:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed Shop Drawings.
  - .5 List of outstanding Shop Drawings.
  - .6 Change Orders.
  - .7 Other modifications to Contract.
  - .8 Requests for Interpretation (RFI), including RFI log.
  - .9 Field test reports.
  - .10 Copy of approved work schedule.
  - .11 Health and Safety Plan and other safety related documents.
  - .12 Environmental Protection Plan, and Spill Response Plan.
  - .13 Other documents as specified.

**1.11 SPECIFICATION AND DRAWING CONVENTIONS**

- .1 Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - .1 Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  - .2 Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- .2 Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- .3 Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
  - .1 Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  - .2 Abbreviations: Materials and products are identified by abbreviations.

**END OF SECTION**



**Part 1            General**

**1.1            SECTION INCLUDES**

- .1    Access and egress
- .2    Use of site and facilities
- .3    Special requirements
- .4    Smoking policy
- .5    Historical/archaeological control
- .6    Migratory birds and species at risk requirements

**1.2            RELATED REQUIREMENTS**

- .1    Section 01 11 00 - Summary of Work, work sequence
- .2    Section 01 35 03 - Conservation Treatment Procedures, for work procedures related to conservation, restoration and rehabilitation work
- .3    Section 01 52 00 - Construction Facilities, for protection and maintenance of traffic

**1.3            DEFINITIONS**

- .1    Federal Heritage Building: Any federally owned building that has been designated by the Minister of Canadian Heritage environment under the Federal Heritage Buildings Policy.

**1.4            REFERENCES**

- .1    Canada National Parks Act (S.C. 2000, c.32)
- .2    Canada's Historic Places
  - .1    Standards and Guidelines for the Conservation of Historic Places in Canada
- .3    Migratory Birds Convention Act, 1994
- .4    Species at Risk Act, 2002

**1.5            ACCESS AND EGRESS**

- .1    Design, construct and maintain temporary "access to" and "egress from" work areas, including runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.
- .2    Establish access routes to and from the work areas. Use only designated access routes for movement of workers, tools, equipment, materials, and construction debris.
- .3    Maintain existing roads and walkways.

**1.6            USE OF SITE AND FACILITIES**

- .1    Execute Work with least possible interference or disturbance of premises.
- .2    Maintain existing access to Visitor Centre.
- .3    Existing paved service road adjacent to the site, and gravel road around the Big House are available for personnel and vehicle access.

- .4 Existing adjacent groundcover area is strictly off limits for transfer of materials and personnel. Use existing roads and foot paths. Refer to Section 01 52 00 - Construction Facilities, for protection and maintenance of traffic.
- .5 Where security is reduced by work provide temporary means to maintain security.

## **1.7 SPECIAL REQUIREMENTS**

- .1 Ensure Contractor's personnel employed on site become familiar with and obey regulations including, but not limited to safety, fire, environmental protection, and traffic regulations.
- .2 Review and coordinate material movement plans with the Departmental Representative before start of Work.
- .3 Ground Protection. Entire site is an archeologically sensitive zone.
  - .1 Do not permit individuals or vehicles to work, travel, rest, store or otherwise occupy unprotected ground. Where work is taking place in the absence of existing walkways or boardwalks, lay plywood protection boards on the ground before start of Work.
  - .2 Use ground protection under work areas to collect debris, for vehicles and machinery, under stockpiles of soil and materials.
  - .3 Plywood Protection Board: 1220 by 2438 by 12.7 mm thick plywood sheets laid in a criss-cross fashion, directly on the ground.
- .4 Coordinate lay down area locations with Departmental Representative. Protect lay down areas with plywood protection boards.
- .5 Keep within limits of work and avenues of ingress and egress.
- .6 Inform Departmental Representative of effects to ground surface before conducting work not specified in the Contract Documents, which may affect the ground surface or involve breaking the ground surface.
- .7 Scaffolding and Fencing:
  - .1 Below ground surface anchoring is not permitted.
  - .2 Digging or pounding into the ground is not permitted.
  - .3 Provide ground protection under scaffolding and fencing supports/legs.
- .8 Use of heavy machinery inside fort walls is not permitted without written permission of Departmental Representative.
- .9 Maintain 2 metre buffer zone between equipment and heritage buildings.
- .10 Departmental Representative will determine minimum distances from buildings for safe placement scaffolding, and placement of stockpiles to prevent damage to historical resources. Confirm with Departmental Representative before start of Work.

## **1.8 SMOKING POLICY**

- .1 Comply with non-smoking regulations and policies.
- .2 Smoking is not permitted within the fort walls and not within 3 m of historic buildings.
- .3 Departmental Representative will designate permitted smoking areas.
- .4 Contractor shall provide receptacles.



## **1.9 HISTORICAL ARTIFACTS**

- .1 If artifacts or structural remains of a historic nature are encountered during the Work:
  - .1 Cease Work in affected area immediately.
  - .2 Immediately notify Departmental Representative, and wait for instructions.
  - .3 Protect artifacts from damage.
  - .4 Record the find to the best of the Contractor's ability using digital photographs, GPS location coordinates, and notes.
  - .5 Resume activity when permitted to proceed with Departmental Representative authorization.

## **1.10 MIGRATORY BIRD AND SPECIES AT RISK REQUIREMENTS**

- .1 The Migratory Birds Convention Act prohibits the disturbance or destruction of nests and eggs of migratory birds. Respect nesting periods.
- .2 The Species at Risk Act requires that potential adverse effects on a listed species at risk and the nature of those effects be considered. LFG has Chimney swifts (*Calcarius ornatus*), which is an endangered species, and Barn swallows (*Hirundo rustica*), which is a threatened species. Both have special protections under the Species at Risk Act.
- .3 Comply with "Migratory Bird Act", and "Species at Risk Act" for work taking place between mid-April and mid-August annually.
  - .1 Work with the Parks Canada Impact Assessment Officer to determine when it is safe to begin work where Species at Risk are present or migratory bird habitat may be affected.
  - .2 The Fur Loft and the Museum have been used by Chimney Swifts. The most western chimney on the Fur Loft is a nesting site and the western chimney on the Museum building is roosting habitat. These chimneys are both residences for Chimney Swifts and it is illegal to damage their residence. Schedule work on these two roofs to begin after the second week of July. Do not work on the roof surrounding the chimney or the chimney itself until after mid-August.
  - .3 Maintain 5 m radius "no work zone" around chimneys on the west end of the roof on the Fur Loft and Museum until after mid-August.
  - .4 Active Barn swallow nests may not be disturbed. Delay any work in the vicinity of an active barn swallow nest until after young birds have left the nest.
- .4 Advise Departmental Representative if an active nest or indicated nest (behaviour indicative of nesting such as aggression, distraction or territorial behaviour; carrying of fecal sacs, nesting material or food) is found outside the breeding and nesting season. Protect active and indicated nests with species-appropriate buffer in accordance with the Manitoba Breeding Bird Atlas – Safe Dates  
<http://www.birdatlas.mb.ca/download/safedates.pdf>

**END OF SECTION**



**Part 1            General**

**1.1            SUMMARY**

- .1      Section includes administrative and procedural requirements for substitutions during the construction period.
- .2      Related Requirements:
  - .1          Divisions 02 through 49 Sections for specific requirements and limitations for substitutions.

**1.2            DEFINITIONS**

- .1      Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
  - .1          Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - .2          Substitutions for Convenience: Changes proposed by Contractor or Departmental Representative that are not required in order to meet other Project requirements but may offer advantage to Contractor or Departmental Representative.

**1.3            ACTION SUBMITTALS**

- .1      Substitution Requests: Submit electronic copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles. Requests not submitted on the form provided may be rejected.
  - .1          Substitution Request Form: Use form provided in the Project Manual, at the end of this Section. Submit completed form and supplementary documentation required for consideration.
  - .2          Departmental Representative's Action: If necessary, Departmental Representative will request additional information or documentation for evaluation within five Working Days of receipt of a request for substitution. Departmental Representative will notify Contractor of acceptance or rejection of proposed substitution within 10 Working Days of receipt of request, or five Working Days of receipt of additional information or documentation, whichever is later.
    - .1              Forms of Acceptance: Change Order, Change Directive, or Supplemental Instructions for minor changes in the Work.
    - .2              Use product specified if Departmental Representative does not issue a decision on use of a proposed substitution within time allocated.

**1.4            QUALITY ASSURANCE**

- .1      Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

**1.5 PROCEDURES**

- .1 Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

**Part 2 Products**

**2.1 SUBSTITUTIONS**

- .1 Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 10 Working Days prior to time required for preparation and review of related submittals.
- .2 Substitutions for Convenience: Not allowed during construction.
- .3 A request for substitution constitutes a representation that the Contractor:
  - .1 Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product, is consistent with the Contract Documents and will produce indicated results, will not adversely affect the construction schedule, is compatible with other portions of the Work, and has received necessary approvals of the authorities having jurisdiction.
  - .2 Will provide the same warranty for the Substitution as for the specified Product.
  - .3 Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Departmental Representative.
  - .4 Waives claims for additional costs or time extension which may subsequently become apparent.
  - .5 Will reimburse Departmental Representative for review or redesign services associated with re-approval by authorities.

**END OF SECTION**

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Section 01 25 00

SUBSTITUTION REQUEST (DURING CONSTRUCTION PERIOD)

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Page 1 of 2

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Project: \_\_\_\_\_ Project Number: \_\_\_\_\_  
To: \_\_\_\_\_ From: \_\_\_\_\_  
Attention: \_\_\_\_\_ Date: \_\_\_\_\_

---

Spec Section No.: \_\_\_\_\_ Spec Section Name: \_\_\_\_\_  
Page: \_\_\_\_\_ Article / Paragraph: \_\_\_\_\_ Description: \_\_\_\_\_

---

Proposed Substitution: \_\_\_\_\_  
Manufacturer: \_\_\_\_\_ Address: \_\_\_\_\_  
Phone: \_\_\_\_\_ Web Address: \_\_\_\_\_  
Trade Name: \_\_\_\_\_ Model No.: \_\_\_\_\_

History:   ☐ New product      ☐ 1-4 years old      ☐ 5-10 years old      ☐ More than 10 years old

Differences between proposed substitution and specified product:

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☐ Point-by-point comparative data attached – REQUIRED BY CONSULTANT

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Supporting Data Attached:    ☐ Drawings      ☐ Product Data      ☐ Samples      ☐ Tests      ☐ Reports  
   ☐ Description of Changes to Contract Documents      ☐ \_\_\_\_\_

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Reason for not providing specified item:

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Similar Installation:

Project: \_\_\_\_\_ Architect: \_\_\_\_\_  
Address: \_\_\_\_\_ Owner: \_\_\_\_\_  
   Date Installed: \_\_\_\_\_

Proposed substitution affects other parts of Work:    ☐ No      ☐ Yes, explain:

---

Proposed substitution changes Contract Price:  
   ☐ NO      ☐ YES      ☐ Add      ☐ Deduct      \$ \_\_\_\_\_  
Proposed substitution changes Contract Time:  
   ☐ NO      ☐ YES      ☐ Add      ☐ Deduct      \_\_\_\_\_ Days

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Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including Consultant design, detailing and construction costs caused by the substitution.
- Coordination, installation and changes in the Work as necessary for accepted substitution will be complete in all respects.

---

Submitted by: \_\_\_\_\_

Signed by: \_\_\_\_\_

Firm: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_ Email: \_\_\_\_\_

List attachments:

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Consultant's REVIEW AND ACTION

- ☐ Substitution approved – Make submittals in accordance with Specification Section 01 33 00 – Submittal Procedures.
- ☐ Substitution approved as noted – Make submittals in accordance with Specification Section 01 33 00 – Submittal Procedures.
- ☐ Substitution rejected – Use specified materials.
- ☐ Substitution Request received too late – Use specified materials.

Signed by (Consultant): \_\_\_\_\_ Date: \_\_\_\_\_

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Additional Comments:      ☐ Contractor              ☐ Subcontractor              ☐ Supplier              ☐ Manufacturer  
   ☐ Consultant              ☐ Other

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**Part 1            General**

**1.1            CONSTRUCTION START-UP MEETING**

- .1 After award of Contract, but before start of Work, a Start-Up Meeting will be held to discuss and resolve administrative procedures and responsibilities.
- .2 Senior representatives of the Departmental Representative, Parks Canada, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Departmental Representative will establish time and location of meeting and notify parties concerned minimum five Working Days before meeting.
- .4 Departmental Representative will chair Start-Up Meeting, record minutes, and distribute minutes to all attending parties within four Working Days of meeting.
- .5 Agenda to include:
  - .1 Appointment of official representative of participants in the Work.
  - .2 Schedule of Work, progress scheduling, phasing.
  - .3 Schedule for provision of mock-ups and field samples.
  - .4 Critical work sequencing and long-lead items.
  - .5 Implications for migratory birds, and species at risk, including Chimney Swifts and Barn Swallows.
  - .6 Lines of communications.
  - .7 Procedures for processing field decisions and Change Orders.
  - .8 Procedures for RFIs.
  - .9 Submittal procedures, and schedule of submission of shop drawings, samples, colour chips, test reports.
  - .10 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences.
  - .11 Safety.
  - .12 Site security.
  - .13 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .14 Record drawings.
  - .15 Maintenance manuals.
  - .16 Take-over procedures, acceptance, and warranties.
  - .17 Monthly progress claims, administrative procedures, photographs, holdbacks.
  - .18 Appointment of inspection and testing agencies or firms.
  - .19 Access and use of site and existing buildings.
  - .20 Conservation standards and guidelines.
  - .21 Environmental protection.
  - .22 Commissioning.
- .6 Submit Construction Progress Schedule, and Shop Drawing Submittal Schedule at initial start-up meeting.

**1.2            PROGRESS MEETINGS**

- .1      Administrative Requirements:
  - .1      During course of Work, arrange and schedule progress meetings every two weeks.
  - .2      Provide physical space for meetings.
  - .3      Prepare agenda for meetings.
  - .4      Distribute written notice of each meeting four days in advance of meeting date to the Departmental Representative, Parks Canada, and major Subcontractors involved in the Work.
  - .5      Preside at meetings.
  - .6      Record minutes of meetings and circulate to attending parties and affected parties not in attendance within three days after meeting. Include significant proceedings and decisions, and identify actions by parties in minutes.
  - .7      Bring one set of As-Built drawings, and project manual to progress meetings.
- .2      Agenda to include the following:
  - .1      Review, approval of minutes of previous meeting.
  - .2      Review of Work progress since previous meeting.
  - .3      Field observations, problems, conflicts.
  - .4      Problems which impede construction schedule.
  - .5      Review of off-site fabrication delivery schedules.
  - .6      Corrective measures and procedures to regain projected schedule.
  - .7      Revision to construction schedule.
  - .8      Progress schedule, during succeeding work period.
  - .9      Review submittal schedules: expedite as required.
  - .10     Maintenance of quality standards.
  - .11     Status of RFIs.
  - .12     Status of Change Orders.
  - .13     Review proposed changes for affect on construction schedule and on completion date.
  - .14     Safety.
  - .15     Cleaning.
  - .16     Commissioning.
  - .17     Other business.

**END OF SECTION**



**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1    Section 01 11 00 - Summary of Work, sequencing of Work
- .2    Section 01 31 19 - Project Meetings, discussion of project scheduling
- .3    Section 01 35 03 - Conservation Treatment Procedures, general procedures and scheduling

**1.2            DEFINITIONS**

- .1    Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2    Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally, Bar Chart should be derived from commercially available computerized project management system.
- .3    Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4    Duration: number of work periods (not including holidays or other non-working periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .5    Master Plan: summary-level schedule that identifies major activities and key milestones.
- .6    Milestone: significant event in project, usually completion of major deliverable.
- .7    Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

**1.3            REQUIREMENTS**

- .1    Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2    Plan to complete Work in accordance with prescribed time frame.
- .3    Limit activity durations to maximum of approximately 14 working days, to allow for progress reporting.
- .4    Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this Contract. Work may take place seven days per week.

**1.4            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Within 10 working days of Award of Contract, submit Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress to Departmental Representative.

- .3 Submit Project Schedule to Departmental Representative within five working days of receipt of acceptance of Master Plan.

## **1.5 MASTER PLAN**

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

## **1.6 PROJECT SCHEDULE**

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Shop Drawings, Samples.
  - .3 Permits.
  - .4 Mobilization.
  - .5 Recontouring grade around buildings.
  - .6 Foundation repair.
  - .7 Exterior building repairs, remediation and restoration including cladding, roofing, windows, and finishes
  - .8 Interior building remediation and restoration, including painting.
  - .9 Operational requirements and continued use of the Big House until July 3, 2018.
  - .10 Plumbing.
  - .11 Electrical and lighting.
  - .12 Controls.
  - .13 Heating, ventilating, and air conditioning.
  - .14 Testing and commissioning.

## **1.7 PROJECT SCHEDULE REPORTING**

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

## **1.8 PROJECT MEETINGS**

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

**1.9 CASH FLOW FORECAST**

- .1 Submit to the Departmental Representative, immediately after award of Contract, a cash flow forecast of approximate costs of the work compiled on a monthly basis over the term of the Contract.

**END OF SECTION**



**Part 1 General**

**1.1 INTENT**

- .1 Provide digital photographs of buildings, grounds, and site features to record existing conditions prior to, during, and at completion of Work.
- .2 Use digital camera with capability of producing digital images at minimum 5.0 megapixels, uncompressed, saved in \*.jpeg format.
- .3 Name photos identifying building name and photo location.

**1.2 GENERAL**

- .1 Keep one set of photographs on site.
- .2 Submit photographs to Departmental Representative on CD-disc, USB memory stick, or email as a WinZip file.
- .3 Format:
  - .1 Colour digital photos, fine resolution of minimum 4 megapixels.
  - .2 RAW format for pre-construction, and post-construction.
  - .3 PDF and JPEG format for construction progress photographs.
- .4 Photograph Quality:
  - .1 Well-illuminated, proper exposure.
  - .2 Clarity: Sufficiently clear to distinguish differences in the pre-construction and post-construction photographs, and allow future reinstallation of restored items in the original locations.
- .5 Indicate project name and number, and date photograph was taken on each photograph.
- .6 Provide key plan and elevation drawings identifying location of photographs.
- .7 Viewpoints: interior and exterior viewpoints, including close ups of specific details in locations as determined by the Departmental Representative.
  - .1 Clearly establish viewpoints and identify them by numbering them with the same first number for the same viewpoint followed by a second number for each stage of work.
  - .2 Example: 1.0 - preconstruction, 1.1 - after removal work, 1.2 - during restoration, 1.3 - reinstallation, 1.4 - completed work.

**1.3 PRE-CONSTRUCTION PHOTOGRAPHS**

- .1 Submit a complete photographic record of the condition of the existing building fabric (all materials and components) before start of Work.
- .2 Do not start work in the location until the photographic record has been reviewed by the Departmental Representative.
- .3 Number of images per set: as required to document each building, site feature, and area of Work.
- .4 Number of sets: One set per building, site feature, or area of Work.

**1.4 CONSTRUCTION PROGRESS PHOTOGRAPHS**

- .1 Provide photographs to record progress of the Work.
- .2 Number of images per set: as required to document each building, site feature, and area of Work.
- .3 Number of sets: One set per building, site feature, or area of Work.
- .4 Frequency: Monthly with progress statement or as directed by Departmental Representative.

**1.5 FINAL PHOTOGRAPHS**

- .1 Provide photographs at completion of Work to record condition of site features, surrounding buildings, and new construction.
- .2 Number of images per set: as required to document each building, site feature, and area of Work.
- .3 Number of sets: one.

**END OF SECTION**

**Part 1            General**

**1.1            SUMMARY**

- .1        Section includes requirements for administrative and procedural requirements for submitting action and informational submittals, and requests for interpretation submittals.

**1.2            DEFINITIONS**

- .1        Action Submittals: Written and graphic information and physical samples that require Departmental Representative's responsive action. Unless specifically noted otherwise in individual sections, the following shall be considered Action Submittals:
  - .1        Shop Drawings and product data.
  - .2        Samples.
- .2        Informational Submittals: Written and graphic information and physical samples that do not require Departmental Representative's responsive action. Submittals may be rejected for not complying with requirements. Unless noted otherwise in individual sections, the following shall be considered Informational Submittals:
  - .1        Certificates.
  - .2        Maintenance data.
  - .3        Test and inspection reports.
  - .4        Delegated design calculations.
  - .5        Closeout submittals.
  - .6        Sample warranties.
- .3        File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- .4        Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.
- .5        Request for Interpretation (RFI): Request from Contractor requesting interpretation or clarification of the Contract Documents, which is not easily inferable from the Contract Documents.

**1.3            ADMINISTRATION**

- .1        Provide submittals in electronic format, unless otherwise agreed to by Contractor and Departmental Representative.
- .2        Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .3        Do not proceed with Work affected by submittal until review is complete.

- .4 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .5 Where items or information is not produced in SI Metric units converted values are acceptable.
- .6 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .7 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .8 Accompany submissions with transmittal letter containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each type of submittal.
  - .5 Other pertinent data.
- .9 Delete information not applicable to project. Supplement standard information to provide details applicable to project.
- .10 Verify field measurements and affected adjacent Work are co-ordinated.
- .11 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .12 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .13 Keep one reviewed copy of each submission on site.
- .14 Computer-generated drawings may be available for Contractor's use in preparing Shop Drawings. Obtain and pay for drawings directly from Departmental Representative. Costs, not including shipping and handling, are as follows:
  - .1 1 to 10 drawings (ordered at the same time): \$100 /drawing sheet plus GST.
  - .2 11 to 50 drawings (ordered at the same time): \$65/drawing sheet plus GST.
  - .3 51 or more drawing (ordered at the same time): \$50/drawing sheet plus GST.

#### **1.4 ELECTRONIC SUBMISSIONS**

- .1 Electronic submittals (excluding samples) shall be submitted for information and review in electronic format using the following guidelines:
  - .1 Provide in Portable Document Format (\*.pdf) with selectable text and graphics that are readable. Generally, merge files into one bookmarked document up to 10 mb. Use hierarchical bookmarks to form a table of contents and provide hyperlinks to the subject topic.
  - .2 Break down information into documents of "like" or related materials or systems.



- .3 Include all final ratings, parameters, specifications, options, etc.. In the case where the Departmental Representative returns the submittal "Reviewed As Noted" and includes mark-ups or comments that change the originally submitted ratings, parameters, specifications, options, etc., the Sub-Contractor shall correct the documents in the original electronic document prior to submitting the final electronic documents.
- .4 Highlight specific rating, parameter, specification, option, etc. when original document includes multiple alternatives. For instance when a range of performance parameters are given, or various sizes are shown, or various options are listed, the applicable item shall be indicated by highlight, circle, pointer, etc..
- .5 Do not include generalized direction from the Departmental Representative that does not relate to ordering and purchasing the equipment. For instance, notes like, "Coordinate with xxx for final motor horsepower" are not to be transferred to the electronic submittal. In that example only the final coordinated sizes would be indicated.
- .6 References within this specification that indicate sheet size will refer to electronic sheet (printing) size.

## **1.5 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures, product data, and other data which the Contractor provides to illustrate details of a portion of the Work.
- .2 Submit Shop Drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Manitoba, Canada, where specified.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review will start on receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - .1 Initial Review: Allow 10 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Departmental Representative will advise Contractor when a submittal being processed must be delayed for coordination.
  - .2 Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  - .3 Resubmittal Review: Allow 5 working days for review of each resubmittal.
- .5 Adjustments made on Shop Drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative before proceeding with Work.
- .6 Make changes in Shop Drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

- .7 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Wiring diagrams.
    - .9 Single line and schematic diagrams.
    - .10 Relationship to adjacent work.
    - .11 Seal and signature of professional engineer if specified.
- .8 After Departmental Representative's review, distribute copies.
- .9 Submit electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where Shop Drawings will not be prepared due to standardized manufacture of product.

## **1.6 SAMPLES**

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's business address.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative before proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

## **1.7 INFORMATIONAL SUBMITTALS**

- .1 Submit electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within three years of date of contract award for project.
- .2 Submit electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .3 Submit electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .4 Submit electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .5 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .6 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

## **1.8 REQUESTS FOR INTERPRETATION (RFI)**

- .1 General: Immediately on discovery of the need for interpretation of the Contract Documents, prepare and submit a RFI to the Departmental Representative in the form specified.
  - .1 Departmental Representative will return RFIs submitted to the Departmental Representative by entities other than the Contractor and controlled by the Contractor with no response.
  - .2 Coordinate and submit RFIs in a prompt manner to avoid delays in Work.
  - .3 For RFIs submitted electronically, include project name and RFI number in subject line of email.
- .2 Content of the RFI: Include a detailed description of item needing information or interpretation and the following:
  - .1 Project name and number.
  - .2 Date.
  - .3 Name of Contractor.

- .4 Name of Departmental Representative.
- .5 RFI number, numbered sequentially.
- .6 RFI subject.
- .7 Applicable specification section number and title and related paragraphs.
- .8 Applicable drawing number and detail references.
- .9 Applicable field dimensions and conditions.
- .10 Contractor's suggested resolution, including impact to Contract Time and Contract Price.
- .11 Contractor's signature.
- .12 Attachments: Include sketches, descriptions, measurements, photos, product data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
  - .1 Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- .3 RFI Forms: Contractor-generated form including all content indicated in this Section.
  - .1 Form and attachments: electronic files in PDF format.
- .4 Departmental Representative's Action: Departmental Representative will review each RFI, determine action required, and respond. Allow ten Working Days for Departmental Representative's response for each RFI. RFIs received by Departmental Representative after 1:00 p.m. will be considered as received the following Working Day.
  - .1 The following Contractor-generated RFIs will be returned without action:
    - .1 Requests for approval of submittals.
    - .2 Requests for approval of substitutions.
    - .3 Requests for approval of Contractor's means and methods.
    - .4 Requests for approval of corrective actions for deficient work.
    - .5 Requests for coordination information already indicated in the Contract Documents.
    - .6 Requests for adjustments in the Contract Time or the Contract Price.
    - .7 Requests for interpretation of Departmental Representative's actions on submittals.
    - .8 Incomplete RFIs or inaccurately prepared RFIs.
  - .2 Departmental Representative's action may include a request for additional information, in which case Departmental Representative's time for response will date from time of receipt of additional information.
  - .3 If Contractor believes the RFI response warrants change in the Contract Time or the Contract Price, notify Departmental Representative in writing within ten days of receipt of the RFI response.
- .5 RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log with progress meeting minutes. Include the following:
  - .1 Project name.
  - .2 Name and address of Contractor.
  - .3 Name and address of Departmental Representative.
  - .4 RFI number including RFIs that were returned without action or withdrawn.
  - .5 RFI description.
  - .6 Date the RFI was submitted.

- .7 Date Departmental Representative's response was received.
- .6 On receipt of Departmental Representative action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Departmental Representative within 10 days if Contractor disagrees with response.

**END OF SECTION**



**Part 1            General**

**1.1            SECTION INCLUDES**

- .1    Section includes:
  - .1        General protection and treatment procedures for historic buildings.
  - .2        Historic significance of buildings.
  - .3        FHBRO Heritage Character Statements

**1.2            REFERENCES**

- .1    Canada's Historic Places
  - .1        Standards and Guidelines for the Conservation of Historic Places in Canada
- .2    Canada National Parks Act (S.C. 2000, c.32)

**1.3            RELATED REQUIREMENTS**

- .1    Section 01 14 00 - Work Restrictions, for access and egress, use of site and facilities, special requirements
- .2    Section 01 45 00 - Quality Control, for mock-up requirements
- .3    Section 01 56 00 - Temporary Barriers and Enclosures
- .4    Division 02 Sections, for hazardous materials abatement
- .5    Section 04 03 01.13 - Historic Masonry Cleaning, for specific requirements for cleaning stone masonry
- .6    Section 04 03 05.13 - Historic Masonry Mortaring
- .7    Section 04 03 05.21 - Historic Masonry Repointing
- .8    Section 06 03 13 - Conservation Treatment for Period Log Construction, for specific requirements for repairing log work
- .9    Section 06 03 20 - Conservation Treatment for Period Finish Carpentry
- .10   Section 07 03 32 - Historic - Wood Shingle and Shake Roofing, for specific requirements for replacing shingle roofing and sidewalls
- .11   Section 07 03 46 - Conservation Treatment for Period Wood Siding, for specific requirements for replacing existing horizontal historic siding
- .12   Section 08 03 52 - Conservation Treatment for Period Wood Windows, for specific requirements for cleaning and repairing wood windows
- .13   Section 09 03 25 - Conservation Treatment for Period Plastering, for specific requirements for repairing historic plaster
- .14   Section 09 03 91 - Conservation Treatment for Period Painted Surfaces, for specific requirements for cleaning, stripping and repainting paint finishes of historic materials and surfaces
- .15   This section describes requirements applicable to all sections within Divisions 02 to 49.

## **1.4 DEFINITIONS**

- .1 Character-defining elements: the materials, forms, location, spatial configurations, uses and cultural associations or meanings that contribute to the heritage value of a historic place, which must be retained in order to preserve its heritage value.
- .2 Conservation: all actions or processes that are aimed at safeguarding the character-defining elements of a cultural resource so as to retain its heritage value and extend its physical life. This may involve "Preservation," "Rehabilitation," "Restoration," or a combination of these actions or processes.
- .3 Consolidate: To strengthen loose or deteriorated materials in place.
- .4 Cultural Resource/Artifact: Any object, grouping of objects, place, or evidence of past human occupation that may be associated with an aspect of human history and culture.
- .5 Dismantle: To disassemble and detach items by hand from existing construction to the limits indicated, using small hand tools and small one-hand power tools, so as to protect nearby historic surfaces; and legally dispose of dismantled items off-site, unless indicated to be salvaged or reinstalled.
- .6 Existing to Remain: Existing items that are not to be removed or dismantled.
- .7 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.
- .8 Historic: Spaces, areas, rooms, surfaces, materials, finishes, and overall appearance which are important to the successful preservation, rehabilitation, restoration, and reconstruction as determined by Parks Canada/Historic Site and Monuments Board/FHBRO. Designated historic buildings are indicated in this Section.
  - .1 Restoration Zones: Areas of greatest architectural importance, integrity, and visibility; to be preserved and restored to the original, circa 1850s, design and finish as shown on Drawings.
  - .2 Renovation Zones: Areas of significant architectural importance, integrity, and visibility; to be preserved and restored consistent with the remaining historic fabric and to the extent shown on Drawings.
  - .3 Alteration Zones: Areas of slight architectural importance, integrity, and visibility; to leave any remaining original fabric untouched insofar as is consistent with accommodating modern uses for the building as shown on Drawings.
- .9 Match Existing: Provide new materials to match existing in material, size, form, colour, texture and finish.
- .10 Match Original: Provide new materials to match original material in all aspects as closely as possible. Original materials are those which were originally installed in the building at the time of its completion, prior to previous alterations, and which may predate existing materials.
- .11 Preservation: The act or process of applying measures necessary to sustain existing form, integrity, and materials of an historic property.
- .12 Reconstruct: To remove existing item, replicate damaged or missing components, and reinstall in original position.
- .13 Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.



- .14 Rehabilitation: the action or process of making possible a continuing or compatible contemporary use of a historic place or an individual component, through repair, alterations, and/or additions, while protecting its heritage value.
- .15 Reinstall: To protect removed or dismantled item, repair and clean it as indicated for reuse, and reinstall it in original position, or where indicated.
- .16 Remove: Specifically for historic spaces, areas, rooms, and surfaces, the term means to detach an item from existing construction to the limits indicated, using hand tools and hand-operated power equipment, and legally dispose of it off-site, unless indicated to be salvaged or reinstalled.
- .17 Repair: To correct damage and defects, retaining existing materials, features, and finishes while employing as little new material as possible. Includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- .18 Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- .19 Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- .20 Reproduce: To fabricate a new item, accurate in detail to the original, and in either the same or a similar material as the original, unless otherwise indicated.
- .21 Restoration: the action or process of accurately revealing, recovering or representing the state of a historic place or of an individual component, as it appeared at a particular period in its history, while protecting its heritage value.
- .22 Restore: To consolidate, replicate, reproduce, repair, and refinish as required to achieve the indicated results.
- .23 Retain: To keep existing items that are not to be removed or dismantled.
- .24 Reversible: New construction work, treatments, or processes that can be removed or undone in the future without damaging historic materials unless otherwise indicated.
- .25 Salvage: To protect removed or dismantled items and deliver them to Departmental Representative ready for reuse.
- .26 Stabilize: To provide structural reinforcement of unsafe or deteriorated items while maintaining the essential form as it exists at present; also, to reestablish a weather-resistant enclosure.
- .27 Strip: To remove existing finish down to base material unless otherwise indicated.

## **1.5 ADMINISTRATIVE REQUIREMENTS**

- .1 Historic Treatment Preconstruction Conference: Conduct conference at Project site.
  - .1 General: Review methods and procedures related to historic treatment including, but not limited to, the following:
    - .1 Review and finalize historic treatment construction schedule; verify availability of materials, equipment, and facilities needed to make progress and avoid delays.
    - .2 Review qualifications of personnel assigned to the work and assign duties.
    - .3 Review material application, work sequencing, tolerances, and required clearances.
    - .4 Review protection of existing construction.

- .2 Removal and Dismantling:
  - .1 Inspect and discuss condition of construction to be removed or dismantled.
  - .2 Review requirements of other work that relies on substrates exposed by removal and dismantling work.

## 1.6 GENERAL PROCEDURES

- .1 Refer to Section 01 11 00 – Summary of Work, Article “Work Sequence”.
- .2 Confine construction activities to designated work areas. Do not store materials, tools or equipment outside of designated work areas.
  - .1 Delineate designated work areas outside the fort walls (around buildings and creek) in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
- .3 Prevent migration of dust and debris.
- .4 Use only designated access routes to and from work areas for movement of workers, tools, equipment, materials, and construction debris.
- .5 Make good roads, soft landscaping, walkways, curbs, sidewalks, possessions and property, soiled or damaged due to the Work.

## 1.7 MATERIAL OWNERSHIP

- .1 Historic objects, artifacts, and similar objects including, but not limited to, commemorative plaques and tablets, antiques, and other items of interest or value to the Departmental Representative that may be encountered during the course of Work remain Parks Canada property.
- .2 Coordinate with Departmental Representative’s historical adviser, who will establish special procedures for dismantling and salvage.
- .3 Buried or concealed objects or unknown structural remains remain the custodial responsibility of the Crown (through Parks Canada) and must be reported immediately to the Departmental Representative.

## 1.8 INFORMATIONAL SUBMITTALS

- .1 Qualification Data: For historic treatment specialist, historic removal and dismantling specialist, historic removal and dismantling specialist's field supervisors, and historic removal and dismantling specialist's workers.
- .2 Inventory of Salvaged Items: After removal or dismantling work is complete, submit a list of items that have been salvaged.

## 1.9 QUALITY ASSURANCE

- .1 Historic Treatment Specialist Qualifications: A contractor with recent, relevant and significant experience in historic building rehabilitation and restoration
  - .1 Field Supervisor Qualifications: Full-time supervisors experienced in historic treatment work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on Project site during times that historic treatment work is in progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.
  - .2 Worker Qualification: Persons who are experienced in historic treatment work of types they will be performing.

- .2 Historic Removal and Dismantling Specialist Qualifications: A qualified historic treatment specialist. General selective demolition experience is not sufficient experience for historic removal and dismantling work.
- .3 Historic Treatment Program: Prepare a written plan for historic treatment for whole Project, including each phase or process and protection of surrounding materials during operations. Describe in detail materials, methods, and equipment to be used. Show compliance with indicated methods and procedures specified in this and other Sections.

#### **1.10 MOCK-UPS**

- .1 Mock-ups: Prepare mock-ups of specific historic treatment procedures specified in this technical Sections to demonstrate aesthetic effects and to set quality standards for materials and execution. Refer to applicable specification sections for specific requirements.

#### **1.11 STORAGE AND PROTECTION OF HISTORIC MATERIALS**

- .1 Salvaged Historic Materials:
  - .1 Clean only loose debris from salvaged historic items unless more extensive cleaning is indicated.
  - .2 Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
  - .3 Store items in a secure area until delivery to storage area.
  - .4 Transport items to Parks Canada storage area on-site.
  - .5 Protect items from damage during transport and storage.
- .2 Historic Materials for Reinstallation:
  - .1 Repair and clean historic items as indicated and to functional condition for reuse.
  - .2 Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
  - .3 Protect items from damage during transport and storage.
  - .4 Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make item functional for use indicated.
- .3 Existing Historic Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work.
  - .1 Some areas and rooms will contain valuable and irreplaceable period furnishings and artifacts, which are not to be moved, rested on, or touched in any way. If the removal or movement of these objects is required, notify the Departmental Representative immediately.
- .4 Storage and Protection: When taken from their existing locations, catalogue and store historic items within a weathertight enclosure where they are protected from wetting by rain, snow, condensation, or ground water, and from freezing temperatures.
  - .1 Identify each item with a non-permanent mark in an accessible but discreet location that would not be visible if the item were to be reinstalled. Document its original location, indicate original locations on plans elevations, sections, or photographs by annotating the identifying marks.
  - .2 Secure stored materials to protect from theft.

**1.12 PROJECT CONDITIONS**

- .1 General Size Limitation in Historic Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 300 mm or more.
- .2 Hazardous Materials: Hazardous materials are present in construction affected by removal, refinishing, and dismantling work including but not limited to mould, mildew and lead-based paints.
  - .1 Remove hazardous materials as specified in Division 02.
  - .2 If hazardous or suspected hazardous materials are encountered beyond those already identified:
    - .1 Stop work in affected area immediately.
    - .2 Notify Departmental Representative and await instructions.
    - .3 Prevent damage to materials. Prevent human contact.

**1.13 HISTORICAL SIGNIFICANCE**

- .1 Refer to Section 01 11 00 – Summary of Work, article HISTORICAL/ARCHAEOLOGICAL FEATURES, PREVIOUS USES.
- .2 Due to the unique historical significance, special procedures and precautions shall be used in the Work.
- .3 Refer to FHBRO Heritage Character Statements, appended to this Section.
- .4 Protect existing construction, features and character defining elements to remain.
- .5 Entire site is an archeologically sensitive zone.

**Part 2 Products**

**2.1 MATERIALS**

- .1 New Materials:
  - .1 Provide new materials to match existing adjacent materials or original materials for repairs, and reconstructions.
  - .2 Match existing materials in material, type, size, quality, colour, finish, and other attributes.

**Part 3 Execution**

**3.1 HISTORIC REMOVAL AND DISMANTLING EQUIPMENT**

- .1 Removal Equipment: Use only hand-held tools except as follows or unless otherwise approved by Departmental Representative on a case-by-case basis:
  - .1 Light jackhammers are not permitted.
  - .2 Large air hammers are not permitted.
- .2 Dismantling Equipment: Use manual, hand-held tools, except as follows or otherwise approved by Departmental Representative on a case-by-case basis:
  - .1 Hand-held power tools are permitted only as submitted in the historic treatment program. They must be adjustable so as to penetrate or cut only the thickness of material being removed.

- .2 Hand-held cutting torches are not permitted.
- .3 Pry bars more than 450 mm long and hammers weighing more than 0.9 kg are not permitted for dismantling work.

### **3.2 EXAMINATION**

- .1 Preparation for Removal and Dismantling: Examine construction to be removed or dismantled to determine best methods to safely and effectively perform removal and dismantling work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed or dismantled and location of utilities and services to remain that may be hidden by construction that is to be removed or dismantled.
  - .1 Inventory and record the condition of items to be removed and dismantled for reinstallation or salvage.
  - .2 Before removal or dismantling of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- .2 Survey of Existing Conditions: Record existing conditions by use of measured drawings, and preconstruction photographs.
  - .1 Comply with requirements specified in Section 01 32 33 - Photographic Documentation.
- .3 Perform surveys as the Work progresses to detect hazards resulting from historic treatment procedures.

### **3.3 PREPARATION**

- .1 Test materials to be used in repairs for compatibility with existing materials. Do not use incompatible materials.
- .2 Cut, move, or remove items to provide access for alterations and restoration work. Replace and restore upon completion.
- .3 Protect existing materials and surfaces from damage by construction operations.
- .4 Structural and Load-bearing Elements:
  - .1 Obtain Departmental Representative's written approval before cutting, boring or sleeving structural or load-bearing members.
  - .2 Do not proceed with the work until Departmental Representative has reviewed and confirmed proposed work.
- .5 Prevent movement, settlement or damage of structures, services, and existing features unless their removal is indicated.
  - .1 Provide supports, bracing, shoring and underpinning as required.
  - .2 Repair damage caused by alterations as directed by Departmental Representative.
  - .3 Notify Departmental Representative of proposed bracing or shoring, and provide drawings/photos where possible and obtain written approval.

### **3.4 PROTECTION**

- .1 Comply with temporary barrier requirements in Section 01 56 00 - Temporary Barriers and Enclosures.
- .2 Ensure that supervisory personnel are on-site and on duty when historic treatment work begins and during its progress.
- .3 Temporary Protection of Historic Materials:
  - .1 Protect existing historic materials with temporary protections and construction. Do not deface or remove existing materials.
  - .2 Do not attach temporary protection to historic surfaces except as indicated as part of the historic treatment program and approved by Departmental Representative.
- .4 Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

### **3.5 GENERAL HISTORIC TREATMENT**

- .1 Ensure that supervisory personnel are present when historic treatment work begins and during its progress.
- .2 Cease Work, notify Departmental Representative, and await instructions if materials or conditions encountered at the site are not as indicated by the Contract Documents or if structure is in danger of movement or collapse.
- .3 Halt the process of deterioration and stabilize conditions unless otherwise indicated. Perform work as indicated on Drawings. Follow the procedures in subparagraphs below and procedures approved in historic treatment program:
  - .1 Retain as much existing material as possible; repair and consolidate rather than replace.
  - .2 Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.
  - .3 Use reversible processes wherever possible.
  - .4 Use historically accurate repair and replacement materials and techniques unless otherwise indicated.
  - .5 Record existing work before each procedure (preconstruction) and progress during the work with digital photographs. Comply with requirements in Section 01 32 33 - Photographic Documentation.
- .4 Notify Departmental Representative of visible changes in the integrity of material or components whether due to environmental causes including biological attack, UV degradation, freezing, or thawing; or due to structural defects including cracks, movement, or distortion.
  - .1 Do not proceed with the work in question until directed by Departmental Representative.
- .5 Blend new Work with existing materials and construction to provide smooth transitions and uniform appearance.
- .6 Where missing features are indicated to be repaired or replaced, provide features whose designs are based on accurate duplications rather than on conjectural designs, subject to approval of Departmental Representative.

- .7 Where Work requires existing features to be removed or dismantled and reinstalled, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.
- .8 Identify new and replacement materials and features with permanent marks hidden in the completed work to distinguish them from original materials. Record a legend of identification marks and the locations of the items on record Drawings.

### **3.6 HISTORIC REMOVAL AND DISMANTLING**

- .1 General: Have removal and dismantling work performed by a qualified historic removal and dismantling specialist. Ensure that historic removal and dismantling specialist's field supervisors are present when removal and dismantling work begins and during its progress.
- .2 Perform work according to the historic treatment program and approved mock-ups.
  - .1 Provide supports or reinforcement for existing construction that becomes temporarily weakened by the work, until the work is completed.
  - .2 Perform cutting by hand or with small power tools wherever possible. Cut holes and slots neatly to size required, with minimum disturbance of adjacent work.
  - .3 Do not drill or cut columns, beams, joints, girders, structural slabs, or other structural supporting elements, without having Contractor's professional engineer's written approval for each location before such work is begun.
  - .4 Do not use explosives.
- .3 Outdoor Tyndal Stone Oven:
  - .1 Remove stone carefully and erect temporary bracing and supports as needed to prevent collapse of materials being removed.
  - .2 Stop removal work and immediately inform Departmental Representative if elements above or adjacent to the work show signs of distress or dislocation during any phase of removal work.

### **3.7 HISTORIC TREATMENT SCHEDULE**

- .1 Buildings, spaces, areas, rooms, and surfaces requiring special care and treatment to ensure successful preservation, rehabilitation, and restoration are indicated on Drawings and generally described below:
- .2 Big House
  - .1 Restoration Zone: Exterior door and window repairs; clean stone masonry and stucco; exterior painting of stucco.
  - .2 Reconstruction Zone: Stair replacement; stone foundation and retaining wall repair and repointing; veranda decking, posts, skirting boards.
  - .3 Alteration Zone: Building drainage, new sump pit and pump, new dehumidifier, veranda support framing.
- .3 Fur Loft
  - .1 Restoration Zone: Exterior building repairs and painting; window repairs.
  - .2 Reconstruction Zone: Stone foundation repair; wooden walkway repairs; repoint and replace masonry in stairwell to basement as required.
  - .3 Alteration Zone: Basement floor repairs, building drainage; new exhaust fans and fresh air inlets with motorized dampers; replace unit heaters.

- .4 Museum
  - .1 Restoration Zone: Roof replacement; exterior building repairs and replacement of siding where required; exterior cleaning and painting; door and window repairs.
  - .2 Reconstruction Zone: Wooden walkway repairs, stone foundation repair.
  - .3 Alteration Zone: Washroom upgrades, building drainage.
- .5 Men's House
  - .1 Restoration Zone: Roof replacement including flashing, cement shoulder at chimney roof penetration and wood rafter tail replacement at eaves; repair and repaint interior and exterior stucco/plaster walls; rebuild dormer windows, and window repairs.
  - .2 Reconstruction Zone: Stone foundation repair; repoint fireplace and chimney.
  - .3 Alteration Zone: Building drainage, new exhaust fan in crawlspace, new sump pits and pumps.
- .6 Warehouse
  - .1 Restoration Zone: Third floor wood floor repairs, roof repairs, exterior building repairs and painting; cracked wall repairs and repointing; window repairs.
  - .2 Reconstruction Zone: Stone foundation repair.
  - .3 Alteration Zone: Building drainage, new exhaust fan in crawlspace, new sump pits and pumps.
- .7 Farm Manager's House (Fraser House)
  - .1 Restoration Zone: Cracked wall repairs; exterior building repairs including re-chinking and painting; window repairs.
  - .2 Reconstruction Zone: Stone foundation repair.
  - .3 Alteration Zone: Building drainage, new sump pits and pumps.
- .8 Ross Cottage
  - .1 Restoration Zone: Exterior building repairs including masonry cleaning and repointing; exterior painting including wood trim; fence repair; window repairs and refinishing; interior wall repair and refinishing.
  - .2 Reconstruction Zone: Foundation and wall repairs, stone foundation repair.
- .9 Doctor's Office
  - .1 Restoration Zone: Roof replacement; exterior building repairs including siding and trim replacement; exterior painting; window repairs.
  - .2 Reconstruction Zone: Stone foundation repair.
  - .3 Alteration Zone: Building drainage.

### **3.8 CLEAN-UP**

- .1 Remove debris and abandoned items from areas of Work and from concealed spaces.

**END OF SECTION**



## **89-04**

Selkirk, Manitoba  
**The Big House**  
Lower Fort Garry

### **HERITAGE CHARACTER STATEMENT**

The Big House was constructed in 1830-32 as a residence and administrative office for the Hudson's Bay Company. The construction was overseen by Pierre Leblanc. The structure had been extensively altered prior to period restoration in the 1960s. It is currently used for interpretive purposes. Parks Canada is the custodian. See FHBRO Building Report 89-04.

### **Reasons for Designation**

The Big House was designated Classified because of its historical associations, its environmental and local importance within Lower Fort Garry, and its architectural significance.

Lower Fort Garry was an administrative headquarters for fur trading and the focal point of the lower Red River settlement as well as an important link to Britain. The construction of the Big House reflects the consolidation of the fur trade under the Hudson Bay Company and the development of the fort as a trans-shipment depot and agricultural supply center.

The Big House is associated with George Simpson, Governor of the Hudson Bay Northern department's fur trade. He initiated the construction of the fort and the residence and office as a center from which to manage the fur trade. The house is also associated with the Northwest Mounted Police, whose initial headquarters were located at the fort.

The Big House is a very good example of a residence and administrative building designed in the British Classical tradition. The "L"-shaped structure was built in two visually distinct stages, each with a dominant hip roof and domestically scaled symmetrical facades. The annex was constructed using colombage pierroté as the structural system. Extensively altered over the years, restoration to the 1850-52 period involved replacement of much of the remaining original fabric of the building.

The Big House is part of the historic enclave defined by the perimeter walls of the fort within which all the buildings have a cohesive design and visual unity. The central location of the Big House has ensured its prominence over the years.

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### **Character Defining Elements**

The heritage character of the Big House resides in the building's form, its overall proportions, construction materials, architectural details, interior layout and finishes, and its relationship to the site and setting.

The building is composed of two linked structures, both of which have prominent hipped roofs and masonry chimneys. The three sided verandah extension at the main house is a character-defining feature. The massing, overall roof profiles and building footprint should not be altered.

The Big House incorporates two of the three traditional building techniques used at the Fort: stone construction and colomage pierroté. The rubblestone walls of the main house are simply detailed with cut stone work at the openings. The colomage pierroté of the annex consists of a heavy oak timber frame infilled with rubblestone and mortar and finished in stucco. The south and east walls of the main house are original; the rest of the exterior walls have been rebuilt at various times. The simple, economical detailing of the wood verandah, windows, doors, and dormers is characteristic. The exterior is in good condition and merits an on-going program of repairs and maintenance.

The symmetrical balance and good proportional relationships of the windows and doors are typical of the British Classical style used for fur trade buildings. The large windows and doors contribute to the building's domestic character. The multi-paned wood sash windows, panelled doors and the shutters of the annex are compatible with the original design intent and should be retained.

The house was designed as a residence and administrative quarters; over the years the functional layout was modified to meet changing needs. The current layout of house reflects the 1850-52 period. Any changes should be based on physical or pictorial evidence.

The central location and scale of the Big House provide it with prominence within the fort environs. The house's manicured grounds with floral planting and a perimeter fence are in keeping with the historic character of the site and should be maintained.

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For further guidance, please refer to the *FHBRO Code of Practice*.

## **HERITAGE CHARACTER STATEMENT**

The Furloft/Saleshop was built in 1830-1831. Pierre Leblanc, a contractor employed by the Hudson's Bay Company, oversaw the construction of the building. The building was constructed to serve as a retail and warehouse/storage facility. It was restored during the 1970s and is used to interpret the fort as a transshipment depot and agricultural supply centre. The custodian of the property is Environment Canada Parks Service. See FHBRO Building Report 89-04.

### **Reasons for Designation**

The Furloft/Saleshop was designated Classified because of its historical associations, its contribution to local development, its architectural significance, and its environmental value.

The Furloft/Saleshop is part of Lower Fort Garry National Historic Site. Established by the Hudson's Bay Company in 1830, the fort represents one of Canada's largest remaining concentrations of fur trade structures.

The Furloft/Saleshop is strongly associated with the current interpretive emphasis at Lower Fort Garry, the development of the fort as a transshipment depot and agricultural centre for the Rupert's Land fur trade. The Furloft/Saleshop had an impact both locally, as it served the surrounding community for many years as a retail outlet, and regionally in that goods and produce which were produced and stored there, supplied the interior network of trading posts.

Viewed collectively, the buildings of Lower Fort Garry represent an important concentration of fur trade architecture. They reflect elements of a common fur trade building tradition, one which was based on both French and British contributions modified by functional and resource considerations. The Furloft/Saleshop along with other stone buildings at Lower Fort Garry represent the earlier construction phases at the site. The Furloft/Saleshop and its nearby contemporary, the Warehouse, are rare examples of their functional type, constructed in stone.

The original buildings remaining at Lower Fort Garry exhibit a strong visual unity due to several factors: all but two are physically contained within the perimeter walls; all but one date from the period 1830-55; and all are constructed either of stone or timber frame with stone infill. Nonetheless, within this physically cohesive unit, individual buildings, such as the Furloft/Saleshop, exert an influence on the present character of the site.

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## **Character Defining Elements**

The heritage character of the Furloft/Saleshop is defined by the integrity of its exterior design and by elements of its interior which express the Georgian tradition and exhibit the standard features of the Hudson's Bay Company's warehouse design. The heritage character also lies in the contextural relationship between the building and its setting.

The Furloft/Saleshop is a two and one-half storey, rectangular limestone structure under a medium-pitched hipped roof anchored by two stone chimneys. The roof is punctured on both the north and south slopes by three gable dormers. The symmetry of design recalls the British classical tradition. Openings on all the elevations are arranged symmetrically with two entrances on the north and one on the west side. The windows are multi-pane double hung units with shutters on the ground floor windows.

The roof is covered with cedar shingles. The cedar shingles contribute to the heritage character of the building. This material should therefore be preserved.

The building features rubble masonry with the use of a massive central bearing wall of masonry in the basement. All the windows have plain stone lintels and sills, and the corners of the building are accentuated by quoins. The masonry work is an important character-defining element and warrants careful maintenance, with the use of appropriate expertise for any repair and repointing.

The interior space is essentially open and suited to bulk storage except on the first floor which formed the principal retail area. The interior is oak with pit-sawn spruce board floors. The original layout and finishes should be retained in any future interior refurbishings. Any element that shows signs of deterioration should be repaired rather than replaced.

The Furloft/Saleshop is located inside the walls in the southeast corner of the fort, and the Warehouse located directly across the grounds, at the northeast corner, echo one another in size, materials, design, and function. The historical relationship of the building to its site and adjacent buildings should be maintained.

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# Museum

## Recognized Federal Heritage Building

Selkirk, Manitoba



Exterior image

(© Parks Canada, 2007)

**Address :** 5925 Highway 9, Selkirk, Manitoba

**Recognition Statute:** Treasury Board Policy on Management of Real Property

**Designation Date:** 2009-01-15

**Dates:** 1962 to 1964 (Construction)

**Custodian:** Parks Canada

**FHBRO Report Reference:** 08-002

**DFRP Number:** 12705 00

### Description of Historic Place

The Museum Building at Lower Fort Garry National Historic Site of Canada is a reconstruction of the fort's old Hudson's Bay Company (HBC) retail store. This interpretation of the Georgian Style is a two-and-a-half-storey rectangular building with hipped roof, brick chimneys, regularly placed multi-pane windows, white-painted wood siding, dark green trim and central main entrance. A single-storey, gable-roofed extension is attached to the rear of the building. The Museum Building is located along the fort's south wall facing the Big House at the fort's centre. The designation is confined to the footprint of the building.

### Heritage Value

The Museum Building is a “Recognized” Federal Heritage Building because of its historical, architectural and environmental values.

#### Historical value

Established by the HBC in 1830, the fort comprises a series of fur trade structures. The Museum Building of Lower Fort Garry National Historical Site (1962-64) was built to house the HBC collection of ethnographic and fur trade artefacts relating to 300 years of company history. In 1994 the collection was transferred to Winnipeg’s Manitoba Museum. The exterior replicates the HBC Retail Store built 1873, dismantled 1924. The building reflects the Canadian conservation movement’s interpretative and commemorative approach to heritage property development in the 1960s, and is associated with the re-launching of Fort Garry as a National Historic Site of Canada. It is associated with its curator Ms. Barbara Johnstone, first superintendent of the national historic site of Fort Garry and first woman in Canada appointed to such a position. Recognized provincially for the significance of her involvement with the collection, she also contributed to the Manitoba Historical Society, Manitoba Archaeological Society and the Canadian Legion.

#### Architectural value

The Museum Building is a reconstruction of the fort’s old HBC Retail Store, an 1873 wood-frame structure. It shows the HBC’s simple interpretation of the Georgian Style popular in Britain and colonial America during the 18th century. Alterations to the building’s symmetry follow modifications to the original retail store. Designed as a modern historical museum by Green Blankstein Russell of Winnipeg, this building’s modern interior features adjustable lighting, exhibition spaces and staff work areas. While changes have been made to the organization of the interior the space designed for the HBC collection remains legible and continues in a museum role. This well-designed building is constructed of concrete while the exterior uses traditional materials with wooden siding and shingles.

#### Environmental value

The Museum Building’s scale, height, exterior materials and placement is typical of HBC posts of the mid-19th century. The building restores the original symmetry of buildings in the fort, and its relationship to the site is unchanged apart from small changes to sidewalks for accessibility. The building compliments the overall character of Lower Fort Garry and is important to understanding the site. While not as prominent as the Big House, the Museum is nevertheless well-known to members of nearby communities, including Winnipeg, and to the many tourists who visit Lower Fort Garry each season.

### **Character-Defining Elements**

The following character-defining elements of the Museum Building which must be respected include:

The exterior that is, in terms of scale, height, and exterior materials, reconstructed in a style that reflects the Hudson’s Bay Company’s simple interpretation of the Georgian Style; the two-and-a-half-storey rectangular massing, and the hipped roof, and the prominent chimneys;

The modern, open, functional plan, adjustable lighting, designed to meet museum requirements;

The quality of the workmanship of the materials of the building's interior and exterior, the concrete and wood frame construction, wood roof shingles, and horizontal wood siding, including the gable-roofed extension with similar cladding and trim;

The asymmetrical ground-storey elevation, reflecting modifications to the original building and considered a vernacular variant of the style, with symmetrical five-bay, multi-pane fenestration pattern on the second storey;

The building's contribution to the symmetry of the fort's layout, including its visual and physical relationship to other buildings within the open surroundings of the fort and its orientation to the Big House located in the centre of the fort;

Its location within the walls of the fort as a component of Lower Fort Garry National Historic Site of Canada.

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## **89-04**

Selkirk, Manitoba  
**Men's House**  
Lower Fort Garry

### **HERITAGE CHARACTER STATEMENT**

The Men's House at Lower Fort Garry was constructed in 1850-54, with an annex built by 1858. Initially it was a group residence for unmarried male servants of the Hudson's Bay Company. The Men's House also served as a women's ward for the provincial lunatic asylum from 1885-86, followed by use as a stable, storage, ice-house and garage. Currently it is used for interpretive purposes. It is thought to have possibly been constructed by Belonie Gilbeault. The structure was restored in the early 1970s. Parks Canada is the custodian. See FHBRO Building Report 89-04.

### **Reasons for Designation**

The Men's House was designated Recognized because of its architectural significance, its environmental importance, and its historical associations.

Lower Fort Garry was established in 1830 as an administrative center for the Northern Department of the fur trade, after the amalgamation of the Hudson Bay Company and the North West Company in 1821. The buildings at the fort represent a range of fur trade building traditions and construction techniques.

The Men's House is of domestic scale and simple in design, reflecting a modest utilitarian construction tradition. The colombage pierroté wall construction is original, while renovations in the 1970s replaced the foundation, main flooring, windows and doors.

The relationship of the Men's House to the adjacent buildings is relatively unchanged. The Men's House has a visual similarity to the annex of the Big House and is familiar as one of the interpreted areas of the fort.

The construction of the Men's House relates to the peak period of occupation of the fort and the need for more housing. It is associated with the continued development of the fort as a trans-shipment depot and agricultural supply center for the fur trade.

### **Character Defining Elements**

The heritage character of the Men's House resides in the building's form, its overall

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Selkirk, Manitoba  
**Men's House** (Continued)

proportions, construction materials, architectural details, surviving interior layout, and the relationship to the site and setting.

The building is a simple one-and-a-half storey structure with a "T" shaped plan. The hipped roof with gabled dormers has a central chimney. The simple massing, the roof profile and the footprint reflect the utilitarian style. The modest design has functionally-located doors and windows in an uneven five bay rhythm on the main facade. This informal order typifies the local building tradition and should be retained.

The stucco walls on a stone foundation reflect one of three traditional building techniques used within the fort. Colomage pierroté consists of timber framing, rubble infill, and stucco finish. The building was renovated in the early 1970s with a new foundation, main floor, and wood shingled roof. The structural system should be respected in any intervention, and the exterior materials merit conservation expertise and regular maintenance.

The small size of the windows and simple design of the doors are typical of the utilitarian style. The wood multi-paned sash windows and plank doors are recent but follow the original configurations and should be maintained.

The structure has retained the early back-to-back double "L" planning of the early dwelling. Restoration to the 1850s period enhanced the two-part division of space and this should be maintained. The largely original second floor and surviving early interior finishes should be preserved and maintained.

The simple landscape treatment is in keeping with the simple character of the fort landscape generally, and should be maintained without embellishment.

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For further guidance, please refer to the *FHBRO Code of Practice*.

## **HERITAGE CHARACTER STATEMENT**

The Warehouse was built around 1838. The construction of the Warehouse was likely directed by Duncan McRae, an Hebridien stonemason employed by the Hudson's Bay Company. The Warehouse was built as a storage facility to address the problem of over crowding of the Furloft/Saleshop. It was restored during the 1970s and is partly used to interpret the fort as a transshipment depot and agricultural supply centre. The custodian of the property is Environment Canada Parks Service. See FHBRO Building Report 89-04.

### **Reasons for Designation**

The Warehouse was designated Recognized because of its historical associations, its architectural significance, and its environmental value.

The Warehouse is part of Lower Fort Garry National Historic Site. Established by the Hudson's Bay Company in 1830, the fort represents one of Canada's largest remaining concentrations of fur trade structures.

The Warehouse is associated with the current interpretive emphasis at Lower Fort Garry, the development of the fort as a transshipment depot and agricultural centre for the Rupert's Land fur trade.

Viewed collectively, the buildings of Lower Fort Garry represent an important concentration of fur trade architecture. They reflect elements of a common fur trade building tradition, one which was based on both French and British contributions modified by functional and resource considerations. The Warehouse along with other stone buildings at Lower Fort Garry represent the earlier construction phases at the site. The Warehouse and its nearby contemporary, the Furloft/Saleshop, are rare examples of their functional type, constructed in stone.

The original buildings remaining at Lower Fort Garry exhibit a strong visual unity due to several factors: all but two are physically contained within the perimeter walls; all but one date from the period 1830-55; and all are constructed either of stone or timber frame with stone infill. Nonetheless, within this physically cohesive unit, individual buildings, such as the Warehouse exert an influence on the present character of the site.

### **Character Defining Elements**

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The heritage character of the Warehouse is defined by the integrity of its exterior design and by elements of its interior which express the Georgian tradition and exhibit the standard features of the Hudson's Bay Company's warehouse design. The heritage character also lies in the contextual relationship between the building and its setting.

The Warehouse is a two and one-half storey rectangular building constructed of rubble and cut quarried limestone. It has a medium pitched hipped roof anchored by two stone chimneys. The roof has three gabled dormers on the south slope and two on the north.

The symmetry of design recalls the British classical tradition. The south elevation is symmetrically arranged with two doors and four windows at the ground level and six corresponding windows on the second. The north (rear) elevation has first and second floor windows aligned with the northwest dormer and a second floor door and first door window aligned with the northeast dormer. The west elevation has a single, centrally placed entrance and the east elevation is a solid wall. All windows are of the multi-pane double-hung configuration.

The roof is covered with cedar shingles. The cedar shingles contribute to the heritage character of the building. This material should therefore be preserved.

The building features rubble masonry with corner quoins and plain stone lintels and sills for the windows. The masonry work is an important character defining element and warrants careful maintenance with the use of appropriate expertise for any repair, repointing and whitewashing.

The initial warehousing function resulted in an open-plan design. Any future interior refurbishing should respect original function, layout and finishes.

The Warehouse is located inside the walls in the northeast corner of the fort, and the Furloft/Saleshop located directly across the grounds, at the southeast corner, echo one another in size, materials, design and function. The historical relationship of the building to its site and adjacent buildings should be maintained.

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**Part 1            General**

**1.1            REFERENCES**

- .1      Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2      Province of Manitoba
  - .1      Workplace Safety and Health Act C.C.S.M. c. W210, including requirements for a "prime contractor" as defined by the Act.

**1.2            ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Submit site-specific Health and Safety Plan within seven days after Notice to Proceed and before starting Work on site.
  - .1      Departmental Representative will review Contractor's site-specific Health and Safety Plan and may provide comments to Contractor within five days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within five days after receipt of comments from Departmental Representative.
  - .2      Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
  - .3      Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.
- .3      Submit copy of Contractor's site health and safety inspection reports to authority having jurisdiction and Departmental Representative daily.
- .4      Submit copies of reports or directions issued by federal, and provincial health and safety inspectors.
- .5      Submit copies of incident and accident reports.
- .6      Submit WHMIS MSDS - Material Safety Data Sheets to Departmental Representative.
- .7      Submit On-site Contingency and Emergency Response Plan, addressing standard operating procedures to be implement during emergency situations.

**1.3            FILING OF NOTICE**

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

**1.4            SAFETY ASSESSMENT**

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

**1.5            MEETINGS**

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

**1.6 PROJECT/SITE CONDITIONS**

- .1 Work at site will involve contact with mould and mildew.

**1.7 HEALTH AND SAFETY PLAN**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment before beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Health and Safety Plan shall include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.

**1.8 RESPONSIBILITY**

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

**1.9 COMPLIANCE REQUIREMENTS**

- .1 Comply with The Manitoba Workplace Safety and Health Act C.C.S.M. c. W210.

**1.10 UNFORSEEN HAZARDS**

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

**1.11 HEALTH AND SAFETY COORDINATOR**

- .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.
  - .2 Have working knowledge of occupational safety and health regulations.
  - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
  - .4 Be responsible for implementing, enforcing daily and monitoring site- specific Contractor's Health and Safety Plan.
  - .5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

**1.12 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

**1.13 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.

**1.14 BLASTING**

- .1 Blasting or other use of explosives is not permitted.

**1.15 POWDER ACTUATED DEVICES**

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

**1.16 WORK STOPPAGE**

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

**1.17 FIRE PROTECTION**

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction, governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.
- .3 Maintain placed or installed fire-resistive construction to protect the portions of the Work during construction.
- .4 Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-prevention devices during each phase or process. Include each fire watch's training, duties, and authority to enforce fire safety.
- .5 Hot Work: Prepare a written plan for work involving hot work (including, but not limited to; welding, brazing, soldering, heat treating, grinding, powder-actuated tools, hot riveting) and all other similar applications producing a spark, flame, or heat, or similar operations that are capable of initiating fires or explosions. Obtain permit from Departmental Representative before performing work involving hot work.

**END OF SECTION**





**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1        Section 01 35 03 - Conservation Treatment Procedures, for Historic Treatment Program

**1.2            REFERENCES**

- .1        Definitions:
  - .1        Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
  - .2        Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.
- .2        Reference Standards:
  - .1        Department of Justice Canada (Jus)
    - .1        Canadian Environmental Protection Act (CEPA), 1999
    - .2        Transportation of Dangerous Goods Act (TDGA), 1992

**1.3            ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Before starting construction activities or delivery of materials to site, submit Environmental Protection Plan for review by the Departmental Representative.
  - .1        Departmental Representative will provide Draft Environmental Protection Plan to Contractor before start of construction.
- .3        Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
- .4        Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5        Include in Environmental Protection Plan:
  - .1        Names of persons responsible for ensuring adherence to Environmental Protection Plan.
  - .2        Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
  - .3        Names and qualifications of persons responsible for training site personnel.
  - .4        Descriptions of environmental protection personnel training program.
  - .5        Erosion and Sediment Control Plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations and CEPA.
  - .6        Drawings indicating locations of proposed temporary excavations or embankments for stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

- .7 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
  - .1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
- .8 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .9 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris, and in accordance with Section 01 74 21 - Construction Waste Management and Disposal.
- .10 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
- .11 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .12 Waste Water Management Plan identifying methods and procedures for discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, and water used in flushing of lines.
- .13 Historical, archaeological, cultural resources biological resources, and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

#### **1.4 FIRES**

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

#### **1.5 DRAINAGE**

- .1 Develop and submit Erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations, and CEPA.
- .2 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .3 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials. Provide a settling pond or pool to ensure that sediments are not introduced into the water treatment plant or drained down to the river bank.
- .4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

#### **1.6 PLANT PROTECTION**

- .1 Protect trees and plants on site and adjacent properties.
- .2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
  - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.

- .4 Minimize stripping of topsoil and vegetation.

#### **1.7 WORK ADJACENT TO WATERWAYS**

- .1 Construction equipment to be operated on land only.
- .2 Waterways to be kept free of excavated fill, waste material and debris.
- .3 Design and construct temporary crossings to minimize erosion to waterways.
- .4 Do not skid construction materials across waterways.
- .5 Avoid indicated spawning beds when constructing temporary crossings of waterways.

#### **1.8 POLLUTION CONTROL**

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
- .3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- .4 Spill Protection:
  - .1 There is potential for contamination of soil within the work areas through spills from machinery/ equipment and storage of fuel and lubricant products.
  - .2 Maintain machinery and equipment in good working order to minimize leaks and potential discharge of fuels, oil and lubricants.
  - .3 Store and dispense fuels in secure storage/fueling areas to contain potential spills in designated location.

#### **1.9 HISTORICAL/ARCHAEOLOGICAL CONTROL**

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

#### **1.10 NOTIFICATION**

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

**Part 2            Products**

**Part 3            Execution**

**3.1                INSPECTION AND MAINTENANCE**

- .1      Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been re-established.
- .2      Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2                CLEANING**

- .1      Progress and Final Cleaning: clean in accordance with Section 01 74 11 – Cleaning, and Section 01 74 21 - Construction Waste Management and Disposal.
- .2      Transport waste in accordance with TDGA, and applicable federal, provincial and municipal regulations.
- .3      Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

**END OF SECTION**

**Part 1            General**

**1.1            REFERENCES AND CODES**

- .1      Perform Work in accordance with National Building Code of Canada (NBC) including amendments up to bid closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2      Meet or exceed requirements of:
  - .1          Contract documents.
  - .2          Specified standards, codes and referenced documents.
- .3      Wherever codes, standards, regulations are referenced throughout the Contract Documents they shall mean the latest editions including amendments, supplements and revisions as of the date of bid closing.
- .4      Perform historic treatment Work to the Standards and Guidelines for the Conservation of Historic Places in Canada, 2010.
- .5      Canada National Parks Act (S.C. 2000, c.32)
- .6      Migratory Birds Convention Act, 1994
- .7      Species at Risk Act, 2002

**END OF SECTION**



**Part 1            General**

**1.1            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 will pay cost of examination and replacement.

**1.2            INDEPENDENT INSPECTION AGENCIES**

- .1    Independent Inspection/Testing Agencies may be engaged by the Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the Departmental Representative.
- .2    Provide equipment required for executing inspection and testing by appointed agencies.
- .3    Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4    If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

**1.3            ACCESS TO WORK**

- .1    Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2    Co-operate to provide reasonable facilities for such access.

**1.4            PROCEDURES**

- .1    Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2    Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3    Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

**1.5 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 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by the Departmental Representative.

**1.6 REPORTS**

- .1 Submit one electronic copy of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested, or fabricator of material being inspected or tested.

**1.7 MOCK-UPS**

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to Departmental Representative.
- .3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

**1.8 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment and balancing reports for mechanical, electrical systems.
- .2 Refer to Divisions 21, 22 and 23 for definitive requirements.

**END OF SECTION**



**Part 1 General**

**1.1 INSTALLATION AND REMOVAL**

- .1 General: Installation and removal of and use charges for temporary utilities shall be included in the Contract Price unless otherwise indicated.
- .2 Provide for temporary utilities in order to execute work expeditiously.
- .3 Remove from site all such work after use.

**1.2 DEWATERING**

- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.
- .2 Provide a settling pond or pool to ensure that sediments are not introduced into the water treatment plant or simply drained down the river bank.

**1.3 WATER SUPPLY**

- .1 Water is available for construction use without metering and without payment of use charges.

**1.4 TEMPORARY HEATING AND VENTILATION**

- .1 Provide temporary heating and ventilation required during construction period, including attendance, maintenance and fuel.
- .2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
  - .1 Facilitate progress of Work.
  - .2 Protect Work and products against dampness and cold.
  - .3 Prevent moisture condensation on surfaces.
  - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
  - .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
- .5 Ventilating:
  - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
  - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
  - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
  - .4 Ventilate storage spaces containing hazardous or volatile materials.
  - .5 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

- .6 Permanent heating system of building, to be used when available. Be responsible for damage to heating system if use is permitted. On completion of Work for which permanent heating system is used, replace filters, clean.
- .7 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
  - .1 Conform with applicable codes and standards.
  - .2 Enforce safe practices.
  - .3 Prevent abuse of services.
  - .4 Prevent damage to finishes.
  - .5 Vent direct-fired combustion units to outside.
- .8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

**1.5 TEMPORARY POWER AND LIGHT**

- .1 Provide temporary power during construction for temporary lighting and operating of power tools.
- .2 Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

**END OF SECTION**

**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1    Section 01 14 00 – Work Restrictions, for Parks Canada scaffolding and fencing requirements, access to site and work areas, and ground protection

**1.2            REFERENCES**

- .1    Canadian Standards Association (CSA International)
  - .1    CAN/CSA-S269.2-16, Access Scaffolding for Construction Purposes.
  - .2    CAN/CSA-Z321-96(R2006), Signs and Symbols for the Occupational Environment

**1.3            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .1    Submit erosion and sedimentation control plan.

**1.4            INSTALLATION AND REMOVAL**

- .1    Prepare a site plan indicating proposed location and dimensions of area to be used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced areas, details of fence installation, project identification sign location.
- .2    Locate construction facilities where they will serve Project adequately and result in minimum interference with performance of the Work, except for construction facilities in locations specifically designated by Departmental Representative. Relocate and modify construction facilities as required by progress of the Work.
- .3    Remove from site all such work after use.
- .4    Indicate use of supplemental or other staging area.

**1.5            SCAFFOLDING**

- .1    Scaffolding in accordance with CAN/CSA-S269.2.
- .2    Provide and maintain scaffolding, ramps, ladders, and platforms.
- .3    Provide scaffolding location plan to Departmental Representative. Indicate type of scaffolding to be used.
- .4    Below ground surface anchoring is not permitted.
- .5    Digging or pounding into the ground is not permitted.
- .6    Provide ground protection under scaffolding supports.

**1.6            HOISTING**

- .1    Provide, operate and maintain hoists required for moving of materials and equipment.
- .2    Hoists to be operated by qualified operator.
- .3    Use of heavy machinery inside fort walls is not permitted without written permission of Departmental Representative.
- .4    Maintain 2 metre buffer zone between equipment and heritage buildings.

**1.7 SITE STORAGE/LOADING**

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

**1.8 CONSTRUCTION PARKING**

- .1 Parking in designated areas will be permitted on site.
  - .1 Personal vehicles: designated area of parking lot.
  - .2 Large vehicles: on service road on north side of the Fort.

**1.9 FIELD OFFICE**

- .1 Prefabricated or mobile units with serviceable finishes, temperature and lighting controls, and foundations adequate for normal loading.
  - .1 Size: Of sufficient size to accommodate needs of Contractor and construction personnel office activities, including site meetings.
  - .2 Provide office with ventilation, heating to 22 deg C, and lighting to 750 lx.
  - .3 Provide drawing laydown table.
  - .4 Provide marked and fully stocked first-aid case in a readily available location
  - .5 Location: to be determined.
- .2 Subcontractors to provide their own offices as necessary. Direct location of these offices.

**1.10 EQUIPMENT, TOOL AND MATERIALS STORAGE**

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

**1.11 SANITARY FACILITIES**

- .1 Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- .2 Locate on site in construction laydown area and as directed by Departmental Representative. Keep facilities clean.
- .3 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .4 Use of Parks Canada facilities is not permitted.

**1.12 CONSTRUCTION SIGNAGE**

- .1 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .2 Maintain approved signs and notices in good condition for duration of project. Dispose of off site on completion of project or earlier if directed by Departmental Representative.
- .3 No other signs or advertisements, other than warning signs, are permitted on site.

**1.13 PROTECTION AND MAINTENANCE OF TRAFFIC**

- .1 Maintain and protect public traffic and pedestrians on affected roads during construction period.
- .2 Protect travelling public from damage to person and property.
- .3 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .4 Verify adequacy of existing roads and allowable load limit on these roads. Be responsible for repair of damage to roads caused by construction operations.
- .5 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of vehicle and pedestrian traffic.
- .6 Provide dust control adequate to ensure safe operation at all times.
- .7 Share space with visitor access on roads and pathways inside and around the fort.
- .8 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .9 Post speed limit sign of 20 km/h on roadways and pathways within designated areas.
- .10 Ensure safe access beginning of May through end of August for visitor transportation buggy (large golf cart) from the north fenced compound along the east gravel pathway past the Fort up to Monkman's Creek. (gravel pathway by river).
- .11 Ensure field and access road south of the Visitor Centre remains clear for safe interpretive use, public programming, weddings and large events until October 30, 2018.

**1.14 PARKS CANADA TRAILERS AND STORAGE REQUIREMENTS**

- .1 If a safe pathway is provided for regular access by student interpreters and Parks Canada staff to the Museum building, which currently serves as the lunch room/change room/interpretive space/collections repair area, inside the Fort walls until September 7, no Parks Canada trailers will be required for the project.
- .2 Otherwise, provide prefabricated or mobile units with serviceable finishes, lighting, plumbing, power, temperature and lighting controls, and foundations adequate for normal loading, and in accordance with requirements appended to this Section entitled "Operational Requirements, Lower Fort Garry, Federal Infrastructure Investment Project 2018" and dated April 26, 2018 AIP VE requirements – updated.

**1.15 CLEAN-UP**

- .1 Comply with requirements specified in Section 01 74 11 – Cleaning, and Section 01 74 21 - Construction Waste Management and Disposal.

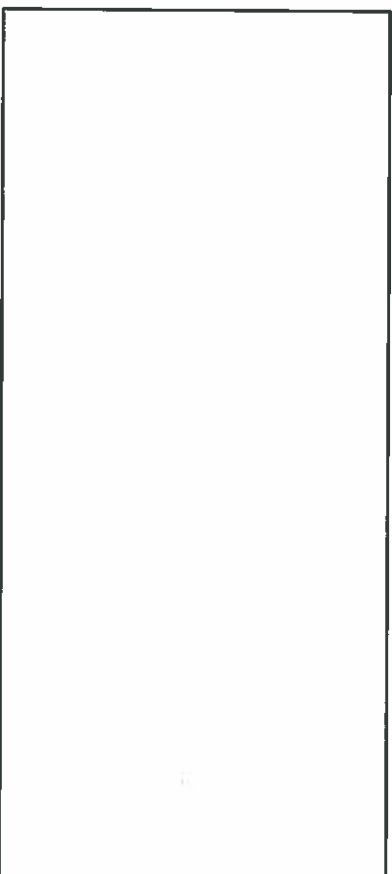
**END OF SECTION**

Operational Requirements  
Lower Fort Garry – Federal Infrastructure Investment Project 2018

Type	Requirement Descriptions	Dates	Comments/ Notes
Storage & Trailer Requirements	Interpretation Storage	May 14, 2018 – September 7, 2018	Location: Please place by the West tree line South of the Visitor Reception Centre. Specifications: Appendix A, Scheme 1
	Men's Change Room w/ Climate Control	May 14, 2018 – September 7, 2018	Location: North Parking Lot Specifications: Appendix A, Scheme 2
	Women's Change Room w/ Climate Control	June 14, 2018 – September 7, 2018	Location: North Parking Lot Specifications: Appendix A, Scheme 3
	Lunch Room and Laundry w/ Climate Control	June 14, 2018 – September 7, 2018	Location: North Parking Lot Specifications: Appendix A, Scheme 4
	Continued access to all pathways outside of the fort and all service roads for Buggy Travel	May 7, 2018 – September 7, 2018	
Access	Easement access for full visitor traffic in and out of east gate of the Fort during May and June	May 7, 2018 – September 7, 2018	The Big House and fenced area inside the fort walls will remain open up to July 3.
	Safe access May-September for the visitor transportation buggy (large golf cart) from the North Fenced Compound along the East gravel pathway past the Fort up to Monkman's Creek. (gravel pathway by river)	May 7, 2018 – September 7, 2018	Although the historic site will be closed beginning of July, the remainder of the site outside of the fort walls remains open for programming such guided tours, the Indigenous Encampment area; where we have planned programming for evening campfire program, ceremonies and demonstrations - the blacksmith shop will also remain open with other areas such as the field.
			Should this not be possible – please notify Visitor Experience as earliest as possible as changes to programming will need to occur along with communication to the public.
Administrative	We may, at times, require access to the site and will either need a pathway identified, scheduled time of day for entry or an escort.	May 2018 – September 2018	Access is requested in whatever capacity possible in order to periodically obtain forgotten items in one of the buildings or other items that are stored inside the fort that would be necessary for ongoing programming Heather can obtain the occasional items if necessary during daily walk through if required.

# Interpretation Storage

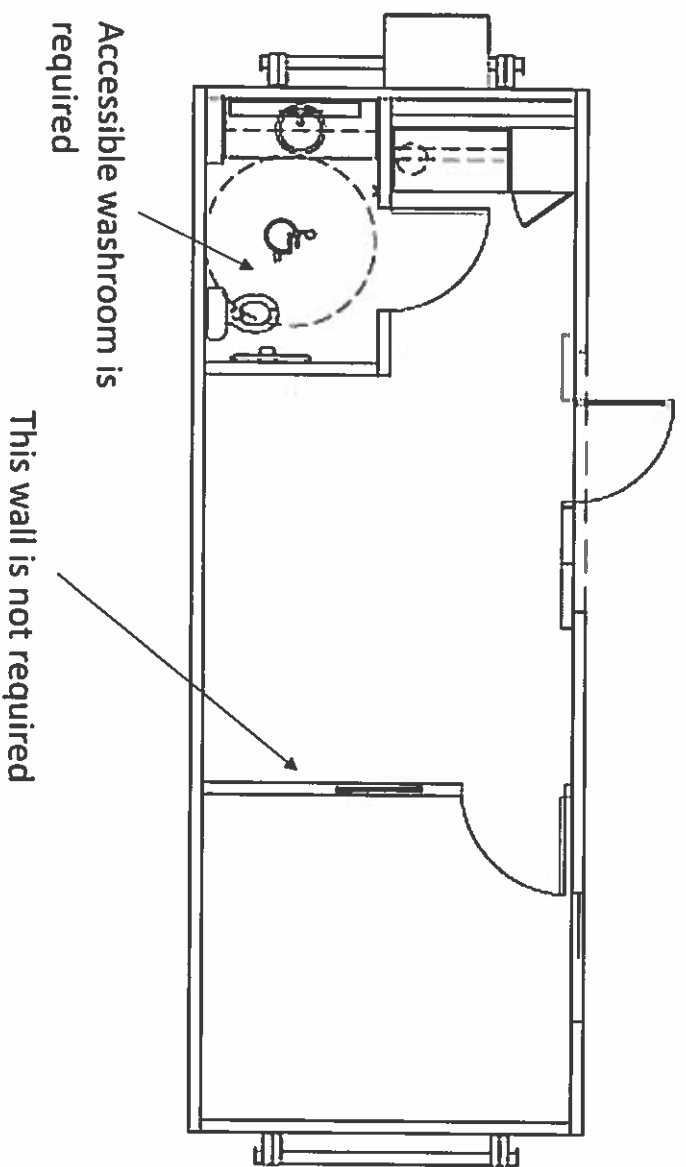
## Appendix A Scheme 1



8' x 20' Steel C-CAN Storage Container  
Neutral Colour or Green

# Men's Change Room

Appendix A  
Scheme 2



**12' x 32' Signature Series**

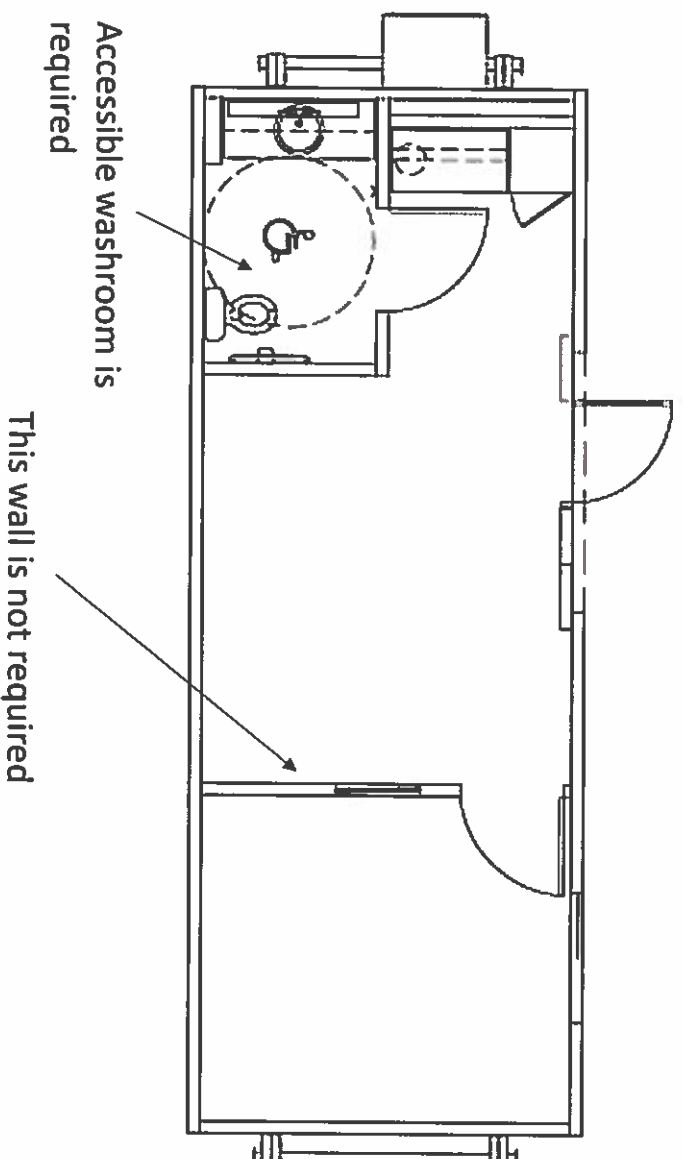
Climate Control is Required

<http://www.atcosl.com/en-ca/Region/Canada/Documents/Prairies-Signature-Series-Layouts.pdf>



# Women's Change Room

Appendix A  
Scheme 3



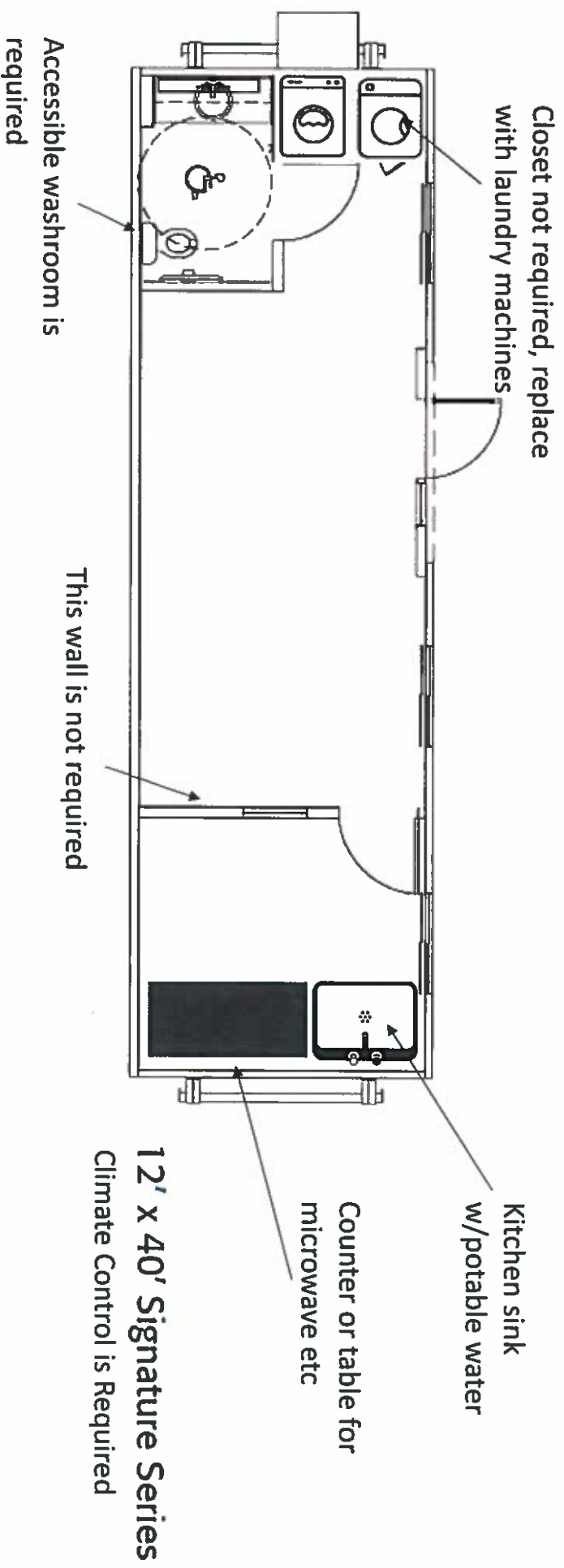
12' x 32' Signature Series

Climate Control is Required

<http://www.atcosl.com/en-ca/Region/Canada/Documents/Prairies-Signature-Series-Layouts.pdf>

# Lunch Room & Laundry

Appendix A  
Scheme 4



<http://www.atcosl.com/en-ca/Region/Canada/Documents/Prairies-Signature-Series-Layouts.pdf>

**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1      Section 01 14 00 - Work Restrictions, for Parks Canada scaffolding and fencing special requirements
- .2      Section 01 35 03 - Conservation Treatment Procedures, alteration requirements

**1.2            INSTALLATION AND REMOVAL**

- .1      Provide temporary barriers and enclosures in order to execute Work expeditiously.
- .2      Locate temporary barriers and enclosures where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- .3      Remove from site all such work after use.
- .4      Do not attach or anchor temporary barriers and enclosures to Heritage Buildings.

**1.3            FENCING**

- .1      Fencing Around Laydown Area Outside Fort Walls: Provide fencing around designated laydown area to secure materials.
- .2      For Work Prior to July 3, 2018 Inside Fort Walls: Provide fencing around the Big House with access by way of the east gate, before construction begins, in a manner that will prevent people and animals from accessing areas outside the fenced area.
- .3      For Work Outside Fort Walls: Provide fencing around individual buildings and construction areas before construction begins as required, in a manner that will prevent people and animals from easily accessing construction area.
- .4      Type of fence at Contractor's discretion, and as follow:
  - .1          Minimum 1.8 m high, and weighted to withstand wind pressure, with adjacent panels securely fastened together to resist vandalism.
  - .2          Provide lockable gate. Equip gates with padlocks and keys.
  - .3          Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Departmental Representative.
  - .4          Ensure gates are locked after work hours.

**1.4            GUARD RAILS AND BARRICADES**

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

**1.5            WEATHER ENCLOSURES**

- .1      Provide temporary enclosures for protection of areas of Work, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
- .2      Do not directly attach or anchor weather enclosures to historic or other buildings and structures on site.

**1.6 DUST-GENERATING ACTIVITIES**

- .1 Prevent migration of dust and debris.
- .2 Localize dust-generating activities and protect workers, finished areas of Work, and public.
- .3 Maintain and relocate protection until such work is complete.

**1.7 FIRE ROUTES**

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.
- .2 Maintain exiting requirements for construction workers, and as required by authorities having jurisdiction.

**1.8 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

**1.9 PROTECTION OF BUILDINGS**

- .1 Provide protection of building and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Be responsible for damage incurred due to lack of or improper protection.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCE STANDARDS**

- .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.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be borne by Departmental Representative in the event of conformance with Contract Documents, or by Contractor in the event of non-conformance.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit WHMIS MSDS for Products and construction materials.

**1.3 QUALITY**

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided, unless otherwise indicated.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous reviews. Departmental Representative's review does not relieve Contractor's 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 the Departmental Representative based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout individual buildings.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable, except where required for operating instructions, or when located in mechanical or electrical rooms.

**1.4 STORAGE, HANDLING AND PROTECTION**

- .1 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) and Material Safety Data Sheets (MSDS) regarding use, handling, and storage of materials.
- .2 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .3 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.

- .4 Store products subject to damage from weather in weatherproof enclosures.
- .5 Store cementitious products clear of earth or concrete floors, and away from walls.
- .6 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .7 Store sheet materials, lumber, and shingles on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .8 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .9 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .10 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.
- .11 Provide product-applicable spill kits to products and materials stored and used on site.

**1.5 TRANSPORTATION**

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

**1.6 MANUFACTURER'S INSTRUCTIONS**

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

**1.7 QUALITY OF WORK**

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

**1.8 CO-ORDINATION**

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.
- .3 Coordinate work of various Subcontractors so as to not conflict or create interference.

**1.9 CONCEALMENT**

- .1 Conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform Departmental Representative if there is interference. Install as directed by the Departmental Representative.
- .3 Consider locations of conduit, wiring and other new equipment is to be installed as approximate. Confirm exact locations with Departmental Representative.

**1.10 REMEDIAL WORK**

- .1 For minimum intervention approach to remedial work refer to Section 01 11 00 – Summary of Work, Article “Heritage Conservation Minimal Intervention Approach”.
- .2 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.
- .3 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

**1.11 LOCATION OF FIXTURES**

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

**1.12 FASTENINGS**

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

**1.13 FASTENINGS - EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

**1.14 PROTECTION OF WORK**

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

**1.15 EXISTING UTILITIES**

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

**END OF SECTION**



**Part 1            General**

**1.1            REFERENCES**

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

**1.2            SURVEY REFERENCE POINTS**

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

**1.3            SURVEY REQUIREMENTS**

- .1      Establish lines and levels, locate and lay out, by instrumentation.
- .2      Establish pipe invert elevations.
- .3      Establish lines and levels for mechanical and electrical work.

**1.4            EXISTING SERVICES**

- .1      Before commencing Work, establish location and extent of service lines in area of Work and notify Departmental Representative findings.

**1.5            LOCATION OF EQUIPMENT AND FIXTURES**

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

**1.6            RECORDS**

- .1      Maintain a complete, accurate log of control and survey work as it progresses.
- .2      Record locations of maintained, re-routed and abandoned service lines.

**END OF SECTION**



**Part 1            General**

**1.1            SECTION INCLUDES**

- .1    Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - .1       Alterations related to the Museum washrooms; and repair work in the Administration Building (Simkin House).

**1.2            RELATED REQUIREMENTS**

- .1    Section 01 35 03 - Conservation Treatment Procedures, for requirements related to general protection and treatment procedures for historic buildings
- .2    Divisions 21, 22, 23 and 26 for specific alteration requirements related to mechanical and electrical services

**1.3            DEFINITIONS**

- .1    Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- .2    Patching: Fitting and repair work required to restore construction to original conditions after installation of other work, or where infill of existing construction is required due to removal of existing work.

**1.4            INFORMATIONAL SUBMITTALS**

- .1    Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Submit written request in advance of cutting or alteration that affects:
  - .1       Structural integrity of any element of Project.
  - .2       Efficiency, maintenance, or safety of any operational element.
  - .3       Visual qualities of sight-exposed elements.
- .3    Include in request:
  - .1       Identification of Project.
  - .2       Location and description of affected Work.
  - .3       Statement on necessity for cutting or alteration.
  - .4       Description of proposed Work, and products to be used.
  - .5       Alternatives to cutting and patching.
  - .6       Date and time work will be executed.

**1.5            QUALITY ASSURANCE**

- .1    Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - .1       Structural Elements: When cutting and patching structural elements, notify Departmental Representative of locations and details of cutting and await directions from Departmental Representative before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

- .2 Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
  - .1 Primary operational systems and equipment.
  - .2 Fire separation assemblies.
  - .3 Air or smoke barriers.
  - .4 Fire-suppression systems.
  - .5 Mechanical systems piping and ducts.
  - .6 Control systems.
  - .7 Communication systems.
  - .8 Fire-detection and -alarm systems.
  - .9 Electrical wiring systems.
  - .10 Operating systems of special construction.
- .3 Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
  - .1 Water, moisture, or vapour barriers.
  - .2 Membranes and flashings.
  - .3 Sprayed fire-resistive material.
  - .4 Equipment supports.
  - .5 Piping, ductwork, vessels, and equipment.
  - .6 Noise- and vibration-control elements and systems.
- .4 Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Departmental Representative's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - .1 If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Departmental Representative for the visual and functional performance of in-place materials.
- .2 Incorporate salvaged, used material in new construction only with Departmental Representative permission, as specified, or as indicated.
- .3 Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Parks Canada property, demolished materials shall become Contractor's property and shall be removed from Project site.

**Part 3            Execution**

**3.1               EXAMINATION**

- .1 Existing Conditions: The existence and location of services and construction indicated as existing are not guaranteed. Before beginning, investigate and verify the existence and location of mechanical and electrical systems, and other construction affecting the Work.
- .2 Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with installer or applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - .1 Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - .2 Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - .3 Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.
- .4 Hazardous Materials: Hazardous materials may to be present in building materials where interior alteration work is scheduled.
  - .1 Should material resembling hazardous materials be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
  - .2 Do not proceed until written instructions have been received from Departmental Representative.

**3.2               NOTICE**

- .1 Notify Departmental Representative before disrupting building access or services.

**3.3               PREPARATION**

- .1 Field Measurements: Take field measurements as required to fit the Work properly.
- .2 Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

**3.4               INSTALLATION**

- .1 General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - .1 Make vertical work plumb and make horizontal work level.
  - .2 Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
- .2 Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- .3 Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- .4 Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- .5 Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

- .6 Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- .7 Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

### **3.5 CUTTING AND PATCHING**

- .1 Cutting and Patching, General: Assign work of moving, removal, cutting and patching to trades qualified to perform work in manner to cause least damage to each type of work.
  - .1 Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- .2 Temporary Support: Provide temporary support of work to be cut.
- .3 Protection: Protect in-place construction during cutting and patching to prevent damage. Provide temporary dust screens, covers, railings, supports and other protection as required.
- .4 Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 11 00 - Summary of Work.
- .5 Where Work of this Contract affects existing structures, equipment, roofing, ceiling or floor assemblies, piping, ductwork or conduit, etc. above, below or beyond areas of scheduled work, patch and repair to standard of construction of surrounding materials. Do such work at no additional cost to the Contract.
- .6 Where penetrations through existing walls or floors result from the installation of new equipment, or the removal or relocation of existing equipment, piping, ductwork or conduit, repair to standard of construction of surrounding materials.
- .7 Existing Mechanical/Electrical Systems:
  - .1 Where existing services/systems are required to be replaced, removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
  - .2 Arrange for temporary disruption of existing services with Departmental Representative.
- .8 Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, using methods least likely to damage adjoining construction.
  - .1 In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - .2 Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - .3 Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - .4 Proceed with patching after construction operations requiring cutting are complete.
  - .5 Remove or cut openings in interior partitions to accommodate new work.

- .6 Firestop penetrations through existing fire-resistive rated assemblies immediately, with firestopping materials to provide equivalent fire-resistance rating of assembly.
- .7 Cut finish surfaces, plaster, metals by methods to terminate surfaces in straight lines, at natural points of division.
- .9 Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
  - .1 Fire-Resistant Rated Assemblies: Where infill or patching occurs in a fire-resistance rated assembly, use materials to match rating of existing assembly.
  - .2 Exposed Finishes: Restore exposed finishes of patched areas and extend finish into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    - .1 Make smooth, approved transition where new work abuts, finishes flush with existing work.
    - .2 Patch, and repair to provide an even-plane surface of uniform appearance
  - .3 Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
    - .1 Terminate existing surface along straight lines at natural division line, provide approved trim when finished surfaces cut in manner preventing smooth transition with new work.
    - .2 Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces at a distance of 1.5 m.
  - .4 Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- .10 Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces

**END OF SECTION**





**Part 1 General**

**1.1 GENERAL**

- .1 Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
- .2 Maintain Project Site, and public properties free from accumulations of waste materials and rubbish.
- .3 Separate waste material for disposal and recycling on site. Deliver recyclable material to a provincially approved facility or contractor. Deliver non-hazardous waste material to a provincially licensed waste disposal facility. Handle and dispose of hazardous waste in accordance with Manitoba's Hazardous Waste Program.
- .4 Provide on-site suitable containers for collection of recycling, waste materials, and rubbish. Do not use Parks Canada containers.
- .5 Store flammable liquids in ULC approved containers. Remove flammable or combustible wastes from premises daily.
- .6 Provide adequate ventilation in areas where noxious or volatile substances are used.
- .7 Do not use Parks Canada cleaning supplies or equipment.

**1.2 RELATED REQUIREMENTS**

- .1 Section 01 74 21 - Construction Waste Management and Disposal

**1.3 MATERIALS**

- .1 Use only cleaning materials in keeping with the Standards and Guidelines for the Conservation of Historic Places in Canada's minimal intervention requirements.

**1.4 PROGRESSIVE CLEANING**

- .1 Clean Project site and work areas daily.
- .2 Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
- .3 Remove spills promptly. For hazardous or toxic substances, follow procedures outlined in the Spill Response Plan.
- .4 Where dust would impair proper execution of the Work, broom-clean or vacuum entire work area, as appropriate.
- .5 Concealed Spaces: Remove debris from concealed spaces.
- .6 Vacuum immediate interior building areas when Work in area is complete or ready to be repainted.
- .7 Do not use, plug or obstruct toilets, sinks or drains.
- .8 Schedule cleaning operations so that resulting dust and other contaminants will not fall on wet, newly painted surfaces, or trigger fire alarm smoke or dust detectors.
- .9 Limiting Exposures: Supervise construction operations to assure that no part of the Work, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

- .10      Cleaning of Streets and Sidewalks: Take precautions to prevent depositing of mud and debris on roadways, boardwalks, on and adjacent to the Site of the Work. Promptly clean up mud and debris.

**1.5                      FINAL CLEANING**

- .1      When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2      Remove waste products and debris. Leave Work clean and suitable for occupancy as applicable.
- .3      Museum Washrooms: Clean mirrors, washroom accessories, floor and wall tile, solid surfacing, stainless steel, chrome, and mechanical and electrical fixtures. Replace mirrors and tile that are broken, scratched or disfigured during performance of the Work.
- .4      Simkin House: Clean inside and outside of insulating glass units replaced as part of the Work. Replace glass that is broken, scratched or disfigured during performance of the Work.
- .5      Other Areas: Clean and restore to preconstruction condition.
- .6      Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, and finished surfaces.
- .7      Clean lighting reflectors, lenses, and other lighting surfaces.
- .8      Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .9      Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .10     Broom clean exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .11     Remove dirt and other disfiguration from exterior surfaces.
- .12     Clean and sweep roofs, gutters, areaways, and sunken wells.
- .13     Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .14     Remove debris and surplus materials from accessible concealed spaces.

**END OF SECTION**

**Part 1            General**

**1.1            WASTE MANAGEMENT GOALS**

- .1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss project waste management plan and goals.
- .2 Departmental Representative has established this Project is to generate the least amount of waste possible. This requires that construction processes ensure as little waste as possible, either due to error, poor planning, breakage, mishandling, contamination, or other factors.
- .3 Minimize waste disposal to landfills.
- .4 Preserve environment and prevent pollution and environment damage.
- .5 Follow minimal intervention approach specified in Section 01 11 00 – Summary of Work, article “Heritage Conservation Minimal Intervention Approach”, related to principles of minimizing removal of original fabric, salvage and reuse where possible.

**1.2            DEFINITIONS**

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 Construction and Demolition Waste: Solid wastes typically including but not limited to, building materials, packaging, trash, debris, and rubble resulting from construction, re-modelling, repair and demolition operations.
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including, but not limited to, ignitability, corrosiveness, toxicity or reactivity.
- .4 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .5 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .6 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .7 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .8 Reuse: repeated use of product in same form but not necessarily for same purpose.
- .9 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .10 Separate Condition: refers to waste sorted into individual types.
- .11 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.
- .12 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill. Refer to Schedule A.

- .13 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .14 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to Schedule B. WRW is based on information acquired from WA (Schedule A).

### **1.3 DOCUMENTS**

- .1 Maintain at job site, one copy of following documents:
  - .1 Waste Audit.
  - .2 Waste Reduction Workplan.
  - .3 Material Source Separation Plan.

### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare and submit following prior to project start-up:
  - .1 Materials Source Separation Program (MSSP) description.
  - .2 Waste Audit (WA).
  - .3 Waste Reduction Workplan (WRW).
  - .4 Submit a list of waste management firms or receivers that will be used, along with a letter from the receiver declaring the end uses of the material diverted from the landfill.
- .3 On a monthly basis, provide a summary of waste materials leaving the site.
  - .1 Classify each load of material leaving the site by material type and disposal type (landfilled, recycled, salvaged, donated, sold, or reused).
  - .2 Loads of material that are considered hazardous material shall not be included on the tracking sheet.
  - .3 Loads of material that are considered excavated material shall not be included on the tracking sheet.
  - .4 Provide tipping receipts, scale tickets, and waybills for all materials leaving the construction site.
  - .5 Quantify materials leaving the construction site by actual weight. Estimates will not be accepted.
  - .6 Identify disposal site and contact information.
- .4 Before final payment application, submit summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.
- .5 At the end of the project provide the following:
  - .1 Copies of all disposal certificates for all hazardous materials.

### **1.5 WASTE AUDIT (WA)**

- .1 Conduct waste audit prior to project start-up.
- .2 Prepare WA: Schedule A. Record extent to which materials or products used consist of recycled or reused materials or products.

**1.6 WASTE REDUCTION WORKPLAN (WRW)**

- .1 Prepare WRW prior to project start-up.
- .2 WRW should include but not be limited to:
  - .1 Proposed destination for all materials listed
  - .2 Proposed on site location for material sorting and storage, and labelling system for storage areas.
  - .3 Potential destinations for recycle / reuse of materials, including receivers' contact information.
    - .1 Submit letter from each receiver confirming all materials received will be reused, recycled, or otherwise diverted from the landfill.
  - .4 Describe management of waste including:
    - .1 Plan for reducing, reusing, and recycling waste, by material type.
    - .2 Details about material handling and removal procedures.
    - .3 Estimation of unit cost for recycling versus disposal of materials.
    - .4 Timetable for implementing the WRW.
    - .5 Projected total volume of waste materials generated.
  - .5 Identify a person who will be responsible for implementing the WRW.
  - .6 Plan for educating site workers on the requirements of the WRW.
  - .7 Identify opportunities for reduction, reuse, and recycling of materials.
- .3 Structure WRW to prioritize actions and follow 3Rs hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .4 Post WRW on site where workers are able to review content.
- .5 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.
- .6 Monitor and report waste reductions on a monthly basis by documenting quantity and cost of actual waste removed from the site.
- .7 Report unanticipated conditions that result in lower diversion rates than projected in order to substantiate variances from expected results.

**1.7 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)**

- .1 Prepare MSSP and have ready for use prior to project start-up.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.
- .3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide containers to deposit reusable and recyclable materials.
- .5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .6 Locate separated materials in areas that minimize material damage.
- .7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition where feasible.

**1.8 STORAGE, HANDLING AND PROTECTION**

- .1 Unless specified otherwise, materials for removal become Contractor's property.
- .2 Retain packaging products for reuse or return to manufacturer when possible.
- .3 Separate and store materials produced during dismantling of structures in designated areas.
- .4 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

**1.9 DISPOSAL OF WASTES**

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

**Part 2 Products**

**Part 3 Execution**

**3.1 APPLICATION**

- .1 Do Work in compliance with WRW.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

**3.2 DIVERSION OF MATERIALS**

- .1 Separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative, and consistent with applicable fire regulations.
  - .1 Mark containers or stockpile areas.
  - .2 Provide instruction on disposal practices.
- .2 Sale of reusable and recyclable materials is not permitted.

### 3.3 WASTE AUDIT (WA) – SCHEDULE A

(1) Material Category	(2) Material Quantity Unit	(3) Estimated Waste %	(4) Total Quantity of Waste (unit)	(5) Generation Point	(6) % Recycled	(7) % Reused
Wood and Plastics Material Description						
Off-cuts						
Warped Pallet Forms						
Plastic Packaging						
Cardboard Packaging						
Other						

### 3.4 WASTE REDUCTION WORKPLAN (WRW) – SCHEDULE B

(1) Material Category	(2) Person(s) Responsible	(3) Total Quantity of Waste (unit)	(4) Reused Amount (units) Projected	Actual	(5) Recycled Amount (unit) Projected	Actual	(6) Material(s) Destination
Wood and Plastics Material Description							
Chutes							
Warped Pallet Forms							
Plastic Packaging							
Cardboard Packaging							
Other							

**END OF SECTION**





**Part 1            General**

**1.1            SECTION INCLUDES**

- .1        Administrative procedures preceding preliminary and final review of Work.

**1.2            RELATED REQUIREMENTS**

- .1        Section 01 78 00 – Closeout Submittals

**1.3            INSPECTION AND DECLARATION FOR SUBSTANTIAL PERFORMANCE OF THE WORK**

- .1        Contractor's Inspection: Before application for Certificate of Substantial Performance of the Work, 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 and that the Work is clean and in condition ready for use.
  - .2            Request the Departmental Representative review.
- .2        Departmental Representative Review: Departmental Representative and Contractor will review the Work to identify obvious defects or deficiencies. Departmental Representative shall prepare a list of defects deficiencies and provide a signed copy to the Contractor.
- .3        Rectify deficiencies and defects, identified by Departmental Representative.
- .4        Declaration of Substantial Performance: When the Departmental Representative considers deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, the Contractor shall make application for certificate of Substantial Performance of the Work.
- .5        Before Substantial Performance of the Work, provide submittals specified in Section 01 78 00 – Closeout Submittals, including operating and maintenance manuals, product data and operation instructions, evidence of satisfactory results of tests, warranties, bonds, as-built documents, service and maintenance contracts, spare parts and maintenance materials, receipts for salvaged items, etc. Instruct Parks Canada personnel to start-up, tune, operate and maintain equipment and systems installed.
- .6        Excessive Administration: If the deficiencies and defects, identified by the Departmental Representative, are not 100% completed when the Contractor requests a second and final Substantial Performance review by the Departmental Representative, the cost of additional site reviews will be back charged to the Contractor. The cost of each additional site review will be \$2,250 per person per visit, and will be invoiced directly to the Contractor. The frequency of additional site reviews will be determined by the Departmental Representative.

**1.4            INSPECTION AND DECLARATION FOR FINAL PAYMENT**

- .1        When Contractor is satisfied that the Work is complete, and after making its own inspection, the Contractor shall make a written request for a final review by the Departmental Representative. Review will be carried out and completed within ten calendar days of the request, and shall constitute the review precedent to the issuance of the final certificate for payment.

- .2 Submit written certificate that following have been performed:
  - .1 Work has been completed and inspected for compliance with Contract Documents.
  - .2 Defects have been corrected and deficiencies have been completed.
  - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
  - .4 Certificates required by fire commissioner, utility companies have been submitted.
  - .5 Operation of systems have been demonstrated to Parks Canada personnel.
  - .6 Building and premises are clean and ready for use or occupancy.
  - .7 Work is complete and ready for final review.
- .3 Defects and deficiencies determined by this review will be listed by the Departmental Representative and Contractor. Rectify defects and deficiencies, and request re-review by Departmental Representative following Contractor's own inspection. Re-review shall take place within seven calendar days from date of request.
- .4 Contractor shall thereafter submit its invoice for final payment.

**END OF SECTION**

**Part 1            General**

**1.1            SECTION INCLUDES**

- .1    Operation and maintenance manuals
- .2    As-Built documents
- .3    Record documents
- .4    Spare parts and special tools
- .5    Warranties and bonds

**1.2            RELATED REQUIREMENTS**

- .1    Section 01 33 00 - Submittal Procedures.
- .2    Section 01 79 00 - Demonstration and Training.
- .3    This section describes requirements applicable to all Sections within Divisions 02 to 49.

**1.3            DEFINITIONS**

- .1    As-Built Documents: Project documents that are annotated by the Contractor during construction to record changes in the Work.
- .2    Record Documents: As-built documents consisting of Drawings and Specifications produced, usually electronically, from information derived from the Contractor's as-built documents.

**1.4            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Provide spare parts, and special tools of same quality and manufacture as products provided in Work.
  - .1    Provide evidence, if requested, for type, source and quality of products provided.
  - .2    Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
  - .3    Pay costs of transportation.

**1.5            OPERATION AND MAINTENANCE MANUALS**

- .1    Submission:
  - .1    Prepare instructions and data using personnel experienced in maintenance and operation of described products.
  - .2    Language of Operating and Maintenance Manuals: English.
  - .3    Schedule:
    - .1    At 75% Construction Completion: Submit to the Departmental Representative, one initial electronic copy of operating and maintenance manual.
    - .2    At Substantial Performance: Submit to the Departmental Representative, one electronic copy of updated operating and maintenance manual.
    - .3    Within seven Days After Substantial Performance: Submit to the Departmental Representative, one electronic copy, and three hard copies of 100% complete operating and maintenance manual.

- .4 Revise content of documents as required before final submittal.
    - .5 Should comments be extensive, the Departmental Representative may require initial submission to be repeated before Substantial Performance.
- .2 Format:
  - .1 Organize data in the form of an instructional manual.
  - .2 Hard Copies: Binders, vinyl, hard covered, 3 'D' ring, loose leaf 219 by 279 mm with spine and face pockets.
  - .3 When multiple volumes are used, correlate data into related consistent groupings. Identify contents of each volume on cover and spine of binder. Identify contents of each electronic volume on cover and in file name.
  - .4 Cover: Identify each volume with printed title 'Operations and Maintenance Manual'; list title of project and identify subject matter of contents.
  - .5 Arrange content by systems under Section numbers and sequence of Table of Contents.
  - .6 Provide tabbed fly leaf in binder, and bookmarks in electronic copy, for each separate product and system, with description of product and major component parts of equipment.
  - .7 Text:
    - .1 Hard copy: Manufacturer's printed data.
    - .2 Electronic copy: Provide electronic documents in accordance with requirements for electronic submissions in Section 01 33 00 – Submittal Procedures.
  - .8 Drawings:
    - .1 Hard copies: with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
    - .2 Electronic copies: CAD and PDF copies of drawings in ledger size on CD.
  - .9 Provide full size drawings in 1:1 scaled CAD files in .dwg format on CD, when size is not practical for inclusion as paper drawings.
- .3 Contents – Each Volume:
  - .1 Table of Contents: provide title of project, and:
    - .1 date of submission;
    - .2 names, addresses, and telephone numbers of Contractor, Departmental Representative and Trade Contractor with name of responsible parties;
    - .3 schedule of products and systems, indexed to content of volume.
    - .4 list names, addresses and telephone numbers of Trade Subcontractors and suppliers, including local source of supplies and replacement parts.
  - .2 Materials and Finishes:
    - .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
    - .2 Provide instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

- .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 For Each Item of Equipment and Each System:
  - .1 Include description, operation and maintenance instructions, including complete assembly drawings and parts list. Indicate nameplate information such as make, size, capacity, serial number, etc.
    - .1 Give function, normal operation characteristics, and limiting conditions.
    - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
  - .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
  - .3 Include installed colour-coded or labeled wiring diagrams.
  - .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
    - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
    - .2 Include summer, winter, and any special operating instructions.
  - .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
  - .6 Provide servicing and lubrication schedule, and list of lubricants required.
  - .7 Include sequence of operation by controls manufacturer.
  - .8 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
  - .9 Provide installed control diagrams by controls manufacturer.
  - .10 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
  - .11 Include test and balancing reports.
  - .12 Field test records.
  - .13 Inspection certificates.
  - .14 Manufacturer's certificates.
  - .15 Additional requirements: As specified in individual specification sections.
- .4 Additional Requirements: as specified in individual specifications sections.
- .5 Warranties and bonds.
- .6 List of spare parts and special tools.
- .7 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .8 Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

## **1.6 AS-BUILT DOCUMENTS**

- .1 Record information on set of black line opaque drawings, and within the Project Manual.
- .2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information and all repairs and new material installed.

- .3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately recorded.
- .4 Drawings and Shop Drawings: legibly mark each item to record actual construction, including:
  - .1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .2 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .3 Field changes of dimension and detail.
  - .4 Changes made by change orders.
  - .5 Details not on original Drawings.
  - .6 References to related Shop Drawings and modifications.
- .5 Specifications: legibly mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by addenda and change orders.
- .6 Submit to Departmental Representative, upon Substantial Performance of the Work, before occupancy, one set of marked up as-built drawings and specifications, which reflect as-built information including all repairs and new material installed.
- .7 Continue to record as-built information occurring after Substantial Performance of the Work on the second set of white prints, and mark "Post Substantial Performance As-Built Drawings". Submit final set of as-built drawings with final changes as soon as Work is complete.
- .8 Include the following information on every as-built document submitted:
  - .1 Current date.
  - .2 Name of company which recorded the information.
  - .3 Name(s) and signature(s) of individuals who recorded the information.

## **1.7 RECORD DOCUMENTS**

- .1 Prepare electronic record drawings based on as-built information. Submit both PDF and CAD format. Provide CAD files in latest CAD format.
- .2 Final payment on the Contract will not be made until correct record drawings are received.
- .3 Consultant's computer-generated drawings are available for Contractor's use in preparing record documents. Obtain and pay for drawings directly from Consultant. Costs, not including shipping and handling, are as follows:
  - .1 1 to 10 drawings (ordered at the same time): \$100 /drawing sheet plus GST.
  - .2 11 to 50 drawings (ordered at the same time): \$65/drawing sheet plus GST.
  - .3 51 or more drawing (ordered at the same time): \$50/drawing sheet plus GST.

## **1.8 SPARE PARTS AND SPECIAL TOOLS**

- .1 Package spare parts, and special tools in suitable containers, labelled for maintenance use. Clearly identify contents of each package (eg. one mechanical seal and one pump casing gasket for pump P-## located in Building XXX, Room ##). Include catalogue, serial or replacement number for each part.

- .2 General: Receive and catalogue items.
  - .1 Submit inventory listing to Departmental Representative four weeks before Substantial Performance.
  - .2 Include approved listings in Operation and Maintenance Manual.
  - .3 Deliver to site, place and store as directed by Departmental Representative.
  - .4 Obtain receipt for delivered products and submit prior to final payment.
- .3 Spare Parts:
  - .1 Provide spare parts, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver fragile spare parts and materials, (e.g. electronic circuit boards, alarm lamps, etc.) in person by Contractor, supplier or their representative directly to Departmental Representative. Package fragile items in suitable containers, marked "FRAGILE" and contents identified.
- .4 Special Tools:
  - .1 Provide special tools, in quantities specified in individual specification section.
  - .2 Provide items with tags identifying their associated function and equipment.

## **1.9 WARRANTIES AND BONDS**

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

**END OF SECTION**





**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1    Mechanical and electrical Specifications and Drawings

**1.2            ADMINISTRATIVE REQUIREMENTS**

- .1    Demonstrate operation and maintenance of equipment and systems to Parks Canada personnel two weeks prior to date of substantial performance.
- .2    Parks Canada: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3    Preparation:
  - .1    Verify conditions for demonstration and instructions comply with requirements.
  - .2    Verify designated personnel are present.
  - .3    Ensure equipment has been inspected and put into operation.
  - .4    Ensure testing, adjusting, and balancing has been performed, and equipment and systems are fully operational.
- .4    Demonstration and Instructions:
  - .1    Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment, at the equipment location.
  - .2    Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
  - .3    Review contents of manual in detail to explain aspects of operation and maintenance.
  - .4    Prepare and insert additional data in operations and maintenance manuals when needed during instructions.
- .5    Time Allocated for Instructions: ensure amount of time required for instruction of each item of equipment or system as follows:
  - .1    Division 22 – Plumbing Systems: 6 hours of instruction.
  - .2    Division 23 – Heating, Ventilation, and Air Conditioning Systems: 6 hours of instruction.
  - .3    Section 23 09 33 – Control Systems for HVAC: 4 hours of instruction.
  - .4    Division 26 – Electrical Systems: 8 hours of instruction.

**1.3            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative approval.
- .3    Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4    Give time and date of each demonstration, with list of persons present.
- .5    Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

**1.4 QUALITY ASSURANCE**

- .1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:
  - .1 Instruct Parks Canada personnel.
  - .2 Provide written report that demonstration and instructions have been completed.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 Related Requirements
  - .1 Mechanical Specifications
- .3 Acronyms:
  - .1 Cx - Commissioning.
  - .2 EMCS - Energy Monitoring and Control Systems.
  - .3 O&M - Operation and Maintenance.
  - .4 PI - Product Information.
  - .5 PV - Performance Verification.
  - .6 TAB - Testing, Adjusting and Balancing.

**1.2 GENERAL**

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

**1.3 COMMISSIONING OVERVIEW**

- .1 Cx to be a line item of Contractor's cost breakdown.
- .2 Cx activities supplement field quality and testing procedures described in relevant technical sections.

- .3 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the Work is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .4 Departmental Representative will issue Interim Acceptance Certificate when:
  - .1 Completed Cx documentation has been received, reviewed for suitability by Departmental Representative.
  - .2 Equipment, components and systems have been commissioned.
  - .3 O and M training has been completed.

#### **1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS**

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

#### **1.5 PRE-CX REVIEW**

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

**1.6 CONFLICTS**

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

**1.7 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.8 COMMISSIONING DOCUMENTATION**

- .1 Departmental Representative will provide Cx forms.
- .2 Departmental Representative will review Cx documentation.
- .3 Provide completed Cx documentation to Departmental Representative.

**1.9 COMMISSIONING SCHEDULE**

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16 - Construction Progress Schedules - Bar (GANTT) Chart.
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
  - .1 Approval of Cx reports.
  - .2 Verification of reported results.
  - .3 Repairs, retesting, re-commissioning, re-verification.
  - .4 Training.

**1.10 COMMISSIONING MEETINGS**

- .1 Convene Cx meetings following project meetings and as specified herein.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60% construction completion stage: Departmental Representative will call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
  - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

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

#### **1.11 STARTING AND TESTING**

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

#### **1.12 WITNESSING OF STARTING AND TESTING**

- .1 Provide 7 days notice prior to start.
- .2 Departmental Representative may witness of start-up and testing.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

#### **1.13 MANUFACTURER'S INVOLVEMENT**

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

#### **1.14 PROCEDURES**

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.

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

#### **1.15 START-UP DOCUMENTATION**

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

#### **1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS**

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit to Departmental Representative for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

**1.17 TEST RESULTS**

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

**1.18 START OF COMMISSIONING**

- .1 Notify Departmental Representative at least 14 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

**1.19 INSTRUMENTS / EQUIPMENT**

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

**1.20 COMMISSIONING PERFORMANCE VERIFICATION**

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

**1.21 WITNESSING COMMISSIONING**

- .1 Departmental Representative may witness activities.

**1.22 AUTHORITIES HAVING JURISDICTION**

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

**1.23 COMMISSIONING CONSTRAINTS**

- .1 It is necessary to complete Cx of occupancy-, weather-, and seasonal sensitive equipment and systems before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.



**1.24            EXTRAPOLATION OF RESULTS**

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

**1.25            EXTENT OF VERIFICATION**

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

**1.26            REPEAT VERIFICATIONS**

- .1        Assume costs incurred by Departmental Representative for third and subsequent verifications where:
  - .1            Verification of reported results fail to receive Departmental Representative's acceptance.
  - .2            Repetition of second verification again fails to receive acceptance.
  - .3            Departmental Representative deems Contractor's request for second verification was premature.

**1.27            SUNDRY CHECKS AND ADJUSTMENTS**

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

**1.28            DEFICIENCIES, FAULTS, DEFECTS**

- .1        Correct deficiencies found during start-up and Cx to satisfaction Departmental Representative.
- .2        Report problems, faults or defects affecting Cx to Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval Departmental Representative.

**1.29            COMPLETION OF COMMISSIONING**

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

**1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING**

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

**1.31 TRAINING**

- .1 In accordance with Section 01 79 00 – Demonstration and Training.

**1.32 SPARE PARTS AND SPECIAL TOOLS**

- .1 Supply, deliver, and document spare parts, and special tools as specified in Contract.

**1.33 OCCUPANCY**

- .1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.

**1.34 INSTALLED INSTRUMENTATION**

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

**1.35 PERFORMANCE VERIFICATION TOLERANCES**

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

**1.36 PERFORMANCE TESTING BY DEPARTMENTAL REPRESENTATIVE**

- .1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

**END OF SECTION**

**Part 1            General**

**1.1            SUMMARY**

- .1    Section Includes:
  - .1    Commissioning forms to be completed for equipment, system and integrated system.
  - .2    Commissioning forms provided herein will be updated as required by Consultant during construction.

**1.2            INSTALLATION/START-UP CHECK LISTS**

- .1    Include the following data:
  - .1    Product manufacturer's installation instructions and recommended checks.
  - .2    Special procedures as specified in relevant technical sections.
  - .3    Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2    Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Consultant supplemental additional data lists will be required for specific project conditions.
- .3    Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4    Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Consultant.
- .5    Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

**1.3            SAMPLES OF COMMISSIONING FORMS**

- .1    Consultant will develop and provide to Contractor required project-specific Commissioning forms.
- .2    Revise items on Commissioning forms to suit project requirements.

**1.4            CHANGES AND DEVELOPMENT OF NEW REPORT FORMS**

- .1    When additional forms are required, but are not available from Consultant develop appropriate verification forms and submit to Consultant for approval prior to use.

**1.5            COMMISSIONING FORMS**

- .1    Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2    Strategy for Use:
  - .1    Consultant provides Contractor project-specific Commissioning forms with Specification data included.
  - .2    Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
  - .3    Confirm operation as per design criteria and intent.
  - .4    Identify variances between design and operation and reasons for variances.
  - .5    Verify operation in specified normal and emergency modes and under specified load conditions.

- .6 Record analytical and substantiating data.
- .7 Verify reported results.
- .8 Form to bear signatures of recording technician and reviewed and signed off by Consultant.
- .9 Submit immediately after tests are performed.
- .10 Reported results in true measured SI unit values.
- .11 Provide Consultant with originals of completed forms.
- .12 Maintain copy on site during start-up, testing and commissioning period.

**1.6 LANGUAGE**

- .1 To suit the language profile of the awarded contract.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Integrated Systems Review**

**Date:**

**System to be Reviewed:** Exhaust Fan EF-\_\_\_\_\_

**Building:** \_\_\_\_\_

**Components of Systems:**

**Visual Review**

Item	Pass/Fail	Comments
Equipment installed, operational, accessible for maintenance, free of defect.		
All shipped loose parts installed.		
All control system functions and interlocking systems are installed.		
Terminal screws and wiring connections secure in control and electrical panels.		
Test and balance (TAB) complete and approved for the air systems.		
All start-up deficiency items for this equipment corrected.		
Safeties and operating ranges reviewed.		
Equipment clean inside and out.		
Equipment and duct identification complete.		
Access doors in place and large enough to maintain service points.		
Associated backdraft and motorized damper linkages are tight and dampers are in correct positions when power is off.		
No unusual noise or vibrations.		

**Systems Verification**

<b>Test to be Performed</b>	Humidity control (where applicable)
<b>Desired Result</b>	On call for dehumidification from dehumidistat, exhaust fan shall be enabled. When dehumidistat is satisfied, exhaust fan shall be disabled.
<b>Pass Fail</b>	
<b>Comments</b>	

<b>SUMP PUMP</b>			
Pump Tag		Spec Reference	
System Served			
Location			
Pump Data	Specified	Shop Drawings	Installed
Manufacturer			
Liquid			
Model Number			
Discharge Size			
Capacity L/s (GPM)			
Head Pressure kPa (PSI)			
TYPE			
RPM			
BHP			
Motor kW (HP)			
Impeller Size			
Volts/Phase			
Amps			
Comments:			

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**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1        Section 033000

**1.2            REFERENCE STANDARDS**

- .1        SP-66-04, ACI Detailing Manual 2004.
- .2        CSA International
  - .1        CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2        CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.
  - .3        CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

**1.3            ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2        Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
- .3        Shop Drawings:
  - .1        Indicate placing of reinforcement and:
    - .1        Bar bending details.
    - .2        Lists.
    - .3        Quantities of reinforcement.
    - .4        Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
    - .5        Indicate sizes, spacings and locations of chairs, spacers and hangers.
  - .2        Detail lap lengths and bar development lengths to CAN/CSA-A23.3.

**1.4            DELIVERY, STORAGE AND HANDLING**

- .1        Storage and Handling Requirements:
  - .1        Store materials off ground, in a dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2        Replace defective or damaged materials with new.

**Part 2           Products**

**2.1            MATERIALS**

- .1        Substitute different size bars only if permitted in writing by Departmental Representative.
- .2        Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3        Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .4        Deformed steel wire for concrete reinforcement: to ASTM A82/A82M.
- .5        Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

**2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and the Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

**2.3 SOURCE QUALITY CONTROL**

- .1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, a minimum of 4 weeks prior to beginning reinforcing work.

**Part 3 Execution**

**3.1 FIELD BENDING**

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

**3.2 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on placing drawings in accordance with CSA-A23.1/A23.2.
- .2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.

**3.3 CLEANING**

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

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 03 20 00

**1.2 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
  - .2 ASTM C494/C494M-15, Standard Specification for Chemical Admixtures for Concrete.
- .2 CSA International
  - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A283-06-R2016, Qualification Code for Concrete Testing Laboratories.

**1.3 ABBREVIATIONS AND ACRONYMS**

- .1 Limestone Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.
  - .1 Type GU, GUb and GUL - General use cement.
- .2 Fly ash:
  - .1 Type F - with CaO content less than 8%.
- .3 GGBFS - Ground, granulated blast-furnace slag.
- .4 SF - Silica fume with high silicon dioxide (SiO<sub>2</sub>) content
- .5 N - Natural pozzolans

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures .
- .2 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.

**1.5 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00- Quality Control.
- .2 Provide Departmental Representative, a minimum 4 weeks prior to starting concrete work, with a valid and recognized certificate from plant delivering concrete.
- .3 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

**1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements:
  - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
    - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
  - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

**Part 2 Products**

**2.1 DESIGN CRITERIA**

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

**2.2 PERFORMANCE CRITERIA**

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

**2.3 MATERIALS**

- .1 Portland Cement: to CSA A3001, Type GU
- .2 Portland-limestone cement: Type GUL to CSA A3001.
- .3 Supplementary cementing materials: with minimum 20% Type F fly ash replacement, by mass of total cementitious materials to CSA A3001.
- .4 Water: to CSA A23.1.
- .5 Aggregates: to CSA A23.1/A23.2.
- .6 Admixtures:
  - .1 Air entraining admixture: to ASTM C260.
- .7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.
  - .1 Compressive strength: 50 MPa at 28 days.
  - .2 Net shrinkage at 28 days: maximum 0 %
  - .3 Acceptable product: Sika 212 or approved equal.
- .8 Curing compound: to CSA A23.1/A23.2.

**2.4 MIXES**

- .1 Alternative 1 - Performance Method for specifying concrete: to meet performance criteria to CSA A23.1/A23.2.
  - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
  - .2 Provide concrete mix to meet following hard state requirements:

- .1 Durability and class of exposure: N.
- .2 Compressive strength at 28 day age: 32 Mpa minimum.
- .3 Intended application: Basement floor slab-on-grade.
- .4 Aggregate size: 20mm maximum
- .5 Slump: 50 to 80 mm
- .3 Provide quality management plan to ensure verification of concrete quality to specified performance.
- .4 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Obtain Departmental Representative's written approval before placing concrete.
  - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00- Concrete Reinforcing.
- .3 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling to facilitate placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix .
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Protect previous Work from staining.
- .7 Clean and remove stains prior to application for concrete finishes.
- .8 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, workability, air content, temperature and test samples taken.
- .9 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
  - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.

### **3.2 INSTALLATION/APPLICATION**

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Finishing and curing:
  - .1 Finish concrete to CSA A23.1/A23.2.
  - .2 Use procedures as noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
  - .3 Use curing compounds compatible with applied finish on concrete surfaces.

**3.3 FIELD QUALITY CONTROL**

- .1 Site tests: conduct tests as follows in accordance with Section 01 45 00- Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .1 Concrete pours.
  - .2 Slump.
  - .3 Air content.
  - .4 Compressive strength at 7 and 28 days.
  - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
  - .1 Ensure testing laboratory is certified to CSA A283.

**3.4 CLEANING**

- .1 Clean in accordance with Section 01 74 11- Cleaning.

**END OF SECTION**

**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Precast concrete pavers

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CSA-A23.4-09(R2014) - Precast Concrete - Materials and construction

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Action Submittals:
  - .1 Product Data: for pavers.

**1.4 QUALITY ASSURANCE**

- .1 Perform Work in accordance with CSA-A23.1/A23.2 and CSA-A23.3.

**1.5 DELIVERY, STORAGE, AND PROTECTION**

- .1 Handle precast units consistent with their shape and design as recommended by manufacturer. Lift and support only from support points.
- .2 Protect units to prevent staining, chipping, or spalling of concrete.

**1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

**Part 2 Products**

**2.1 PAVERS**

- .1 Precast Concrete Pavers: CSA-A231.1/A231.2, precast concrete units, 28 MPa compressive strength, air entrained mix; nominal natural colour, non-slip finish, 610 by 610 by 45 mm thick. Location: Crawl space in Farm Manager's House (Fraser House).

**2.2 FABRICATION**

- .1 Fabricate to CSA-A23.4. Use rigid moulds, constructed to maintain precast unit uniform in shape, size, and finish. Maintain consistent quality during manufacture.
- .2 Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
- .3 Minor patching in plant is acceptable.

**Part 3            Execution**

**3.1                INSTALLATION**

- .1       Place units without damage to shape or finish in locations indicated. Replace or repair damaged products.

**END OF SECTION**



**Part 1            General**

**1.1            REFERENCE STANDARDS**

- .1 CSA Group
  - .1 CAN/CSA-Z94.4-11(R2016) , Selection, Use, and Care of Respirators.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .3 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, (1992, c. 34).

**1.2            DEFINITIONS**

- .1 Low-pressure water soaking: less than 72 kPa (500 psi), measured at nozzle tip.
- .2 Medium-pressure water soaking: minimum 72 kPa (500 psi) and maximum 144 kPa (1000 psi), measured at nozzle tip.

**1.3            ADMINISTRATIVE REQUIREMENTS**

- .1 Provide time and allow attendance of relevant employees at environmental briefing session arranged by Departmental Representative prior to beginning work of this Section.

**1.4            ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Provide proposed cleaning method and type of protection from cleaning residue for in-place conditions.
- .3 Product Data:
  - .1 Provide technical data on cleaning materials, equipment, machinery, compressors, tools and nozzles.
  - .2 Submit copies of WHMIS MSDS in accordance with 01 35 29.06- Health and Safety Requirements.
- .4 Samples:
  - .1 Provide samples of cleaning materials for approval of Departmental Representative if requested.
- .5 Test and Evaluation Reports:
  - .1 Provide test results.
    - .1 Provide a list of the cleaning methods to be used for cleaning of test patches.
    - .2 Proceed with cleaning upon receiving written approval by Departmental Representative concerning tested cleaning methods.

**1.5            QUALITY ASSURANCE**

- .1 Regulatory Requirements: ensure work is performed in compliance with applicable Provincial regulations.

- .2 Comply with requirements of Workplace Hazardous Materials Information Sheet (WHMIS).
- .3 Test Sections:
  - .1 Do tests sections in accordance with Section 01 45 00- Quality Control.
  - .2 Mock-up test patch locations are to be determined by the Departmental Representative.
  - .3 Notify Departmental Representative 48 hours before commencing cleaning of each test patch.
    - .1 Obtain approval from Departmental Representative before commencing test.
  - .4 Before proceeding with mock up:
    - .1 Ensure area of testing is water tight and decorative elements are protected.
    - .2 Ensure contaminated water is kept in containers and their disposal respects environmental regulations.
  - .5 Conduct tests on building to determine effectiveness of moderate pressure wash, scrubbing with neutral pH detergent in warm water, and low pressure wash cleaning methods.
  - .6 Start with lowest impact tests and stop testing when desired level of cleaning is achieved, stop testing immediately when damage is caused.
  - .7 Test pressure at each storey height to determine effect of "line drop" on effectiveness of water jets.
  - .8 Test brushing and spraying as alternative to pressure washing. Consult Departmental Representative to review test results. Use method approved by Departmental Representative.
  - .9 Add increasing amount of surfactant until cleaning can be done efficiently.
  - .10 Locate test patches in inconspicuous places directed by Departmental Representative.
  - .11 Test patches 2 m<sup>2</sup>.
  - .12 Conduct tests to determine best methods of protecting surrounding historic material, openings and plants during test cleaning procedure, and monitor for detrimental effects.
  - .13 Do not proceed with work without approval of test sections.
  - .14 Allow 24 hours for inspection of test sections by Departmental Representative.
  - .15 Accepted test sections will demonstrate minimum standard for work. Test sections may remain as part of finished work.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in an indoor dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

**1.7 SITE CONDITIONS**

- .1 Ambient conditions:
  - .1 Do not use wet cleaning methods when there is threat of frost.
  - .2 Do not use chemical cleaners when temperature is below 10 degrees C.
  - .3 Follow manufacturer's written instructions on use of chemical cleaners in accordance with product's temperature range application.
  - .4 Provide shading to wall to avoid cleaning in full, hot sunlight.
  - .5 Do not clean if there is risk of chemical spray being blown onto surrounding historic material, publicly accessible areas or plants.
  - .6 Protect work in the event of high winds.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Use clean potable water free from contaminants.
- .2 Treat water which has high metal content before use in cleaning.
- .3 Use air free from oil or other contaminants.
- .4 Use masking material to approval of Departmental Representative.
- .5 Surfactants: Use a maximum of 2 % by volume
- .6 Use clean Diatomaceous Earth as poultice medium.
- .7 Use non-ferrous or plastic mesh as support mechanism for poultice.
- .8 Use Organic grits for fine work.
- .9 Prepare poultices to treat iron stains on limestone using:
  - .1 7 parts glycerine, 1 part sodium citrate and 6 parts warm water 15 % solution by weight in water of sodium citrate mixed 1:1 with glycerine.

**2.2 TOOLS AND EQUIPMENT**

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

**Part 3 Execution**

**3.1 SITE VERIFICATION OF CONDITIONS**

- .1 Record existing conditions, by means of photographs, before and after cleaning. Advise Departmental Representative of potential complications.

- .2 Report to Departmental Representative conditions of deteriorated masonry or pointing not noted on Contract Drawings found before and during cleaning.
- .3 Obtain written approval of Departmental Representative before cleaning areas of deteriorated masonry.

### **3.2 PREPARATION**

- .1 Protect operatives and other site personnel from hazards.
  - .1 Ensure good ventilation in work area.
  - .2 Ensure workers wear appropriate personal protective equipment and a respirator to CAN/CSA-Z94.4
- .2 Place safety devices and signs near work areas as indicated and directed.

### **3.3 PROTECTION OF IN-PLACE CONDITIONS**

- .1 Cover and protect surfaces and non-masonry finishes not to be cleaned.
  - .1 Obtain approval of protection method from Departmental Representative before commencing cleaning procedure.
- .2 Protect vents, windows, and other openings, to prevent water entry.
  - .1 Protect masonry openings from water/chemical infiltration with polyethylene during cleaning.
- .3 Protect wood, glass, and metal adjacent to masonry.
- .4 Hang tarpaulins from scaffolding to enclose water spray.
- .5 Protect cleaned surfaces to be painted from contact with rain and snow.
- .6 Protect rainwater leaders, eaves troughs and gutters from being blocked by residue.
- .7 Protect adjacent Work from spread of dust and dirt beyond work areas.
- .8 Protect building envelope from water infiltration.

### **3.4 EXECUTION OF CLEANING**

- .1 Proceed with cleaning in accordance with written instructions of methods, systems, tools and equipment approved by Departmental Representative.
- .2 Dry brush or scrape accumulations from walls, ledges and cornices.
- .3 Pre-wet masonry surface when necessary. Work from bottom of wall upwards.
- .4 Do not exceed maximum pressure at nozzle or have nozzle closer to masonry than approved by Departmental Representative at tests.
- .5 Stop work when cleaning has detrimental effect on surrounding material and plants.
- .6 Avoid prolonged wetting and excessive water penetration.
- .7 Apply chemical cleaners approved by Departmental Representative based on test areas.
- .8 Brush and scrape only to supplement water washing.
- .9 Undertake prolonged water spray to soften and loosen heavy deposits, then brush. Remove thick incrustations with wooden scrapers.
- .10 Apply poultices as approved by Departmental Representative based on tests.

- .11 Removal of vegetation or organic growth growing in or on masonry.
  - .1 Soak masonry with low-pressure water.
  - .2 Follow soaking by scraping with soft plastic or wood spatulas and gentle scrubbing with natural bristle brushes.
- .12 Low-Pressure Water Soaking:
  - .1 Remove stains and accumulated dirt with low-pressure maximum 350 kPa wash-down at flow rate of 0.25 L/s.
  - .2 Hold nozzle minimum 450 mm from masonry surface.
  - .3 Follow soaking by gentle scrubbing with natural bristle brushes.
- .13 Medium-Pressure Water Cleaning:
  - .1 Remove stains and accumulated dirt with medium-pressure 350-2700 kPa wash-down at flow rate of 0.25 L/s. Compressed air not to exceed 700 kPa.
  - .2 Use a fan-type nozzle with minimum 375 mm spread.
  - .3 Hold nozzle minimum 450 mm from masonry surface.

### **3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Rinse off masonry until no indications of chemicals are present to satisfaction of Departmental Representative.
- .3 Rinse from bottom to top and from top to bottom.
- .4 Clean up work area as work progresses.[At end of each work day remove debris and waste from site.
- .5 Upon completion, clean and restore areas used for work to condition equal to that previously existing.
- .6 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

### **3.6 PROTECTION OF WORK**

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

**END OF SECTION**

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**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1    Section 04 03 05.21
- .2    Section 04 03 43.16
- .3    Section 04 03 43.19

**1.2            MEASUREMENT AND PAYMENT**

- .1    No direct payment for masonry mortaring will be made. Refer to Sections 04 03 05.21 and 04 03 43.13 for measurement and payment details.

**1.3            ALTERNATIVES**

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

**1.4            REFERENCE STANDARDS**

- .1    ASTM International
  - .1    ASTM C5-10, Standard Specification for Quicklime for Structural Purposes.
  - .2    ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar.
  - .3    ASTM C185-15a, Standard Test Method for Air Content of Hydraulic Cement Mortar.
  - .4    ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes.
  - .5    ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.
  - .6    ASTM C270-14a, Standard Specification for Mortar for Unit Masonry.
  - .7    ASTM C780-15a, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
  - .8    ASTM C1072-13e1, Standard Test Method for Measurement of Masonry Flexural Bond Strength.
- .2    CSA International
  - .1    CSA A23.1/A23.2-09(2014), Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2    CAN/CSA-A179-14, Mortar and Grout for Unit Masonry.
  - .3    CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

**1.5            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2    Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for mortar and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Prior to mixing or preparation of mortars submit for review to Departmental Representative confirmation of source or product data sheet of:
  - .1 Aggregate.
  - .2 Cement.
  - .3 Lime.
  - .4 Premixed products.
  - .5 Pigments.
- .3 Samples:
  - .1 Provide samples in quantity and size in accordance with CAN/CSA-A179.
- .4 Test reports:
  - .1 Submit test results during site work as directed by Consultant as follows:
    - .1 Sieve analysis: sand.
    - .2 Bulking analysis: sand.
    - .3 Air content: mortar mix in plastic state.
    - .4 Vicat cone penetration: mortar mix.
    - .5 Mortar compressive strength: at 28 days or otherwise required.

## **1.6 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Mechanics to have documented experience in lime mortar preparation.
  - .2 Mortar to be mixed by same mechanics throughout project.
- .2 Mock-ups:
  - .1 Construct mock-up in accordance with Section 01 45 00- Quality Control.
  - .2 Submit methods of reproducing existing mortar colour, texture and pointing types, and samples.
  - .3 Construct mock-up 1000 x 1000 mm.
  - .4 Mock-up will be used:
    - .1 To judge quality of work, substrate preparation, and material application.
    - .2 For testing to determine compliance with performance requirements.
  - .5 Locate as directed by Departmental Representative.
  - .6 Notify Departmental Representative 24 hours before commencing mock-up.
  - .7 Allow 48 hours for inspection of mock-up before proceeding with work.
  - .8 When accepted, mock-up will demonstrate minimum standard for this Work. Approved mock-up will not remain as part of finished work. Remove mock-up and dispose of materials when no longer required and when directed by Departmental Representative.

## **1.7 DELIVERY, STORAGE AND HANDLING**

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



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

## 1.8 SITE CONDITIONS

- .1 Ambient Conditions:
  - .1 Provide weather-tight enclosure to store materials and mix mortars, maintain air temperature above 10 degrees C at all times.
  - .2 Maintain maximum/minimum thermometers and relative humidity gauges on site and in enclosures.
    - .1 Maintain a daily record of temperature and humidity.
- .2 Contractor shall install relative humidity and temperature equipment, including data loggers in close proximity of the masonry work. Recordings of temperature and relative humidity shall be submitted daily to Departmental Representative during mortaring operations.

## Part 2 Products

### 2.1 MATERIALS

- .1 Water: potable, clean and free from contaminants.
- .2 Sand: mixture of 50% 'play sand' and 50% all purpose sand

Sieve Size (ASTM)	% By Weight Passing Each Sieve
No. 5 (4 mm)	100
No. 10 (2 mm)	98
No. 18 (1 mm)	85
No. 35 (0.5mm)	55
No. 60 (0.25 mm)	15
No. 120 (0.125 mm)	3

- .1 Sharp, screened and washed pit sand, free of organic material, with final grading and colour to approval of Departmental Representative.
- .2 Custom blend sands where necessary to provide appropriate colour match and gradation to approval of Departmental Representative.
- .3 Portland cement: to CAN/CSA-A3000.
- .4 Masonry cement: to CAN/CSA-A3000.
- .5 Lime:

- .1 Processed Lime (Quicklime): to ASTM C5, fresh, finely ground and crushed; high calcium, 3/16" fines, dry bagged
- .2 Air-entrained dolomitic lime, Type SA lime.
- .6 Colour:
  - .1 Coloured sand to match existing. Use minimum amount necessary.
  - .2 Maximum colour: 2 % of total volume of aggregate.
  - .3 Match core of freshly broken sample of original mortar.
  - .4 Coloured admixtures: maximum 15 % of binder content by mass.
- .7 Additives:
  - .1 Obtain written approval of Departmental Representative before using additives.
- .8 Air entrainment:
  - .1 Bedding Mortar (Type N)
    - .1 Included in Type SA lime.
  - .2 Repointing Mortar (Type O)
    - .1 To CAN/CSA A-179 and ASTM C270 requirements.
    - .2 Obtain written approval of Departmental Representative before using.
- .9 Mortar mill:
  - .1 Mortar mill comprising mortar pan with adjustable cast iron sprung rollers on cranked roller shaft, steel scrapers and blades for lime putty mixing.
- .10 Spiral paddle mill comprising a mechanically driven rotating barrel with integral internal paddles for other than lime putty mixing
  - .1 Each batch add up to 6 large stones to tumble and pound mortar during mixing process.

## **2.2 MORTAR MIXES**

- .1 Proportion requirements for Portland cement-lime mortar:
  - .1 For bedding stones and all masonry repairs: Type N, based on proportion specifications, consisting of 1 part white Portland cement, 1 part air-entrained dolomitic lime and 6 parts sand.
  - .2 For repointing: Type O, based on proportion specifications, consisting of 1 part white Portland cement, 1.75 slaked lime putty (minimum 3 months old) and 6 parts sand.
  - .3 Obtain written approval of Departmental Representative before changing mix proportions. Change mix proportions only as directed by Departmental Representative.

## **2.3 ALLOWABLE TOLERANCES**

- .1 Mortar compression strength minimum 5 MPa at 7 days, and 12 MPa at 28 days. .
- .2 If mortar fails to meet the 7 day compressive strength requirements, but meets the 28 day compressive strength requirement, it is acceptable. If mortar fails to meet the 7 day compressive strength requirement, but its strength at 7 days exceeds two thirds of the value required for the 7 day strength, contractor may elect to continue work at his own risk while awaiting the results of the 28 day tests, or to take down the work affected.

**Part 3 Execution**

**3.1 GENERAL PREPARATIONS**

- .1 Traditional Mortar:
  - .1 Prepare measuring boxes to ensure accurate proportioning of materials.
  - .2 Maintain separate measuring boxes for each component.
  - .3 Ensure sand is tested and volume corrected for bulking.
  - .4 Ensure air entraining agent is available together with a graduated container for accurate volume measurements.
  - .5 Ensure testing equipment is ready and in working order.
  - .6 Use ground protection under work areas to collect debris and waste and to prevent staining.
  - .7 Apply Vicat cone test to ensure desirable performance of the mortar and record results.

**3.2 BULKING OF SAND**

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

### **3.3 PREPARATION OF MORTAR**

- .1 Hydrated Lime-Cement Mortar (Type 'N' Bedding Mortar):
  - .1 Prepare measuring boxes to ensure accurate proportioning of air entrained hydrated lime and sand.
  - .2 Mix air-entrained hydrated lime and sand thoroughly in spiral blade mechanical mixer for a minimum of 3 minutes. Do not add water. No spots or streaks of lime to remain upon completion of mixing.
  - .3 Add water as required
- .2 Lime Putty-Cement Mortar (Type 'O' Repointing Mortar):
  - .1 Prepare lime putty from processed Lime (Quicklime).
  - .2 Allow to stand at least 3 months in covered containers before use.
  - .3 Take lime putty from containers; siphon off water by screening lime through muslin, or cheesecloth, to remove excess water. Rework lime without adding water until it regains plasticity by beating, ramming and chopping.
  - .4 Adjust sand for bulking as described in article 3.2.
  - .5 Mix lime putty with sand and cement as required
  - .6 Add additives to manufacturer's instructions if using.

### **3.4 MIXING**

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

### **3.5 CONSTRUCTION**

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

### **3.6 CLEANING**

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

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning and 01 41 21 – Construction/Demolition Waste Management and Disposal.
- .3 Remove droppings and splashings using clean sponge and water.
- .4 Clean masonry with low pressure 1 to 3 bar clean water and soft natural bristle brush.
- .5 Obtain approval of Departmental Representative prior to using other cleaning methods for persistent stains.

### **3.7 PROTECTION OF COMPLETED WORK**

- .1 Cover completed and partially completed work not enclosed or sheltered at end of each work day.
- .2 Enclose and protect work using wetted burlap.
- .3 Cover with waterproof tarps to prevent weather from eroding recently laid material.
  - .1 Maintain tarps in place for minimum of 1 week after laying.
  - .2 Ensure that bottoms of tarps permit airflow to reach mortar in joints.
- .4 Anchor coverings securely in position without anchoring into existing structures (external anchorages or self-supporting coverings only).

**END OF SECTION**

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**Part 1            General**

**1.1            PRICE AND PAYMENT PROCEDURES**

- .1    Work of this Section will be measured by Departmental Representative. Work will be paid for under payment items:
  - .1        Repointing - per square metre of surface area of masonry.

**1.2            REFERENCE STANDARDS**

- .1    CSA Group
  - .1        CSA A23.1/A23.2-09(R2014) , Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2        CAN/CSA-A179-04, Mortar and Grout for Unit Masonry.
- .2    ASTM International
  - .1        ASTM C1713-15 Standard Specification for Mortars for the Repair of Historic Masonry

**1.3            DEFINITIONS**

- .1    Raking: removal of loose/deteriorated mortar to a depth suitable for repointing until sound mortar.
- .2    Repointing: filling and finishing of masonry joints from which mortar is missing, has been raked out or has been omitted.
- .3    Back Pointing: repointing to depths greater than minimum raked depths specified, to bring mortar face to specified depth for raked joints.
- .4    Finish Pointing: repointing face of joint, to depth specified for raked joints.
- .5    Tooling: finishing of masonry joints using tool to provide final contour.
- .6    Low-pressure water cleaning: water soaking of masonry using less than 350 kPa (50 psi) water pressure, measured at nozzle tip of hose.

**1.4            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00- Submittal Procedures .
  - .1        Provide labelled samples of materials to be used on project for approval before work commences.
- .2    Test and Evaluation Reports:
  - .1        Provide certified test reports showing compliance with specified performance characteristics and physical properties.
  - .2        Provide laboratory test reports certifying compliance of mortar ingredients with specifications requirements.

**1.5            QUALITY ASSURANCE**

- .1    Masonry Contractor:
  - .1        Use single Masonry Contractor for masonry work.

- .2 Masonry Contractor to have documented successful experience in historic stone masonry repair and conservation work on projects of similar size and complexity to Work of this Contract.
- .3 Masonry Contractor to have good level of understanding of structural behaviour of masonry walls when masonry work involves replacing or repairing stones which are part of structural masonry work.
- .4 Masonry Contractor will be responsible for all aspects of masonry work for duration of project.
- .2 Project Supervisor:
  - .1 Masonry Contractor to employ a Project Supervisor with documented successful experience of historic masonry repair and conservation work of required for this Contract. Project Supervisor to be present on site full-time for duration of Work.
  - .2 Demonstrate competence levels to satisfaction of Departmental Representative before undertaking Work.
- .3 Masons:
  - .1 Masons to have qualification with successful experience in historic stone masonry repair and conservation work required for this Contract.
- .4 Departmental Representative reserves the right to reject the Masonry Contractor or proposed Project Supervisor, mason or apprentice if, documentation provided does not demonstrate a level of experience or skill required for successful completion of Work of this Contract.
- .5 Obtain written approval from Departmental Representative for changes to qualified personnel.
- .6 Laboratory tests for mortar:
  - .1 Refer to specification 04 03 05.13

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in a dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store cementitious materials and aggregates in accordance with CSA A23.1/A23.2.
  - .3 Store lime putty in plastic lined sealed drums.
  - .4 Keep material dry. Protect from weather, freezing and contamination.
  - .5 Remove rejected or contaminated material from site.
  - .6 Replace defective or damaged materials with new.
  - .7 Masons to have proof of licence certification for proprietary restoration mortars.

## **1.7 SITE CONDITIONS**

- .1 Ambient conditions:



- .1 Maintain masonry temperature between 10 and 27 degrees C for duration of work.
- .2 When ambient temperature is above 21 degrees C:
  - .1 Protect repointed areas from direct sunlight and wind.
  - .2 Use protective methods acceptable to the Departmental Representative .
- .3 Provide humid cure for a minimum of 7 days.
- .4 Use and prepare mortar when the ambient air temperature is between 10 and 27 degrees C at the location of the work.
- .5 Maintain sand temperature between 10 and 30 degrees C.
- .6 Maintain mortar mix temperature between 10 and 30 degrees C.
- .7 Do not do work if the ambient temperature is below 10 degrees C, or is forecasted to fall below 10 degrees C within 24 hours.

## **Part 2 Products**

### **2.1 MORTAR**

- .1 Mortar: in accordance with CAN/CSA-A179 and Section 04 03 05.13- Historic Masonry Mortaring .
- .2 Proportion Specification:
  - .1 In accordance with Section 04 03 05.13- Historic Masonry Mortaring and CAN/CSA-A17 .

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify masonry, staging and storage areas and notify Departmental Representative in writing of conditions detrimental to acceptable and timely completion of Work.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform in writing to Departmental Representative of deteriorated areas of masonry not previously identified.
- .2 Stop work in that area and report to Departmental Representative immediately upon evidence of hazardous materials.

### **3.2 PROTECTION OF IN-PLACE CONDITIONS**

- .1 Protection requirements are specified in Section 04 05 00- Common Work Results for Masonry.

### **3.3 SPECIAL TECHNIQUES**

- .1 Examine mortar joints.
  - .1 Examine horizontal and vertical joints to determine which were struck first and whether they are the same style, as well as aspects of quality of work which establish authenticity of original work.

- .2 Replicate the style selected by Departmental Representative.
- .2 Test mortar joints.
  - .1 Procedure of testing: examine joints visually for signs of deteriorated masonry such as spalled surfaces, voids, cracking or micro-cracking at edges of joints or across joints, dense cement-rich mortar and loose or missing mortar.
  - .2 Test joints not visually deteriorated as follows:
    - .1 Test for voids and weakness by using hammers or other approved means.
    - .2 Perform examination and testing in co-operation with Departmental Representative so that unsound joints can be marked and recorded.

### **3.4 RAKING JOINTS**

- .1 Use manual raking tool to obtain clean masonry surfaces.
  - .1 Remove deteriorated and adhered mortar from masonry surfaces to a minimum of 25 mm or sound mortar 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 by hand tools only.
  - .1 Power tools shall not be used for the removal of existing mortar.
- .3 Clean surfaces of joints with non-ferrous brush or by moderate water wash 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. Ensure all joints shed water.
- .6 Replace stone damaged as a result of careless raking, at no cost to Owner.
- .7 Remove mortar from top, bottom and side joints, with back surface of joint square and of an even depth.

### **3.5 REPOINTING**

- .1 When required repair and replacement work is complete carry out repointing.
- .2 Before repointing, wash down wall to be repointed and allow to dry to damp, but not wet. Ensure that dust and debris are removed from joints and wall surfaces prior to repointing.
- .3 Keep masonry damp while pointing is being performed.
- .4 Completely fill joint with mortar.
  - .1 If surface of masonry units has worn rounded edges keep pointing back 1 mm from surface to maintain same width of joint
  - .2 Avoid feathered edges.
  - .3 Pack mortar firmly into voids and joints, ensuring full contact with back and sides of joint and leaving no voids.
- .5 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.
- .6 Tool joints to match existing profile as directed by the Departmental Representative.

- .1 Tool, compact and finish using mason's slick or jointing tool to force mortar into joint. Ensure jointing tool fits within width of joint. Use tools of varying widths to meet this requirement.
- .2 Provide final exposed aggregate texture when mortar has dried to thumb-print hardness by striking the surface of the joint with a stiff bristle brush and with a lightly moistened sponge.
- .7 Remove excess mortar from masonry face before it sets.

### **3.6 PROTECTION DURING CURING PROCESS**

- .1 Cover completed and partially completed work not enclosed or sheltered at end of each work day.
  - .1 Membranes should extend to 0.5 m over surface area of work and be tightly installed to prevent finished work from drying out too rapidly.
- .2 Cover with waterproof tarps to protect newly laid mortar from frost, rainfall and rapid drying conditions such as wind.
  - .1 Maintain 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. Anchors shall not be anchored to the stone wall.
- .4 Damp cure:
  - .1 Provide damp cure for back pointing and finish pointing mortars, at a minimum temperature of 10 degrees C.
  - .2 Install and maintain wetted burlap protection during the curing process, using heavy and tight-woven burlap:
    - .1 Minimum 7 days.
  - .3 Wet mist burlap only - ensure no direct spray reaches surface of curing mortar.
  - .4 Ensure burlap is not in contact with masonry. Leave air space of minimum 50 mm between burlap and masonry.
  - .5 Shade areas of work from direct sunlight and maintain constant dampness of burlap.
  - .6 Provide for off-hours and week-end work as required to maintain specified curing conditions.
- .5 Protect from drying winds. Pay particular attention at corners of structure.
- .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 using dry heated enclosures.

### **3.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning .
  - .1 Leave Work area clean at end of each day.
- .2 Clean surfaces thoroughly of mortar droppings, stains and other blemishes resulting from work of this contract on a daily basis, as work progresses.
- .3 Remove droppings and splashings using clean water and thick cotton rags.

- .4 Clean masonry with stiff natural bristle brushes and plain water only if mortar has fully cured.
- .5 Clean masonry with low pressure 103 to 310 kPa (15 to 45 psi) clean water and soft natural bristle brush.
- .6 Obtain approval of Departmental Representative prior to using other cleaning methods for persistent stains.
- .7 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning .

**3.8 PROTECTION OF COMPLETED WORK**

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

**END OF SECTION**

**Part 1 General**

**1.1 PRICE AND PAYMENT PROCEDURES**

- .1 Measurement for payment for this work will be on m<sup>2</sup> basis and will include costs associated with supplying materials, repointing and executing work as described herein and reflected in Contract.

**1.2 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM C568/C568M-15, Standard Specification for Limestone Dimension Stone.
- .2 CSA Group
  - .1 CAN/CSA-A179-14, Mortar and Grout for Unit Masonry.
  - .2 CAN/CSA-A371-14, Masonry Construction for Buildings.

**1.3 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 documented experience. Employ skilled stone masons on site to do necessary field cutting as stones are set.

**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's on-site representation.

**1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Shop Drawings:
  - .1 Submit drawings describing method of stone replacement, including removal, shoring and erection.

**1.6 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 documented 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.
- .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.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Prevent damage and soiling of finishes when transporting, storing and handling.
- .4 Keep materials dry. Protect against weather, freezing and any source of contamination.
- .5 Do not place stones directly on the ground.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Obtain new stone from a single quarry source acceptable to Departmental Representative.
  - .1 Ensure single quarry source has resources to provide materials of consistent quality and matching existing stone.
  - .2 Procurement of stones to meet approved schedule.
- .2 Limestone: to ASTM C568/C568M, category III - High Density, colour and texture to match approved sample obtained by Parks Canada.
- .3 Stones:
  - .1 Good quality, free of cracks, quarrying marks, pick marks and other defects impairing structural integrity of material.
  - .2 Stone: quarry without blasting.

### **2.2 FABRICATION TOLERANCES**

- .1 Fabricate limestone dimension stone to the following tolerances:
  - .1 Unit Length: plus or minus 9 mm.
  - .2 Unit Height: plus or minus 9 mm.
  - .3 Bed Depth: plus or minus 6 mm.

### **2.3 EXISTING STONE**

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

**2.4 MORTAR**

- .1 Mortar: in accordance with Section 04 03 05.13- Historic - Mortaring.

**2.5 ACCESSORIES**

- .1 Setting Buttons: resilient plastic type; non-staining; sized to suit joint thicknesses and bed depths without intruding into required depths of joint sealants or causing third-side adhesion between sealant and setting button.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify masonry, staging and storage areas and notify Departmental Representative in writing of conditions detrimental to acceptable and timely completion of Work.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform in writing to Departmental Representative areas of deteriorated masonry not previously identified.
  - .3 Obtain Departmental Representative's approval and instructions for repair and replacement of masonry units before proceeding with repair work.
  - .4 Stop work immediately and report to Departmental Representative evidence of hazardous materials.

**3.2 PREPARATION**

- .1 Weather (seasoned or aged) stone for three months or time specified by Departmental Representative. Prevent absorption of ground water and water accumulation on stone. Rest stones in their natural bedding during weathering.
- .2 Move and lift stone units using means to prevent damage. Submit stone units dropped or impacted to Departmental Representative for inspection and approval. Do not make holes or indentations for Lewises or dogs on face or top side of stone.
- .3 Indicate bedding planes of stone units. Duplicate bedding marks on usable pieces of cut stone.
- .4 Place safety devices and signs near work area as directed in accordance with Section 01 56 00- Temporary Barriers and Enclosures.
- .5 Install and remove self-supporting scaffolding in accordance with Section 01 52 00- Construction Facilities.
- .6 Protection of in-place conditions:
  - .1 Cover adjacent plant material and fragile surfaces.

**3.3 RESETTING**

- .1 Fix dislodged masonry units in correct location with softwood wedges.
- .2 Insert and compress firm mortar to within 50 mm of pointing surface. Allow mortar to set 24 hours. Damp cure required for minimum 12 hours.
- .3 Pull out wood wedges when dried and shrunken and fill voids with mortar.
- .4 Point to surface in two layers.

**3.4 STONE REMOVAL**

- .1 Stone removal in accordance with Section 04 03 43- Historic - Dismantling Stone Masonry.
- .2 Remove deteriorated and loose material from stones.
- .3 Clean dust, mortar and stone fragments from slot.

**3.5 RAKING JOINTS**

- .1 Use manual raking tool to obtain clean masonry surfaces.
  - .1 Remove deteriorated and adhered mortar from masonry surfaces to sound mortar but in no case less than 25 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.
- .3 Clean by compressed air or by moderate water wash 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.

**3.6 CUTTING/SIZING OF STONE**

- .1 Use calipers, squares and levels to measure hole for new stone. Allow for mortar joints of to match existing.

**3.7 MOVING STONES**

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

**3.8 STONE REPLACEMENT**

- .1 Co-ordinate bond pattern, coursing height and joint width with existing stonework in area selected by Departmental Representative.
- .2 Clean dust and stone fragments from slot.
- .3 Clean stone by washing with water and natural fibre brush before laying.
- .4 Before proceeding with Work, inspect cleaned surface with Departmental Representative.
- .5 Install anchors, dowels and cramps.
  - .1 Obtain approval of Departmental Representative of placement of anchors, dowels and cramps prior to placing mortar.
  - .2 Use non-corrosive anchors, dowels and cramps to fix stone face plates.
- .6 Dampen slot's surfaces before applying mortar.



- .7 Apply bedding mortar.
  - .1 Lay stones on full beds of mortar.
  - .2 Lay heavy stones and projecting stones after mortar in courses below has hardened sufficiently to support weight.
  - .3 Prop and anchor projecting stones until wall above is set.
  - .4 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.
  - .5 Set stones to match alignment of adjacent stones in full bed of mortar with vertical joints buttered and placed full except where otherwise specified.
- .8 Fill vertical joints buttered and placed full in face, and at vertical joint between wythes.
- .9 Tool joints with a round jointer to provide smooth joints compressed uniformly concave.
- .10 Rake bedding mortar back to a minimum depth of 25 mm and make ready for pointing with pointing mortar in separate operation.
  - .1 Provide minimum 3-day damp cure to bedding mortar prior to pointing.
  - .2 Remove mortar dropping from face of stone before mortar is set. Sponge stone free of mortar along joints as work progresses.

**3.9 FILLING JOINTS/POINTING**

- .1 Fill joints and point: in accordance with Section 04 03 05.21- Historic Masonry Repointing.

**3.10 REPOINTING**

- .1 Do pointing work in accordance with Section 04 03 05.21- Historic Masonry Repointing.

**END OF SECTION**

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**Part 1 General**

**1.1 ADMINISTRATIVE REQUIREMENTS**

- .1 For any areas requiring partial dismantling, conduct a pre-dismantling meeting with Departmental Representative to verify project requirements, equipment, procedures and assigned storage areas.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures .
- .2 Submit method of reference numbering for dismantling stone prior to start of stone removal to Departmental Representative
- .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.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual. Include:
  - .1 Photographically record stonework to be dismantled and rebuilt.
  - .2 Record drawings of layout of stored stones.

**1.4 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Masonry Contractor:
    - .1 Work of this Section: executed by contractor specializing in historic stone conservation work, using similar stone dismantling techniques.
  - .2 Foreperson:
    - .1 Provide competent trade foreperson specializing in type of work required.
    - .2 Experience: documented experience in deconstruction of historic stone masonry. Must be present on site throughout Work.
  - .3 Dismantlers:
    - .1 Experience: documented record of successful masonry dismantling.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements.
- .2 Protect and store stones to facilitate their resetting.
  - .1 Store dismantled masonry units on wood platforms, protected from exposure to water, elements, and potential mechanical damage fully covered under polyethylene.
  - .2 Submit storage and identification system to Departmental Representative review and approval .

**1.6 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.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 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.
  - .1 Visually inspect substrate in presence of Departmental Representative .
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative .
  - .4 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.

**3.2 PREPARATION**

- .1 Remove deteriorated portions of stones using low impact removal methods until sound surface is reached.
- .2 Remove deteriorated portions of stones by scraping and chiselling using hand methods only.
- .3 Obtain Departmental Representative's approval for alternative methodology and tools to be employed before commencing the work.
- .4 Clean stone surface of dust and stone chips.

**3.3 PROTECTION**

- .1 Prevent damage to surrounding building elements, vegetation and fencing which are to remain.
- .2 Make good damage incurred.
- .3 Protect surrounding components from damage during work.
- .4 Make good damage to historic fabric.
- .5 Obtain Departmental Representative's approval for repair methodology.

**3.4 SPECIAL TECHNIQUES**

- .1 Number and identify stones and other elements on a photographic record.

- .2 Before dismantling stones, indicate dimensions of each numbered stone in removal area on an index card or chart .
- .3 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 Waxless chalk directly on stone.
  - .2 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 photographs or chart.
  - .3 Ensure that temporary marking will remain in use resistant to weather, handling and cleaning until final marking of stones.
  - .4 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

### **3.5 TEMPORARY SHORING**

- .1 Construct shoring and bracing if required. A temporary bracing plan shall be submitted to the Departmental Representative for review and approval prior to undertaking the Work.

### **3.6 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 Prior to removing a stone approved for replacement or re-installation, rake out existing mortar joints around the stone.
- .3 Remove mortar from top, bottom and side joints, with the back surface of the joint square and of an even depth.
- .4 Ensure that adjacent stones are not used as lever points in removal of stone.

### **3.7 DISMANTLING AND MOVING STONES**

- .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 wood shims to isolate units from hoisting belts.
- .6 Where damage occurs to stone, report to Departmental Representative and repair stone with a method reviewed and approved by Departmental Representative.
- .7 Make good damage incurred at no additional cost to Contract.
- .8 Obtain review approval of repaired damage by Departmental Representative.

**3.8 HANDLING**

- .1 Usage of Lewis bolts for handling stone is not 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.

**3.9 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.

**3.10 CLEANING**

- .1 Clean stones in accordance with Section 04 03 01.13- Historic - Cleaning Masonry.
- .2 Do cleaning operations at above freezing temperature.
  - .1 After cleaning, protect wet stones against freezing until dry.
- .3 Clean stones by wet scrubbing with vegetable fibre brush unless otherwise instructed by Departmental Representative.
  - .1 Do not use high pressure water jet.
  - .2 Remove excess mortar with hand tools.
- .4 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning .
  - .1 Leave Work area clean at end of each day.
- .5 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning .

**3.11 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 m.
- .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.

**3.12 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.

**END OF SECTION**

**Part 1            General**

**1.1            SECTION INCLUDES**

- .1      Chinking repair

**1.2            RELATED REQUIREMENTS**

- .1      Section 01 35 03 - Conservation Treatment Procedures
- .2      Section 09 03 91 - Conservation Treatment for Period Painted Surfaces, for repainting

**1.3            ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.4            QUALITY ASSURANCE**

- .1      Qualifications:
  - .1      Contractors undertaking work in this Section are required to be skilled craftspersons and have experience in this field.
  - .2      Before the start of work submit qualifications, including examples of previous work, and references.
- .2      Mock-ups:
  - .1      Construct mock-up in accordance with Section 01 45 00 - Quality Control.
  - .2      Construct a 600 mm long mock-up of re-chinking work including specified materials.
  - .3      Mock-up will be used to judge quality of work, substrate preparation, material application, and colour and texture of daubing.
  - .4      Allow 48 hours for review of mock-up by Departmental Representative before proceeding with Work.
  - .5      When accepted, mock-up demonstrates minimum standard for this Work.
  - .6      Approved mock-up may remain as part of finished Work.

**1.5            AMBIENT CONDITIONS**

- .1      Do not perform daubing work in full sun, excessive heat or when freezing temperatures are expected.
- .2      Provide weather-tight enclosure to store materials and mix mortars. Maintain air temperature above 10 degrees C.
- .3      Maintain maximum/minimum thermometers and relative humidity gauges on site and in enclosures.
  - .1      Maintain a daily record of temperature and humidity.

**1.6            DELIVERY, STORAGE AND HANDLING**

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

- .3 Store cementitious materials and aggregates off ground, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area. Protect from weather, freezing and contamination.

## 1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

## Part 2 Products

### 2.1 MATERIALS

- .1 Packing Materials:
  - .1 Rigid Blocking Filler: Wood strips of same species as existing, cut to fit.
  - .2 Soft Filler: Oakum made from dry, twisted hemp or jute fibres, free from hard, coarse fibres and extraneous matter.
- .2 Daubing: Mix of clean wash sand, slaked lime, and cement.
  - .1 Mixture proportions, strength and colour to match existing daubing based on approved mock-up.
  - .2 Modern commercially-available chinking products are not permitted.
- .3 Water: Potable, clean and free from contaminants.

### 2.2 MIXING

- .1 Dry-mix daubing materials. Add water and stir to a stiff, paste-like consistency.
  - .1 Record amount of water required to reach this consistency and use for subsequent mixes, based on approved mock-up.
- .2 Do not mix more daubing than can be applied in about 30 minutes. Do not retemper daubing materials beyond this time.
- .3 Appoint single individual to mix daubing mixture.

## Part 3 Execution

### 3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable.
  - .1 Visually examine substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.
- .2 Examine timber structure and report to Departmental Representative conditions relevant to this Work not described in Contract Documents.
- .3 Stop work and report in writing immediately to Departmental Representative evidence of structural deficiencies, fungal activity or insect infestation not described in Contract Documents that may affect scope of the Work, and durability of repairs.



**3.2 PROTECTION**

- .1 Protect adjacent wall surfaces from damage during repair work.
- .2 Use ground protection under work areas to collect debris and waste.

**3.3 REMOVAL OF EXISTING MATERIALS**

- .1 Carefully remove existing damaged or loose daubing and soft filler materials using hand tools.
- .2 Do not disturb non-deteriorated intact blocking filler behind daubing. Remove loose or deteriorated rigid blocking filler only.
- .3 Where possible, cut off nails driven into logs below chinked joints.

**3.4 INSTALLATION**

- .1 Filler:
  - .1 Where existing rigid blocking filler has been removed, refit with new pieces cut to fit between existing filler.
  - .2 Pack space between logs from outside with new soft filler. Cut oakum into workable strips. Loosen jute fibres by hand. Press firmly into voids with a stick, putty knife, or slotted screw driver.
- .2 Daubing:
  - .1 Before daubing, spray chinking area including filler and log surfaces to receive daubing with water to prevent dry filler from too rapidly drawing off daubing moisture.
  - .2 Using a trowel, ground to the width of the daubing, press daubing into chinking space. Trowel smooth filled areas.
  - .3 Apply daubing in multiple layers to prevent sagging and separation from the logs by applying one or two scratch coats before finishing the surface of wide or deep chinking spaces or joints.

**3.5 CLEANING**

- .1 Remove droppings and splatters of daubing mixture from adjacent surfaces using clean sponge and water, or soft natural bristle brush.

**3.6 PROTECTION**

- .1 Cover completed and partially completed work not enclosed or sheltered at end of each work day.
- .2 Enclose and protect work using wetted burlap.
- .3 Cover with waterproof tarps to prevent weather from eroding recently laid material.
  - .1 Ensure that bottoms of tarps permit airflow to reach daubing in joints.
- .4 Anchor coverings securely in position without fastening to historic buildings.

**END OF SECTION**



**Part 1            General**

**1.1            SECTION INCLUDES**

- .1       Restoration and repair of finish carpentry including but not limited to existing doors and frames, sills, casing and trim

**1.2            RELATED REQUIREMENTS**

- .1       Section 01 32 33 - Photographic Documentation
- .2       Section 01 35 03 - Conservation Treatment Procedures: Administrative, procedural, and temporary work requirements
- .3       Section 08 06 11 - Period Wood Door Assessment Schedule
- .4       Section 08 06 50 - Period Wood Window and Dormer Assessment Schedule
- .5       Section 09 03 91 - Conservation Treatment for Period Painted Surfaces, for removal of existing finishes, surface preparation and paint treatments

**1.3            REFERENCES**

- .1       ASTM International (ASTM)
  - .1       ASTM F1667-17, Standard Specification for Driven Fasteners: Nails, Spikes and Staples
- .2       Canada's Historic Places
  - .1       Standards and Guidelines for the Conservation of Historic Places in Canada
- .3       CSA Group
  - .1       CSA O141-05(R2014), Softwood Lumber
  - .2       CSA B111-1974(R2003), Wire Nails, Spikes and Staples

**1.4            ADMINISTRATIVE REQUIREMENTS**

- .1       Preinstallation Conference: Conduct conference at Project site.
  - .1       Review minutes of Historic Treatment Preconstruction Conference that pertain to treatment of period finish carpentry and doors.
  - .2       Review methods and procedures related finish carpentry work including, but not limited to, the following:
    - .1       Verify project requirements, including mock-up requirements
    - .2       Verify substrate conditions.
    - .3       Review proposed repair and replacement methods and materials.
    - .4       Co-ordinate products, installation methods and techniques.
    - .5       Review temporary protection requirements.
    - .6       Existing conditions that may require notification of Departmental Representative before proceeding.
- .2       Coordination: Undertake each step of finish carpentry restoration and repair including tagging, disassembly, surface preparation, repair, painting and installation under review of Departmental Representative.
- .3       Sequencing: Do not start repair and replacement work before having a photographic record of interior and exterior surfaces of finish carpentry.

**1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Action Submittals:
  - .1 Preconstruction Submittals:
    - .1 Submit a description of methods of work to be employed repair and restoration of finish carpentry.
    - .2 Provide photographic documentation of finish carpentry before, during and after the works in accordance with Section 01 32 33 – Photographic Documentation.
    - .3 Existing condition report and agreed to repair work.
    - .4 Obtain written approval of products, materials, operations, schedules and methods from Departmental Representative before starting with work of this Section.
  - .2 Product Data: Submit product data sheets and MSDS information for each product or material used in the execution of the work of this Section.
  - .3 Shop Drawings: Indicate plans and elevations of units; materials, surface grain directions, details at 1:2 scale for items of finish carpentry. Show profiles of components, joint details, and anchorage details.
  - .4 Samples: Submit 300 mm long of each new fabricated replacement part.
- .3 Informational Submittals:
  - .1 Qualification Statement: Restorer qualifications, including previous projects.

**1.6 QUALITY ASSURANCE**

- .1 Restorer Qualifications:
  - .1 Company specializing in performing the work of this section with documented experience.
  - .2 Successful completion of at least three projects of similar scope and complexity.

**1.7 MOCK-UP**

- .1 Construct Mock-Ups in accordance with Section 01 45 00 - Quality Control.
- .2 Construct Mock-Ups under supervision of Departmental Representative, to demonstrate a full understanding of specified procedures, techniques and formulations.
- .3 Include the following:
  - .1 Repair of wood checking, moderate weathering, and severe weathering
  - .2 Spliced sill repair
  - .3 Spliced stile and rail repair
  - .4 Each profile of finish carpentry for repair
  - .5 Typical door repair
- .4 Allow 48 hours for review of mock-up by Departmental Representative.
- .5 Repeat mock-up until satisfactory results are obtained to approval of Departmental Representative.
- .6 When accepted by Departmental Representative in writing, mock-up will demonstrate minimum standard for this work. Accepted Mock-up may remain as part of finished work.

**1.8 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Replacement Wood Members: Clear slow growth Spruce lumber to CSA O141, air dried to 15% moisture content, growth rings and grain orientation to match parts being repaired. Finger-jointing not permitted.
  - .1 Profiled replacement wood members to match existing components.
  - .2 Use material to match existing as close as possible in terms of species, finish and dimension.
- .2 Wood Preservative:
  - .1 Organic purified raw and boiled linseed oil.
  - .2 Turpentine.
- .3 Finishing Nails: to CSA B111 or ASTM F1667, No. 304 stainless steel finishing nails.
- .4 Nails: to CSA B111 or ASTM F1667, stainless steel, size and type to suit application.
- .5 Screws: for Dutchmen type repairs, brass or stainless steel sized to fit.
- .6 Wood Repair Materials:
  - .1 Liquid Wood Consolidant: Two-component compound forming a slow-curing, low-viscosity liquid epoxy consolidant designed for saturating and encapsulating wood decay, or priming damaged areas. Specifically used for consolidating and stabilizing pockets of wood decay, checks, fissures and other surface imperfections due to weather exposure or insect infestation. Applications include porous end grain, window sills, sash, jambs and trims.
    - .1 Basis-of-Design Products: RotFix Epoxy Wood Sealer and Consolidant manufactured by System Three Resins (Industrial Formulators); LiquidWood manufactured by Abatron; ConServ 100 Flexible Epoxy Consolidant manufactured by ConServ; Rhino Wood Repair System manufactured by Stell-Chem.
  - .2 Wood Epoxy Filler: Two-component, shrink-free adhesive compound for filling cavities, voids and surface imperfections in wood. Flexible to withstand expansion and contraction of wood, firm enough to replace damaged portions of wood. Easily tooled, carved, planed, drilled or sanded. Capable of accepting nails and screws. Able to be painted or stained solid.
    - .1 Basis-of-Design Products: Sculpwood Putty or Paste Epoxy Repair Compounds manufactured by System Three Resins (Industrial Formulators); WoodEpoxy manufactured by Abatron; ConServ Flexible Epoxy Patch 200 series manufactured by ConServ; Rhino Wood Repair System manufactured by Stell-Chem.

- .3 Adhesive: Weather-resistant multi-purpose structural epoxy adhesive, medium viscosity, 2:1 mix ratio, room temperature or heat cure. Room temperature working time of 60-90 minutes, complete cure in 24 hours at 22 deg C. Capable of producing specific bond-line thickness, and prevent joint starvation from over-clamping. Can be machined, sanded, drilled, tapped, and painted. Solvent-free with 100% reactive components.
- .1 Basis-of-Design Products: Cold Cure General Purpose Epoxy Resin System, G2 Epoxy Glue manufactured by System Three Resins (Industrial Formulators), or product acceptable to Departmental Representative manufactured by West System Epoxies.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Examine areas and conditions under which work is to be performed and notify Departmental Representative in writing of conditions detrimental to the proper and timely completion of the work.
- .2 Notify Departmental Representative of conditions relevant to the Work, but not described in Drawings, including evidence of deficiencies, fungal or insect attack which may affect the scope of work and durability of the finished product.
- .3 Verify adequacy of backing and support.

### **3.2 PROTECTION**

- .1 Protect adjacent surfaces during repair of finish carpentry to prevent damage.
- .2 Use ground protection under work areas to collect debris and waste.

### **3.3 PREPARATION**

- .1 Follow designated substances guidelines for lead abatement for paint removal.
- .2 Carefully clean, scrape and wash finish carpentry items as required to assess condition, and to determine extent of repairs required.
- .3 Verify condition and extent of repair work with Departmental Representative. Submit report documenting existing conditions and agreed to extent of repair work to Departmental Representative before starting repair work.

### **3.4 WOOD REPAIR AND REPLACEMENT**

- .1 Refer to finish carpentry repair notes on Drawings, and as follows.
- .2 Severe Deterioration:
  - .1 Replace deteriorated finish carpentry components with new wood as specified in this Section.
  - .2 For items being disassembled, photograph in accordance with Section 01 32 33 - Photographic Documentation, and submit to Departmental Representative for review before proceeding with work.
  - .3 Before disassembling, label components using indelible black marker on painter's tape.
    - .1 Use two labels per component. Ensure labels show clearly in photographs.

- .2 Include compass orientation, and any other information required on labels to ensure that component is reinstalled in its original location.
  - .4 Immediately following disassembly of each component, label components using indelible black marker on gasket paper, securely fasten to back of component with staple gun.
    - .1 Use two labels per component and record same information as labels on front of components.
    - .2 Store original elements. Turn over to Parks Canada as directed.
  - .5 Tools:
    - .1 Use fine pry bars, such as Richardson bars, designed for this type of work, not pry bars intended for nail pulling, etc.
    - .2 Use fine sharp tool to cut paint films in construction joints before attempting to disassemble.
    - .3 Take care with tools to avoid marring, crushing or splitting components.
  - .6 Upon removal of components, snap iron nails off flush with backside. For wire nails pull nails through from backside. Do not drive nails back through finished surfaces.
  - .7 Cut back damaged or decayed wood to a point 10 mm beyond the last evidence of decay or as indicated on Drawings.
  - .8 Use Dutchmen type repairs, including wood splicing or inserts and weather-resistant glue, where wood is broken or missing. Fit to hairline joint, glue and nail. Stapling not permitted.
    - .1 Match replacement components to size, profile and grain of existing finish carpentry.
    - .2 Scarf in replacement components.
    - .3 Make joints tight so that after finishing they are visible only upon close inspection.
    - .4 Attach replacement materials to the parent piece, not adjacent components.
  - .9 Trial fit joints before fastening in place. Adjust as necessary to ensure close accurate fit with adjacent surfaces.
- .3 Moderate Deterioration:
  - .1 Clean and dry surfaces before applying liquid wood consolidant and epoxy filler. Apply products in accordance with manufacturers' instructions.
  - .2 Consolidate soft wood with liquid wood consolidant.
  - .3 Repair cracks and holes in wood with wood epoxy filler. Tool cured patch to match adjacent area.
  - .4 Allow proper curing of consolidant and filler before painting.
- .4 Minor Deterioration:
  - .1 Once wood is stripped bare, apply linseed oil turpentine mix 50/50 to renew wood.
  - .2 Use thinned linseed oil-based glazing compound to fill checks and open joints. Allow time to dry before sanding and painting.
  - .3 Consolidate soft wood with liquid wood consolidant. Clean and dry surfaces before applying liquid wood consolidant. Apply consolidant in accordance with manufacturer's instructions.

- .5 Missing Elements:
  - .1 Replace missing finish carpentry items with new wood as specified in this Section.
  - .2 Use Dutchmen type repairs, including wood splicing or inserts and weather-resistant glue. Fit to hairline joint, glue and nail. Stapling not permitted.
    - .1 Match replacement components to size, profile and grain of existing finish carpentry.
    - .2 Scarf in replacement components.
    - .3 Make joints tight so that after finishing they are visible only upon close inspection.
    - .4 Attach replacement materials to the parent piece, not adjacent components.
  - .3 Trial fit joints before fastening in place. Adjust as necessary to ensure close accurate fit with adjacent surfaces.
- .6 Raised Knots:
  - .1 Remove loose paint.
  - .2 Level surface by planing and sanding.
  - .3 Apply wood epoxy filler to voids in and around knot.

**END OF SECTION**



**Part 1            General**

**1.1            SECTION INCLUDES**

- .1      Men's House - Removal and replacement of cedar shingle roofing, repair dormers
- .2      Museum - Removal and replacement of cedar shingle roofing
- .3      Doctor's Office - Removal and replacement of cedar shingle roofing
- .4      Picnic Shelter – Removal and replacement of cedar shingle roofing
- .5      Replacement of deteriorated roof decking

**1.2            RELATED REQUIREMENTS**

- .1      Section 01 35 03 - Conservation Treatment Procedures
- .2      Structural Drawings: Rafter tail replacement

**1.3            MATERIALS OWNERSHIP**

- .1      Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Parks Canada property, demolished materials shall become Contractor's property and shall be removed from Project site.

**1.4            DEFINITIONS**

- .1      Shingle: tapered slice of wood sawn from block with taper in direction of grain or axial direction.

**1.5            REFERENCES**

- .1      ASTM International (ASTM)
  - .1          ASTM A653/A653M-15e1 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - .2          ASTM F1667-17, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
- .2      CSA Group (CSA)
  - .1          CSA A123.3-05(R2015), Asphalt Saturated Organic Roofing Felt
  - .2          CSA B111-1974(R2003), Wire Nails, Spikes and Staples
  - .3          CSA O118.1-08 (R2013), Western Red Cedar Shakes and Shingles
  - .4          CSA-O141-05 (R2014) - Softwood Lumber
- .3      Cedar Shake and Shingle Bureau (CSSB)
  - .1          CSSB-97, Cedar Shake and Shingle Grading Rules
  - .2          CSSB New Roof Construction Manual 2014
- .4      National Lumber Grading Authority (NLGA)
  - .1          NLGA Standard Grading Rules for Canadian Lumber 2017

## **1.6 ADMINISTRATIVE REQUIREMENTS**

- .1 Preinstallation Conference: Conduct conference at Project site.
  - .1 Review minutes of Historic Treatment Preconstruction Conference that pertain to treatment of historic roofing.
  - .2 Review methods and procedures related to roof replacement Work including, but not limited to, the following:
    - .1 Verify project requirements, including mock-up requirements
    - .2 Verify substrate conditions.
    - .3 Review proposed replacement methods and materials.
    - .4 Co-ordinate products, installation methods and techniques.
    - .5 Review temporary protection requirements.
    - .6 Existing conditions that may require notification of Departmental Representative before proceeding.
- .2 Sequencing: Treat replacement rafter tails with wood preservative after machining but before installation

## **1.7 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Action Submittals:
  - .1 Product Data: for shingles, and specified underlayment products.
  - .2 Shop Drawings: Provide Shop Drawings: in accordance with Section 01 33 00 - Submittal Procedures.
    - .1 Include the following details:
      - .1 Dormer construction.
      - .2 Flashing profiles and installation.
  - .3 Samples: Duplicate 300 by 300 mm samples of ventilated underlayment.
- .3 Informational Submittals:
  - .1 Qualification Statement: Installer qualifications, including previous projects.
  - .2 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
  - .3 Photographs: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by roofing operations. Submit before Work begins.

## **1.8 QUALITY ASSURANCE**

- .1 Grading Agency Qualifications: An independent testing and inspecting agency recognized by authorities having jurisdiction as qualified to label wood shingles for compliance with referenced grading rules.
- .2 Source Limitations: Obtain wood shingles from single source from single manufacturer.

- .3 Fire-Resistance Characteristics: Provide wood shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by ULC or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

- .1 Exterior Fire-Test Exposure: Class C to ULC S107.

- .4 Installer Qualifications:

- .1 Company specializing in performing the work of this section with documented experience.

- .2 Successful completion of at least three projects of similar scope and complexity.

## **1.9 MOCK-UP**

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct mock-up large enough to include specified shingle pattern, eave protection, ridge, and valley details.
- .3 Construct portion of sidewall shingling at dormer including corner, valley, and flashing.
- .4 Allow 48 hours for review of mock-up by Departmental Representative before proceeding with wood shingle work.
- .5 Approved mock-up of dormer may remain as part of the Work.

## **1.10 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Shingles:
  - .1 Provide platform to prevent bundles and loose shingles coming in contact with ground.
  - .2 Cover top of bundles to keep out rain and prevent over-drying.
- .3 Store underlayment rolls on end, on pallets or other raised surfaces. Do not double stack rolls.
- .4 Protect waterborne wood preservatives from freezing.

## **1.11 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

## **1.12 PROJECT CONDITIONS**

- .1 Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from roofing operations.
- .2 Weather Limitations:
  - .1 Proceed with roofing work only when existing and forecasted weather conditions permit Work to proceed without water entering existing roof system or building, and as specified.
  - .2 Do not install shingles on wet or frozen substrate.
  - .3 Apply wood preservative to wood surfaces with surface temperature between 5 and 32 deg C.

**Part 2 Products**

**2.1 MANUFACTURERS**

- .1 Member of the Cedar Shake and Shingle Bureau (CSSB).
- .2 Shingles with Certi-label indicating:
  - .1 Product grade.
  - .2 Product type.
  - .3 Independent third-party quality control agency.
  - .4 Compliance with Total Quality Manufacturing system.
  - .5 Mill Name, location and phone number.
  - .6 Industry product description.
  - .7 Product dimensions.
  - .8 Cedar Bureau label number.
  - .9 Building Code Compliance numbers.
  - .10 Product performance tests passed.
  - .11 Label identification number.
  - .12 UPC Code.
  - .13 Coverage chart and recommended exposure.
  - .14 Application instructions.

**2.2 MATERIALS**

- .1 Roofing Shingles:
  - .1 Species: Western Red Cedar to CSA O118.1.
  - .2 Grade: CSSB No. 1 Blue Label Certi-grade; fire-retardant treated.
  - .3 Face: Sawn both sides, clear heartwood, 100% edge grain, no defects.
  - .4 Widths: random widths, 75 mm minimum; 355 mm maximum dimension.
  - .5 Lengths: 457 mm.
  - .6 Thickness: 5/2, five butts together equals 50 mm.
  - .7 Exposure: 127 mm.
  - .8 Butt pattern: Chisel shape to match existing at Museum; plain elsewhere.
- .2 Dormer Sidewall Shingles - Men's House: as specified for roof shingles.
- .3 Ridge and Hip Boards: Site-fabricated units of Eastern White Pine, Eastern Red Pine, or Western White Pine, Select Grade C or better, dressed to size indicated; air-dried and thoroughly seasoned or kiln-dried to maximum moisture content 15%, maximum lengths; beveled, overlapped, and screw-fastened with stainless steel screws.
- .4 Trim Boards: WRCLA Western Red Cedar, grade A Clear to NLGA paragraph 200b, kiln-dried, size and profile to match existing.
- .5 Rake Boards: WRCLA Western Red Cedar bevel siding, grade A clear grade to NLGA paragraph 201b, kiln-dried, size and profile to match existing.
- .6 Dimension Lumber: to CSA-O141, softwood lumber unless indicated otherwise, S4S, air-dried and thoroughly seasoned or kiln-dried with maximum moisture content 15%; graded to NLGA Standard Grading Rules for Lumber.
  - .1 Roof Decking: Commercial grade, species Douglas Fir-Larch, nominal board size to match existing approximately 30 mm thick by 150 to 184 mm wide, square edge.

- .2 Rafter Tails: Refer to Structural.
- .7 Underlayment: to CSA A123.3, No.15 asphalt-saturated organic felt.
- .8 Ventilated Underlayment: Three-dimensional nylon matrix, fire-resistant.
  - .1 Acceptable Products: Cedar Breather Ventilated Underlayment manufactured by Benjamin Obdyke; CedAir-Mat manufactured by Advanced Building Products.
- .9 Flashing: Hot dipped galvanized to ASTM A653, minimum 0.476 mm thick, with Z275 coating. Provide two coats of clear acrylic where in contact with cedar.
- .10 Nails:
  - .1 Flashing Nails: to be of same material as sheet metal to CSA B111, flat head roofing nails of length and thickness suitable for metal flashing application.
  - .2 Shingle Nails: to CSA B111 or ASTM F1667, flat head, diamond point, length to penetrate minimum 19 mm into deck boards, Type 316 stainless steel.
  - .3 Felt Underlayment Nails: Stainless-steel wire nails; with 25-mm- minimum diameter, low-profile capped heads or disc caps.
- .11 Screws: Stainless steel Type 316; type and size suitable for application.
- .12 Flashing Mortar at Stone Chimneys: Lime mortar parging made of 1-part Medusa, 3-parts lime putty, and 9-parts sand by volume.
- .13 Wood Preservative (Surface Application): Water-soluble inorganic borate salt containing compound with insecticidal, termiticidal and fungicidal properties, made of a combination of glycol and borate. Colourless. Active ingredient: 25.31% disodium Octaborate Tetrahydrate by weight.
  - .1 Basis-of-Design Product: Shell-Guard Concentrate.

## **2.3 FLASHING FABRICATION**

- .1 Form flashings to profiles indicated on Drawings, and as specified to protect materials from physical damage and shed water.
- .2 Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance, with soldered joints.
- .3 Chimney Flashing:
  - .1 Head Flashing: Fabricate with vertical leg extending up chimney to a height not less than 75 mm, and up the roof slope to a point equal in height to the flashing on the chimney but not less than 1 1/2 times shingle exposure.
  - .2 Apron Flashings: Fabricate with lower flange extending 1.5 times shingle exposure or minimum 150 mm over and 100 mm beyond each side of downslope wood roofing and 100 mm up the vertical surface.
- .4 Step Flashings: Fabricate with a head lap of minimum 75 mm, and minimum extension of 100 mm both horizontally and vertically.
- .5 Drip Edges (for Picnic Shelter): Fabricate in length not exceeding 3 m with 100 mm roof deck flange, 50 mm fascia flange with 10 mm drip at lower edge.
- .6 Hem exposed edges of flashings minimum 6 mm on underside.
- .7 Apply bituminous paint on concealed surfaces of flashings.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Examine surfaces scheduled for complete roofing replacement.

**3.2 PROTECTION**

- .1 Protect existing roofing materials indicated to remain.
  - .1 Limit traffic to areas of existing roofing that have been protected.
  - .2 Do not store materials on existing roofing.
  - .3 During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- .2 Use ground protection under work areas to collect debris and waste.

**3.3 REROOFING**

- .1 Stripping off Existing Roofing:
  - .1 Remove existing shingle roofing, and dormer finishes where indicated including flashings and underlayment. Expose deck boards of roof and dormers.
  - .2 Withdraw existing shingle and flashing nails. Do not hammer nails into boards. Leave surfaces free from dirt and loose material.
- .2 Roof and Sidewall Sheathing Preparation:
  - .1 Check for presence of moisture by visually observing deck boards.
  - .2 Report to Departmental Representative unforeseen deficiencies and deterioration.
  - .3 Remove deteriorated, wet or damp deck boards as directed by Departmental Representative.
  - .4 Remove loose nails in deck boards, and refasten in place.
  - .5 Replace cut out portions of deck boards with boards of equal sectional dimensions, and specified grade. Seat each end of board on rafter, with 25 mm bearing, and secure to rafter.
  - .6 Inform Departmental Representative when work is completed and ready for review.
- .3 Disposal of Demolished Materials:
  - .1 Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
  - .2 Transport and legally dispose of demolished materials off site.
- .4 Flashing Installation:
  - .1 Valley Flashings:
    - .1 Place one ply of underlayment over area covered by valley flashing. Lap strips of underlayment in shingle fashion by 100 mm. Fasten with nails.
    - .2 Extend valley flashing from centreline of valley, up each side a distance of at least 250 mm.
    - .3 Lap transverse joints in valley flashing in shingle fashion with minimum 250 mm lap. Solder joints.

- .2 Hip and Ridge Flashing:
  - .1 Place one ply of underlayment over area covered by hip and ridge flashing. Lap strips of underlayment in shingle fashion by 100 mm. Fasten with nails.
  - .2 Install hip and ridge flashing beneath hip and ridge boards. Extend flashing on each side of ridge 75 to 100 mm.
- .3 Base:
  - .1 Where base flashing is stepped, ensure steps are equal, horizontal width between 230 and 300 mm.
  - .2 On sloped intersections, lap sheets minimum 75 mm.
  - .3 When run horizontally, flat lock and solder sheets.
  - .4 Provide lock seam joints at vertical corners of chimney flashing.
- .5 Drip Edges (Picnic Shelter): Install beneath underlayment and fasten to roof deck at 400 mm on centre.
- .6 Roof and Sidewall Shingle Application:
  - .1 Install shingles over dry substrate.
  - .2 Spacing:
    - .1 Roof and Sidewall Shingles on Historic Buildings: to match existing.
    - .2 Roof Shingles on non-historic buildings:
      - .1 Shingles under 130 mm wide minimum 3 mm joints.
      - .2 Shingles over 130 mm wide 6 to 10 mm joints.
  - .3 Joints: Stagger side lap joints 38 mm with no joint lining up within three courses.
  - .4 Nailing:
    - .1 Use two nails per shingle. Space nails 19 mm from edge 40 mm above exposure line of following course.
    - .2 Provide double starter course at eaves. Provide additional line of nailing 13 mm back from overhang. Spacing to be similar to that of typical roof course. Do not drive nails through eave boards if overhang does not have a soffit.
    - .3 Provide extra nailing to final course of shingles at ridge, approximately 25 mm down from ridge if sawing off, or breaking off of extra shingle length, in situ, is required.
    - .4 Drive nails flush but do not crush shingles.
- .7 Starter Course:
  - .1 Double shingles at eaves.
  - .2 Block up starter course sufficient to bring high points of all shingle courses into alignment.
  - .3 Project butts 40 mm beyond roof deck.
- .8 Typical Course:
  - .1 Install shingles with 127 mm weather exposure and having triple thickness of shingles at any given point.
  - .2 Lay shingles with grain perpendicular to eaves.
  - .3 Keep shingles 25 mm clear of vertical flashing.

- .9 Finishing Gable Rake:
  - .1 Place 150 mm strip of bevel cedar siding full length of each rake and with thinner edge inward to give shingles slight tilt away from gable.
  - .2 Cut back butts of shingles that rest on cedar strip to produce slight slant.
  - .3 Clip off upper corner of edge shingles.
  - .4 Extend shingles over gable or rake end, rafter, or barge boards 25 to 30 mm.
- .10 Finishing Closed Valleys:
  - .1 Do not lay shingles or shakes with grain parallel to centreline of valleys.
  - .2 Keep mitred edges of shingles laid each side of valley 13 mm apart.
  - .3 Use only unbroken joints into valleys.
- .11 Finishing Hips and Ridges:
  - .1 Carry slope shingles of main roof up to centreline of hips and ridge.
  - .2 Fasten site-fabricated hip and ridge boards using stainless steel screws at 300 mm oc with overlap facing away from prevailing wind direction.

### 3.4 MUSEUM ROOF AND PICNIC SHELTER

- .1 General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- .2 Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at eaves. Lap sides minimum 100 mm over underlying course. Lap ends minimum 100 mm. Stagger end laps between succeeding courses at least 1830 mm. Fasten with felt underlayment nails.
- .3 Ventilated Underlayment:
  - .1 Install on roof deck parallel with and starting at eaves with dimples facing towards roof deck. Install flush against eave and rake edges.
  - .2 Tack underlayment in place in accordance with manufacturers instructions.
  - .3 Do not lap layers. Butt each course against previous course.
  - .4 Work from eave to ridge while installing shingles to avoid walking directly on underlayment.

### 3.5 MEN'S HOUSE SHINGLE SIDE WALLING AT DORMERS

- .1 Single Coursing:
  - .1 Provide doubled lowest course. Install first course with butt 13 mm lower than butt of undercourse.
  - .2 Block up starter course to bring high points of all shingle courses into alignment.
  - .3 Install shingles with 127 mm weather exposure and having minimum double thickness of shingles at any given point.
  - .4 Securely fasten shingles by nailing about 50 mm above butt line of course above, with minimum two nails per shingle, except three nails per shingle wider than 200 mm. Provide one nail 19 mm from each edge of shingles and third nail in centre of shingles wider than 200 mm.
  - .5 Provide nails of appropriate length so that nails to not penetrate through dormer sides.
- .2 Finishing outside corners: Fit shingles against corner boards.



**3.6 FLASHING MORTAR**

- .1 Remove loose flashing mortar around chimneys.
- .2 Apply lime mortar parging to full cover metal flashing around chimneys to deflect rainwater onto shingles.
- .3 Match height and profile of existing parging.

**3.7 RAFTER TAIL TREATMENT**

- .1 Mix and apply surface-applied preservative treatment to manufacturer's written instructions after machining rafter tails.
  - .1 Brush apply two coats of preservative treatment to all surfaces of rafter tails before installation.
  - .2 Allow preservative to be absorbed dry between coats, and prior to erecting members.
  - .3 Protect vegetation in area of application from spills and splatters. Do not contaminate water when disposing of equipment wash-water.

**3.8 PROTECTION**

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

**END OF SECTION**



**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Museum, and Doctor's Office - Replacement of damaged historic wood siding and trim

**1.2 RELATED REQUIREMENTS**

- .1 Section 01 35 03 - Conservation Treatment Procedures
- .2 Section 08 03 52 - Conservation Treatment for Period Wood Windows, for repair of window windows and trim
- .3 Section 09 03 91 - Conservation Treatment for Period Painted Finishes, for cleaning and refinishing historic wood siding

**1.3 MATERIALS OWNERSHIP**

- .1 Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Parks Canada property, demolished materials shall become Contractor's property and shall be removed from Project site.

**1.4 REFERENCES**

- .1 ASTM International
  - .1 ASTM F1667-17, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
- .2 CSA International
  - .1 CSA A123.3-05(R2015), Asphalt Saturated Organic Roofing Felt
  - .2 CSA B111-1974(R2003), Wire Nails, Spikes and Staples
- .3 National Lumber Grading Authority (NLGA)
  - .1 NLGA Standard Grading Rules for Canadian Lumber 2017

**1.5 ADMINISTRATIVE REQUIREMENTS**

- .1 Preinstallation Conference: Conduct conference at Project site.
  - .1 Review minutes of Historic Treatment Preconstruction Conference that pertain to treatment of historic siding.
  - .2 Review methods and procedures related to siding repair and replacement Work including, but not limited to, the following:
    - .1 Verify project requirements, including mock-up requirements
    - .2 Verify substrate conditions.
    - .3 Review proposed repairing methods and materials.
    - .4 Review proposed replacement methods and materials.
    - .5 Co-ordinate products, installation methods and techniques.
    - .6 Review temporary protection requirements.
    - .7 Existing conditions that may require notification of Departmental Representative before proceeding.

**1.6 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Submit printed product literature and data sheets for [wood siding] and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Submit duplicate 300 mm long samples of each type of siding to match existing materials, illustrating surface texture and profile.
- .4 Informational Submittals:
  - .1 Qualification Statement: Installer qualifications, including previous projects.

**1.7 QUALITY ASSURANCE**

- .1 Installer Qualifications:
  - .1 Company specializing in performing the work of this section with documented experience.
  - .2 Successful completion of at least three projects of similar scope and complexity.

**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 Store underlayment rolls on end, on pallets or other raised surfaces. Do not double stack rolls.

**1.9 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

**1.10 PROJECT CONDITIONS**

- .1 Protect buildings to be have siding replaced, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from siding operations.
- .2 Weather Limitations: Proceed with siding work only when existing and forecasted weather conditions permit Work to proceed without water entering existing wall system, and as specified.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Lumber Siding: to NLGA Standard Grading Rules for Canadian Lumber.
  - .1 Rabetted Bevel Siding: Wood species to match existing, kiln-dried, surface texture and profile size and shape to match existing. Finger-jointing is not acceptable. Location: Museum.
  - .2 Lap Cove Siding: Wood species to match existing, kiln-dried, surface texture and profile size and shape to match existing. Finger-jointing is not acceptable. Pattern may be similar to 105 WRCLA SL5. Location: Doctor's Office.

- .2 Replacement Trim Boards: Wood species to match existing, air dried to 15% moisture content, growth rings and grain orientation to match parts being repaired. Finger-jointing not permitted.
  - .1 Profiled replacement wood trim to match existing components.
  - .2 Use material to match existing as close as possible in terms of species, finish and dimension.
- .3 Accessory Components: Starter strips, trim, of same material and finish as siding.
- .4 Dimension Lumber: to CSA-O141, softwood lumber unless indicated otherwise, S4S, air-dried and thoroughly seasoned or kiln-dried with maximum moisture content 15%; graded to NLGA Standard Grading Rules for Lumber.
  - .1 Strapping: Commercial grade, species Douglas Fir-Larch, nominal board size to match existing, square edges.
- .5 Nails:
  - .1 Where existing nails are hand-forged, provide new nails to match existing.
  - .2 Otherwise: to CSA B111 or ASTM F1667, corrosion-resistant, stainless steel, splitless, ring-shank, marine-grade type; non-staining, of size and strength to securely and rigidly retain the work, length to provide 32 mm penetration into nailing substrate. Head shape to match existing
- .6 15# Felt: to CSA A123.3, No.15 asphalt-saturated organic felt.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

- .1 Examine surfaces to be repaired.

#### **3.2 PROTECTION**

- .1 Protect existing siding materials indicated to remain.
- .2 During replacement operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- .3 Use ground protection under work areas to collect debris and waste.

#### **3.3 PREPARATION**

- .1 Carefully clean, scrape and wash wood siding as required to assess condition, and to determine extent of repairs required.
- .2 Verify condition and extent of repair work with Departmental Representative. Submit report documenting existing conditions and agreed to extent of repair work to Departmental Representative before starting repair work.

#### **3.4 REMOVAL AND REPLACEMENT**

- .1 Carefully remove existing siding, trim, and underlying materials where indicated. Cut back damaged or decayed wood to a point 10 mm beyond the last evidence of decay or as indicated on Drawings.
- .2 Carefully withdraw existing siding nails. Set nails that break off. Do not withdraw nails through face of boards.

- .3 Maintain existing flashing in place, unless otherwise directed by Departmental Representative to remove and replace.
- .4 Preparation:
  - .1 Check for presence of moisture by visually observing supporting framing.
  - .2 Report to Departmental Representative unforeseen deficiencies and deterioration.
  - .3 Remove deteriorated, wet or damp strapping, plywood, and framing and felt underlayment as directed by Departmental Representative.
  - .4 Replace cut out portions of strapping, plywood, and framing with materials of equal sectional dimensions, and grade. Secure to adjoining framing.
  - .5 Replace cut out portions of felt underlayment. Lap existing materials 50 mm.
  - .6 Inform Departmental Representative when work is completed and ready for review.
- .5 Horizontal Siding:
  - .1 Install horizontal siding using single course method with exposure to match existing.
  - .2 Hand nail at spacing to match existing nailing pattern. Fasten siding in place level and plumb.
  - .3 Scarf horizontal end joints tight at 45 degrees. Stagger horizontal end joints not less than 800 mm.
  - .4 Corners: Butt boards into vertical trim.
  - .5 Position cut ends over bearing surfaces. Sand cut edges smooth and clean. Seal cut surfaces.
  - .6 Do not overdrive nails in siding.
- .6 Trim:
  - .1 Scarf in replacement trim pieces.
  - .2 Attach replacement materials to the parent piece, not adjacent components.
  - .3 Trial fit joints before fastening in place. Adjust as necessary to ensure close accurate fit with adjacent surfaces.

### **3.5 PROTECTION**

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

**END OF SECTION**

**Part 1            General**

**1.1            SECTION INCLUDES**

- .1       Polystyrene insulation
- .2       Polyurethane foam insulating sealant

**1.2            REFERENCES**

- .1       ASTM International (ASTM)
  - .1       ASTM C177-13, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
  - .2       ASTM C518-10, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- .2       Underwriters Laboratories of Canada (ULC)
  - .1       CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings
  - .2       CAN/ULC-S710.1-11, Standard for Thermal Insulation – Bead-Applied One Component Polyurethane Air Sealant Foam, Part 1: Material Specification
  - .3       CAN/ULC-S710.2-11, Standard for Thermal Insulation – Bead-Applied One Component Polyurethane Air Sealant Foam – Part 2: Installation

**1.3            ACTION AND INFORMATIONAL SUBMITTALS**

- .1       Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2       Action Submittals:
  - .1       Product Data: Submit manufacturer's printed product literature, specifications, and data sheets.
- .3       Informational Submittals:
  - .1       Evaluation Reports: Provide CCMC evaluation report for polyurethane foam insulating sealant.

**1.4            QUALITY ASSURANCE**

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

**1.5            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 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

## **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

## **Part 2 Products**

### **2.1 INSULATION**

- .1 Board Insulation - Extruded Polystyrene Insulation (XPS): to CAN/ULC-S701, thickness indicated.
  - .1 Type: 4.
  - .2 Compressive strength: minimum 200 kPa.
  - .3 Thickness: indicated.
  - .4 Thermal Resistance per 25 mm thickness: minimum 0.87 m<sup>2</sup> C/W when tested in accordance with ASTM C177 or ASTM C518.
  - .5 Location: below grade.
- .2 Polyurethane Foam Insulating Sealant: to CAN/ULC-S710.1, one-part open-cell polyurethane foam sealant, low-expansion, remains flexible after curing, skin-forming type. CCMC-listed.

## **Part 3 Execution**

### **3.1 INSTALLATION – BOARD INSULATION**

- .1 Below Grade:
  - .1 Lay boards extending horizontally as indicated. Butt board joints tightly.
  - .2 Place boards in a method to maximize contact with bedding.

### **3.2 INSTALLATION – POLYURETHANE FOAM INSULATING SEALANT**

- .1 Install in accordance with CAN/ULC-S710.2, and manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Fill gaps and voids where indicated. Fit insulation tight around penetrations. Apply in layers to allow foam to cure.
- .3 Do not enclose insulation until it has been reviewed by Departmental Representative.



**3.3            CLEANING**

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

**END OF SECTION**



**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Below grade vapour retarder in crawlspace of Farm Manager's House (Fraser House)

**1.2 REFERENCES**

- .1 ASTM International (ASTM)
  - .1 ASTM D1709-09-16ae1, Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
  - .2 ASTM E96/E96M-16, Standard Test Methods for Water Vapor Transmission of Materials.
  - .3 ASTM E154/E154M-08(2013)e1, Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs.
  - .4 ASTM E1643-18a, Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
  - .5 ASTM E1745-17, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Action Submittals:
  - .1 Product Data: Provide data indicating material characteristics and performance criteria.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

**Part 2 Products**

**2.1 SHEET MATERIALS**

- .1 Vapour Retarder: To ASTM E1745, Class A, 0.381 mm thick.
  - .1 Water Vapour Permeance: 0.0063 perms to ASTM E96.
  - .2 Puncture Resistance: >3200 grams to ASTM D1709, Method B.
  - .3 Tensile Strength: 12.61 kN/m to ASTM E154, Section 9.
  - .4 Acceptable Products: WR Meadows Perminator 15.

**2.2 ACCESSORIES**

- .1 Joint Sealing Membrane: Water-based, liquid waterproofing membrane recommended by vapour retarder manufacturer.
- .2 Joint Sealing Tape: High density polyethylene tape with pressure sensitive adhesive, 100 mm wide.
- .3 Primer: As recommended by vapour retarder manufacturer to promote adhesion of joint sealing tape.

- .4 Termination Bar: High-strength, UV-resistant, non-corrosive plastic, pre-drilled, trapezoidal shape to provide trough for sealing mastic at top.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

- .1 Examine areas and conditions under which work is to be performed.
  - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied.
- .2 Verify sub-grade is properly prepared and at correct elevation, level, smooth without sharp projections that could puncture vapour retarder.
- .3 Start of Work implies acceptance of conditions.

#### **3.2 PREPARATION**

- .1 Remove loose or foreign matter which might impair adhesion.

#### **3.3 INSTALLATION**

- .1 Install vapour retarder in accordance with requirements of ASTM E1643.
- .2 Use sheets of largest practical size to minimize joints.
- .3 Lap ends and side joints 150 mm. Clean joint area free of dust, dirt and moisture. Seal with liquid waterproofing membrane. Allow membrane to cure, and tape seams continuously.
- .4 Prime concrete surfaces where required to promote adhesion of sealing tape, in accordance with manufacturer's instructions.
- .5 Seal vapour retarder to foundations, and around penetrations using joint sealing tape, and mechanically fasten to inside face of foundation walls. Apply bead of pointing mastic along top edge of termination bar.
- .6 Inspect for continuity and repair in accordance with ASTM E1643 and as follows.
  - .1 Repair small punctures and tears with sealing tape before work is concealed.
  - .2 Where damage to vapour retarder exceeds tape width, repair with additional layer of vapour retarder, minimum 150 mm overlap in all directions from edge of damage.
    - .1 Tape continuously around perimeter of patch.

**END OF SECTION**

**Part 1            General**

**1.1            SECTION INCLUDES**

- .1       Replacement of sealed glazing units in Administration Building (Simkin House)

**1.2            RELATED REQUIREMENTS**

- .1       Section 08 03 52 - Conservation Treatment for Period Wood Windows, glass replacement in historic windows

**1.3            REFERENCES**

- .1       ASTM International (ASTM)
  - .1       ASTM E1300-09, Standard Practice for Determining Load Resistance of Glass in Buildings
- .2       Canadian General Standards Board (CGSB)
  - .1       CAN/CGSB 12.3-M91(R2017), Flat, Clear Float Glass
  - .2       CAN/CGSB 12.8-97 - Insulating Glass Units
  - .3       CAN/CGSB 12.20-M89 - Structural Design of Glass for Buildings
- .3       Glass Association of North American (GANA)
  - .1       GANA Glazing Manual, latest edition.
- .4       Insulating Glass Manufacturers Alliance (IGMA)
  - .1       TM-3000-90(16), North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use

**1.4            ADMINISTRATIVE REQUIREMENTS**

- .1       Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

**1.5            ACTION AND INFORMATIONAL SUBMITTALS**

- .1       Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2       Product Data: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements for each type of glass, and glazing sealant.

**1.6            QUALITY ASSURANCE**

- .1       Perform Work in accordance with IGMA, GANA Glazing Manual glazing installation methods.
- .2       Manufacturer Qualifications for Insulating-Glass Units with Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
- .3       Installer Qualifications: Company specializing in performing the work of this section with documented experience and approved by the manufacturer.
- .4       Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGMA.

**1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

**1.8 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

**1.9 AMBIENT CONDITIONS**

- .1 Do not install glazing or glazing sealants when ambient temperature is less than 10 degrees C.
- .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

**1.10 WARRANTY**

- .1 Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
  - .1 Warranty Period: 10 years.

**Part 2 Products**

**2.1 PERFORMANCE REQUIREMENTS**

- .1 General: Installed glazing systems shall withstand normal thermal movement and wind loads without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- .2 Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
  - .1 Use inner light of multiple light sealed units for continuity of air and vapour seal.
- .3 Delegated Design: Design glass, including comprehensive engineering analysis according to CAN/CGSB-12.20 or ASTM E1300, and Manitoba Building Code by a qualified professional engineer.
  - .1 Design Wind Pressures: Per National Building Code for Project location.
  - .2 Design Snow Loads: Per National Building Code for Project location.
  - .3 Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
    - .1 Temperature change: 65 deg C ambient.
  - .4 Design, and verify maximum glass sizes, thickness, strength, for glass types specified, to support design, and maximum allowable uniform static loads, using design factor of 2.5, in accordance with CAN/CGSB 12.20 or ASTM E1300, but thickness shall not be less than as specified in this Section.
- .4 Limit mullion deflection to L/175; with full recovery of glazing materials.

## **2.2 GLASS MATERIALS**

- .1 Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
- .2 Source Limitations for Glass: Obtain coated float glass, and insulating glass from single source from single manufacturer for each glass type.
- .3 Strength: Where float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully-tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide fully tempered float glass.
- .4 Float glass: to CAN/CGSB-12.3, glazing quality, minimum 6 mm thick.
- .5 Insulating Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to CAN/CGSB 12.8, with silicone secondary edge seals in accordance with ASTM C 1249, and complying with other requirements specified.
  - .1 Insulating glass units: Double unit, 25 mm overall thickness.
    - .1 Glass: to CAN/CGSB-12.3.
    - .2 Glass thickness: minimum 6 mm each light.
    - .3 Inter-cavity space: 12 mm, with low conductivity spacers.
    - .4 Glass coating: surface number 2, low "E" soft-sputtered coating.
    - .5 Inert gas fill: argon.

## **2.3 ACCESSORIES**

- .1 General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- .2 Primer, Sealers, Cleaners: Types recommended by sealant or gasket manufacturer.
- .3 Setting blocks: Elastomeric material with a Shore, Type A durometer hardness of 85,  $\pm 5$ , recommended by the manufacturer as being acceptable for use in the intended application, and compatible with glass and glazing materials.
- .4 Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lights in place for installation indicated.
- .5 Glazing Tape: Preformed butyl compound, paper released backed.
  - .1 Acceptable Products: Tremco 440 tape, black.
- .6 Glazing Sealants - General:
  - .1 Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, fire-rated glass, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  - .2 Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

## **2.4 FABRICATION OF GLAZING UNITS**

- .1 Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Existing Conditions: verify conditions of substrates.
  - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .2 Verify glass is free of chips, cracks, and other inclusions that could inhibit structural or aesthetic integrity.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 GLAZING, GENERAL**

- .1 Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- .2 Protect glass edges from damage during handling and installation. Remove damaged glass from site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- .3 Provide spacers for glass lights where length plus width is larger than 1270 mm as follows:
  - .1 Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - .2 Provide 3-mm minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- .4 Provide edge blocking where indicated or needed to prevent glass lights from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

### **3.3 INSULATING GLAZING UNIT REPLACEMENT**

- .1 Carefully remove existing glazing stops on inside of windows.
- .2 Carefully remove existing insulating glass unit.
- .3 Remove glazing tapes and adhesives from permanent stops.
- .4 Clean contact surfaces with solvent and wipe dry.



- .5 Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
  - .1 Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
  - .2 Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
  - .3 Do not remove release paper from tape on fixed stops until just before each glazing unit is installed.
- .6 Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapour seal.
- .7 Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- .8 Centre glass light in openings and rest glazing on setting blocks. Push glass light firmly against tape for full contact at perimeter of unit.
- .9 Place glazing tape on free perimeter of glazing in same manner described, or on face of removable glazing stops facing glass. Install removable stops without displacement of tape. Exert pressure on tape for full continuous contact.
  - .1 Trim protruding tape edge.
- .10 Replace interior glazing stops with new glazing stops to match if they are damaged/deteriorated as directed by Departmental Representative.

### **3.4 CLEANING**

- .1 Remove glazing materials from finish surfaces.
- .2 Remove labels after Work is complete.
- .3 Clean glass and adjacent surfaces. Clean both sides of glass surfaces.
- .4 Repair damage to adjacent materials caused by glazing installation.

**END OF SECTION**



**Part 1            General**

**1.1            SECTION INCLUDES**

- .1    Restoration and repair of existing wood windows
- .2    Replacement of existing deteriorated wood window components
- .3    Replacement of damaged and missing hardware
- .4    Removal and reglazing of existing glass lights
- .5    Replacement of broken and missing glass

**1.2            RELATED REQUIREMENTS**

- .1    Section 01 32 33 - Photographic Documentation
- .2    Section 01 35 03 - Conservation Treatment Procedures: Administrative, procedural, and temporary work requirements
- .3    Section 06 03 20 - Conservation Treatment for Period Finish Carpentry, for in-situ repairs of finish carpentry and wood doors
- .4    Section 08 06 11 - Period Wood Door Assessment Schedule
- .5    Section 08 06 50 - Period Wood Window and Dormer Assessment Schedule
- .6    Section 09 03 91 - Conservation Treatment for Period Painted Surfaces, for paint treatments

**1.3            REFERENCES**

- .1    ASTM International (ASTM)
  - .1    ASTM F1667-17, Standard Specification for Driven Fasteners: Nails, Spikes and Staples
- .2    Canada's Historic Places
  - .1    Standards and Guidelines for the Conservation of Historic Places in Canada
- .3    CSA Group
  - .1    CSA O141-05(R2014), Softwood Lumber
  - .2    CSA B111-1974(R2003), Wire Nails, Spikes and Staples
- .4    Canadian General Standards Board (CGSB)
  - .1    CGSB-12.3-M91(R2017), flat, Clear Float Glass

**1.4            ADMINISTRATIVE REQUIREMENTS**

- .1    Preinstallation Conference: Conduct conference at Project site.
  - .1    Review minutes of Historic Treatment Preconstruction Conference that pertain to treatment of period wood windows and trim.
  - .2    Review methods and procedures related to repair work including, but not limited to, the following:
    - .1    Verify project requirements, including mock-up requirements
    - .2    Verify substrate conditions.
    - .3    Review proposed repair and replacement methods and materials.

- .4 Co-ordinate products, installation methods and techniques.
  - .5 Review temporary protection requirements.
  - .6 Existing conditions that may require notification of Departmental Representative before proceeding.
- .2 Coordination: Undertake each step of window restoration and repair including tagging, disassembly, surface preparation, repair, painting and installation under review of Departmental Representative.
- .3 Sequencing:
  - .1 Do not start restoration and repair of windows before having a photographic record of surfaces from inside and outside.
  - .2 Complete remedial work of adjacent construction designated to remain before reinstallation of sashes.

## **1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Action Submittals:
  - .1 Preconstruction Submittals:
    - .1 Submit a description of methods of work to be employed for removal, packing and transport; paint and dirt removal; repair and restoration, and assembly, painting, and re-installation.
    - .2 Include information on infrared heater for removing putty and paint.
    - .3 Provide photographic documentation of wood windows before, during and after the works in accordance with Section 01 32 33 – Photographic Documentation.
    - .4 Existing condition report and agreed to repair work.
    - .5 Obtain written approval of products, materials, operations, schedules and methods from Departmental Representative before starting with work of this Section.
  - .2 Product Data: Submit product data sheets and MSDS information for each product or material used in the execution of the work of this Section.
  - .3 Shop Drawings:
    - .1 Indicate plans and elevations of units; materials, surface grain directions, details at 1:2 scale for head, jamb, sill profiles of components, joint details, glazing details, and anchorage details.
  - .4 Samples: Submit 300 mm long of each new fabricated replacement part.
- .3 Informational Submittals:
  - .1 Qualification Statement: Restorer qualifications, including previous projects.

## **1.6 QUALITY ASSURANCE**

- .1 Restorer Qualifications:
  - .1 Company specializing in performing the work of this section with documented experience.
  - .2 Successful completion of at least three projects of similar scope and complexity.
- .2 Where sashes are removed to facilitate restoration and repair work, set up on-site workshop to complete restoration and repair work.

**1.7 MOCK-UP**

- .1 Construct Mock-Ups in accordance with Section 01 45 00 - Quality Control.
- .2 Construct Mock-Ups under supervision of Departmental Representative, to demonstrate a full understanding of specified procedures, techniques and formulations.
- .3 Include the following:
  - .1 Stainless steel tags for identification during removal of sashes.
  - .2 One of each repair technique result.
  - .3 Typical window repair including glass and glazing putty replacement, window trim replacement, and refinishing.
  - .4 Reinstallation of a restored sash window.
- .4 Allow 48 hours for review of mock-up by Departmental Representative.
- .5 Repeat mock-up until satisfactory results are obtained to approval of Departmental Representative.
- .6 When accepted by Departmental Representative in writing, mock-up will demonstrate minimum standard for this work. Accepted Mock-up may remain as part of finished work.

**1.8 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Replacement Wood Members: Clear slow growth Spruce lumber to CSA O141, air dried to 15% moisture content, growth rings and grain orientation to match parts being repaired. Finger-jointing not permitted.
  - .1 Profiled replacement wood members to match existing components.
  - .2 Use material to match existing as close as possible in terms of species, finish and dimension.
- .2 Glass:
  - .1 Existing glass: Salvage from existing sashes.
  - .2 New glass: Float glass to CAN/CGSB-12.3, thickness to match existing.
- .3 Filler and Glazing Materials:
  - .1 Organic linseed oil filler and glazing compound and made from cold pressed linseed oil and chalk produced in a vacuum process.
    - .1 Acceptable Product: Allbäck Linseed Putty.
  - .2 Shellac flakes, de-waxed.
- .4 Glazing Points: Non-ferrous metal.
- .5 Wood Preservative:
  - .1 Organic purified raw and boiled linseed oil.
  - .2 Turpentine.
- .6 Finishing Nails: to CSA B111 or ASTM F1667, No. 304 stainless steel finishing nails.

- .7 Nails: to CSA B111 or ASTM F1667, stainless steel, size and type to suit application.
- .8 Screws: for Dutchmen type repairs, brass or stainless steel sized to fit.
- .9 Wood Repair Materials:
  - .1 Liquid Wood Consolidant: Two-component compound forming a slow-curing, low-viscosity liquid epoxy consolidant designed for saturating and encapsulating wood decay, or priming damaged areas. Specifically used for consolidating and stabilizing pockets of wood decay, checks, fissures and other surface imperfections due to weather exposure or insect infestation. Applications include porous end grain, window sills, sash, jambs and trims.
    - .1 Basis-of-Design Products: RotFix Epoxy Wood Sealer and Consolidant manufactured by System Three Resins (Industrial Formulators); LiquidWood manufactured by Abatron; ConServ 100 Flexible Epoxy Consolidant manufactured by ConServ; Rhino Wood Repair System manufactured by Stell-Chem.
  - .2 Wood Epoxy Filler: Two-component, shrink-free adhesive compound for filling cavities, voids and surface imperfections in wood. Flexible to withstand expansion and contraction of wood, firm enough to replace damaged portions of wood. Easily tooled, carved, planed, drilled or sanded. Capable of accepting nails and screws. Able to be painted or stained solid.
    - .1 Basis-of-Design Products: Sculpwood Putty or Paste Epoxy Repair Compounds manufactured by System Three Resins (Industrial Formulators); WoodEpoxy manufactured by Abatron; ConServ Flexible Epoxy Patch 200 series manufactured by ConServ; Rhino Wood Repair System manufactured by Stell-Chem.
  - .3 Adhesive: Weather-resistant multi-purpose structural epoxy adhesive, medium viscosity, 2:1 mix ratio, room temperature or heat cure. Room temperature working time of 60-90 minutes, complete cure in 24 hours at 22 deg C. Capable of producing specific bond-line thickness, and prevent joint starvation from over-clamping. Can be machined, sanded, drilled, tapped, and painted. Solvent-free with 100% reactive components.
    - .1 Basis-of-Design Products: Cold Cure General Purpose Epoxy Resin System, G2 Epoxy Glue manufactured by System Three Resins (Industrial Formulators), or product acceptable to Departmental Representative manufactured by West System Epoxies.

## **2.2 EQUIPMENT**

- .1 Infrared Heater: as recommended by linseed oil paint manufacturer for removal of existing paint.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Examine areas and conditions under which work is to be performed and notify Departmental Representative in writing of conditions detrimental to the proper and timely completion of the work.
- .2 Notify Departmental Representative of conditions relevant to the Work, but not described in Drawings, including evidence of deficiencies, fungal or insect attack which may affect the scope of work and durability of the finished product.
- .3 Verify adequacy of backing and support.

### **3.2 PROTECTION**

- .1 Protect adjacent surfaces during sash removal, and repair of in-situ wood window components to prevent damage.
- .2 Use ground protection under work areas to collect debris and waste.

### **3.3 PREPARATION**

- .1 Follow designated substances guidelines for lead abatement for paint removal.
- .2 Clean and scrape window components as required to assess condition, and to determine extent of repairs required.
- .3 Verify condition and extent of repair work with Departmental Representative. Submit report documenting existing conditions and agreed to extent of repair work to Departmental Representative before starting repair work.
- .4 Existing Sashes:
  - .1 Before removing sashes, install two stainless steel tags with stainless steel wire to each window sash.
  - .2 Tag each sash with sufficient information to ensure configuration and orientation will be repeated during assembly and reinstallation. Include additional label information in drawings or tables as required.
  - .3 Record condition of each sash, and how it fits relative to adjacent construction using digital photography and annotated drawings before removal.
- .5 Mark window condition discrepancies on the drawing set and report immediately to the Departmental Representative.

### **3.4 WINDOW RESTORATION**

- .1 Restore windows in accordance with the reviewed Shop Drawings. Verify dimensions by on-site measurement. Record actual dimensions on Shop Drawings.
- .2 At Contractor's option, either restore window sashes in-place, or carefully remove and transport to on-site workshop for restoration.
- .3 Provide temporary protection of openings as specified in Section 01 56 00 – Temporary Barriers and Enclosures.
- .4 Carefully remove glazing compound and glass panels. Tag glass panels as to location before removing. Retain and clean glass panels for reinstallation.
- .5 Complete restoration on one window before starting work on subsequent openings.

### **3.5 WOOD REPAIR AND REPLACEMENT**

- .1 Refer to window repair notes on Drawings, Section 08 06 50 - Period Wood Window and Dormer Assessment Schedule, and as follows:
- .2 Severe Deterioration:
  - .1 Replace deteriorated wood members with new wood as specified in this Section.
  - .2 Tools:
    - .1 Use fine pry bars, such as Richardson bars, designed for this type of work, not pry bars intended for nail pulling, etc.
    - .2 Use fine sharp tool to cut paint films in construction joints before attempting to disassemble.
    - .3 Take care with tools to avoid marring, crushing or splitting components.

- .3 Upon removal of components, snap iron nails off flush with backside. For wire nails pull nails through from backside. Do not drive nails back through finished surfaces.
- .4 Cut back damaged or decayed wood to a point 10 mm beyond the last evidence of decay or as indicated on Drawings.
- .5 Use Dutchmen type repairs, including wood splicing or inserts and weather-resistant glue, where wood is broken or missing. Fit to hairline joint, glue and nail. Stapling not permitted.
  - .1 Match replacement components to size, profile and grain of existing wood components.
  - .2 Scarf in replacement components.
  - .3 Make joints tight so that after finishing they are visible only upon close inspection.
  - .4 Attach replacement materials to the parent piece, not adjacent components.
- .6 Trial fit joints before fastening in place. Adjust as necessary to ensure close accurate fit with adjacent surfaces.
- .7 Where required, fabricate replacement frame and sash members with mortise and tenon joints.
- .3 Moderate Deterioration:
  - .1 Clean and dry surfaces before applying liquid wood consolidant and epoxy filler. Apply products in accordance with manufacturers' instructions.
  - .2 Consolidate soft wood with liquid wood consolidant.
  - .3 Repair cracks and holes in wood with wood epoxy filler. Tool cured patch to match adjacent area.
  - .4 Allow proper curing of consolidant and filler before painting.
- .4 Minor Deterioration:
  - .1 Once wood is stripped bare, apply linseed oil turpentine mix 50/50 to renew wood.
  - .2 Use thinned linseed oil-based glazing compound to fill checks and open joints. Allow time to dry before sanding and painting.
  - .3 Consolidate soft wood with liquid wood consolidant. Clean and dry surfaces before applying liquid wood consolidant. Apply consolidant in accordance with manufacturer's instructions.
- .5 Missing Elements:
  - .1 Replace missing wood window components with new wood as specified in this Section.
  - .2 Use Dutchmen type repairs, including wood splicing or inserts and weather-resistant glue. Fit to hairline joint, glue and nail. Stapling not permitted.
    - .1 Match replacement components to size, profile and grain of existing wood components.
    - .2 Scarf in replacement components.
    - .3 Make joints tight so that after finishing they are visible only upon close inspection.
    - .4 Attach replacement materials to the parent piece, not adjacent components.
  - .3 Trial fit joints before fastening in place. Adjust as necessary to ensure close accurate fit with adjacent surfaces.



- .4 Where required, fabricate replacement frame and sash members with mortise and tenon joints.
- .6 Raised Knots:
  - .1 Remove loose paint.
  - .2 Level surface by planing and sanding.
  - .3 Apply wood epoxy filler to voids in and around knot.

### 3.6 REMOVING EXISTING FINISHES

- .1 If existing paint is well adhered, only light sanding may be required before applying new paint.
- .2 Where paint is not well adhered, remove existing paint and glazing putty using raw purified linseed oil and infrared heater to soften existing paint and putty.
  - .1 Remove existing paint in accordance with infrared heater manufacturer's instructions.
  - .2 Remove existing glazing putty with infrared heater and scrapers.

### 3.7 REPLACEMENT OF GLASS

- .1 Preparation:
  - .1 Sand and clean glazing rebates .
  - .2 Before applying glazing putty, prime the glazing rebate with a mixture of shellac flakes and alcohol in accordance with linseed oil putty manufacturer's instructions.
  - .3 Brush shellac mixture into rebates .
  - .4 Allow 2 hours to dry before applying putty .
- .2 Mix glazing putty in accordance with linseed oil putty manufacturer's instructions.
- .3 Cut replacement glass to suit size of existing lights and to clearances recommended by glass manufacturer. Undersize each pane of glass approximately 1.5 mm around perimeter.
- .4 Clean faces and edges of glass.
- .5 Set glass lights in original locations, and new replacement glass using glazing putty.
  - .1 Apply back putty to rebates about 1-2 mm thick but with enough putty so that glass is well seated and there are no gaps between glass and rebates .
  - .2 Set glass on full bed of putty to proper frame tolerances. Ensure glass is evenly seated.
  - .3 Install glazing points at 300 mm on centre, with edge point maximum 75 mm from corners.
  - .4 Neatly apply exterior putty bevel in line with edges of stiles and rails .
  - .5 Allow putty to set up for 24 hours before striking off excess .
  - .6 Tool putty to true, even lines, and free of creases, cavities, bubbles, and other defects.
  - .7 Apply ground pumice to each pane of glass, sequentially. Spread liberally with a soft brush, allowing pumice to absorb oil residue. Sweep pumice off glass.
  - .8 Allow putty to cure for minimum 72 hours before painting .
  - .9 Paint cured putty in accordance with Section 09 03 91 - Conservation Treatment for Period Painted Surfaces. Lap paint onto glass. When paint is dry, wet glass and trim back paint leaving 2 mm on glass surface.

- .6 Replace missing glazing putty from existing windows where glass has not been removed.

**3.8 REPAIR AND REPLACEMENT OF HARDWARE**

- .1 Tighten loose fasteners.

**3.9 REFINISHING**

- .1 Refinish wood windows as specified in Section 09 03 91 - Conservation Treatment for Period Painted Surfaces.

**3.10 SASH REINSTALLATION**

- .1 Set and secure materials and components in place, level, plumb, square and true-to-line.
- .2 Lubricate operable parts. Adjust for smooth operation.
- .3 Touch up surfaces damaged during installation as specified in Section 09 03 91 - Conservation Treatment for Period Painted Surfaces.

**3.11 CLEANING**

- .1 Remove glazing putty, and paint drips from glazing.
- .2 Clean inside and outside of glass with non-abrasive cleaner.
- .3 Remove tags.

**END OF SECTION**

All dimensions are approximate and are to be verified on site. See drawings for repair definitions, quantities, and door profiles.

1. Big House					Casing/Exterior Repairs		Door Repairs					Other/Remarks
Door No.	Floor	Class	Rough Opening (WxH)	Door Dimensions (WxH)	Sill/Threshold	Jamb/Stop/Head/Trim	Stile/Mullion/Rail	Panel	Shoe	Muntin	Lites	
1	0	A	Verify on site	985x1790		A10			A7			
2	0	A	Verify on site	815x2030		A4			A7			
3	1	B	Verify on site	915x1945		A4	A8	B1				
4	1	A	Verify on site	815x1935	A6	A10		B1,B2				

## 2. Fur Loft

					Casing/Exterior Repairs		Door Repairs					
Door No.	Floor	Class	Rough Opening (WxH)	Door Dimensions (WxH)	Sill/Threshold	Jamb/Stop/Head/Trim	Stile/Mullion/Rail	Panel	Shoe	Muntin	Lites	Other/Remarks
1	0	A	1085x1725	985x1620		A4			A7			
2	1	A	915x2070	940x1995	A6		Secure @ lites		Secure			
3	1	A	1250x2090	1250x2090								
4	1		1040x2080	1245x2085								Not Inspected
5	2	A	Verify on site	875x1975	A6	A4						

#### 4. Museum

					Casing/Exterior Repairs		Door Repairs					
Door No.	Floor	Class	Rough Opening (WxH)	Door Dimensions (WxH)	Sill/Threshold	Jamb/Stop/Head/Trim	Stile/Mullion/Rail	Panel	Shoe	Muntin	Lites	Other/Remarks
1a	1	A	Verify on site	1420x2590								Replace both exterior doors
1b		C	Verify on site	1345x2260								Interior doors
2	1	A	Verify on site	1015x2235		A9,A10	A2					
3		A	Verify on site	1015x2235		A9,A10		A10			B3	
4	1	A	Verify on site	1345x2260		A9,A10, B5	A2	B1, Secure trim				Secure hinge

## 5. Men's House

					Casing/Exterior Repairs		Door Repairs					
Door No.	Floor	Class	Rough Opening (WxH)	Door Dimensions (WxH)	Sill/Threshold	Jamb/Stop/Head/Trim	Stile/Mullion/Rail	Panel	Shoe	Muntin	Lites	Other/Remarks
1	1	A	820x1980	820x1945	A6	B1,B3			A7			
2	1	A	820x1970	820x1940	A6	A9,A10,B3						Secure door
3	1	A	820x1970	820x1940	A6	A6,B3						Repair rot at bottom of door
4	1	A	820x1980	820x1945	A6	A4,A9,A10						Inspect for rot behind shoe. Repair door and shoe as required.

## 6. Warehouse

					Casing/Exterior Repairs		Door Repairs					
Door No.	Floor	Class	Rough Opening (WxH)	Door Dimensions (WxH)	Sill/Threshold	Jamb/Stop/Head/Trim	Stile/Mullion/Rail	Panel	Shoe	Muntin	Lites	Other/Remarks
1	1	A	960x2110	885x1925								Remove shoe to fix roat at door. Re-secure shoe to door.
2	1	A	1250x2065	1270x2020								Repair door.
3	1	C	1250x2065	1270x2020								
4	2	A	775x2020	765x1890							A3	

7. Farm Manager

Door No.	Floor	Class	Rough Opening (WxH)	Door Dimensions (WxH)	Casing/Exterior Repairs		Door Repairs					Other/Remarks
					Sill/Threshold	Jamb/Stop/Head/Trim	Stile/Mullion/Rail	Panel	Shoe	Muntin	Lites	
1	1		860x2390	810X1910								Not inspected.
2	1	A	860x2025	810X1910	A6	A2,A10,B3			Secure			

8. Ross Cottage

Door No.	Floor	Class	Rough Opening (WxH)	Door Dimensions (WxH)	Casing/Exterior Repairs		Door Repairs					Other/Remarks
					Sill/Threshold	Jamb/Stop/Head/Trim	Stile/Mullion/Rail	Panel	Shoe	Muntin	Lites	
1	1	A	930x2160	690x1675		B3	A8					
2	1		930x2160	690x1675								Not inspected

10. Doctor's Office

Door No.	Floor	Class	Rough Opening (WxH)	Door Dimensions (WxH)	Casing/Exterior Repairs		Door Repairs					Other/Remarks
					Sill/Threshold	Jamb/Stop/Head/Trim	Stile/Mullion/Rail	Panel	Shoe	Muntin	Lites	
1	1	A	Verify on site	865x2090			A2,B2	B1				

END OF SECTION

All dimensions are approximate and are to be verified on site.

See drawings for repair definitions, quantities, and window profiles.

Big House Basement					Casing/Exterior Repairs		Sash Repairs				Other/Remarks
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
1	C	A	815x915	710x815	A6	A4					
2	C	A	815x915	710x815	B4	A4	A2				
3	C	A	815x915	710x815	A6	A4	A2			A1	
4	C	A	815x915	710x815	A6	A4	B2				
5	C	A	815x915	710x815		A4	A2, B2	A7			
6	C	C	815x915	710x815							Interior
7	C	C	Verify on site	Verify on site							
8	C	C	940x610	890x560							
9	C	C	940x610	890x560							
10	C	A	940x610	890x560	A6	A4	A2,B2			A3	
11	C	A	940x610	890x560			B2Int			A3	
12	C	A	940x610	890x560	A6		B2			A3	
13	C	A	940x610	890x560			A2, B2			A3	
14	C	C	940x610	890x560							
15	C	C	940x610	890x560							
16	C	C	940x610	890x560							
17	C	C	940x610	890x560							
18	C	A	635x660	480x585		A4					

**Big House Main Floor**

Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Casing/Exterior Repairs		Sash Repairs				Other/Remarks
					Sill	Jamb	Stile/Rail	Shoe	Muntin	Lites	
19	S	A	980x1665	890x1525			A2, B2Int		A5Int		A8Int
20	S	A	980x1665	890x1525			B1Int			A1	A8Int
21	S	A	980x1665	890x1525						A1	
22	S	B	980x1665	890x1525			B2Int				
23	S	A	980x1665	890x1525			A2				
24	S	C	940x1230	840x1145							Interior
25	S	A	980x1665	890x1525			A2				
26	S	A	980x1665	890x1525			A2				
27	S	A	980x1665	890x1525	A6Int						
28	S	A	980x1665	890x1525			A2				
29	S	A	980x1665	890x1525			A2			A3	
30	S	A	980x1665	890x1525			A2, B1				
31	S	A	980x1665	890x1525			B2Int			A1	
32	S	A	1080x1800	990x1660		A9,B1	B2			A3	
33	S	A	1080x1800	990x1660			B1		A5	A1,A3	A8Int
34	S	A	1080x1800	990x1660			B2Int			A1,A3	
35	S	A	1080x1800	990x1660		A9,B2	B2Int			A1,A3	
37	S	B	1080x1800	990x1660					A5Int		
38	S	A	1080x1800	990x1660		A9	B2Int		A5Int	A1,A3	A8Int
39	S	A	1080x1800	990x1660			B2		A5Int	A1,A3	
40	S	A	1080x1800	990x1660			B2Int		A5Int	A1,A3	A8Int
SL1	SL	B	575x1665	485x1525			B2Int				
SL2	SL	A	575x1665	485x1525			B2Int			A3	A8Int
T1	T	A	N/A	1075x495			B2Int			A1Int	
T2	T	C	N/A	1110x475							

**Big House Attics**

Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Casing/Exterior Repairs		Sash Repairs				Other/Remarks
					Sill	Jamb	Stile/Rail	Shoe	Muntin	Lites	
D1	Dr, C	C	745x1080	700x900							
D2	Dr, C	A	745x1080	700x900		A4	A2	A7	A5		

All dimensions are approximate and are to be verified on site.  
See drawings for repair definitions, quantities, and window profiles.

Fur Loft Main Floor					Casing/Exterior		Sash Repairs				
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	Other/Remarks
1	C	A	770x1085	710x1005	A6	A9					
2	C	A	760x1085	710x1005	A6	A9					
3	C	A	770x1080	710x1005		A4	B2Int	A7	A5		
4	C	A	770x1085	710x1005						A3	Secure frame
5	C	A	775x1080	710x1005			A2			A3	Secure frame
6	C	A	760x1085	710x1005	A6	A4					
7	C	A	770x1075	710x1005		A9					A8
8	C	C	770x1080	710x1005							
9	C	A	770x1080	710X1005		A4					

**Fur Loft Second Floor**

					Casing/Exterior		Sash Repairs				
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	Other/Remarks
10	C	C	750x1080	710x1005							Does not close
11	C	C	755x1085	710x1005							
12	C	A	770x1090	710x1005	A6					A3	
13	C	A	770x1080	710x1005	A6						
14	C	A	760x1080	710x1005	A6	A4,A9					
15	C	A	760x1080	710x1005	A6	A4					
16	C	A	770x1085	710x1005	A6	A4,A9		A7		A1,A3	
17	C	A	750x1085	710x1005	A6	A4,A9				A1,A3	
18	C	A	770x1080	710x1005	A6	A4,A9				A1	
19	C	A	755x1080	710X1005						A3	Does not close

**Fur Loft Attic**

Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Casing/Exterior		Sash Repairs				Other/Remarks
					Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
D1	Dr, C	A	755x1120	710x1005		A4,A9		A7		A1	
D2	Dr, C	A	770x1120	710x1005	A6	A4,A9	A2			A1	
D3	Dr, C	A	740x1120	710x1005		A4,A9	A2	A7		A3	
D4	Dr, C	A	750x1120	710x1005		A4,B2Int		A7		A3	A8
D5	Dr, C	A	725x1120	710x1005	A6	A4	A2	A7	A5	A3	
D6	Dr, C	A	770x1120	710X1005		A4,A9					



All dimensions are approximate and are to be verified on site.

See drawings for repair definitions, quantities, and window profiles.

Museum Main Floor					Casing/Exterior		Sash Repairs				Other/Remarks
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
1	C	A	1320x1790	1010x1510	A6	A10	A2				
2	F	A	3035x1755	2725x1510	A6	A10				A1,A3	
3	F	A	3035x1755	2725x1510		B5				A1,A3	
4	C	A	1320x1790	1010x1510	A6	A10,B5					
5	C	A	1320x1790	1010x1510		A10					
8	C	A	1320x1790	1010x1510		A10,B5				A3	
9	C	A	1320x1790	1010x1510	A6	A10,B5	A2			A3	
S1	C	A	850x1790	540x1510			B1			A3	
S2	C	A	850x1790	540x1510		A10	B2			A3	
S3	C	A	850x1790	540x1510		A10,B1,B5	A2			A3	
S4	C	A	850x1790	540x1510		A10	A2				

#### Museum Second Floor

					Casing/Exterior		Sash Repairs				Other/Remarks
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
10	C	TBD	1320x1790	1010x1510							
11	C	TBD	1320x1790	1010x1510							
12	C	TBD	1320x1790	1010x1510							
13	C	TBD	1320x1790	1010x1510							
14	C	TBD	1320x1790	1010x1510							
15	C	TBD	1320x1790	1010x1510							
16	C	TBD	Verify on site	Verify on site							
17	C	TBD	Verify on site	Verify on site							

Museum second floor windows have not been assessed. Perform general maintenance on every window, and repair where rot, deterioration, and missing elements are found.

All dimensions are approximate and are to be verified on site.

See drawings for repair definitions, quantities, and window profiles.

Men's House Main Floor					Casing/Exterior Repairs		Sash Repairs				Other/Remarks
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
1	D	A	750x1045	690x995		A9,A10				A1,A3	B3
2	D	A	750x1045	690x995	A6	A9,A10				A3	
3	D	A	750x1045	690x995	B1	A9,A10				A3	
4	D	A	750x1045	690x995		A9,A10				A3	
5	D	A	750x1045	690x995	B1	A10				A1,A3	
6	D	A	750x1045	690x995	B1	A10				A1,A3	
7	D	A	750x1045	690x995	A6	A9,A10				A3	
8	D	A	750x1045	690x995	A6	A9,A10				A3	
9	D	A	750x1045	690x995		A9,A10				A1,A3	
10	D	A	750x1045	690x995	A6,B1	A9,A10,B1				A3	

Men's House Second Floor

					Casing/Exterior Repairs		Sash Repairs				Other/Remarks
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
D1	Dr, C	C	805x1055	690x995							
D2	Dr, C	C	805x1055	690x995							
D3	Dr, C	C	805x1055	690x995							

All dimensions are approximate and are to be verified on site.

See drawings for repair definitions, quantities, and window profiles.

Warehouse Main Floor					Casing/Exterior		Sash Repairs				Other/Remarks
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
1	C	A	745x1050	690x990						A3	
2	C	A	745x1050	690x990		A9				A1,A3	
3	C	A	745x1050	690x990						A1,A3	
4	C	A	745x1050	690x990						A1,A3	
5	C	A	745x1050	690x990						A1	
6	C	A	745x1050	690x990						A1	

Warehouse Second Floor					Casing/Exterior		Sash Repairs				Other/Remarks
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
7	C	C	745x1050	690x990							
8	C	A	745x1050	690x990						A1,A3	
9	C	A	745x1050	690x990		A9				A1,A3	
10	C	A	745x1050	690x990						A1	
11	C	A	745x1050	690x990		A9				A1,A3	
12	C	A	745x1050	690x990		A9				A1,A3	
13	C	C	745x1050	690x990							

Warehouse Third Floor					Casing/Exterior		Sash Repairs				Other/Remarks
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
D1	Dr, C	A	685x1095	685x1030		B1Int		A7		A3	
D2	Dr, C	A	685x1095	685x1030				A7		A3	
D3	Dr, C	A	685x1095	685x1030	A6			A7		A3	
D4	Dr, C	B	685x1095	685x1030			B2Int				
D5	Dr, C	A	685x1095	685x1030		A9		A7	A5		

All dimensions are approximate and are to be verified on site.

See drawings for repair definitions, quantities, and window profiles.

Farm Manager Main Floor					Casing/Exterior		Sash Repairs				Other/Remarks
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
1	S	A	935x1525	700x1270	A6	A9	A2		A5Int	A1,A3Int	
2	S	A	935x1525	700x1270	A6	A9	A2,B2Int			A3Int	A8
3	S	A	935x1525	700x1270	A6	A9,A11	A2,B2Int				A8
4	S	A	935x1525	700x1270	A6	A9				A3Int	
5	S	A	935x1295	700x1030	B1	A9				A3Int	
6	S	A	935x1295	700x1030	A6	A9				A3Int	
7	S	A	935x1295	700x1030	A6		A2		A5Int	A3Int	

**Farm Manager Second Floor**

Farm Manager Second Floor					Casing/Exterior		Sash Repairs				Other/Remarks
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
8	S	A	935x1295	700x1030			A2, A2Int,B2Int		A5Int	A1	
9	S	A	935x1295	700x1030	A6		A2		A5Int	A3Int	
10	F	A	875x970	690x755		A4Int,A9Int	B2				
11	F	A	770x790	585x645			B2Int			A3	

All dimensions are approximate and are to be verified on site.  
 See drawings for repair definitions, quantities, and window profiles.

Ross Cottage Main Floor					Casing/Exterior		Sash Repairs				Other/Remarks
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
1	C	A	1120x1440	880x1200			A2	A7		A3	
2	C	A	1120x1440	880x1200		B1Int	A2			A1,A3	
3	C	A	1005x1215	760x970			B2Int	A7	A5Int	A3	
4	C	A	1005x1215	760x970			A2			A1,A3	
5	C	A	1120x1440	880x1200			A2	A7		A1,A3	
6	C	A	1120x1440	880x1200			A2	A7		A3	

**All dimensions are approximate and are to be verified on site.  
 See drawings for repair definitions, quantities, and window profiles.**

Doctor's Office Main Floor					Casing/Exterior		Sash Repairs				Other/Remarks
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
1	S	C	990x1830	735x1650							
2	S	C	990x1830	735x1650							
3	S	C	990x1830	735x1650							

All dimensions are approximate and are to be verified on site.  
See drawings for repair definitions, quantities, and window profiles.

Administration Building Main Floor					Casing/Exterior		Sash Repairs				Other/Remarks
Window No.	Function	Class	Rough Opening (WxH)	Sash Dimensions (WxH)	Sill	Jamb/Head/Trim	Stile/Rail	Shoe	Muntin	Lites	
1	F	C	Verify on site	600x1350							
2	F	C	Verify on site	600x1350							
3	A	C	Verify on site	900x1350							
4	F	C	Verify on site	900x1350							
5	A	C	Verify on site	900x1350							
6	A	C	Verify on site	900x1350							
7	A	C	Verify on site	900x1350							
8	A	C	Verify on site	700x510							
Mech	A	C	Verify on site	700x510							
9	A	C	Verify on site	900x1350							
10	F	C	Verify on site	900x1350							
11	A	C	Verify on site	900x1350							
12	A, Fx2	C	Verify on site	900x1350 (x3)							
13	A	C	Verify on site	900x1350							
14	F, A	C	Verify on site	900x1350 (x2)							
15	F, A	B	Verify on site	900x1350 (x2)			B1				
16	F	C	Verify on site	900x1350							

END OF SECTION





**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Access doors and panels in walls and ceilings of Museum washrooms

**1.2 RELATED REQUIREMENTS**

- .1 Section 09 91 00 - Painting, for site painting of factory-primed access doors and panels
- .2 Division 22 - Plumbing, and Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC): Mechanical components requiring access
- .3 Division 26 - Electrical, Division 27 – Communications, and Division 28 – Electronic Safety and Security: Electrical components requiring access

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination: Coordinate locations of ceiling-mounted items including access doors and frames.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Action Submittals:
  - .1 Product Data: Provide sizes, types, finishes, fire ratings, hardware, scheduled locations, and details of adjoining work.

**1.5 QUALITY ASSURANCE**

- .1 Source Limitations: obtain each type of access door and frame through one source from a single manufacturer.
- .2 Size Variations: obtain Departmental Representative acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

**1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Apply temporary protective coating to finished surfaces. Remove coating after erection. Do not use coatings that will become hard to remove or leave residue.
- .2 Leave protective covering in place until final cleaning of building.

**1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

**Part 2 Products**

**2.1 NON-RATED WALL AND CEILING ACCESS DOORS**

- .1 Gypsum Board Surfaces: Flush access doors with concealed flanges as follows:
  - .1 Size: 305 by 305 mm.
  - .2 Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
  - .3 Metallic-Coated Steel Sheet for Door: Nominal 1.63 mm thick. Factory primed finish.
  - .4 Hinges: Manufacturer's standard.
  - .5 Hardware: Latch.
  - .6 Acceptable Products: Acudor DW-5040 series; Best Access Doors BA-AHD-GYP; Larsen's Manufacturing L-DWC; Maxam Metal Products Model NDB; Mifab MDW Series; Milcor DW series; Nystrom NW series.
- .2 Tile Surfaces: Flush access doors with exposed flanges:
  - .1 Size: to match openings in existing walls.
  - .2 Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
  - .3 Door Material: Stainless-Steel Sheet for Door: Nominal 1.57 mm, No. 4 finish.
  - .4 Hinges: Manufacturer's standard.
  - .5 Latch: Type and operation selected by Departmental Representative.
  - .6 Acceptable Products: Acudor UF-5000, Best Access Doors BA-AHD series; Larsen's Manufacturing L-MPG and L-MPSS series; Maxam Metal Products NSM and NSS series; Milcor M – Architectural Flush Access Door; Mifab UA and UASS series; Nystrom NT series.

**2.2 FABRICATION**

- .1 General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- .2 Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- .3 Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
  - .1 Provide mounting holes in frame for attachment of masonry and concrete anchors.
- .4 Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

**2.3 FINISHES**

- .1 Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- .2 Steel and Metallic-Coated-Steel Finishes:
  - .1 Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate free, universal primer immediately after surface preparation and pretreatment.
- .3 Stainless Steel Finishes:
  - .1 Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
  - .2 Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - .3 Run grain of directional finishes with long dimension of each piece.
  - .4 When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
  - .5 Directional Satin Finish: No. 4.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 INSTALLATION**

- .1 Comply with manufacturer's written instructions.
- .2 Install frames plumb and level in opening. Secure rigidly in place.
- .3 Install doors flush with adjacent finish surfaces.
- .4 Locate access doors and panels so that equipment is within view and accessible for operating, inspecting, adjusting, servicing without using special tools.

**3.3 ADJUSTING**

- .1 Adjust doors and hardware, after installation, for proper operation.
- .2 Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

**END OF SECTION**



**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Gypsum board ceiling repair, including vapour barrier in Administration Building (Simkin House)
- .2 Replacement of ceilings in Museum washrooms

**1.2 RELATED REQUIREMENTS**

- .1 Section 01 73 00 - Execution, for general provisions related to cutting and patching
- .2 Section 06 10 53 - Miscellaneous Rough Carpentry, for wood framing materials
- .3 Section 09 91 00 - Painting, for finish painting of new gypsum board surfaces

**1.3 REFERENCES**

- .1 ASTM International
  - .1 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - .2 ASTM C475/C475M-17, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
  - .3 ASTM C645-13, Specification for Nonstructural Steel Framing Members
  - .4 ASTM C754-11, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
  - .5 ASTM C840-17a, Standard Specification for Application and Finishing of Gypsum Board
  - .6 ASTM C1002-16, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
  - .7 ASTM C1047-14a, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
  - .8 ASTM C1396/C1396M-17, Standard Specification for Gypsum Wallboard
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB 51.34-M86 - Vapour Barrier, Polyethylene Sheet for Use in Building Construction

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements, and with manufacturer's written instructions.
- .2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.
- .3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

**1.6 SITE ENVIRONMENTAL REQUIREMENTS**

- .1 Maintain temperature between 10 and 21 degrees C for 48 hours prior to and during application of gypsum board and joint treatment, and for at least 48 hours after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost free surfaces.
- .3 Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Ceiling Framing: to ASTM C645, size indicated, roll formed from hot dipped galvanized steel sheet, for screw attachment of gypsum board. Galvanized to zinc coating designation Z120 to ASTM A653. Minimum base steel thickness 0.455 mm.
- .2 Metal Furring Runners, Hangers, Tie Wires, Inserts, and Anchors: to ASTM C1280, galvanized.
- .3 Gypsum Board: Non-sag ceiling board to ASTM C1396/C1396M, thickness to match existing, 1200 mm wide by maximum practical length, ends square cut, edges tapered. Location: Administration Building (Simkin House) ceiling.
- .4 Moisture-Resistant Interior Gypsum Board: to ASTM C1396M, moisture-resistant, treated core, mould resistance rating 10 to ASTM D 3273. Type X, 12 mm thick for ceilings by 1200 mm wide by maximum practical length, ends square cut, long edges bevelled. Location: Museum washroom ceilings.
  - .1 Acceptable Products: Georgia-Pacific Dens-Armor Plus Interior Drywall, CGC Fiberock Aqua-Tough Interior Panel, CertainTeed M2Tech.
- .5 Joint Compound: to ASTM C475, asbestos-free.
- .6 Steel Drill Screws: to ASTM C1002.
- .7 Edge Trim: to ASTM C1047, zinc-coated by hot-dip process, 0.46 mm base thickness, laminated to paper tape.
- .8 Vapour Barrier: to CAN/CGSB 51.34, polyethylene film, 0.15 mm thick.
- .9 Joint Sealing Tape: Air resistant, pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Examine existing ceiling to determine extent of ceiling removal and replacement.
  - .1 Visually inspect substrate in presence of Departmental Representative.

**3.2 PROTECTION**

- .1 Protect in-place construction during cutting and patching to prevent damage.

### **3.3 ADMINISTRATION BUILDING (SIMKIN HOUSE) CEILING**

- .1 Removal:
  - .1 Neatly cut out damaged gypsum board ceiling using methods least likely to damage elements retained or adjoining construction.
  - .2 Notify Departmental Representative if insulation or framing is damaged and requires replacement.
- .2 Patching and Repairing Ceiling:
  - .1 Provide additional 38 by 89 mm wood framing as required to support edges of patch.
  - .2 Vapour Barrier:
    - .1 Patch vapour barrier as required using largest possible sheet to minimize joints.
    - .2 Overlap existing vapour barrier by 50 mm.
    - .3 Apply continuous strip of joint sealing tape around patch.
    - .4 Inspect for continuity. Repair punctures and tears with joint sealing tape before work is concealed.
  - .3 Gypsum Board:
    - .1 Apply and finish gypsum board in accordance with ASTM C840, using screw fasteners at maximum 300 mm on centre.
    - .2 Finish joints in accordance with ASTM C840, with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
    - .3 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
    - .4 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

### **3.4 MUSEUM BUILDING WASHROOM CEILINGS**

- .1 Removal:
  - .1 Remove existing plaster ceiling, lath and support structure.
  - .2 Neatly cut at perimeter of bulkheads to remain using methods least likely to damage elements retained or adjoining construction.
- .2 New Ceiling Framing:
  - .1 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840.
  - .2 Install work level to tolerance of 1:1200.
  - .3 Frame perimeter of openings for access panels with furring channels.
- .3 Gypsum Board:
  - .1 Apply and finish moisture-resistant gypsum board in accordance with ASTM C840, using screw fasteners at maximum 300 mm on centre.
  - .2 Do not apply gypsum board until work above ceiling is approved.
  - .3 Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member

- .4 Stagger end joints at least 250 mm. Locate edge or end joints over supports.
- .5 Install casing beads around perimeter of suspended ceilings.
- .6 Install casing beads where gypsum board butts against surfaces having no trim concealing junction.
- .7 Install access doors to electrical and mechanical fixtures. Rigidly secure frames to furring or framing.
- .4 Finishing Gypsum Board:
  - .1 Finish gypsum board in accordance with ASTM C840, to Level 4 finish.

**END OF SECTION**



**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Repair of exterior stucco and interior flat plaster finishes at Men's House, and Ross Cottage

**1.2 RELATED REQUIREMENTS**

- .1 Section 01 35 03 - Conservation Treatment Procedures
- .2 Section 09 03 91 - Conservation Treatment for Period Painted Finishes, for cleaning and refinishing stucco and plaster finishes

**1.3 REFERENCES**

- .1 ASTM International (ASTM)
  - .1 ASTM C206-14, Standard Specification for Finishing Hydrated Lime
  - .2 ASTM C842-05(R2015), Standard Specification for Application of Interior Gypsum Plaster

**1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Preinstallation Conference: Conduct conference at Project site.
  - .1 Review minutes of Historic Treatment Preconstruction Conference that pertain to treatment of historic stucco and plaster.
  - .2 Review methods and procedures related to stucco and plaster repair Work including, but not limited to the following:
    - .1 Review proposed repairing methods and materials.
    - .2 Co-ordinate products, installation methods and techniques.
    - .3 Review temporary protection requirements.
    - .4 Existing conditions that may require notification of Departmental Representative before proceeding.

**1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Action Submittals:
  - .1 Samples: Submit two samples, 300 by 300 mm in size illustrating colour and texture of each type of stucco and plaster.
- .3 Informational Submittals:
  - .1 Qualification Statement: Installer qualifications, including previous projects.

**1.6 QUALITY ASSURANCE**

- .1 Installer Qualifications:
  - .1 Company specializing in performing the work of this section with documented experience.
  - .2 Successful completion of at least three projects of similar scope and complexity.

- .2 Analysis of Existing Finishes:
  - .1 Remove four samples of existing stucco and plaster finishes from different locations at interior and exterior surfaces of each building scheduled for stucco or plaster repair.
  - .2 Retain one sample for later comparison.
  - .3 Break up remaining samples individually with mallet until constituent parts remain. Examine under microscope to determine:
    - .1 Approximate proportions of aggregate, lime, and cement.
    - .2 Type, size, and colour of aggregate.

## **1.7 MOCK-UP**

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Locate where directed by Departmental Representative.
- .3 Provide 1 sq m mock-up including applicable lath, each type of stucco and plaster repair work to illustrate repair methods, materials, surface texture and colour.
- .4 Allow 48 hours for inspection of mock-up by Departmental Representative before proceeding with repair work.
- .5 When accepted, mock-up will demonstrate minimum standard of quality required for this work.
- .6 Approved mock-up may remain 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.
  - .1 Protect materials from moisture absorption and damage; reject damaged containers.
  - .2 Store sand to prevent inclusion of foreign matter.
  - .3 Protect material from damage by moisture and freezing.

## **1.9 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

## **1.10 AMBIENT CONDITIONS**

- .1 Do stucco and plaster work when ambient temperature is between 13 and 21 degrees C.
- .2 Ventilate to facilitate proper application and curing of stucco and plaster in accordance with manufacturer's instructions.
  - .1 Ensure that high temperatures do not effect plaster drying process when spotlights are used during repair of existing interior plaster.
  - .2 In hot weather, provide temporary covering and wet curing to prevent rapid drying.
- .3 Maintain air moisture content in accordance with manufacturer's instructions to facilitate proper curing of stucco and plaster and minimize cracking.
  - .1 Keep records of actual air moisture content for specified period of cure.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Fasteners: Galvanized steel lath nails, minimum 16 mm penetration into supports.
- .2 Wood Lath: Match existing in dimension, species, and grain, rough sawn.
- .3 Hydraulic lime: to ASTM C206.
- .4 Gypsum Plaster: to ASTM C842.
- .5 Gypsum Gauging Plaster: to ASTM C842.
- .6 Sand: Clean, sharp, free from deleterious matter. Custom blend sands where necessary to provide appropriate colour match and gradation.
- .7 Water: potable, free of substances that would affect set of plaster, or staining and efflorescence.

### **2.2 MIXES**

- .1 Lime Stucco for Repair: composed of 3-parts sand to 1-part hydraulic lime, hand mixed with water to achieve workable consistency, or as determined based on accepted mock-up.
- .2 Plaster Mixes: Mix plaster in accordance with ASTM C842.
  - .1 Plaster Base Coat: Gypsum neat hardwall type, unfibrated
  - .2 Plaster Top Coat: Gypsum/Lime Putty Type to ASTM C28M; mixture of gauging plaster and lime.
- .3 Patching Paste: Mixture of four-parts hydrated lime or lime putty, and one-part plaster of Paris with enough water to make a thick paste.
- .4 Accurately maintain measuring proportions from batch to batch.
- .5 Keep mixing tools and bins free of hardened residue.
- .6 Do not overmix.
- .7 Discard mixed stucco and plaster that is not used and placed within material working time. Do not retemper mixes.
- .8 Keep ungauged lime plaster mix covered when not being used.

## **Part 3 Execution**

### **3.1 SITE VERIFICATION OF CONDITIONS**

- .1 Examine and report in writing to Departmental Representative areas of deteriorated plaster not previously identified.

### **3.2 PROTECTION**

- .1 Do not touch furnishings or artifacts in historic buildings. If objects need to be moved or covered, notify Departmental Representative immediately. Departmental Representative will arrange to have items moved or covered.
- .2 No fastenings associated with hoarding or other protection shall be installed in historic material.

- .3 Use ground protection under work areas to collect debris and waste.
- .4 Cover or mask floors and decks adjacent to areas where plaster or stucco repair is performed.

### **3.3 PREPARATION**

- .1 Carefully remove loose and friable stucco and plaster where indicated.
- .2 Do not break keys of surrounding sound stucco and plaster materials when removing deteriorated materials.
- .3 Clean substrates of materials interfering with bond of new materials including plant growth, dust, dirt, loose coatings, oil and grease using bristle brush.
- .4 Bevel edges of existing stucco and plaster to accept new materials.
- .5 Obtain approval from Departmental Representative of preparation work prior to proceeding with patching and repairing.

### **3.4 REPAIR OF NAIL HOLES, SMALL CRACKS AND MINOR DAMAGE**

- .1 Remove existing damaged stucco and plaster back to a point at which sound material is reached.
- .2 Remove loose and foreign matter that could impair adhesion.
- .3 Thoroughly wet adjacent plaster surfaces to minimize suction. Remove excess water.
- .4 Fill voids with plaster patching paste; apply with sufficient pressure to eliminate voids and ensure adhesion.
- .5 Smooth off flush and finish to match adjacent surfaces.

### **3.5 REPAIR OF LARGE CRACKS**

- .1 Remove existing damaged stucco and plaster back to a point at which sound material is reached.
- .2 Remove loose and foreign matter that could impair adhesion.
- .3 Fill voids with patching compound; apply with sufficient pressure to eliminate voids and ensure adhesion.
- .4 Embed tape in wet compound. Apply additional compound to cover tape.
- .5 Finish to match adjacent surfaces.

### **3.6 REPAIR OF DAMAGED STUCCO OR PLASTER OVER LATH**

- .1 Remove loose and friable stucco and plaster where indicated down to lath or masonry substrate.
- .2 Reattach loose lath with non-corrosive nails or wire ties.
- .3 Replace deteriorated or missing lath with new lath to match existing lath materials. Typically, use wood lath over masonry infill unless rubble infill provides rough enough surface to provide key for stucco.
- .4 Thoroughly wet wood lath and masonry substrates before applying stucco or plaster.
- .5 Apply scratch, brown, and finish coats to thickness to match existing as directed by Departmental Representative.
- .6 Finish to match adjacent surfaces.

**3.7 REPAIR OF DAMAGED STUCCO OR PLASTER OVER MASONRY**

- .1 Remove existing damaged plaster down to masonry.
- .2 Where required, rake out mortar joints in masonry substrates to provide good bonding surface.
- .3 Apply scratch, brown, and finish coats to thickness to match existing as directed by Departmental Representative.
- .4 Finish to match adjacent surfaces.

**3.8 APPLICATION OF STUCCO AND PLASTER**

- .1 Scratch Coat:
  - .1 Apply scratch coat with trowel, using sufficient pressure to force it between gaps of lath. Ensure even surface.
  - .2 Cross-hatch or scratch surface when initial set is obtained to provide key for brown coat.
- .2 Intermediate Brown Coat:
  - .1 Dampen scratch coat before application of brown coat.
  - .2 Apply brown coat with sufficient pressure to ensure tight contact with scratch coat.
  - .3 Moist cure base coats.
- .3 Finish Coat:
  - .1 Wet intermediate brown coat thoroughly. Eliminate standing water from surface.
  - .2 Apply specified finish coat.
  - .3 Smooth finish coat with trowel to achieve texture and appearance to match existing.
  - .4 Trowel patch work to smooth surface, even with adjacent work.
- .4 Curing:
  - .1 Prevent stucco and plaster from drying out too quickly.
  - .2 Maintain air temperature and air moisture content in accordance with manufacturer's instructions to facilitate proper curing of stucco and plaster and minimize cracking.
  - .3 Record temperature and humidity during application and curing.

**3.9 CLEANING**

- .1 Remove droppings and splashings, immediately, using clean sponge and water.

**END OF SECTION**



**Part 1            General**

**1.1            SECTION INCLUDES**

- .1      Cleaning surfaces
- .2      Removing existing finishes
- .3      Repairing substrates
- .4      Plain painting of historic interior and exterior surfaces, including masonry, wood, stucco/plaster, and metal

**1.2            RELATED REQUIREMENTS**

- .1      Section 01 11 00 - Summary of Work, for requirements related to Heritage Conservation Minimal Intervention Approach
- .2      Section 01 35 03 - Conservation Treatment Procedures, for general protection and treatment procedures
- .3      Section 04 03 01.13 - Historic Masonry Cleaning, for cleaning of masonry before application of finishes
- .4      Section 06 03 20 - Conservation Treatment for Period Finish Carpentry, for repair and restoration of period finish carpentry
- .5      Section 08 03 52 - Conservation Treatment for Period Wood Windows, for repair and restoration for period wood windows, including removal of existing finishes
- .6      Section 09 03 25 - Conservation Treatment for Period Plastering, for repair and restoration for period plastering
- .7      Section 09 91 00 - Painting, for painting of new surfaces, and existing non-historic surfaces

**1.3            REFERENCES**

- .1      Canada's Historic Places
  - .1          Standards and Guidelines for the Conservation of Historic Places in Canada
- .2      Master Painters Institute (MPI)
  - .1          The Maintenance Repainting Manual

**1.4            DEFINITIONS**

- .1      Historic Paint Materials: Paint materials manufactured to match historic paint formulations; either custom-formulated products or standard products of manufacturers of historic paint materials.
- .2      Modern Paint Materials: Paint materials not designed to match historic paint formulations but that may be required to match historic paint colours.
- .3      Period Paint Samples: Paint chips obtained from paint coatings on historic structures for purpose of paint analysis, colour matching and other paint information recording.
- .4      Plain Painting: For historic treatment, this means painting that requires attention to historic treatment requirements, but no special, decorative or artistic painting skill.

## **1.5 ADMINISTRATIVE REQUIREMENTS**

- .1 Preinstallation Conference: Conduct conference at Project site.
  - .1 Review minutes of Historic Treatment Preconstruction Conference that pertain to historic treatment of painted surfaces.
  - .2 Review methods and procedures related to historic treatment of plain painting including, but not limited to, the following:
    - .1 Verify historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
    - .2 Materials, material application, colours, patterns, and sequencing.
    - .3 Fire-protection plan.
    - .4 Plan painting historic treatment program.
- .2 Sequencing:
  - .1 Complete regrading work, foundation repair, roofing and window repairs, waterproofing work, and other related work before cleaning of surfaces in preparation for painting and staining, to minimize potential for water infiltration into existing structures.
  - .2 Complete masonry repair, repointing and cleaning specified in Division 04 before application of period finishes on existing masonry surfaces.
  - .3 Complete re-chinking of log walls before application of period finishes on existing log surfaces.
  - .4 Perform historic treatment of painting in the following sequence, which includes work specified in this and other Sections:
    - .1 Dismantle existing surface-mounted objects and hardware except items indicated to remain in place. Tag items with location identification and protect.
    - .2 Verify that temporary protections have been installed.
    - .3 Examine condition of surfaces to be painted.
    - .4 Remove existing paint to the degree required for each substrate and surface condition of existing paint.
    - .5 Apply paint system.
    - .6 Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.
- .3 Scheduling:
  - .1 Obtain Departmental Representative permission on a daily basis before starting painting or preparation work. Departmental Representative will be tracking temperature and relative humidity.
  - .2 Ensure prepared surfaces are primed same day. Do not leave bare wood or exposed edges left unprimed or unfinished.

## **1.6 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Action Submittals:
  - .1 Preconstruction Submittals:
    - .1 Submit a description of methods of work to be employed for paint and dirt removal.
    - .2 Include information on infrared heater for removing paint.



- .3 Provide photographic documentation of surfaces to be finished before, during and after the works in accordance with Section 01 32 33 – Photographic Documentation.
- .2 Product Data: For each type of product. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
- .3 Samples: For each type of paint system, colour, and gloss; in sizes indicated.
  - .1 Include stepped Samples defining each separate coat, including fillers and primers. Resubmit until each required sheen, colour, and texture is achieved.
  - .2 For each painted colour being matched to a standardized colour-coding system, include the colour chips from the colour-coding-system company with Samples.
  - .3 Include a list of manufacturer's product number, name, type and use, and colour number for each coat of each Sample.
  - .4 Label each Sample for location and application.
  - .5 Sample Size:
    - .1 Painted Surfaces: 100-by-200-mm Samples for each colour and material, on hardboard.
    - .2 Stained or Natural Wood: 300-by-300-mm Samples of natural- or stained-wood finish, on representative surfaces.
- .3 Informational Submittals:
  - .1 Qualification Data: For historic treatment specialist.
  - .2 Painting Historic Treatment Program: Submit before work begins.
  - .3 Colour-Matching Certificate: For computer colour-matching of historic colours.
  - .4 Preconstruction Test Reports: For cleaning materials, and coatings and systems.

## **1.7 CLOSEOUT SUBMITTALS**

- .1 Record paint information on historic paint materials including paint material, colour, treatment or finish methods.
- .2 Record information on modern paint materials, including manufacturer's product number, name, type and use, and colour number, and location for each product used.
- .3 Keep maintenance-record of painting work to indicate detailed work carried out for each area of historic structures including methods of surface preparation and paint application with comments as necessary.
- .4 Use appropriate card format for above recording for easy information retrieval.
- .5 Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for surfaces coated with linseed oil paint.

## **1.8 QUALITY ASSURANCE**

- .1 Applicator Qualifications:
  - .1 Contractor: to have a proven satisfactory experience. When requested, provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.
  - .2 Qualified journey persons as defined by local jurisdiction to be engaged in painting work, to have proven satisfactory experience.

- .3 Apprentices: may be employed provided they work under direct supervision of qualified journeypersons in accordance with applicable trade regulations.
- .2 Colour-Matching: Custom computer-match paint colours to colours indicated. For colours indicated by a standardized coding system, obtain a colour chip for each colour indicated from the colour-coding-system company; computer match paint colours to the colour chips.
- .3 Plain Painting Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site during cleaning, paint removal, repainting, and other processes.
- .1 If materials and methods other than those indicated are proposed for any phase of historic treatment work, include 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.

## **1.9 MOCK-UPS**

- .1 Mock-ups: Prepare mock-ups of historic treatment processes for each type of coating system and substrate indicated and each colour and finish required to demonstrate aesthetic effects and to set quality standards for materials and execution. Duplicate appearance of approved Sample submittals.
  - .1 Locate mock-ups on existing surfaces where directed by Departmental Representative.
  - .2 Surface-Preparation Mock-ups: On existing surfaces using applicable specified methods of cleaning and other surface preparation, provide mock-up sample of at least 5 sq. m.
  - .3 Coating Mock-ups: Two wall surfaces of at least 5 sq. m to represent surfaces and conditions for application of each type of coating system under same conditions as the completed Work.
  - .4 Approval of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless Departmental Representative specifically approves such deviations in writing.
  - .5 Subject to compliance with requirements, approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.

## **1.10 PRECONSTRUCTION TESTING**

- .1 Preconstruction Testing Service: Engage a qualified historic treatment specialist to perform preconstruction testing of cleaning materials and methods, and compatibility of paint coatings and systems for each type of historic painted surface.
  - .1 Use test areas as indicated and representative of proposed materials and existing construction.
  - .2 Propose changes to materials and methods to suit Project.

## **1.11 DELIVERY, STORAGE, AND HANDLING**

- .1 Store materials and equipment in secure, dry, well-ventilated area with temperature range between 7 and 30 degrees C. Store materials and supplies away from heat generating devices and sensitive products above minimum temperature as recommended by manufacturer.
  - .1 Maintain containers in clean condition, free of foreign materials and residue.
  - .2 Remove paint materials from storage in quantities required for same day use.

- .3 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site daily.

## **1.12 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

## **1.13 AMBIENT CONDITIONS**

- .1 Weather Limitations: Proceed with historic treatment of painting only when existing and forecasted weather conditions are within the environmental limits acceptable to the Departmental Representative, and in accordance with each manufacturer's written instructions and specified requirements.
- .2 If unexpected artifacts are encountered, stop work in that particular area and notify Departmental Representative for direction.

## **Part 2 Products**

### **2.1 MANUFACTURERS**

- .1 Linseed Oil Paint: Products manufactured by Allbäck.

### **2.2 PREPRATORY CLEANING AND SCRAPING MATERIALS**

- .1 Water: Potable.
- .2 Detergent Solution for Wood: Solution prepared by mixing 125 ml of household detergent in 4 litres of warm water.
- .3 Detergent Solution for Stucco and Plaster: Solution prepared by mixing 125 ml of household non-ionic detergent in 4 litres of warm water.
- .4 Mildew Cleaner for Wood: 4 litres hot water mixed with 250 ml linseed oil soap, 125 ml ethyl alcohol, and 55 to 80 grams boric acid.
- .5 Sandpaper: Medium to fine grit for wood.
- .6 Paint Scraper: Maximum 75 mm wide.
- .7 Infrared Heater: as recommended by linseed oil paint manufacturer for removal of existing paint.

### **2.3 PAINT, GENERAL**

- .1 Material Compatibility:
  - .1 Provide materials for use within each paint system that are compatible with one another, substrates indicated and repair compounds including epoxy-based fillers and consolidants, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - .2 For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- .2 Use primer, undercoater or sealer as a base coat whenever substrate has been exposed bare or substrate is not compatible with desired finish condition to be provided by selected topcoat.
- .3 Select paint materials of each coating system from products of a single manufacturer.

- .4 Provide manufacturer's recommended transition coat to improve paint adhesion over residual existing coating, where required.
- .5 Linseed Oil Paint: Cold-pressed, cleaned, filtered, sterilized, well-matured, cooked linseed oil only, with no solvents.
  - .1 At factory add 20% zinc by volume.
  - .2 Pigments: made from titanium oxide, iron oxides, chromium oxide green and ultramarine blue.
  - .3 Tinting: as recommended by paint manufacturer.
- .6 Wood Primer: Boiled linseed oil type, by same manufacturer as paint.
- .7 Wood Sealer: Shellac flakes mixed with methyl hydrate, in accordance with linseed oil paint manufacturer.

## **2.4 INTERIOR COATINGS**

- .1 Stucco/Plaster Surfaces: Whitewash
  - .1 Whitewash Formula: Stearate of lime made by mixing 30 kg of lime with 9 kg of finely chopped suet, and adding boiling water until ingredients are thoroughly mixed and about the consistency of lime putty.
  - .2 Mix only as much whitewash as can be applied while still hot.
  - .3 Brush apply hot whitewash in minimum two coats, or number of coats as required to match accepted mock-up.
- .2 Wood Floor Access Covers: Constructed of salvaged floor materials
  - .1 Coat cut ends of boards to match existing
- .3 Dressed Lumber and Finish Carpentry: including wood doors and frames, wood window frames, sills, sashes, trim, casings, and other wood surfaces:
  - .1 One coat Linseed Oil primer
  - .2 Minimum three coats solvent-free Linseed Oil paint
  - .3 One coat Le Tonkinois Heavy Duty Linseed Varnish, if required to achieve desired sheen

## **2.5 EXTERIOR COATINGS**

- .1 Stucco/Plaster Surfaces: Whitewash
  - .1 Whitewash Formula: as specified for interior stucco/plaster surfaces
  - .2 Mix only as much whitewash as can be applied while still hot
  - .3 Brush apply hot whitewash in minimum two coats, or number of coats as required to match accepted mock-up
- .2 Stone Masonry Surfaces: Whitewash.
  - .1 Whitewash Formula: as specified for interior stucco/plaster surfaces
  - .2 Mix only as much whitewash as can be applied while still hot
  - .3 Brush apply hot whitewash in minimum two coats, or number of coats as required to match accepted mock-up.

- .3 Dressed Lumber and Finish Carpentry: including wood doors and frames, wood window frames, sills, sashes, trim, casings, and other wood surfaces:
  - .1 One coat Linseed Oil primer
  - .2 Minimum three coats solvent-free Linseed Oil paint
  - .3 One coat Le Tonkinois Heavy Duty Linseed Varnish, if required to achieve desired sheen
- .4 Wood Log Surfaces: Whitewash.
  - .1 Whitewash Formula: as specified for interior stucco/plaster surfaces.
  - .2 Mix only as much whitewash as can be applied while still hot.
  - .3 Brush apply hot whitewash in minimum two coats, or number of coats as required to match accepted mock-up.
- .5 Wood decking, columns above deck level, rails - Stained:
  - .1 Stain to match samples provided by Departmental Representative.
  - .2 Apply in number of coats as required to match accepted mock-up.
- .6 Wood pickets and deck skirting board, columns below deck level - Painted:
  - .1 One coat Linseed Oil primer
  - .2 Minimum three coats solvent-free Linseed Oil paint
- .7 Wood Siding - Painted:
  - .1 One coat Linseed Oil primer
  - .2 Minimum three coats solvent-free Linseed Oil paint
- .8 Metal Surfaces including bars at windows:
  - .1 One coat Linseed Oil primer
  - .2 Minimum three coats solvent-free Linseed Oil paint

### **Part 3 Execution**

#### **3.1 EXAMINATION**

- .1 Investigate effect of existing moisture conditions of painted surfaces, caused by interior and exterior environmental conditions, on planned surface preparation and subsequent paint application.
- .2 Check other interior conditions such as relative humidity and ambient temperature.
- .3 Investigate structural conditions to ensure that any part of floor area of other part of historic structures are sound enough to carry out painting work.
- .4 Report to Departmental Representative defects or unfavourable conditions found from above investigations before carrying out painting work.

#### **3.2 PROTECTION**

- .1 Do not touch furnishings or artifacts in historic buildings. If objects need to be moved or covered, notify Departmental Representative immediately. Departmental Representative will arrange to have items moved or covered.
- .2 Cover or mask floors and decks adjacent to areas where painting is performed, to prevent damage and to protect from paint drops and splatters.

- .3 No fastenings associated with hoarding or other protection shall be installed in historic material.
- .4 Use ground protection under work areas to collect debris and waste.

### **3.3 EXISTING CONDITIONS**

- .1 Degree of surface deterioration (DSD) to be assessed using MPI Identifiers and Assessment criteria indicated in the MPI Maintenance Repainting Manual.
- .2 Include costs of repair of DSD-1 through DSD-3 defects in the Work. Do not repaint surfaces until DSD-4 defects have been corrected.

Condition	Description
DSD-0	Sound Surface (includes visual (aesthetic) defects that do not affect film's protective properties).
DSD-1	Slightly Deteriorated Surface (indicating fading; gloss reduction, slight surface contamination, minor pin holes and scratches).
DSD-2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, and staining).
DSD-3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).
DSD-4	Substrate Damage (repair or replacement of surface required).

### **3.4 SURFACE PREPARATION**

- .1 Prepare surfaces to be painted in accordance with manufacturer's written instructions for each substrate condition, and as follows:
- .2 Report to Departmental Representative damage to substrate surfaces incurred during surface preparation, due to rot condition of substrate material.
- .3 Do not use mechanical abrasive techniques to remove or smooth painted surfaces.
- .4 Allow sufficient drying time and test surfaces using electronic moisture meter before commencing work. Maximum moisture content as follows:
  - .1 Wood: 10%.
  - .2 Plaster/Stucco: 12%.
- .5 Notify Departmental Representative when surface preparation work is finished, and before application of finish coatings.
- .6 Prevent contamination of cleaned surfaces by salts, acids, alkalis, corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats.
- .7 Dirty Exterior Stucco/Plaster Surfaces:
  - .1 Loosen dirt with direct stream of water from garden hose nozzle. Scrub stains with non-ionic detergent solution and soft natural bristle brush. Rinse with direct stream of water from garden hose nozzle. Dry thoroughly.
  - .2 Dampen surfaces of plaster before applying whitewash.
- .8 Dirty Interior Plaster Surfaces:
  - .1 Wash surfaces with cloth or sponge and warm water. Dry thoroughly.
  - .2 Scrub stains with non-ionic detergent solution and soft natural bristle brush.
  - .3 Dampen surfaces of plaster before applying whitewash.
- .9 Dirty Masonry Surfaces: Cleaning of masonry surfaces is specified in Section 04 03 01.13 - Historic Masonry Cleaning.

- .10 Wood Surfaces:
  - .1 Avoid washing with products with a high pH.
  - .2 Clean mould and mildew on wood with mildew cleaner for wood mixture.
    - .1 Let mixture absorb into wood grain for approximately 30 minutes without drying, while brushing surface. Rinse with wet microfibre cloth. Rinse microfibre cloth in warm water frequently.
  - .3 Clean and prepare wood surfaces in accordance with linseed oil paint manufacturer's instructions, and MPI Repainting Manual for surface preparation requirements based on degree of surface degradation.
  - .4 Prime prepared wood surfaces same day. Do not leave bare wood or exposed edges left unprimed or unfinished.

### **3.5 PAINT APPLICATION**

- .1 Use natural or synthetic bristle brush for applicable of paints and coatings as recommended by coating manufacturer. Use of rollers or sprayers is not permitted.
  - .1 Apply paint in a uniform layer using brush of types suitable for application. Work paint into cracks, crevices and corners.
  - .2 Repaint thin spots or bare areas before next coat of paint is applied.
  - .3 Paint surfaces and corners not accessible to brush using daubers or sheepskins.
  - .4 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
  - .5 Gently sand and dust between coats to remove visible defects.
  - .6 Brush runs and sags, and over-lap marks.
  - .7 Remove runs and sags from finished work and repaint. Some brush marks may be acceptable to match finished appearance of surrounding similar finishes
  - .8 Repaint thin spots or bare areas before next coat of paint is applied.
- .2 Wood Surfaces:
  - .1 Seal exposed knots with shellac mixture.
  - .2 New and Bare Wood: Apply one coat heated boiled linseed oil primer to warmed surface.
  - .3 Prior to assembly, prime hidden surfaces including end grain of components with one coat of heated boiled linseed oil applied to warmed surfaces.
- .3 Linseed Oil Paint:
  - .1 Ensure linseed oil is completely absorbed before applying linseed oil paint.
  - .2 Allow surfaces to dry completely between coats.
  - .3 Brush apply warmed paint in thin coats to WFT in accordance with manufacturer's recommendations.
- .4 Where required, apply transition coat over incompatible existing coatings.
- .5 Blending Plain Painted Surfaces: When painting new substrates patched into existing surfaces or touching up missing or damaged finishes, apply coating system specified for the specific substrate. Apply final finish coat over entire surface from edge to edge and corner to corner.
- .6 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.

**3.6 CLEANING**

- .1 At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- .2 Dispose of paint scrapings based on requirements related to content of paint.
  - .1 Dispose of lead-contaminated waste generated by scraping activities in accordance with federal, provincial, and municipal regulations.
  - .2 All other paint scrapings may be disposed of in sanitary landfill with other non-hazardous project waste
- .3 After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- .4 At completion of construction activities of other trades, touch-up and restore damaged or defaced painted surfaces.

**3.7 PROTECTION OF COMPLETED WORK**

- .1 Protect exterior surfaces from moisture and water as necessary from time of preparation until the final coats of paint have sufficiently dried to be unaffected by moisture and/or water.
- .2 Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Departmental Representative, and leave in an undamaged condition.
- .3 Protect areas where paint has been applied from possible contamination caused by surrounding environment and also from other trade activities.

**END OF SECTION**



**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Ceramic wall tile, and porcelain wall and floor tile installed over existing tile surfaces in renovated washrooms in Museum basement
- .2 Mortar and grout
- .3 Metal trims and reducer strips

**1.2 RELATED REQUIREMENTS**

- .1 Section 08 31 00 - Access Doors and Panels

**1.3 REFERENCES**

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
  - .1 ANSI A108/A118/A136.1-2009, Specification for the Installation of Ceramic Tile
- .2 International Standards Organization (ISO)
  - .1 ISO 10545, Ceramic Tiles
  - .2 ISO 13007-1: 2010 Ceramic tiles -- Grouts and adhesives -- Part 1: Terms, definitions and specifications for adhesives
- .3 Terrazzo Tile and Marble Association of Canada (TTMAC)
  - .1 Tile Specification Guide 09 30 00 Tile Installation Manual, 2016-2017
  - .2 Tile Maintenance Guide, latest edition

**1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Preinstallation Meeting: Convene one week prior to commencing work of this section.
  - .1 Require attendance of installation material manufacturer, tile supplier, tile installer and installers of related work, to review:
    - .1 Installation procedures and coordination required with related work.
    - .2 Tile and installation material compatibility.
    - .3 Grouting procedure.
    - .4 Maintenance and cleaning products and methods.
    - .5 Surface preparation.

**1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Action Submittals:
  - .1 Product Data: Submit manufacturer's product data for each type of setting material, grout, primer, sealant, and trim product specified.
  - .2 Samples for Initial Selection: Submit the following samples for initial selection:
    - .1 Grout: Manufacturer's standard colours using actual sections of grout showing full range of colours available for each type of grout indicated.

.3 Samples for Verification: Submit the following samples for final verification, including full range of colour and texture variations expected.

.1 Metal Trims and Reducer Strips: Submit full size units of each type in each colour required for installation; minimum 150-mm lengths.

.3 Informational Submittals:

.1 Installer qualifications.

.2 Statement of material compatibility, and existing surface acceptance.

## **1.6 CLOSEOUT SUBMITTALS**

.1 Maintenance Data: Submit maintenance data for incorporation into Operations and Maintenance Manual in accordance with Section 01 78 00 – Closeout Submittals.

.1 Submit cleaning and maintenance recommendations.

.2 Submit TTMAC Maintenance Guide. Provide specific warning of maintenance practice or materials that may damage or disfigure finished work.

## **1.7 QUALITY ASSURANCE**

.1 Installer Qualifications: skilled mechanics trained and experienced in type of tile work specified. Installation firm registered as member in good standing with TTMAC.

.2 Source Limitations for Setting and Grouting Materials: Obtain ingredients for each primer, mortar, and grout component from one manufacturer.

.3 Material Compatibility: Provide materials that are compatible with one another under conditions of service and application required.

## **1.8 DELIVERY, STORAGE AND HANDLING**

.1 Deliver and store packaged materials in original containers with seals unbroken and labels intact.

.2 Store materials to prevent damage or contamination to materials by water, freezing, foreign matter, and other causes; store cementitious materials in a dry area, and raised off floor and ground surfaces.

## **1.9 WASTE MANAGEMENT AND DISPOSAL**

.1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

## **1.10 AMBIENT CONDITIONS**

.1 Apply bond promoting primer at ambient and substrate surface temperatures between 10 and 35 deg C.

.2 Apply tile after completion of Work by other sections, to dry, clean, firm, level and plumb surfaces, free from oil or wax or any other material detrimental to tile adhesion.

.3 Maintain tile materials and substrate temperature between manufacturer's recommended minimum and maximum temperature range. Store materials in area of installation minimum 24 hours before work begins.

.4 Maintain temperature range for minimum 48 hours before and during installation and until materials are fully set and cured to manufacturer's recommendations.

**Part 2 Products**

**2.1 TILE**

- .1 Wall Tile, except for Accent Wall:
  - .1 Composition: Ceramic.
  - .2 Moisture Absorption:  $\leq 0.5\%$ .
  - .3 Size: 200 by 505 mm.
  - .4 Surface Finish: Smooth, non-textured.
  - .5 Glaze: Matte.
  - .6 Variation Rating: V1.
  - .7 Colour: Warm White Matte.
  - .8 Basis-of-Design Product: Olympia Colour and Dimension.
- .2 Accent Wall Tile:
  - .1 Composition: Porcelain.
  - .2 Moisture Absorption:  $\leq 0.5\%$  to ISO 10545-3.
  - .3 Size: 300 by 600 mm, and 600 by 600 mm by 10 mm thick.
  - .4 Edges: Rectified.
  - .5 Surface Finish: Matte, natural.
  - .6 Variation Rating: V2.
  - .7 Colour: Allow for one colour of each size as selected by Departmental Representative.
  - .8 Basis-of-Design Products: Olympia Shadestone Light (300 by 600), and Shadestone Mix Light (600 by 600).
- .3 Floor Tile:
  - .1 Composition: Porcelain.
  - .2 Moisture Absorption:  $\leq 0.5\%$  to ISO 10545-3.
  - .3 Size: Polygon, 300 by 300 by 10 mm thick.
  - .4 Edges: Rectified.
  - .5 Surface Finish: Non-textured, natural, anti-slip.
  - .6 Variation Rating: V2.
  - .7 Slip Resistance:  $>R10$  to DIN 51130.
  - .8 Colour: Taupe Natural.
  - .9 Basis-of-Design Product: Olympia Shadestone Code Nat.

**2.2 MORTAR AND GROUT MATERIALS**

- .1 Latex Additive: Manufacturer's formulated for use in thin set bond coat.
- .2 Mortar: Polymer-modified, non-sagging dry-set cement mortar for large and heavy tile in thinset applications, complying with ANSI A118.4, A118.11 and ISO 13007 C2TES1P1.
  - .1 Acceptable Products: Mapei Ultraflex LFT, or comparable products in compliance with specified requirements by Laticrete, or Flextile.

- .3 Grout: Epoxy grout to ISO 13007 classification RG, ANSI A118.3, two-component, 100% solid, water-cleanable, non-sagging, chemical- and stain-resistant. Colour selected by Departmental Representative.
  - .1 Acceptable Products: Mapei Kerapoxy CQ, Laticrete SpectraLock Pro Premium Flextile FlexEpoxy 100.
- .4 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

## **2.3 ACCESSORIES**

- .1 Bond-Promoting Primer: Ready-to-use, low-VOC synthetic resin-based primer with bond-promoting silica aggregates suspended in a dispersion, to promote performance and adhesion of mortars to existing ceramic tile.
  - .1 Basis-of-Design Product: Mapei ECO Prim Grip.
- .2 Metal Trim: Purpose-made stainless steel tile trim, coved profile for floor-to-wall and inside wall-to-wall corners, including connectors and corners.
  - .1 Acceptable Product: Schluter Dilex-EHK.
- .3 Reducer Strips: Purpose made anodized aluminum extrusion, with sloped transition surface, height to suit on-site conditions on each side of existing marble threshold.
  - .1 Corridor Side: with countersunk holes for mechanically fastening.
    - .1 Acceptable Product: Schluter Reno-Ramp (without anchoring leg) or Reno-Ramp K.
  - .2 Washroom Side: with perforated anchoring leg and integrated joint spacer between tile and profile.
    - .1 Acceptable Product: Schluter Reno-U.
- .4 Joint Sealant: Mildew-resistant flexible silicone to ASTM C920, or hybrid silicone, colour-matched to grout.
  - .1 Acceptable Products: Mapei Mapesil T, Laticrete Latasil, Flextile Ultra Performance Hybrid Caulk.
- .5 Tile Cleaner: Neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

## **2.4 MIXES**

- .1 Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- .2 Add materials, water, and additives in accurate proportions.
- .3 Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Examine substrates, areas, and conditions where tile will be installed, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
  - .1 Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - .2 Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 PREPARATION**

- .1 Blending: For tile exhibiting colour variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colours as those taken from other packages and match approved samples. If not factory blended, blend tiles at Project site before installing.
- .2 Before installation clean back of tile free of contaminants.

**3.3 SURFACE PREPARATION**

- .1 Clean substrates free of soap scum, oil, wax, sealers, dust, and bond-inhibiting materials.
- .2 Sound existing wall and floor areas. Remove "hollow-sounding" tiles.
- .3 Infill voids, chipped tile, and areas where tiles have been removed with specified mortar, up to 12 mm deep.
- .4 Prime tile surfaces to receive new tile with bond-promoting primer using nap roller or brush in accordance with manufacturer's instructions. Apply thin film to completely cover substrates.
- .5 Apply mortar and tile materials over primer within manufacturer's recommended time limit.

**3.4 TILE INSTALLATION**

- .1 Comply with TTMAC Specification Guide 09 30 00 Tile Installation Manual for TTMAC installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile", that are referenced in TTMAC installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
  - .1 For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
    - .1 Tile larger than 300 mm in any dimension.
    - .2 Tile with raised, ribbed or textured back.
    - .3 Tile installed with chemical-resistant mortars and grout.
    - .4 Tiles with installation rated for heavy or extra heavy duty.

- .2 Extend tile work into recesses behind fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- .3 Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- .4 Jointing Pattern: Lay wall tile in stack pattern unless otherwise indicated. Lay out tile work and centre tile fields in both directions in each space or on each wall area. Lay out tile work to minimize use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- .5 Joint Widths: Unless otherwise indicated, install tile with 1.5 mm joints.
- .6 Grouting:
  - .1 Allow proper setting time before grouting.
  - .2 Grout joints solidly with grout mixed to proper consistency to flow into and fill joints.
  - .3 Apply grout in dust free environment. Protect for minimum seven days.
  - .4 Ensure that grout is free of pits or voids. When sufficiently set tool surface to a slightly concave profile. Repoint as necessary.
  - .5 Maintain uniform colour throughout.
  - .6 As work progresses, remove excess grout and polish with clean cloths.
  - .7 Do not grout joints around fixtures, pipes or other fittings. Fill joints with silicone sealant.
- .7 Metal Trim: Install cove trim at wall-to-wall, and wall-to-floor joints.
- .8 Reducer Strip: Install reducer strip at entrances on both sides of existing marble threshold at doorways.
  - .1 Mechanically fasten reducer strip on corridor side with countersunk fasteners.
  - .2 Anchor reducer strip on washroom side in mortar.

### **3.5 MOVEMENT JOINTS**

- .1 Provide sealant-filled joints, including control, contraction, and isolation joints. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - .1 Provide movement joints in accordance with TTMAC detail 301MJ.
  - .2 Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
  - .3 Provide control joints around perimeter of large areas, around columns, in locations where area changes direction and where tile abuts other hard material.
- .2 Fill movement joints with sealant.

### **3.6 LIPPAGE TOLERANCES**

- .1 Field Verification of Finished Installation: To TTMAC Manual.

**3.7 TILE INSTALLATION SCHEDULE**

- .1 Wall Tile: Thin-set mortar on existing wall tile on CMU and CIP concrete walls. Similar to TTMAC 324RF.
- .2 Floor Tile: Thin-set mortar on existing floor tile. TTMAC Detail 324RF.

**3.8 CLEANING**

- .1 Cleaning: On completion of placement and grouting, clean tile surfaces so they are free of foreign matter.
  - .1 Remove grout residue from tile as soon as possible.
  - .2 Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

**3.9 PROTECTION OF FINISHED WORK**

- .1 Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls.
- .2 Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

**END OF SECTION**





**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Section Includes: the following for non-historic or period finishes
  - .1 Surface preparation
  - .2 Interior painting, and repainting
  - .3 Site painting of factory- and shop-primed surfaces

**1.2 RELATED REQUIREMENTS**

- .1 Section 06 40 00 - Architectural Woodwork, factory-primed countertop brackets
- .2 Section 09 03 91 - Conservation Treatment for Period Painted Surfaces, for treatment of historic finishes
- .3 Section 23 05 53.01 - Mechanical Identification

**1.3 REFERENCES**

- .1 The Master Painters Institute (MPI)
  - .1 MPI Architectural Painting Specification Manual
  - .2 MPI Maintenance Repainting Manual
- .2 Systems and Specifications Manual, SSPC Painting Manual, Volume Two, Society for Protective Coatings (SSPC).

**1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Scheduling: Schedule painting operations in occupied areas to prevent disruption of occupants in and about the building. Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

**1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Action Submittals:
  - .1 Product Data: Submit Product data on all specified finishing products, including MSDS.
  - .2 Samples:
    - .1 Submit three drawdowns of each product and colour combination. Drawdowns shall be applied using 4 mil WFT drawdown bar on Leneta form WD plain white coated cards size 100 by 150 mm, mounted on 216 by 280 mm sheets.
    - .2 For natural and stained finishes on wood: Submit duplicate samples of specified finish on specified wood species.
    - .3 When approved, sample panels shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

- .4 Label each card with the following:
  - .1 Job name.
  - .2 Date.
  - .3 Product name and number.
  - .4 Colour number as stated in the colour schedule.
  - .5 Name, address, and phone number of the supplying facility.
- .5 Submit full range of available colours where colour availability is restricted.

## **1.6 CLOSEOUT SUBMITTALS**

- .1 Section 01 78 00: Submission procedures.
- .2 Record Documentation: Upon completion, provide itemized list of products used including the following:
  - .1 Manufacturer's name.
  - .2 Product name, type and use.
  - .3 Colour coding number.

## **1.7 QUALITY ASSURANCE**

- .1 Installer Qualifications: Company specializing in performing the work of this section with documented experience.
- .2 Conform to MPI Painting Manual requirements for materials, preparation and workmanship.
- .3 Paint Products: Paint manufacturers and paint Products listed under the Approved Product List section of the MPI Painting Manual.

## **1.8 DELIVERY, HANDLING AND STORAGE**

- .1 Deliver products to site in sealed and labeled containers showing manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, colour designation, and written instructions for mixing and reducing.
- .2 Remove damaged, opened and rejected materials from site.
- .3 Store paint materials at minimum ambient temperature of 10 degrees C and a maximum of 32 degrees C, in dry, ventilated area and as required by manufacturer's written instructions.
- .4 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .5 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. After completion of operations, return areas to clean condition to approval of Departmental Representative.
- .6 Remove paint materials from storage only in quantities required for same day use.
- .7 Provide adequate fireproof storage lockers and warnings as required by authorities having jurisdiction for storing toxic and volatile/explosive/flammable materials.

- .8 Fire Safety Requirements:
  - .1 Provide Type ABC fire extinguisher adjacent to storage area.
  - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
  - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

## **1.9 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

## **1.10 SITE REQUIREMENTS**

- .1 Ambient Conditions:
  - .1 Perform painting Work when ambient air and substrate temperatures, and relative humidity meet paint product manufacturer's requirements.
  - .2 Do not perform painting Work when maximum moisture content of substrate exceeds:
    - .1 Wood: 15%.
    - .2 Gypsum board: 12%.
  - .3 Conduct moisture tests using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test".
  - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .2 Ventilation and Lighting:
  - .1 Ventilate enclosed spaces.
  - .2 Where required, provide continuous ventilation after completion of application of paint.
  - .3 Coordinate use of existing ventilation system with Departmental Representative, and ensure its operation during and after application of paint as required.
  - .4 Provide temporary ventilating equipment where permanent facilities are not available, or supplemental ventilating equipment, if ventilation from existing system is inadequate to meet minimum requirements.
  - .5 Provide minimum lighting level of 323 lux on surfaces to be painted.
- .3 Surface and Environmental Conditions:
  - .1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when ventilation conditions are such that airborne particles will not affect quality of finished surface.
  - .2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits specified.
  - .3 Apply paint only when previous coat of paint is dry or adequately cured.
- .4 Additional Exterior Application Requirements:
  - .1 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
  - .2 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

## Part 2 Products

### 2.1 MATERIALS

- .1 Use only lead- and mercury-free low VOC materials (primers, paints, coatings, varnishes, stains, lacquers, fillers) listed in the latest edition of the MPI Approved Product List (APL) on this project.
- .2 Ancillary materials such as linseed oil, shellac, thinners, solvents to be of highest quality product and provided by an MPI listed manufacturer, and compatible with paint materials being used.
- .3 Provide material for each system from a single manufacturer.

### 2.2 COLOURS

- .1 Colour Schedule will be provided after Contract award.
  - .1 Colour schedule will be based upon existing colours.
  - .2 Departmental Representative may select colours from several different paint manufacturers. Manufacturers of other brands shall match these colours exactly.
- .2 Selection of colours will be from manufacturers' full ranges of colours.
- .3 Where specific products are available in a restricted range of colours, selection will be based on the limited range.

### 2.3 MIXING AND TINTING

- .1 Coatings: Ready-mixed and pre-tinted; re-mix paint in containers before and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.
- .2 Paste, Powder or Catalyzed Paint: Mixed in accordance with manufacturer's written instructions.
- .3 Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
  - .1 Do not exceed paint manufacturer's recommendations for addition of thinner. Do not use kerosene or any such organic solvents to thin water-based paints.
  - .2 Thin paint for spraying in accordance with paint manufacturer's instructions.
- .4 Tint second coat in a three-coat system slightly lighter colour than top coat to show visible difference between coats.

### 2.4 GLOSS/SHEEN RATINGS

- .1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following values:

Gloss Level Category	Units @ 60 deg	Units @ 85 deg
G1 - matte finish	0 to 5	max. 10
G2 - velvet finish	0 to 10	10 to 35
G3 - eggshell finish	10 to 25	10 to 35
G4 - satin finish	20 to 35	min. 35
G5 - semi-gloss finish	35 to 70	
G6 - gloss finish	70 to 85	
G7 - high gloss finish	> 85	

- .2

- 2.5 Gloss level ratings of painted surfaces as follows, unless otherwise indicated:**
- .1 Ceilings: G1.
  - .2 Metal Fabrications: G5.
  - .3 Metal Frames: G5.
  - .4 Wood Doors: G5.
- .2 Repainting and Patchwork: gloss level of patchwork to match existing surfaces as closely as possible.

**2.6 INTERIOR PAINTING AND REPAINTING SYSTEMS**

- .1 Provide for required surface preparation and transition coat/tie coat primer where required to change from existing alkyd to latex finishing systems.
- .2 New Factory- or Shop-Primed Metal: including factory-primed washroom lavatory countertop supports, factory-primed access doors and panels, and other primed metal items.
  - .1 MPI#141 - High performance architectural latex finish, two coats; touch-up self-prime if required.
- .3 New Galvanized Metal: including exposed electrical conduit, ductwork and piping, and other exposed galvanized metal items:
  - .1 INT 5.3J - High performance architectural latex finish (over water-based galvanized primer).
- .4 Existing Galvanized Metal: including existing HM frames at Museum basement washrooms, exposed electrical conduit, ductwork and piping, other exposed existing galvanized metal items in areas of alteration or renovation affected by the Work.
  - .1 RIN 5.3J - High performance architectural latex finish (over water-based galvanized primer).
- .5 Existing Dressed Lumber: including existing wood doors at Museum basement washrooms, and window trim and mouldings in areas of alteration or renovation affected by the Work.
  - .1 RIN 6.3T: High performance architectural latex.
- .6 Gypsum Board:
  - .1 New Surfaces: INT 9.2B - High performance architectural latex.
  - .2 Existing Surfaces: RIN 9.2B - High performance architectural latex.

**Part 3 Execution**

**3.1 GENERAL**

- .1 Perform preparation and operations for painting in accordance with MPI Painting Specifications Manual, and Maintenance Repainting Manual.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

**3.2 EXAMINATION**

- .1 Investigate substrates for problems related to proper and complete preparation of surfaces to be painted or repainted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

- .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, and report findings to Departmental Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Test shop applied primer for compatibility with subsequent cover materials.
- .4 Maximum moisture content as follows:
  - .1 Gypsum board, concrete: 12%.
  - .2 Wood: 15%.
- .5 Correct defects and clean surfaces that affect work of this section. Start of finish painting of defective surfaces indicates acceptance of substrate and making good defects will be at no additional cost.

### 3.3 EXISTING CONDITIONS

- .1 Degree of surface deterioration (DSD) to be assessed using MPI Identifiers and Assessment criteria indicated in the MPI Maintenance Repainting Manual.
- .2 Include costs of repair of DSD-1 through DSD-3 defects in the Work. Do not repaint surfaces until DSD-4 defects have been corrected.

Condition	Description
DSD-0	Sound Surface (includes visual (aesthetic) defects that do not affect film's protective properties).
DSD-1	Slightly Deteriorated Surface (indicating fading; gloss reduction, slight surface contamination, minor pin holes and scratches).
DSD-2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, and staining).
DSD-3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).
DSD-4	Substrate Damage (repair or replacement of surface required).

### 3.4 PROTECTION

- .1 Protect adjacent finished surfaces from paint spatters, markings and other damage. If damaged, clean and restore surfaces as directed by Departmental Representative.
- .2 Protect exterior surfaces and areas, including landscaping, walks, drives, adjacent building surfaces; equipment and signs from repainting operations and damage. If damaged, clean and restore surfaces as directed by Departmental Representative.
- .3 Protect items that are permanently attached including fire labels on doors and frames, and non-removable signs.
- .4 Protect factory-finished products and equipment.
- .5 Remove electrical cover plates, light fixtures, surface hardware on doors, and other surface mounted equipment, fittings and fastenings before starting painting operations. Securely store items and re-install after painting is completed.
- .6 As painting operations progress, place "WET PAINT" signs.

### **3.5 PREPARATION**

- .1 Clean and prepare new and existing surfaces in accordance with MPI Painting Specification Manual, and MPI Maintenance Repainting Manual "Repaint Surface Preparation Standards" requirements. Refer to MPI Manuals in regard to specific requirements.
  - .1 Gypsum Board Surfaces: Fill minor defects with filler compound. Sand smooth and wipe clean. Spot prime defects after repair. Dull glossy areas of existing gypsum surfaces with sand paper.
  - .2 Metal Surfaces:
    - .1 Remove loose or flaked paint, rust, loose mill scale, dirt, oil, grease and other foreign substances in accordance with MPI requirements.
    - .2 Shop Primed Steel Surfaces: Sand to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces. Spot prime bare steel surfaces.
- .2 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .3 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

### **3.6 APPLICATION**

- .1 Apply coatings in accordance with MPI Painting Manual Premium Grade finish requirements.
- .2 Apply coatings by brush, or roller. Conform to manufacturer's application instructions unless specified otherwise.
- .3 Brush and Roller Application:
  - .1 Apply paint in a uniform layer using brush or roller of types suitable for application.
  - .2 Work paint into cracks, crevices and corners.
  - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
  - .4 Brush or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Departmental Representative.
  - .5 Remove runs, sags and brush marks from finished work and repaint.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by Departmental Representative.
- .5 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .7 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

- .8 Number of coats of paint specified are intended to cover surface completely. If necessary apply additional coats until satisfactory coverage is obtained. Additional coats without cost to the Departmental Representative.
- .9 Finish surfaces both above and below sight lines as specified for surrounding surfaces.
- .10 Finish top, bottom, edges and cutouts of doors as specified for door surfaces.
- .11 Continue paint finish behind wall-mounted items.

### **3.7 REPAINTING EXISTING SURFACES**

- .1 Wherever painting of existing doors is indicated, paint both sides of doors and frames. Remove doors before repainting to paint bottom and top edges.
- .2 Painting of patchwork shall include for painting of existing surfaces up to nearest change in direction or surface interruption (i.e. door jamb, corner, bulkhead). Make neat termination, match paint as closely as possible.

### **3.8 MECHANICAL/ELECTRICAL EQUIPMENT**

- .1 Mechanical and Electrical Rooms: paint new exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment to match existing.
- .2 Unfinished Areas: leave equipment, piping, conduits, etc. in original finish and touch-up scratches and marks.
- .3 Elsewhere:
  - .1 Paint new exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted or specified otherwise.
  - .2 Repaint existing exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment affected by alteration or renovation work.
- .4 Identification of mechanical work is specified in Section 23 05 53.01 - Mechanical Identification.
- .5 Do not paint over nameplates.
- .6 Keep sprinkler heads free of paint.
- .7 Paint inside of new ductwork where visible behind grilles, registers and diffusers with primer and one coat of matte black paint.

### **3.9 FIELD QUALITY CONTROL**

- .1 Standard of Acceptance:
  - .1 No visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 1000 mm.
  - .2 No visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 1000 mm.
  - .3 No visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
  - .4 Uniformity of colour, sheen, texture, and hiding across full surface area.

### **3.10 PROTECTION**

- .1 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.



- .2 Protect newly repainted exterior surfaces from rain and snow, condensation, contamination, dust, and freezing temperatures until paint coatings are completely dry.

**3.11 CLEANING AND RESTORATION**

- .1 Clean and re-install all hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

**END OF SECTION**



**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Solid plastic toilet compartments, floor-mounted overhead braced configuration in renovated washrooms in Museum basement
- .2 Solid plastic urinal screen, floor-to-ceiling mounted configuration in renovated washrooms in Museum basement

**1.2 REFERENCES**

- .1 ASTM International (ASTM)
  - .1 ASTM B86-13 Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings
  - .2 ASTM B221-14 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Action Submittals:
  - .1 Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - .2 Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show locations of centrelines of toilet fixtures.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Maintenance Data: For toilet compartments to include in maintenance manuals

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

**1.6 PROJECT CONDITIONS**

- .1 Field Measurements: Verify actual locations of toilet fixtures, walls, columns, and other construction contiguous with toilet compartments by field measurements before fabrication.

**Part 2 Products**

**2.1 MANUFACTURERS**

- .1 Acceptable Products: Hiny Hider Toilet Partitions manufactured by Scranton Products; Bradmar Solid Plastic Partitions manufactured by Bradley; Solid Plastic Headrail Braced manufactured by Hadrian; Solid Plastic (HDPE) Floor Anchored Overhead Braced by ASI Global Partitions.

## **2.2 MATERIALS**

- .1 Injection Moulded Plastic: High density polyethylene (HDPE), fabricated from extruded polymer resins, forming single thickness panel.
  - .1 Waterproof, non-absorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
  - .2 Thickness: 25-mm, with 6 mm radius edges.
  - .3 Texture: Orange peel.
  - .4 Colour: Concrete.
- .2 Stainless Steel: Type 304.
- .3 Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.
- .4 Aluminum Die Castings: ASTM B85, A380 alloy.
- .5 Zamac: ASTM B 86, commercial zinc-alloy die castings.
- .6 Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

## **2.3 HARDWARE**

- .1 Hinges: 200 mm long, heavy-duty extruded aluminum with bright dip anodized finish, wrap-around flanges, through bolted to doors and pilasters.
  - .1 Hinges operate on field-adjustable nylon cams, field adjustable in 30 degree increments.
- .2 Latch and Keeper: Stainless steel, surface-mounted slide latch unit designed for emergency access and with combination vinyl or rubber-faced door strike and keeper
- .3 Coat Hook/Bumper: Combination type, chrome plated Zamac.
- .4 Door Pulls: Chrome plated Zamac.

## **2.4 COMPONENTS**

- .1 Doors, Panels, and Pilasters:
  - .1 Doors and Panels: 1400 mm high, mounted 355 mm AFF.
  - .2 Pilasters: 2083 mm high, fastened to pilaster shoe with stainless steel tamper resistant Torx head sex bolt.
- .2 Urinal Screen: Flat panel matching panel construction of toilet compartment panel, with floor-to-ceiling pilaster and full length double ear wall brackets.
- .3 Pilaster Shoe and Cap: 75 mm high, stainless steel.
- .4 Brackets: 1372 mm long, double-ear stainless steel.
- .5 Headrail: Heavy-duty extruded aluminum, anti-grip design, clear anodized finish.
- .6 Headrail Brackets: Heavy-duty extruded aluminum, clear anodized finish.

## **2.5 FABRICATION**

- .1 Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at posts to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

- .2 Floor-and-Ceiling-Anchored Urinal Screen: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verify existing conditions before starting work.
- .2 Verify that field measurements are as indicated on Shop Drawings.
- .3 Verify correct spacing of and between plumbing fixtures.
- .4 Verify correct location of anchorage, and bracing.

### **3.2 INSTALLATION**

- .1 Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
  - .1 Maximum Clearances:
    - .1 Pilasters and Panels: 13 mm.
    - .2 Panels and Walls: 25 mm.
  - .2 Secure panels to walls and to pilasters with continuous brackets.
- .2 Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 44 mm into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- .3 Floor-and-Ceiling-Anchored Urinal Screen:
  - .1 Secure pilaster to supporting construction and level, plumb, and tighten.
  - .2 Location: between urinal and lavatory counter.
- .4 Replace damaged or scratched materials with new materials.

### **3.3 ADJUSTING**

- .1 Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched.

**END OF SECTION**



**Part 1            General**

**1.1            SECTION INCLUDES**

- .1        Toilet accessories in renovated washrooms in Museum basement

**1.2            RELATED REQUIREMENTS**

- .1        Electrical: for wiring and connections of hand dryer

**1.3            ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2        Action Submittals:
  - .1        Product Data: For each type of product indicated. Include the following:
    - .1        Construction details and dimensions.
    - .2        Anchoring and mounting requirements, including requirements for cut-outs in other work and substrate preparation.
    - .3        Material and finish descriptions.
    - .4        Features that will be included for Project.
- .3        Shop Drawings: Include wiring diagrams for hand dryers.

**1.4            CLOSEOUT SUBMITTALS**

- .1        Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

**1.5            EXTRA MATERIALS**

- .1        Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00 – Closeout Submittals.
- .2        Deliver special tools to Departmental Representative.

**1.6            DELIVERY, STORAGE AND HANDLING**

- .1        Deliver materials in sealed cartons and containers with manufacturer's name and Product description clearly marked.

**1.7            WASTE MANAGEMENT AND DISPOSAL**

- .1        Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

**Part 2           Products**

**2.1            MATERIALS**

- .1        Stainless steel sheet metal: Type 304, with No. 4 finish.

- .2 Fasteners: Manufacturer's standard for installation; through bolts for mounting to toilet partitions; expansion anchors of type designed to accept anticipated loads and as follows:
  - .1 Galvanized Steel Mounting Devices: In accordance with ASTM A153/A153M, hot dip galvanized after fabrication.
  - .2 Screws, Bolts, and other Devices: Same material as accessory unit, tamper and theft resistant when exposed, and galvanized steel when concealed.

## **2.2 TOILET AND BATH ACCESSORIES**

- .1 Mirror:
  - .1 Mirror Glass: Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
  - .2 Backing: full-size, shock-absorbing, water-resistant padding primary backing, and galvanized steel secondary backing.
  - .3 Frame: Stainless-steel angle with mitred and mechanically interlocked corners.
  - .4 Hangers: Produce rigid, tamper- and theft-resistant installation, to hold mirror unit in position with no exposed screws or bolts.
  - .5 Size: 457 by 915 mm.
  - .6 Acceptable Products: Bobrick B-290.
- .2 Sanitary Waste Receptacle: Surface mounted, stainless steel, satin finish, curved front. Hinged lid.
  - .1 Acceptable Products: Bobrick B-270, ASI 20852, Frost 622.
- .3 Soap Dispenser: Surface mounted, vertical format, stainless steel construction, satin finish. Hinged cap on top for filling. Capacity: 1.2 L.
  - .1 Acceptable Products: Bobrick B-2111, ASI 0347.
- .4 Toilet Tissue Dispenser: Surface-mounted, plastic construction, 229 mm dia. jumbo roll dispenser, lockable cover.
  - .1 Acceptable Products: San Jamar model R2000TBK.
- .5 Hand Dryer: Surface-mounted, automatic, high-speed, warm air dryer, listed to CSA C22.2, with cUL label.
  - .1 Adjustable Speed: 12+ seconds
  - .2 Adjustable Sound Level: 83 - 69 dB
  - .3 Electrical Requirements: 540W 120VAC.
  - .4 Motor: 5/8 hp, 24,000 to 14,000 RPM adjustable, commutated through-flow discharge vacuum motor/blower with automatic resetting thermal protector.
  - .5 Air Temperature: 29 deg Cat 22 deg C ambient temperature.
  - .6 Energy Usage: 22 kJ.
  - .7 Operation: Automatic, microprocessor controlled infrared-sensor activated with timed power cut-off switch.
  - .8 Maximum Operation Time: 35 seconds.
  - .9 Cover Material and Finish: Stainless steel type 304 with no. 4 brushed finish.
  - .10 Acceptable Products: Extreme Air Eco Series Model # EXT7-SS.



## **2.3 FABRICATION**

- .1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.
- .2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.
- .3 Brake form sheet metal work with 1.5 mm radius bends.
- .4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- .5 Back paint components where contact is made with building finishes to prevent electrolysis.
- .6 Hot dip galvanize concealed ferrous metal anchors and fastening devices.
- .7 Shop assemble components and package complete with anchors and fittings.
- .8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.
- .9 Provide steel anchor plates and components for installation on studding and building framing.
- .10 Manufacturer's or brand names on face of units not acceptable.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install toilet accessory units level, plumb, and firmly anchored in locations and at heights indicated or as directed.
- .2 Install and secure accessories rigidly in place as follows:
  - .1 Stud walls: install steel back-plate to stud prior to plaster or gypsum board finish. Provide plate with threaded studs or plugs.
  - .2 Stud walls: For low weight devices (less than 2.5 kg) mounted on gypsum board, such as soap dispensers use suitably sized self-drilling anchor.
  - .3 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/wall cavity, metal hollow wall anchors or a chemical injected anchor system.
  - .4 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole, or stainless steel concrete screw.
  - .5 For installation on surfaces with plywood backing: wood screw of length such that 2/3 of screw is in plywood, and remaining length passes through non-anchor surface.
- .3 Use tamper proof screws/bolts for fasteners.
- .4 Fill units with necessary supplies shortly before final acceptance of building.
- .5 Location and Quantity:
  - .1 Mirror: One centred above each new sink.
  - .2 Sanitary Waste Receptacle: One per stall in Women's Washroom.
  - .3 Toilet Paper Dispenser: One per stall in each washroom.
  - .4 Soap Dispenser: One per washroom centred between mirrors.
  - .5 Hand Dryer: One per washroom.

- .6 Verify exact location of washroom accessories on job site with Departmental Representative.

**3.2 ADJUSTING, CLEANING AND POLISHING**

- .1 Remove protective coatings and paper including adhesives.
- .2 Test mechanisms, hinges, locks and latches.
- .3 Adjust and lubricate for smooth operation.
- .4 Clean and polish mirrors, aluminum and stainless steel surfaces.

**END OF SECTION**

**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Washroom countertops and backsplashes

**1.2 RELATED REQUIREMENTS**

- .1 Section 09 91 00 - Painting, for site painting of prime painted countertop brackets
- .2 Division 22 - Plumbing, for undermount sinks and plumbing fittings

**1.3 DEFINITIONS**

- .1 Solid Surface: Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

**1.4 REFERENCES**

- .1 International Surface Fabricators Association (ISFA)
  - .1 Classification and Standards for Solid Surfacing Material ISFA 2-01 (2013)
- .2 ASTM International (ASTM)
  - .1 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants

**1.5 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination:
  - .1 Coordinate locations of utilities that will penetrate countertops or backsplashes.
  - .2 Coordinate sizes and locations of brackets with sinks to ensure countertops can be supported and installed as indicated.

**1.6 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Action Submittals:
  - .1 Product Data:
    - .1 Submit manufacturer's product data for solid surfacing.
  - .2 Shop Drawings: For countertops.
    - .1 Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
    - .2 Show required locations of support and blocking members, and installation details and methods.
  - .3 Samples: Submit duplicate samples as follows:
    - .1 Sample size approximately: 200 by 250 mm unless specified otherwise.
    - .2 Each colour and finish of solid surfacing, with specified edge profile.
- .3 Informational Submittals:
  - .1 Solid surfacing fabricator qualifications.

**1.7 CLOSEOUT SUBMITTALS**

- .1 Submit cleaning and maintenance data in accordance with Section 01 78 00 – Closeout Submittals for solid surfacing.

**1.8 QUALITY ASSURANCE**

- .1 Fabricator Qualifications: trained and approved by solid surfacing manufacturer.

**1.9 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

**1.10 PROJECT CONDITIONS**

- .1 Field Measurements: Verify dimensions of countertops by field measurements.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Solid Surfacing: Homogeneous solid sheets of filled plastic resin complying with ISFA 2-01, and as follows:
  - .1 Size: Slabs minimum 760 by 3658 mm to minimize number of joints.
  - .2 Thickness: as specified.
  - .3 Colour: Allow for one colour selected by Departmental Representative based on Corian Price Group D.
  - .4 Colour Matching: sheets from same batch, with consecutive numbers.
  - .5 Finish: polished finish with gloss range of 50 to 80.
  - .6 Flammability: Flame Spread Index 0 and Smoke Development Index 5 when tested to CAN/ULC-S102.
  - .7 Acceptable Products: Dupont Corian (colour Rain Cloud), Wilsonart Solid Surfacing, Formica Solid Surfacing.
- .2 Adhesives: Manufacturer's recommended waterproof adhesive for bonding solid surface materials to plywood.
- .3 Canadian Softwood Plywood (CSP): to CSA O151, exterior grade, veneer core, 12.7 mm thick, solid two sides.
- .4 Sealant: Mildew-resistant, paintable silicone, to ASTM C920, Type S, Grade NS, Class 25, one-part, high modulus silicone, movement range  $\pm 25\%$ , for interior use around countertops.
- .5 Brackets: Prime painted steel bracket; maximum depth available to suit application; 500 kg load capacity per pair. Finish paint as specified in Section 09 91 00 – Painting. Allow for number of brackets spaced as required to support countertops and sinks.
  - .1 Basis-of-Design: Hafele Hebgo Bracket.

**2.2 SOLID SURFACING COUNTERTOPS**

- .1 Configuration: Refer to Drawings.
- .2 Countertops: 12 mm thick solid surface material laminated to 12.7 mm thick plywood with exposed edges built up with 12-mm thick, solid surface material.

**2.3 FABRICATION**

- .1 Fabricate tops in one piece without seams. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
- .2 Fabricate components in shop to greatest extent practical, to size and configurations indicated.
- .3 Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
- .4 Laminate solid surfacing to substrate in one piece.
- .5 Carefully cut solid surfacing to fit abutting walls and to accommodate fixtures, fittings, or other projecting, intersecting or penetrating objects.
- .6 Provide 19 mm support block as recommended by manufacturer for drop edges greater than 38 mm.
- .7 Ease top, bottom, and front edges and corners.
- .8 Provide holes and cutouts for plumbing accessories indicated on Drawings:
  - .1 Provide minimum inside corner radius for cutouts, as recommended by manufacturer.
  - .2 Rout and finish component edges to a smooth, uniform finish.
  - .3 Rout cutouts, then sand edges smooth.
  - .4 Polish edges of cutouts exposed in finished work.
- .9 Fabrication Tolerances:
  - .1 Variation in Component Size: +/-3 mm.
  - .2 Location of Openings: +/-3 mm from indicated location.

**Part 3 Execution**

**3.1 PREPARATION**

- .1 Verify adequacy of backing and support framing.
- .2 Verify plumbing and other building components, affecting work in this Section are in place and ready.

**3.2 INSTALLATION**

- .1 Fasten and anchor countertops and brackets securely. Provide heavy duty fixture attachments. Space brackets as indicated, and to suit weight of countertop and sinks.
- .2 Apply water-resistant building paper over wood framing members in contact with cementitious construction.
- .3 Install countertops with no more than 3 mm in 2400-mm sag, bow, or other variation from a straight line.
- .4 Adhere undermount sinks to countertops using manufacturer's recommended adhesive and mounting hardware.
- .5 Apply small bead of silicone sealant at junction of countertop and adjacent wall finish.

**3.3 CLEANING AND ADJUSTING**

- .1 Clean countertops in accordance with manufacturer's instructions.
- .2 Remove excess sealants and adhesives from surfaces.

**3.4 PROTECTION**

- .1 Protect work from damage until final inspection.

**END OF SECTION**

**PART 1 General**

**1.1 GENERAL**

- .1 All drawings and all sections of the specifications shall apply to and form an integral part of this section.
- .2 Provide fully tested and operational mechanical systems in complete accordance with applicable codes and bylaws.
- .3 Contract documents of this section are diagrammatic and approximately to scale. Do not scale from the drawings, exact dimensions to be taken from architectural drawings or from the site. The drawings and specifications establish scope for material and installation quality and are **not** detailed installation instructions. Follow Manufacturer's recommendations for installation supplemented by contract documents, unless otherwise specified by the Departmental Representative. Any discrepancies must be brought to the Departmental Representative's attention in writing prior to the close of tenders.

**1.2 SCOPE OF WORK**

- .1 Work to include labour, material and equipment required for supplying, installing, testing, adjusting, balancing, commissioning mechanical systems and provision of As-built drawings, O & M manuals and personnel training as detailed in this and other Sections of Divisions 21, 22 & 23.
- .2 It is the responsibility of the General Mechanical Contractor to co-ordinate the work among the various sub-trades to ensure complete functioning systems.

**1.3 DEFINITIONS**

- .1 Whenever "drawings" and "specifications" are referred to, it means "the Contract Documents".

**1.4 WORK INCLUDED**

- .1 Sections of these mechanical specifications are not intended to delegate functions or to delegate work and supply to any specific trade. The work shall include all labour, materials, equipment, and tools required for a complete and working installation as described on the drawings and all Sections of Divisions 22 & 23.

**1.5 COMMISSIONING**

- .1 Systems commissioning will be conducted prior to substantial completion. The purpose of the Commissioning is to ensure all systems are functioning as designed prior to substantial completion.
- .2 Commissioning will require the presence of knowledgeable representatives of the necessary Mechanical Trades. Manufacturer representatives are required to be on site for commissioning. The Mechanical Contractor shall include all necessary costs for systems commissioning. The Departmental Representative will participate to the extent deemed necessary.
- .3 All aspects of mechanical systems operations will be operated, checked and verified. If any portion of the work fails to meet design requirements, the Commissioning procedure will be halted and only resumed when all necessary repairs are completed. All extra costs including

costs for the Departmental Representative to revisit the site resulting from this postponement will be borne by this Contractor.

- .4 **The Contractor shall submit, to the Departmental Representative, a commissioning report detailing the commissioning tests performed and the results of these tests. Format of report is to be one sheet for each piece of mechanical equipment and it shall include: Equipment tag, description, location and point form description of tests and results.**
- .5 Contractor to provide seasonal commissioning as required. If heating or cooling systems can not be commissioned at the completion of the work due to outside weather conditions, the contractor is to return for the heating or cooling season to ensure the system is fully operational and functioning properly.

## 1.6 COMPLETION

- .1 After completing tests and adjustments remove temporary covers, and strainers, and obstructions to flow. Drain, flush and refill piping systems as often as required until all piping is clear of dirt and debris.
- .2 Leave Mechanical work in specified working order.
- .3 Provide spare components as specified in other Sections of Divisions 22 & 23.
- .4 Provide one set of all specialized tools required to service equipment as recommended by manufacturers.

## 1.7 CONTRACT DRAWINGS AND SPECIFICATIONS

- .1 Drawings and specifications are complementary each to the other, what is called for by one shall be binding as if called for by both. Many items, such as valves, vents, thermometers, pressure gauges, etc. are shown only on schematics and are not shown on plan and elevation views. Provide and install all items shown in any or all of the drawings (or schematics).
- .2 Should any discrepancy appear between the drawings and specifications, which leave the Contractor in doubt as to the true intent and meaning of the plans, and specifications, the Contractor shall obtain a ruling from the Departmental Representative in writing **before submitting a tender**. If this is not done it will be assumed that the most expensive alternative has been included in the tender price. For any ruling to become binding, the Departmental Representative must issue the new direction in a published addendum.
- .3 Examine all contract documents, including all drawings, specifications and work of other trades to ensure that work is co-ordinated and satisfactorily carried out without changes to the building or contract value.
- .4 The drawings for mechanical work are performance drawings. They are generally diagrammatic and are not to scale unless detailed otherwise. They establish scope, material and installation quality and are not detailed installation instructions showing every offset, fitting, valve or every difficulty encountered during execution of work and should not be used as an excuse for deficiencies or omissions.
- .5 Follow the recommended installation details and procedures for equipment as found in Supplier technical data, supplemented by contract document details.



- .6 Install piping, ductwork, etc., generally in the locations and routes shown on the drawings, close to the building structure to minimize furring and interference with other services or free space. Remove piping, ductwork, etc. that is not properly installed and replace to the satisfaction of the Departmental Representative at no additional cost.
- .7 Be completely responsible for the acceptable condition and operation of systems and equipment components forming part of the installation or associated with it. Promptly replace defective materials, parts and equipment and repair related damage.
- .8 The drawings are intended to convey the scope of work and indicate general arrangement and approximate location of apparatus and fixtures, and indicate the general location and route to be followed by pipes and ducts. Where required installations are not shown on plans or are only shown diagrammatically, install in such a way as to conserve headroom and interfere as little as possible with free use of space through which they pass, while allowing adequate space for service, maintenance, repair, or replacement for all equipment.
- .9 All serviceable items, such as valves, controls, bearings, filters and similar items, must be installed in such a manner as to be accessible for service, maintenance, repair and replacement without the removal of other material or equipment, and without the need for specialized equipment such as lifts, harnesses, or other safety items. Basically, work to be installed to allow easy equipment isolation and servicing functions while all surrounding systems continue to operate.
- .10 All individual pieces of equipment shall be provided with appropriate means of isolation and bypass so that systems may continue to operate during maintenance of individual components. It is understood that this may not be possible in all situations, but this is a requirement where isolation is possible.
- .11 Drawings and specifications to be considered as an integral part of contract documents and neither drawings nor specifications are to be used alone. Misinterpretation of requirements of plans or specifications shall not relieve Contractor of responsibility of properly completing work to approval of Departmental Representative.
- .12 Obtain information involving accurate dimensions from dimensions shown by site measurement. Visit and inspect the site of the work to verify location and elevation of existing services which may affect the Tender and work of this Division (water, electrical, sanitary, ductwork etc.) before submission of tender and proceeding with work. Make all necessary changes or additions to runs to accommodate structural conditions (pipes or ducts around beams, columns etc.) without additional expense to the Departmental Representative. Locations of pipes, ducts and other equipment to be altered without charge to Departmental Representative, provided change is made before installation and does not necessitate additional materials and that all such changes are acceptable to the Departmental Representative and are suitably recorded on Record Set of Drawings.
- .13 Confirm on the site the exact location and mounting elevation of outlets and fixtures as related to existing Mechanical & Electrical components.
- .14 As work progresses and before installing piping, ductwork, fixtures and equipment interfering with interior treatment and use of building, consult Departmental Representative for appropriate action before proceeding. This applies to all levels and proper grading of piping. If Contractor fails to perform above checking and fails to inform Departmental Representative of such interference, Contractor to bear all subsequent expense to make good the installation.

- .15 Refer to Structural drawings for roof construction details. These shall relate to roof supports, piping penetrating roofs, etc. as indicated on mechanical detail sheets.
- .16 Alter, at no additional cost, the locations of materials and/or equipment as directed that do not necessitate additional material.

## **1.8 CUTTING AND PATCHING**

- .1 Cutting, core drilling, patching and repairs to existing surfaces required as a result of the removal and/or relocation of existing equipment and piping, and/or installation of new equipment and piping to be included by Divisions 22 & 23 - Mechanical in tender price. Divisions 22 & 23 to employ and pay appropriate sub-trade whose work is involved, for carrying out work described above.
- .2 The cutting of openings not requiring lintels or other structural support will be the responsibility of the trade requiring the opening, the opening size will be the minimum required, and that patching will be the responsibility of the trade making the opening to the original or specified conditions.
- .3 Where openings require lintels or other structural support, or roofing work, such openings will be specified under other divisions of this specification.

## **1.9 PAINTING**

- .1 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.
- .2 Prime and paint marred finished paintwork to match original.
- .3 Restore to new condition finishes which have been damaged too extensively to be merely primed and touched up.

## **1.10 DOCUMENTATION AND SYSTEMS ACCEPTANCE**

- .1 Provide the following on substantial performance of the work:
  - .1 As-Built drawings. As-built information is to be recorded as detailed elsewhere in this Section. Submit As-Built drawings to Departmental Representative for review prior to total completion.
  - .2 Assemble the specified quantity of O&M manuals in D-ring binders with index tabs, each containing this Sub-Contractor's and suppliers names and telephone numbers, data sheets, valve charts, brochures, operating, maintenance, and lubricating instructions as well as number coded wiring diagrams and a complete set of reviewed shop drawings for all equipment provided by this Division. Include one electronic copy in portable document format (PDF). Present all copies to the Departmental Representative for review.
  - .3 Extended warranty certificates, where specified in other Sections of Divisions 22 & 23.
  - .4 Balancing report. The work of Divisions 22 & 23 will not be considered totally performed until acceptance by the Departmental Representative of the Balancing Report.

**1.11 EQUIPMENT PROTECTION AND CLEANUP**

- .1 Protect equipment and materials in storage on site, during and after installation until final acceptance. Leave factory covers in place and take special precautions to prevent entry of foreign material into working parts of piping and duct systems.
- .2 Clean exposed surfaces of mechanical equipment, ductwork, piping, etc., and polish plated work.
- .3 Remove tools, surplus and waste material from the building site upon completion. Clean grease, dirt and excess material from walls, floors, ceilings and fixtures for which this Contractor was responsible, and leave the premises suitable for immediate use.

**1.12 EXAMINATION OF THE SITE AND DOCUMENTATION**

- .1 Prior to submitting tender, carefully examine site conditions, adjacent buildings and local conditions at the site, which could affect the work of this Division.
- .2 Examine all contract drawings to ensure work can be performed without changes to the building, or work, as shown on plans. No allowance will be made later for necessary changes, unless notification of interferences has been brought to Departmental Representative's attention, in writing, prior to closing of tenders.
- .3 Verify that materials and equipment can be delivered to the place of the work and that sufficient space and access is available to permit installation thereof in locations shown on the drawings.

**1.13 GUARANTEES AND WARRANTIES**

- .1 Guarantee satisfactory operation of all work and apparatus installed under this contract. Replace, at no expense to the Departmental Representative, all items, which fail or prove defective within a period of time as define in Division 1, but in no circumstances shall the warranty period be less than one (1) year after final acceptance of complete contract by the Departmental Representative. Make good all damage incurred as a result of failure or repair of mechanical work.
- .2 No certification given, payment made, partial or entire use of equipment by the Departmental Representative, shall be construed as acceptance of defective work or acceptance of improper materials. Make good at once, without cost to the Departmental Representative, all such defective work or materials and consequence resulting, within the period of time defined in Division 1, but not less than one (1) year from time of final acceptance date.
- .3 This general guarantee shall not act as a waiver for any specified guarantee and/or warranty of greater length of time noted elsewhere in these documents.
- .4 Comply with requirements of Division 1. Where warranties specified in Division 1 are longer, or more stringent than in Divisions 22 & 23, Division 1 shall govern. Provide warranties on specified products, equipment and components as well as on the installation of these items. Include for all costs for cutting and patching, removals and restoration materials and work and repairs to other equipment affected in performance of warranty work.
- .5 Provide warranty certificates, wherever given or required, that are in excess of the normal warranty period showing the name of the firm giving the warranty, dated and acknowledged, on specific equipment and system.

**1.14 INSTRUCTIONS TO THE OPERATIONS PERSONNEL**

- .1 At the completion of the work, the Contractor shall instruct and demonstrate to the operations personnel, who will have charge of the equipment, the operation, maintenance care, and adjustment of all parts of the system to satisfaction of Departmental Representative.
- .2 Demonstrate the specific starting, stopping, controlling and general maintenance requirements for each major piece of equipment and system.
- .3 Demonstrate all mechanical systems and provide a Contractor guided tour of the facility to point out all locations of equipment, dampers, control devices and the like.

**1.15 LIABILITIES**

- .1 Install concealed pipes and ducts neatly, close to building structure so furring is minimum size. Pipes, ducts and equipment installed improperly, to be removed and replaced without cost to Departmental Representative.
- .2 Co-ordinate work with other sections to avoid conflict and to ensure proper installation of all equipment. Review all contract drawings.

**1.16 MECHANICAL SUBTRADES**

- .1 Submit, with the tender, the names of all Sub-Trades to be used on this project as well as the extent of work to be performed by each.
- .2 Contractor to have documented experience in field of mechanical contracting and to have successfully performed work of similar nature and approximate size to that indicated in specifications and on drawings.

**1.17 OPERATING AND MAINTENANCE MANUALS**

- .1 Provide O & M Manuals to the Departmental Representative for review 2 weeks prior to final inspection. Incorporate Departmental Representative's review comments into final copies.
- .2 Provide three (3) sets of manuals in separate 3 "D" ring, loose leaf binders with spine and face pockets, with the project name clearly indicated on the spine and face and one electronic copy in portable document format (PDF). The final accepted copies shall be provided to the Departmental Representative.
- .3 General catalogue data for the Operations and Maintenance Manual is unacceptable. If manufacturer's specification sheets are generalized in any way, they shall be clearly marked to show exactly which item has been supplied, and the project designation for that item (e.g., SP-1) is to be noted on Manufacturer's specification sheet which includes all details for this unit, including complete model number, serial number, and construction & performance data.
- .4 The outline for the Operating & Maintenance Manual shall be as follows:
  - Contractor and Subcontractor Contact Information
  - Purpose
  - General Description
  - Operating Instructions
  - Seasonal Operations
  - Normal Valve Positions and Control
  - Recommended Inspection and Preventative Maintenance

- Maintenance Schedule
  - Description of Maintenance Procedures
  - Recommended Major Equipment Spare Parts List
  - Appendices
  - Equipment Shop Drawings
  - Equipment Supplier Schedule
  - Manufacturer Recommended O & M Information
  - Exploded Views and Parts Lists
  - As-Built Drawings (reduced)
  - Control Narrative
  - Control Drawings
- .5 Include the following information in the manuals, incorporated into the outline format above, as applicable:
- .1 Mechanical Systems
    - 1. Maintenance Tasks - including daily, weekly, monthly, semi-annual and annual checks.
    - 2. Lubrication Information.
    - 3. List of Contractors and Equipment Suppliers including contact information
    - 4. Parts and Troubleshooting Information.
  - .2 Certification and Identification
    - 1. Inspection Certificates
    - 2. Balance Reports
  - .3 Component Information
    - .1 Section for each type of equipment to include shop drawings, installation and maintenance information.
  - .4 Safety Information
  - .5 Also provide the following information:
    - .1 Include control diagrams, (including Building Automation System diagrams), sequence of operations, and service instructions (calibration, trouble shooting, etc.).
    - .2 Provide Manufacturer's preventive maintenance procedures (recommended lubrication materials and procedures, frequency, etc.).
    - .3 System and equipment troubleshooting guides.
    - .4 A copy of the final balancing reports.

## **1.18 PERFORMANCE OF WORK**

- .1 Protect and maintain work until work has been completed and accepted. Protect work against damage during installation. Cover with tarpaulins if necessary. Repair all damage to floor and wall surfaces resulting from carrying out of work, without expense to the Departmental Representative.

## **1.19 PERMITS, FEES AND INSPECTIONS**

- .1 Apply for, obtain, and pay for all permits, licences, inspections, examinations and fees required for work of Divisions 22 & 23.
- .2 Review drawings with authorities having jurisdiction to ensure compliance with all applicable codes and by-laws.

- .3 In case of conflict, codes and regulations take precedence over the contract documents. In no instance reduce the standard or scope of work or intent established by the drawings and specifications by applying any of the codes referred to herein. Any discrepancies must be brought to the Departmental Representative's attention in writing.
- .4 Before starting any work submit the required number of copies of drawings and specifications to the Authorities for their approval and comments. Comply with any changes requested as part of the contract, but notify the Departmental Representative immediately of such changes. Prepare and submit any additional drawings, details or information as may be required.

#### **1.20 RECORD DRAWINGS**

- .1 Obtain one set of drawings and specifications and, as the job progresses, mark these prints clearly in red pencil to accurately indicate installed work, as well as alterations to ductwork, piping, equipment and associated work changes and deviations from work shown on Contract Drawings, including all Addenda and Work Order Changes.
- .2 As-Built drawings to be maintained on a continuous basis to ensure they are up-to-date and accurate, and have current prints available for inspection at the site at all times.
- .3 Submit this set of record drawings to the Departmental Representative for review on completion of the work. Should the record drawings be lacking information or details of changes made, they will be returned to the contractor. The contractor is to, without additional cost to the Departmental Representative, make the required site inspections, etc. and update the record drawings to the satisfaction of the Departmental Representative.
- .4 All mechanical drawings (including those without any markups) shall be stamped with contractor's as-built stamp, signed and dated prior to submission.

#### **1.21 REGULATORY REQUIREMENTS**

- .1 Comply with the most stringent requirements of all Municipal, Provincial and Federal Bylaws and Ordinances, the requirements of Utilities such as Manitoba Hydro, and all sections of this specification.
- .2 Provide necessary notices, obtain permits and pay all fees, in order that work specified may be carried out.
- .3 Furnish certificates confirming work installed conforms to requirements of authorities having jurisdiction.

#### **1.22 SHOP DRAWINGS**

- .1 Submit to the Departmental Representative for review one electronic (PDF) set of detailed shop drawings.
- .2 Check shop drawings for conformity to plans and specifications prior to submission.
- .3 Submit shop drawings for all items specified in the sections of Divisions 22 & 23. For equipment, provide performance, physical and operating data as described in the Specifications and listed in equipment schedules. Provide performance curves for all pumps and fans.

- .4 Shop drawings shall include copies of applicable brochure or catalogue material clearly indicating manufacturer and model. Ambiguous shop drawings will not be reviewed.
- .5 Clearly mark submittal to indicate all differences from the specified material. The Departmental Representative will require all options and material indicated on the shop drawing to be provided and installed. Specifically note on the submittal specified features such as tank linings, pump seal materials, painting finish, etc.
- .6 Include dimensional and technical data sufficient to determine if equipment meets requirements, including weights, loading points, electrical data and motor sizes.
- .7 Identify the equipment by system name and number, e.g. "S1, Second Floor, Air Supply Fan", "P1, Chilled Water Pump", etc.
- .8 Installed materials and equipment shall meet specified requirements regardless of whether or not the shop drawings were reviewed by the Departmental Representative.
- .9 Each drawing to include name of project, equipment supplier and clause number equipment is specified under.
- .10 Clearly show division of responsibility. No item, equipment or description of work shall be indicated to be supplied or work to be done "By Others" or "By Purchaser". Any item, equipment or description of work shown on shop drawings shall form part of contract, unless specifically noted to contrary.
- .11 Take full responsibility for securing and verifying field dimensions. In cases where fabrication must proceed prior to field dimensions being available, check all shop drawings and approve for dimensions only. In this case guarantee that dimensions will be worked to and ensure that other sub-trades are aware of these dimensions and shall comply with them.
- .12 Review by Departmental Representative shall be mutually understood to refer to general design only. If errors in detailed dimensions or interference with work are noticed, attention of Contractor will be called to such errors of interferences, but Departmental Representative's review of drawings will not in any way relieve Contractor from responsibility for said errors or interferences, or from necessity of furnishing such work, and materials as may be required for completion of work as called for in contract documents.
- .13 This review by the Departmental Representative is for the sole purpose of ascertaining conformance with the design concept.
- .14 Do not order equipment until the Departmental Representative has reviewed and returned the reviewed shop drawings.
- .15 Keep one set of shop drawings on the site.
- .16 Bind one complete set of checked shop drawings in each operating and maintenance instruction manual.

## **1.23 SITE REVIEW**

- .1 The Contractor's work will be reviewed periodically by the Departmental Representative or their representatives, solely for the purpose of determining general quality of work. Guidance will be offered to Contractor in interpretation of plans and specifications as assistance to carry out work.

- .2 Reviews and directives given to Contractor, his agents, servants and employees does not relieve the Contractor, his agents, servants or employees of their responsibility to provide the work in all its parts in a safe and workmanlike manner, and in accordance with plans and specifications, nor impose on Departmental Representative or their representatives, any responsibility to supervise or oversee erection or installation of any work.

**1.24 SPECIAL TOOLS AND SPARE PARTS**

- .1 Furnish the Departmental Representative with spare parts as follows:
  - .1 Spare parts as detailed in individual Sections of Divisions 22 & 23.

**1.25 STANDARDS**

- .1 Conform to the best modern practices of workmanship and installation methods and employ only skilled tradesmen working under the direction of fully qualified personnel.

**1.26 STANDARD OF MATERIAL**

- .1 All materials and equipment installed under this contract shall be new unless otherwise noted.
- .2 Materials and equipment specified and acceptable manufacturers are named in this specification for the purpose of establishing the standard of materials and workmanship to which Contractor shall adhere. Tender price shall be based on the use of materials and equipment as specified.
- .3 Provide new material and equipment of first class quality, delivered, erected, connected and finished in every detail, and supplied with the acceptance of the Departmental Representative. Assume responsibility of ensuring that provided equipment performs as specified.
- .4 In the preparation of the tender, if a Sub-Contractor neglects to name the manufacturer where accepted equals have been shown, it will be understood that the specified equipment will be provided.
- .5 Requests for approval of equals must be submitted not less than seven business days prior to closing date of the tender, and submissions must bear proof of acceptance by the Departmental Representative if used in the tender.
- .6 Assume full responsibility for ensuring that, when providing accepted equals, all space, weight, connections, power and wiring requirements, etc. are considered and adjusted costs are included in the tender. Alternative equipment requiring greater than specified energy requirements or unduly limiting service space requirements will not be accepted.
- .7 All additional costs for mechanical, electrical, structural and architectural revisions required to incorporate materials accepted as an equal and substituted by Contractor shall be responsibility of Contractor.
- .8 Equipment listed as "equal" in specifications or submitted as equal by the Contractor must meet all space requirements, specified capacities and must have equipment characteristics of specified equipment as interpreted by Departmental Representative. Install equipment in strict accordance with Manufacturer's published recommendations.

**1.27 SUBSTANTIAL COMPLETION**



- .1 Prior to requesting any substantial completion inspection, complete all of the following items.
  - .1 All systems shall be operational with alarms, interlocks and control functions.
  - .2 Obtain all certificates of approval from the authorities having jurisdiction.
  - .3 All manufacturer start-ups shall be complete.
  - .4 Complete valve tagging and identification of all new mechanical systems and components.
  - .5 Lubricate all equipment as per manufacturers' instructions.
  - .6 Submit O & M Manuals and perform operator training.
  - .7 Provide all Manufacturers' reports required by specifications.
  - .8 Complete System Commissioning
  - .9 Complete all previously identified deficiencies.
  - .10 Clean equipment both inside and out.
  - .11 Complete final air and water balancing and submit reports.
  - .12 Complete final calibration.
  - .13 Provide As-Built record drawings in accordance with the tender documents.

**1.28 SUPERINTENDENCE**

- .1 Maintain qualified job site personnel consisting of licensed tradesmen and registered apprentices with proven documented experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.

**1.29 TEMPORARY USE OF EQUIPMENT**

- .1 Permanent systems and/or equipment are not to be used during construction period, without the Departmental Representative's permission.
- .2 Temporary use of equipment shall in no way relieve Contractor of providing warranties, as described elsewhere in this Section and in Division 1, on all equipment and systems so used.
- .3 Operate systems under conditions that ensure no temporary or permanent damage. Operate systems with proper treatment. Operate fans at proper resistance with filters installed. Change filters at regular intervals and prior to final acceptance. Operate with proper safety devices and controls installed and fully operational.
- .4 Under no circumstances shall air moving systems be used to provide temporary cooling or ventilation during construction. Air systems shall only be operated after any operations that creates considerable dust or fibres is complete.

**1.30 WELDING REGULATIONS**

- .1 Welding shall be performed by welder holding current welder's certificate from Provincial Department of Labour.
- .2 Suitable fire extinguishers are to be present during welding operations and during fire watch period.

- .3 During welding or soldering ensure structure is protected against fire, shield with fire-rated sheets and galvanized iron sheets.
- .4 Proper ventilation shall be provided during welding operations. A fume extraction system shall be used for welding operations taking place indoors.
- .5 Maintain a fire watch for a minimum of 1 hour after welding operations are complete.

**1.31 WORKMANSHIP**

- .1 Only first class workmanship will be accepted, not only as regards to safety, efficiency, and durability but also as regards to neatness of detail. Pipework must be installed parallel to, or at right angles to building planes. The entire work shall present a neat and clean appearance on completion.

**PART 2 Products**

- .1 NOT USED.

**PART 3 Execution**

**3.1 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 91 00 – Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

**3.2 CLEANING**

- .1 Clean interior and exterior of all systems including strainers.

**3.3 DEMONSTRATION**

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Materials and installation for plumbing pumps.

**1.2 REFERENCES**

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

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
- .3 Shop Drawings.
  - .1 Submit shop drawings to indicate:
    - .1 Equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled.
    - .2 Wiring and schematic diagrams.
    - .3 Dimensions and recommended installation.
    - .4 Pump performance and efficiency curves.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturers' Field Reports: manufacturers' field reports specified.
- .7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals, include:
  - .1 Manufacturers name, type, model year, capacity and serial number.
  - .2 Details of operation, servicing and maintenance.
  - .3 Recommended spare parts list with names and addresses.

**Part 2 Products**

**2.1 SUBMERSIBLE SUMP PUMPS (SP- )**

- .1 Construction: 6 mm (1/4") solids handling, solid, one-piece housing, integral mid-mounted peripheral-port inlets eliminate bottom suction of debris and foreign material. 8 vane, glass reinforced thermoplastic impeller with non-clog design. Wide angle float switch.
- .2 Materials: Powder coated cast iron housing. Stainless steel fasteners, rotor shaft, and volute intake plate.

- .3 Motor: 3400 RPM, oil filled, thermally protected and permanently lubricated. Hermetically sealed.
- .4 Electrical: Series (piggy-back) plug. Quick disconnect power cord. Provide length of power cord as required to suit distance to electrical receptacle.
- .5 Dimensions: 250 mm height, 225 mm diameter, 38 mm discharge. Weight: 9.5 kg (22 lb).
- .6 Approvals: CSA Approved.
- .7 Performance as per the following schedules:

**Big House**

Tag	Description	Flow (L/s)	Head (m)	Motor Power (HP)	Voltage (V/Ph/Hz)
SP-1	Sump Pump	1.0	4.5	1/4	120/1/60

**Men's House**

Tag	Description	Flow (L/s)	Head (m)	Motor Power (HP)	Voltage (V/Ph/Hz)
SP-1	Sump Pump	1.0	4.5	1/4	120/1/60

**Warehouse**

Tag	Description	Flow (L/s)	Head (m)	Motor Power (HP)	Voltage (V/Ph/Hz)
SP-1	Sump Pump	1.0	4.5	1/4	120/1/60
SP-2	Sump Pump	1.0	4.5	1/4	120/1/60

- .8 Acceptable Manufacturers: "Liberty Pumps", "Zoeller", "Little Giant", or approved equal.

**2.2 SUMP PIT (TWO PITS ARE REQUIRED TO CONSTRUCT ONE PIT INSTALLATION-SEE DRAWINGS.)**

- .1 Perforated pit walls, made from polyethylene material, 260 litre (69 usgal) capacity, includes pit cover. Bell shaped profile with widened base.
- .2 Dimensions: 700mm (28") diameter, 1200 mm (48") height,
- .3 Acceptable Manufacturers: "Saber Industries", "Polywest", "Unipar", or approved equal.

**2.3 SUMP PIT DISCHARGE PIPING**

- .1 Carrier Pipe: Sch. 80 PVC, solvent weld.
- .2 Insulation: 25mm thickness. Polyurethane foam with minimum 90% closed cell content.

- .3 Outer Jacketing: PVC, Type 1, Grade 1, Class 12454-B, conforming to ASTM 1784.
- .4 Extruded molding heat trace conduit.
- .5 Acceptable Manufacturers: "Urecon", "Rovanco", "Insul-Tek", or approved equivalent.

## **2.4 SUMP PIT DISCHARGE VALVES/FITTINGS**

- .1 Ball Valve: Sch. 80 PVC, 150 PSI pressure rating at 23°C, socket end connections, EPDM O-Rings, one-piece molded body, 1/4 turn operation.
- .2 Check Valve: Sch. 80 PVC, 235 PSI pressure rating at 23°C, socket end connections, EPDM seals, ball type, 60°C maximum service temperature.
- .3 Union: Sch. 80 PVC, 150 PSI pressure rating at 23°C, socket end connections, EPDM O-Rings.
- .4 Acceptable Manufacturers: "Nibco", "Spears", "GF Piping Systems", "IPEX", or approved equivalent.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

### **3.2 INSTALLATION**

- .1 Make piping and electrical connections to pump and motor assembly and controls as indicated.
- .2 Ensure pump and motor assembly do not support piping.
- .3 Align vertical pit mounted pump assembly after mounting and securing cover plate.

### **3.3 FIELD QUALITY CONTROL**

- .1 Site Tests/Inspection:
  - .1 Check power supply.
  - .2 Check starter protective devices.
- .2 Start-up, check for proper and safe operation.
- .3 Check settings and operation of hand-off-auto selector switch, operating, safety and limit controls, audible and visual alarms, over-temperature and other protective devices.
- .4 Adjust flow from water-cooled bearings.
- .5 Adjust impeller shaft stuffing boxes, packing glands.

### **3.4 START-UP**

- .1 General:
  - .1 Procedures:
    - .1 Check power supply.
    - .2 Check starter O/L heater sizes.
    - .3 Start pumps, check impeller rotation.

- .4 Check for safe and proper operation.
- .5 Check settings, operation of operating, limit, safety controls, over-temperature, audible/visual alarms, other protective devices.
- .6 Test operation of hands-on-auto switch.
- .7 Test operation of alternator.
- .8 Adjust leakage through water-cooled bearings.
- .9 Adjust shaft stuffing boxes.
- .10 Adjust leakage flow rate from pump shaft stuffing boxes to manufacturer's recommendations.
- .11 Check base for free-floating, no obstructions under base.
- .12 Run-in pumps for 12 continuous hours.
- .13 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.
- .14 Adjust alignment of piping and conduit to ensure full flexibility.
- .15 Eliminate causes of cavitation, flashing, air entrainment.
- .16 Measure pressure drop across strainer when clean and with flow rates as finally set.
- .17 Replace seals if pump used to degrease system or if pump used for temporary heat.
- .18 Verify lubricating oil levels.

### **3.5 REPORTS**

- .1 Include:
  - .1 Product Information report forms.
  - .2 Pump performance curves (family of curves) with final point of actual performance.

### **3.6 TRAINING**

- .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Training of O M Personnel, supplemented as specified.

**END OF SECTION**

**Part 1 General**

- .1 All valves, piping, fittings, solder and accessories shall contain no lead to be in conformance with latest edition of NSF 61 Drinking Water System Components – Health Effects.

**1.2 REFERENCES**

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
  - .1 ANSI/ASME B16.15, Cast Bronze Threaded Fittings, Classes 125 and 250.
  - .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
  - .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .2 ASTM International Inc.
  - .1 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .2 ASTM A536, Standard Specification for Ductile Iron Castings.
  - .3 ASTM B88M, Standard Specification for Seamless Copper Water Tube (Metric).
- .3 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)
  - .1 ANSI/AWWA C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .4 Canadian Standards Association (CSA International)
  - .1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.
- .5 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .7 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
  - .1 MSS-SP-67, Butterfly Valves.
  - .2 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.
- .8 National Research Council (NRC)/Institute for Research in Construction
  - .1 NRCC 38728, National Plumbing Code of Canada (NPC).
- .9 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

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

**Part 2 Products**

**2.1 PIPING**

- .1 Domestic hot, cold and recirculation systems, within building.
  - .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.

**2.2 FITTINGS**

- .1 Bronze pipe flanges and flanged fittings, Class 150: to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125: to ANSI/ASME B16.15.
- .3 Cast copper, solder type: to ANSI/ASME B16.18.
- .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .5 NPS 1 and smaller: wrought copper to ANSI/ASME B16.22; Suitable for operating pressure to 1380 kPa.

**2.3 JOINTS**

- .1 Rubber gaskets, latex-free 1.6 mm thick: to AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 Solder: 95/5 tin copper alloy.
- .4 Teflon tape: for threaded joints.
- .5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.
- .6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

**2.4 BALL VALVES**

- .1 NPS 2 and under, soldered:
  - .1 To ANSI/ASME B16.18, Class 150.
  - .2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle, with NPT to copper adaptors.

**Part 3 Execution**

**3.1 APPLICATION**

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



### **3.2 INSTALLATION**

- .1 Install in accordance with Manitoba Plumbing Code.
- .2 Install pipe work in accordance with Section 23 05 05 - Installation of Pipework, supplemented as specified herein.
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .6 Buried tubing:
  - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
  - .2 Bend tubing without crimping or constriction. Minimize use of fittings.

### **3.3 VALVES**

- .1 Isolate equipment, fixtures and branches with ball valves.

### **3.4 PRESSURE TESTS**

- .1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.
- .2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

### **3.5 FLUSHING AND CLEANING**

- .1 Flush entire system for 8 h. Ensure outlets flushed for 2 hours. Let stand for 24 hours, and then draw one sample off longest run. Submit to testing laboratory to verify that system is clean. Let system flush for additional 2 hours, then draw off another sample for testing.

### **3.6 PRE-START-UP INSPECTIONS**

- .1 Systems to be complete, prior to flushing, testing and start-up.
- .2 Verify that system can be completely drained.
- .3 Ensure that pressure booster systems are operating properly.
- .4 Ensure that air chambers, expansion compensators are installed properly.

### **3.7 DISINFECTION**

- .1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction.
- .2 Upon completion, provide laboratory test reports on water quality for approval.

### **3.8 START-UP**

- .1 Timing: start up after:
  - .1 Pressure tests have been completed.
  - .2 Disinfection procedures have been completed.
  - .3 Certificate of static completion has been issued.
  - .4 Water treatment systems operational.
- .2 Provide continuous supervision during start-up.

- .3 Start-up procedures:
  - .1 Establish circulation and ensure that air is eliminated.
  - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
  - .3 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
  - .4 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

### **3.9 OPERATION REQUIREMENTS**

- .1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products with Section 23 05 05 - Installation of Pipework.

### **3.10 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .1 Waste Management: In accordance with 01 74 21 Construction Waste Management.

**END OF SECTION**

**Part 1            General**

**1.1            REFERENCES**

- .1    ASTM International Inc.
  - .1    ASTM D2564, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2    Canadian Standards Association (CSA International)
  - .1    CAN/CSA-Series B1800, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.
- .3    Green Seal Environmental Standards (GSES)
  - .1    Standard GS-36, Commercial Adhesives.

**1.2            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1    Provide manufacturer's printed product literature and datasheets for piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3            DELIVERY, STORAGE AND HANDLING**

- .1    Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2    Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3    Store at temperatures and conditions recommended by manufacturer.
- .1    Waste Management: In accordance with 01 74 21 Construction Waste Management.

**Part 2           Products**

**2.1            MATERIAL**

**2.2            PIPING AND FITTINGS**

- .1    For buried and above ground:
  - .1    PVC-DWV piping to CAN/CSA B1800.

**2.3            JOINTS**

- .1    Solvent weld for PVC: to ASTM D2564.

**Part 3                    Execution**

**3.1                    APPLICATION**

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

**3.2                    INSTALLATION**

- .1           In accordance with Section 23 05 05 - Installation of Pipework.
- .2           Install in accordance with Manitoba Plumbing Code.

**3.3                    TESTING**

- .1           Pressure test buried systems before backfilling.
- .2           Hydraulically test to verify grades and freedom from obstructions.

**3.4                    CLEANING**

- .1           Clean in accordance with Section 01 74 11 - Cleaning.
  - .1           Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2           Waste Management: In accordance with 01 74 21 Construction Waste Management.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .2 CSA International
  - .1 CSA-B64 Series, Backflow Preventers and Vacuum Breakers.
  - .2 CSA B79, Commercial and Residential Drains and Cleanouts.
- .3 Efficiency Valuation Organization (EVO)
  - .1 International Performance Measurement and Verification Protocol (IPMVP).
    - .1 IPMVP Version.
- .4 Plumbing and Drainage Institute (PDI)
  - .1 PDI-WH201, Water Hammer Arresters Standard.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Instructions: submit manufacturer's installation instructions.
- .5 Manufacturers' Field Reports: manufacturers' field reports specified.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.
  - .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
  - .2 Details of operation, servicing and maintenance.
  - .3 Recommended spare parts list.

**1.4 DELIVERY, STORAGE AND HANDLING**

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

- .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect plumbing materials from damage.
- .3 Replace defective or damaged materials with new.
- .1 Waste Management: In accordance with 01 74 21 Construction Waste Management.

## **Part 2 Products**

### **2.1 CLEANOUTS**

- .1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- .2 Access Covers:
  - .1 Wall Access: face or wall type, stainless steel square cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
  - .2 Floor Access: rectangular cast iron body and frame with adjustable secured nickel bronze top and:
    - .1 Plugs: bolted bronze with neoprene gasket.
    - .2 Cover for Unfinished Concrete Floors: cast iron square, gasket, vandal-proof screws.
    - .3 Cover for Terrazzo Finish: polished nickel bronze with recessed cover for filling with terrazzo, vandal-proof locking screws.
    - .4 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.
    - .5 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

### **2.2 WATER HAMMER ARRESTORS**

- .1 Copper construction, piston type: to PDI-WH201.

### **2.3 VACUUM BREAKERS**

- .1 Breakers: to CSA-B64 Series, vacuum breaker atmospheric

## **Part 3 Execution**

### **3.1 EXAMINATION**

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

### **3.2 MANUFACTURER'S INSTRUCTIONS**

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

### **3.3 INSTALLATION**

- .1 Install in accordance with Manitoba Plumbing Code.
- .2 Install in accordance with manufacturer's instructions and as specified.

### **3.4 CLEANOUTS**

- .1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.
- .2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
- .3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.

### **3.5 WATER HAMMER ARRESTORS**

- .1 Install on branch supplies to fixtures or group of fixtures.

### **3.6 START-UP**

- .1 General:
  - .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: General Requirements, supplemented as specified herein.
- .2 Timing: start-up only after:
  - .1 Pressure tests have been completed.
  - .2 Disinfection procedures have been completed.
  - .3 Certificate of static completion has been issued.
  - .4 Water treatment systems operational.
- .3 Provide continuous supervision during start-up.

### **3.7 TESTING AND ADJUSTING**

- .1 General:
  - .1 Test and adjust plumbing specialties and accessories in accordance with Section 01 91 13- General Commissioning (Cx) Requirements: General Requirements, supplemented as specified.
- .2 Timing:
  - .1 After start-up deficiencies rectified.
  - .2 After certificate of completion has been issued by authority having jurisdiction.
- .3 Vacuum breakers, backflow preventers, backwater valves:
  - .1 Test tightness, accessibility for O M of cover and of valve.
  - .2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.
  - .3 Verify visibility of discharge from open ports.
- .4 Access doors:

- .1 Verify size and location relative to items to be accessed.
- .5 Cleanouts:
  - .1 Verify covers are gas-tight, secure, yet readily removable.
- .6 Water hammer arrestors:
  - .1 Verify proper installation of correct type of water hammer arrester.

**3.8 CLOSEOUT ACTIVITIES**

- .1 Commissioning Reports: in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: reports, supplemented as specified.
- .2 Training: provide training in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Training of O M Personnel, supplemented as specified.

**3.9 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: In accordance with 01 74 21 Construction Waste Management.

**3.10 PROTECTION**

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

**END OF SECTION**



**Part 1 General**

**1.1 REFERENCES**

- .1 Air-Conditioning and Refrigeration Institute (ARI)
  - .1 ARI 1010, Self-Contained, Mechanically Refrigerated Drinking-Water Coolers.
  - .2 CAN/CSA-B45 Series, Plumbing Fixtures.
  - .3 CSA B125.3, Plumbing Fittings.
  - .4 CSA B651, Accessible Design for the Built Environment.
- .2 Green Seal (GS)
  - .1 GS-36, Adhesives for Commercial Use.
- .3 South Coast Air Quality Management District (SCAQMD)
  - .1 SCAQMD Rule 1168, Adhesive and Sealant Applications.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing fixtures and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Indicate fixtures and trim:
    - .1 Dimensions, construction details, roughing-in dimensions.
    - .2 Factory-set water consumption per flush at recommended pressure.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Include:
  - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
  - .2 Details of operation, servicing, maintenance.
  - .3 List of recommended spare parts.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect materials from damage.
  - .3 Replace defective or damaged materials with new.
- .1 Waste Management: In accordance with 01 74 21 Construction Waste Management.

**Part 2 Products**

**2.1 P-1 Water Closet (Museum)**

- .1 Tank type, pressure assisted siphon jet action, white, vitreous china, 6.0 LPF, elongated bowl, floor mounted, fully glazed 54 mm trapway, metal chrome trip lever. To meet or exceed ASME A112.19.2. Meets the ADA Act and ANSI A117.1 requirements. Dimensions (WxHxD): 521x781x768mm. 420 mm bowl height.
- .2 Seat: Elongated, open front toilet seat. Commercial grade.
- .3 Acceptable Manufacturers: "American Standard", "Kohler", "Toto" or approved equal.

**2.2 P-2 Urinal (Museum)**

- .1 Urinal: Exposed top spud urinal, washout flush action, extended sides for privacy, vitreous china, white color, operates in the range of 0.5 LPF to 3.8 LPF, flushing rim, elongated 350 mm rim from finished wall, 19 mm inlet spud, 50 mm outlet connection, strainer included. 20-80 PSI operating pressure. 360 mm x 480 mm x 664 mm nominal fixture dimensions. Meets or exceeds ASME A112.19.2-2008 and CSA B45.1-08.
- .2 Acceptable Manufacturers: "American Standard", "Kohler", "Toto" or approved equal.
- .3 Manual Flush Valve: Self cleaning brass piston with integral wiper spring. Piston valve remains closed and does not need to be reset after loss of water pressure. Non-hold open handle, positive seal, chrome-plated cast brass construction, EPDM seals, adjustable tailpiece, can be installed left or right hand. 0.5 LPF. Listed to ASSE 1037, ANSI/ASME A112.19.2, ADA Compliant.
- .4 Acceptable Manufacturers: "American Standard", "Kohler", "Toto", "Delta" or approved equal.

**2.3 P-3 Lavatory (Museum)**

- .1 Basin: Undercounter mounting, oval shape, vitreous china, unglazed rim for undercounter mount, rear overflow holes. Supplied with mounting kit. Nominal Dimensions: 489 mm x 400 mm. 102 mm deep bowl. White color. Meets or exceeds the following specifications: ASME A112.19.2M, CAN/CSA B45, 1995 NBC Section 3.7, and CAN/CSA-B651-M90.
- .2 Acceptable Manufacturers: "American Standard Ovalyn Universal Access", "Kohler", "Toto" or approved equal.
- .3 Faucet: Deck mount, polished chrome finish, cast brass construction with all brass shank nuts and coupling nuts. Pressure compensating, vandal resistant, 1.3 LPM, non-aerated spray. 1/4 turn washerless ceramic disc valve cartridges. 102 mm centres. 95 mm long spout. 98 mm long vandal resistant wrist blade handles. Lead Free. Meets and exceeds the following standards: ANSI A117.1, ASME A112.18.1, CSA B125, IAPMO (cUPC), NSF 61 Section 9 and Annex G.
- .4 Acceptable Manufacturers: "American Standard", "Kohler", "Delta" or approved equal.

**Part 3 Execution**

**3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- .1 Mounting heights:
  - .1 Standard: to manufacturer's recommendations, measured from finished floor.
  - .2 Wall-hung fixtures: measured from finished floor.
  - .3 Barrier-free: to most stringent requirements.
- .2 Drinking fountains:
  - .1 In accordance with ARI 1010.

**3.3 ADJUSTING**

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:
  - .1 Adjust water flow rate to design flow rates.
  - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
  - .3 Adjust flush valves to suit actual site conditions.
- .3 Checks:
  - .1 Aerators: operation, cleanliness.
  - .2 Vacuum breakers, backflow preventers: operation under all conditions.
- .4 Thermostatic controls:
  - .1 Verify temperature settings, operation of control, limit and safety controls.

**3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: In accordance with 01 74 21 Construction Waste Management.

**END OF SECTION**

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**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.
- .2 Green Seal Environmental Standards (GSES)
  - .1 Standard GS-11, Environmental Standard for Paints and Coatings.
- .3 National Fire Code of Canada (NFCC 2005)

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheets for piping and equipment and include product characteristics, performance criteria, physical size, finish and limitations.

**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:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .1 Waste Management: In accordance with 01 74 21 Construction Waste Management.

**Part 2 Products**

**2.1 MATERIAL**

- .1 Paint: zinc-rich to CAN/CGSB-1.181.
  - .1 Primers, paints and coating: in accordance with manufacturer's recommendations for surface conditions.
- .2 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
- .3 Fire Stopping: in accordance with Section 07 84 00 - Fire Stopping.

**Part 3 Execution**

**3.1 APPLICATION**

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

**3.2 CONNECTIONS TO EQUIPMENT**

- .1 In accordance with manufacturer's instructions unless otherwise indicated.

- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

### **3.3 CLEARANCES**

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and related codes.
- .2 Provide space for disassembly, removal of equipment and components without interrupting operation of other system, equipment, components.

### **3.4 DRAINS**

- .1 Install piping with grade in direction of flow except as indicated.
- .2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.
- .3 Pipe each drain valve discharge separately to above floor drain.
  - .1 Discharge to be visible.
- .4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

### **3.5 DIELECTRIC COUPLINGS**

- .1 General: compatible with system, to suit pressure rating of system.
- .2 Locations: where dissimilar metals are joined.
- .3 NPS 2 and under: isolating unions or bronze valves.
- .4 Over NPS 2: isolating flanges.

### **3.6 PIPEWORK INSTALLATION**

- .1 Screwed fittings jointed with Teflon tape.
- .2 Protect openings against entry of foreign material.
- .3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .4 Assemble piping using fittings manufactured to ANSI standards.
- .5 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.
  - .1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.
- .6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
- .7 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

- .8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- .9 Install, except where indicated, to permit separate thermal insulation of each pipe.
- .10 Group piping wherever possible.
- .11 Ream pipes, remove scale and other foreign material before assembly.
- .12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .13 Provide for thermal expansion as indicated.
- .14 Valves:
  - .1 Install in accessible locations.
  - .2 Remove interior parts before soldering.
  - .3 Install with stems above horizontal position unless indicated.
  - .4 Valves accessible for maintenance without removing adjacent piping.
  - .5 Install globe valves in bypass around control valves.
  - .6 Use ball or butterfly valves at branch take-offs for isolating purposes except where specified.
- .15 Check Valves:
  - .1 Install silent check valves where indicated on plans.

### **3.7 SLEEVES**

- .1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.
- .2 Material: schedule 40 black steel pipe.
- .3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.
- .4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.
- .5 Installation:
  - .1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.
  - .2 Other floors: terminate 25 mm above finished floor.
  - .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
- .6 Sealing:
  - .1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.
  - .2 Elsewhere:
    - .1 Provide space for firestopping.
    - .2 Maintain fire rating integrity.
  - .3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
  - .4 Ensure no contact between copper pipe or tube and sleeve.

**3.8 ESCUTCHEONS**

- .1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.
- .2 Construction: one piece type with set screws.
  - .1 Chrome or nickel plated brass or type 302 stainless steel.
- .3 Sizes: outside diameter to cover opening or sleeve.
  - .1 Inside diameter to fit around pipe or outside of insulation if so provided.

**3.9 PREPARATION FOR FIRE STOPPING**

- .1 Install firestopping within annular space between pipes, ducts, insulation and adjacent fire separation in accordance with Section 07 84 00 - Fire Stopping.
- .2 Uninsulated unheated pipes not subject to movement: no special preparation.
- .3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe movement without damaging firestopping material or installation.
- .4 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.

**3.10 FLUSHING OUT OF PIPING SYSTEMS**

- .1 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 11 - Cleaning supplemented as specified in relevant mechanical sections.
- .2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

**3.11 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK**

- .1 Advise Departmental Representative 48 hours minimum prior to performance of pressure tests.
- .2 Piping: test as specified in relevant sections of heating, ventilating and air conditioning work.
- .3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.
- .4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
- .5 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.
- .6 Insulate or conceal work only after approval and certification of tests.

**3.12 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: In accordance with 01 74 21 Construction Waste Management.

**END OF SECTION**



**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Electrical motors, drives and guards for mechanical equipment and systems.
  - .2 Supplier and installer responsibility indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
  - .3 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 23. Refer to Division 26 for quality of materials and workmanship.

**1.2 REFERENCES**

- .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
  - .1 ASHRAE 90.1-01, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).
- .2 Electrical Equipment Manufacturers' Association Council (EEMAC)
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.3 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
- .3 Closeout Submittals
  - .1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

**1.4 QUALITY ASSURANCE**

- .1 Regulatory Requirements: work to be performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial regulations.

**1.5 DELIVERY, STORAGE, AND HANDLING**

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

**Part 2 Products**

**2.1 GENERAL**

- .1 Motors: high efficiency, in accordance with Manitoba Hydro standards and to ASHRAE 90.1.

## **2.2 MOTORS**

- .1 Provide motors for mechanical equipment as specified.
- .2 Motors under 373 W (1/2 HP): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.
- .3 Motors 373 W (1/2 HP) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40 degrees C, 3 phase, 208 V, unless otherwise indicated.

## **2.3 TEMPORARY MOTORS**

- .1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Contract Administrator for temporary use. Work will only be accepted when specified motor is installed.

## **2.4 BELT DRIVES**

- .1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.
- .2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise indicated.
- .3 For motors under 7.5 kW (10 HP): standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.
- .4 Correct size of sheave determined during commissioning.
- .5 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.
- .6 Motor slide rail adjustment plates to allow for centre line adjustment.
- .7 Supply one set of spare belts for each set installed in accordance with Section 01 78 00 - Closeout Submittals.

## **2.5 DRIVE GUARDS**

- .1 Provide guards for unprotected drives.
- .2 Guards for belt drives;
  - .1 Expanded metal screen welded to steel frame.
  - .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
  - .3 38 mm dia holes on both shaft centres for insertion of tachometer.
  - .4 Removable for servicing.
- .3 Provide means to permit lubrication and use of test instruments with guards in place.
- .4 Install belt guards to allow movement of motors for adjusting belt tension.-
- .5 Guard for flexible coupling:
  - .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
  - .2 Securely fasten in place.
  - .3 Removable for servicing.
- .6 Unprotected fan inlets or outlets:
  - .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
  - .2 Net free area of guard: not less than 80% of fan openings.
  - .3 Securely fasten in place.
  - .4 Removable for servicing.

**Part 3            Execution**

**3.1            MANUFACTURER'S INSTRUCTIONS**

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

**3.2            INSTALLATION**

- .1        Fasten securely in place.
- .2        Make removable for servicing, easily returned into, and positively in position.

**3.3            FIELD QUALITY CONTROL**

- .1        Manufacturer's Field Services:
  - .1        Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
  - .2        Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3        Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

**3.4            CLEANING**

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

**END OF SECTION**

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**Part 1 General****1.1 RELATED SECTIONS**

- .1 01 33 00 - Submittal Procedures
- .2 01 78 00 - Closeout Submittals.

**1.2 REFERENCES**

- .1 American Society of Mechanical Engineers (ASME)
  - .1 ASME B31.1-07, Power Piping.
- .2 ASTM International
  - .1 ASTM A125-1996(2007), Standard Specification for Steel Springs, Helical, Heat Treated.
  - .2 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .3 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts.
- .3 Factory Mutual (FM)
- .4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
  - .1 MSS SP58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.
  - .2 MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.
  - .3 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .5 Underwriter's Laboratories of Canada (ULC)

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit shop drawings for:
    - .1 Bases, hangers and supports.
    - .2 Connections to equipment and structure.
    - .3 Structural assemblies.
- .3 Certificates:
  - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Manufacturers' Instructions:
  - .1 Provide manufacturer's installation instructions.

**1.4 CLOSEOUT SUBMITTALS**

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

**1.5 DELIVERY, STORAGE AND HANDLING**

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

**Part 2 Products****2.1 SYSTEM DESCRIPTION**

- .1 Design Requirements:
  - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
  - .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
  - .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
  - .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
  - .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

**2.2 GENERAL**

- .1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP58.
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

**2.3 PIPE HANGERS**

- .1 Finishes:
  - .1 Pipe hangers and supports: galvanized after manufacture.
  - .2 Use hot dipped galvanizing process.
  - .3 Ensure steel hangers in contact with copper piping are copper plated.
- .2 Upper attachment structural: suspension from lower flange of I-Beam:
  - .1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
    - .1 Rod: 13 mm FM approved.
  - .2 Cold piping NPS 2-1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed to MSS-SP58 and MSS-SP69.

- .3 Upper attachment structural: suspension from upper flange of I-Beam:
  - .1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed to MSS SP69.
  - .2 Cold piping NPS 2-1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed.
- .4 Upper attachment to concrete:
  - .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
  - .2 Concrete inserts: wedge shaped body with knockout protector plate UL listed to MSS SP69.
- .5 Hanger rods: threaded rod material to MSS SP58:
  - .1 Ensure that hanger rods are subject to tensile loading only.
  - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
- .6 Pipe attachments: material to MSS SP58:
  - .1 Attachments for steel piping: carbon steel.
  - .2 Attachments for copper piping: copper plated black steel.
  - .3 Use insulation shields for hot pipework.
  - .4 Oversize pipe hangers and supports.
- .7 Adjustable clevis: material to MSS SP69 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
  - .1 Ensure "U" has hole in bottom for riveting to insulation shields.
- .8 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.
- .9 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.
  - .1 Finishes for steel pipework: black.
  - .2 Finishes for copper, glass, brass or aluminum pipework: galvanized, with formed portion plastic coated.
- .10 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69.

## 2.4 RISER CLAMPS

- .1 Steel or cast iron pipe: black carbon steel to MSS SP58, type 42, UL listed.
- .2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.
- .3 Bolts: to ASTM A307.
- .4 Nuts: to ASTM A563.

## 2.5 INSULATION PROTECTION SHIELDS

- .1 Insulated cold piping:
  - .1 164 kg/m<sup>3</sup> density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

- .2 Insulated hot piping:
  - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.

## **2.6 CONSTANT SUPPORT SPRING HANGERS**

- .1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).
- .2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
- .3 Provide upper and lower factory set travel stops.
- .4 Provide load adjustment scale for field adjustments.
- .5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.
- .6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

## **2.7 VARIABLE SUPPORT SPRING HANGERS**

- .1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.
- .2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.
- .3 Variable spring hanger complete with factory calibrated travel stops.
- .4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

## **2.8 EQUIPMENT SUPPORTS**

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel. Submit calculations with shop drawings.

## **2.9 EQUIPMENT ANCHOR BOLTS AND TEMPLATES**

- .1 Provide templates to ensure accurate location of anchor bolts.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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



**3.2 INSTALLATION**

- .1 Install in accordance with:
  - .1 Manufacturer's instructions and recommendations.
- .2 Vibration Control Devices:
  - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.
- .3 Clamps on riser piping:
  - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
  - .2 Bolt-tightening torques to industry standards.
  - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
  - .4 Cast iron pipes: install below joint.
- .4 Clevis plates:
  - .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.
- .5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .6 Use approved constant support type hangers where:
  - .1 Vertical movement of pipework is 13 mm or more,
  - .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
- .7 Use variable support spring hangers where:
  - .1 Transfer of load to adjacent piping or to connected equipment is not critical.
  - .2 Variation in supporting effect does not exceed 25 % of total load.

**3.3 HANGER SPACING**

- .1 Plumbing piping: to Manitoba Plumbing Code and authority having jurisdiction.
- .2 Copper piping: up to NPS 12: every 1.5 m.
- .3 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.
- .4 Within 300 mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 32	2.4 m	1.8 m
38	3.0 m	2.4 m
50	3.0 m	2.4 m
63	3.7 m	3.0 m
75	3.7 m	3.0 m
89	3.7 m	3.3 m
100	3.7 m	3.6 m
125	4.3 m	
150	4.3 m	
200	4.3 m	
250	4.9 m	
300	4.9 m	

- .5 Pipework greater than NPS 300: to MSS SP69.

**3.4 HANGER INSTALLATION**

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

**3.5 HORIZONTAL MOVEMENT**

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

**3.6 FINAL ADJUSTMENT**

- .1 Adjust hangers and supports:
  - .1 Ensure that rod is vertical under operating conditions.
  - .2 Equalize loads.
- .2 Adjustable clevis:
  - .1 Tighten hanger load nut securely to ensure proper hanger performance.
  - .2 Tighten upper nut after adjustment.
- .3 C-Clamps:
  - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
  - .1 Hammer jaw firmly against underside of beam.

**3.7 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.

**1.2 REFERENCES**

- .1 CSA/CGA B149.1, Natural Gas and Propane Installation Code.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.
  - .2 CAN/CGSB-24.3, Identification of Piping Systems.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
- .2 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Product data to include paint colour chips, other products specified in this section.
- .4 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Samples to include nameplates, labels, tags, lists of proposed legends.

**1.4 QUALITY ASSURANCE**

- .1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .1 Waste Management: In accordance with 01 74 21 Construction Waste Management.

**Part 2 Products**

**2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES**

- .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

- .2 Lettering and numbers raised or recessed.
- .3 Information to include, as appropriate:
  - .1 Equipment: manufacturer's name, model, size, serial number, capacity.
  - .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

## **2.2 SYSTEM NAMEPLATES**

- .1 Colours:
  - .1 Hazardous: red letters, white background.
  - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
  - .1 3 mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
  - .1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20
  - .2 Use maximum of 25 letters/numbers per line.
- .4 Locations:
  - .1 Terminal cabinets, control panels: use size # 5.
  - .2 Equipment in Mechanical Rooms: use size # 9.
- .5 Apply existing identification system to new work.
- .6 Where existing identification system does not cover for new work, use identification system specified this section.

## **2.3 PIPING SYSTEMS GOVERNED BY CODES**

- .1 Identification:
  - .1 Natural gas: to CSA/CGA B149.1.

## **2.4 IDENTIFICATION OF PIPING SYSTEMS**

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Pictograms:
  - .1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

- .3 Legend:
- .1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.
- .4 Arrows showing direction of flow:
- .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
- .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
- .3 Use double-headed arrows where flow is reversible.
- .5 Extent of background colour marking:
- .1 To full circumference of pipe or insulation.
- .2 Length to accommodate pictogram, full length of legend and arrows.
- .6 Materials for background colour marking, legend, arrows:
- .1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
- .2 Other pipes: pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.
- .7 Colours and Legends:
- .1 Where not listed, obtain direction from Departmental Representative.
- .2 Colours for legends, arrows: to following table:
- |                    |                 |
|--------------------|-----------------|
| Background colour: | Legend, arrows: |
| Yellow             | BLACK           |
| White              | Black           |
|                    |                 |
- .3 Background colour marking and legends for piping systems:
- | Contents                   | Background colour marking | Legend         |
|----------------------------|---------------------------|----------------|
| Domestic hot water supply  | White                     | DOM. HW SUPPLY |
| Dom. HWS recirculation     | White                     | DOM. HW CIRC   |
| Domestic cold water supply | White                     | DOM. CWS       |
| Natural gas                | Yellow (to B149.1)        |                |
| Gas regulator vents        | Yellow (to B149.1)        |                |

## **2.5 IDENTIFICATION DUCTWORK SYSTEMS**

- .1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.
- .2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

## **2.6 VALVES, CONTROLLERS**

- .1 Brass tags with 12 mm stamped identification data filled with black paint.
- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

## **2.7 CONTROLS COMPONENTS IDENTIFICATION**

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.
- .2 Inscriptions to include function and (where appropriate) fail-safe position.

## **2.8 LANGUAGE**

- .1 Identification in English.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

### **3.2 TIMING**

- .1 Provide identification only after painting specified Section 09 91 23 - Interior Painting has been completed.

### **3.3 INSTALLATION**

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Provide ULC or CSA registration plates as required by respective agency.

### **3.4 NAMEPLATES**

- .1 Locations:
  - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs:
  - .1 Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection:
  - .1 Do not paint, insulate or cover.

### **3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS**

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.
- .3 At least once in each small room through which piping or ductwork passes.
- .4 On both sides of visual obstruction or where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.
- .6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.
- .7 At beginning and end points of each run and at each piece of equipment in run.

- .8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.
- .9 Identification easily and accurately readable from usual operating areas and from access points.
  - .1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

### **3.6 VALVES, CONTROLLERS**

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Contract Administrator. Provide one copy (reduced in size if required) in each operating and maintenance manual.
- .3 Number valves in each system consecutively.

### **3.7 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: In accordance with 01 74 21 Construction Waste Management.

**END OF SECTION**

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**Part 1 General**

**1.1 SUMMARY**

- .1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.
- .2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.
- .3 This section includes the testing of all new fire dampers.

**1.2 QUALIFICATIONS OF TAB PERSONNEL**

- .1 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:
  - .1 Associated Air Balance Council, (AABC) National Standards for Total System Balance.
  - .2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems..
  - .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing.
- .2 Recommendations and suggested practices contained in the TAB Standard: mandatory.
- .3 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- .4 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- .5 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- .6 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.
  - .1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.
  - .2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

**1.3 PURPOSE OF TAB**

- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads
- .2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.
- .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

**1.4 EXCEPTIONS**

- .1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

**1.5 CO-ORDINATION**

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

**1.6 PRE-TAB REVIEW**

- .1 Review contract documents before project construction is started and confirm in writing to Contract Administrator adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.
- .2 Review specified standards and report to Departmental Representative in writing proposed procedures which vary from standard.
- .3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

**1.7 START-UP**

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in Division 23.

**1.8 OPERATION OF SYSTEMS DURING TAB**

- .1 Operate systems for length of time required for TAB and as required by Contract Administrator for verification of TAB reports.

**1.9 START OF TAB**

- .1 Notify Departmental Representative 7 days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
  - .3 Installation of ceilings, doors, windows, other construction affecting TAB.
  - .4 Application of weatherstripping, sealing, and caulking.
  - .5 Pressure, leakage, other tests specified elsewhere Division 23.
  - .6 Provisions for TAB installed and operational.
- .7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
  - .1 Proper thermal overload protection in place for electrical equipment.
  - .2 Air systems:
    - .1 Filters in place, clean.
    - .2 Duct systems clean.
    - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
    - .4 Correct fan rotation.
    - .5 Fire, smoke, volume control dampers installed and open.

- .6 Coil fins combed, clean.
- .7 Access doors, installed, closed.
- .8 Outlets installed, volume control dampers open.
- .3 Liquid systems:
  - .1 Flushed, filled, vented.
  - .2 Correct pump rotation.
  - .3 Strainers in place, baskets clean.
  - .4 Isolating and balancing valves installed, open.
  - .5 Calibrated balancing valves installed, at factory settings.
  - .6 Chemical treatment systems complete, operational.

**1.10 APPLICATION TOLERANCES**

- .1 Do TAB to following tolerances of design values:
  - .1 HVAC systems: plus 10 %, minus 5 %.

**1.11 ACCURACY TOLERANCES**

- .1 Measured values accurate to within plus or minus 2 % of actual values.

**1.12 INSTRUMENTS**

- .1 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .2 Calibrate within 3 months of TAB.

**1.13 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit, prior to commencement of TAB:
- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

**1.14 TAB REPORT**

- .1 Format in accordance with relevant standard.
- .2 TAB report to show results in SI units and to include:
  - .1 Project record drawings.
  - .2 System schematics.
- .3 Submit 1 copy of TAB Report to Departmental Representative for verification and approval, in English in D-ring binders, complete with index tabs.

**1.15 VERIFICATION**

- .1 Reported results subject to verification by Departmental Representative.
- .2 Provide personnel and instrumentation to verify up to 30% of reported results.
- .3 Pay costs to repeat TAB as required to satisfaction of Departmental Representative.

**1.16 SETTINGS**

- .1 After TAB is completed to satisfaction of Departmental Representative, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.
- .2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

**1.17 COMPLETION OF TAB**

- .1 TAB considered complete when final TAB Report received and approved by the Departmental Representative.

**1.18 AIR SYSTEMS**

- .1 Standard: TAB to most stringent of TAB standards of AABC or ASHRAE.
- .2 Do TAB of following systems, equipment, components, controls:
  - .1 Fur Loft
    - .1 Ventilation Exhaust Fan, EF-1
  - .2 Men's House
    - .1 Ventilation Exhaust Fan, EF-1
  - .3 Museum
    - .1 Washroom Exhaust Fans, EF-3 and EF-4
  - .4 Warehouse
    - .1 Ventilation Exhaust Fan, EF-1
- .3 Qualifications: personnel performing TAB to be current member in good standing of AABC or NEBB.
- .4 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dew point), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
- .5 Locations of equipment measurements: to include, but not be limited to, following as appropriate:
  - .1 Inlet and outlet of dampers, grille, filter, coil, humidifier, fan, other equipment causing changes in conditions.
  - .2 At controllers, controlled device.
- .6 Locations of systems measurements to include, but not be limited to, following as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register, diffuser, or louver).

**1.19 OTHER TAB REQUIREMENTS**

- .1 General requirements applicable to work specified this paragraph:
  - .1 Qualifications of TAB personnel: as for air systems specified this section.
  - .2 Quality assurance: as for air systems specified this section.

- .2 Zone pressure differences:
  - .1 Adjust HVAC systems, equipment, controls to establish specified air pressure differentials, with systems in every possible combination of normal operating modes.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

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**Part 1            General**

**1.1            REFERENCES**

- .1 Definitions:
  - .1 For purposes of this section:
    - .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
    - .2 "EXPOSED" - means "not concealed" as previously defined.
    - .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
  - .2 TIAC Codes:
    - .1 CRD: Code Round Ductwork,
    - .2 CRF: Code Rectangular Finish.
- .2 Reference Standards:
  - .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
    - .1 ANSI/ASHRAE/IESNA 90.1, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
  - .2 ASTM International Inc.
    - .1 ASTM B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
    - .2 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
    - .3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
    - .4 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
    - .5 ASTM C547, Standard Specification for Mineral Fiber Pipe Insulation.
    - .6 ASTM C553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
    - .7 ASTM C612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
    - .8 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
    - .9 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
  - .3 Canadian General Standards Board (CGSB)
    - .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
  - .4 Green Seal Environmental Standards (GSES)
    - .1 Standard GS-36, Commercial Adhesives.
  - .5 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).
  - .6 Underwriters Laboratories of Canada (ULC)

- .1 CAN/ULC-S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

## **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.
    - .1 Description of equipment giving manufacturer's name, type, model, year and capacity.
    - .2 Details of operation, servicing and maintenance.
    - .3 Recommended spare parts list.
- .3 Manufacturers' Instructions:
  - .1 Provide manufacture's written duct insulation jointing recommendations. and special handling criteria, installation sequence, cleaning procedures.

## **1.3 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: specialist in performing work of this section, and have successful documented experience in this size and type of project.

## **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address and ULC markings.
- .1 Waste Management: In accordance with 01 74 21 Construction Waste Management.

## **Part 2 Products**

### **2.1 FIRE AND SMOKE RATING**

- .1 To CAN/ULC-S102:
  - .1 Maximum flame spread rating: 25.
  - .2 Maximum smoke developed rating: 50.

### **2.2 INSULATION**

- .1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.



- .3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section)
- .4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
  - .1 Mineral fibre: to ASTM C553.
  - .2 Jacket: to CGSB 51-GP-52Ma.
  - .3 Maximum "k" factor: to ASTM C553.

## **2.3 JACKETS**

- .1 Canvas:
  - .1 220 gm/m2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .2 Lagging adhesive: compatible with insulation.
  - .1 Maximum VOC limit 200g/L GSES GS-36 to SCAQMD Rule 1168.

## **2.4 ACCESSORIES**

- .1 Vapour retarder lap adhesive:
  - .1 Water based, fire retardant type, compatible with insulation.
- .2 Tape: self-adhesive, aluminum, plain, 50 mm wide minimum.
- .3 Contact adhesive: quick-setting
- .4 Canvas adhesive: washable.
- .5 Banding: 19 mm wide, 0.5 mm thick stainless steel.
- .6 Fasteners: 2 mm diameter pins with 35 mm diameter clips, length to suit thickness of insulation.

## **Part 3 Execution**

### **3.1 APPLICATION**

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

### **3.2 PRE-INSTALLATION REQUIREMENTS**

- .1 Pressure test ductwork systems complete, witness and certify.
- .2 Ensure surfaces are clean, dry, free from foreign material.

### **3.3 INSTALLATION**

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturer's instructions and as indicated.
- .3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

- .1 Ensure hangers, and supports are outside vapour retarder jacket.
- .5 Hangers and supports in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
  - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

### 3.4 DUCTWORK THERMAL INSULATION SCHEDULE

- .1 Insulation types and thicknesses: conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Cold temperature supply air ducts	C-1	yes	50
Exhaust duct where indicated on drawings (downstream of motorized damper)	C-1	yes	50
Exhaust duct where indicated on drawings (upstream of motorized damper)	C-1	yes	25

- .2 Finishes:
  - .1 Provide canvas jacket in exposed locations. (Fur loft basement, Men's House Attic.)

### 3.5 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .1 Waste Management: In accordance with 01 74 21 Construction Waste Management.

**END OF SECTION**

**Part 1            General**

**1.1            REFERENCES**

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- .2 ASTM International
  - .1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Green Seal Environmental Standards (GS)
  - .1 GS-36, Standard for Adhesives for Commercial Use.
- .4 National Fire Protection Association (NFPA)
  - .1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
  - .2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
  - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible.
  - .2 SMACNA HVAC Air Duct Leakage Test Manual.
  - .3 IAQ Guideline for Occupied Buildings Under Construction.

**1.2            ACTION AND INFORMATIONAL SUBMITTALS**

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

**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 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect metal ducts from damage.
  - .3 Replace defective or damaged materials with new.
- .1 Waste Management: In accordance with 01 74 21 Construction Waste Management.

**Part 2 Products**

**2.1 SEAL CLASSIFICATION**

- .1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	B
250	B
125	B
125	B

- .2 Seal classification:

- .1 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.

**2.2 SEALANT**

- .1 Sustainability Characteristics:

- .1 Adhesives and sealants: in accordance with Section 07 92 00 - Joint Sealants.

- .2 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus -30 degrees C to plus 93 degrees C.

**2.3 DUCT LEAKAGE**

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual and National Energy Code for Buildings.

**2.4 FITTINGS**

- .1 Fabrication: to SMACNA.

- .2 Radiused elbows:

- .1 Rectangular: standard radius or short radius without turning vanes. Centreline radius: 1.5 times width of duct.

- .2 Round: smooth radius. Centreline radius: 1.5 times diameter.

- .3 Mitred elbows, rectangular:

- .1 To 400 mm: with single thickness turning vanes.

- .2 Over 400 mm: with double thickness turning vanes.

- .4 Branches:

- .1 Rectangular main and branch: with radius on branch 1.5 times width of duct, 45 degrees entry on branch.

- .2 Round main and branch: enter main duct at 45 degrees with conical connection.

- .3 Provide volume control damper in branch duct near connection to main duct.

- .4 Main duct branches: with splitter damper.

- .5 Transitions:
  - .1 Diverging: 20 degrees maximum included angle.
  - .2 Converging: 30 degrees maximum included angle.
- .6 Offsets:
  - .1 Full radiused elbows.
- .7 Obstruction deflectors: maintain full cross-sectional area.
  - .1 Maximum included angles: as for transitions.

## 2.5 FIRE STOPPING

- .1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 - Fire Stopping.
- .2 Fire stopping material and installation must not distort duct.

## 2.6 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to SMACNA.
- .3 Joints: SMACNA.

## 2.7 HANGERS AND SUPPORTS

- .1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
  - .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
    - .1 Maximum size duct supported by strap hanger: 500 mm. Larger ducts to use trapeze hangers.
  - .2 Hanger configuration: to SMACNA.
  - .3 Hangers: galvanized steel angle with galvanized steel rods to SMACNA following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

- .4 Upper hanger attachments:
  - .1 For concrete: manufactured concrete inserts.
  - .2 For steel joist: manufactured joist clamp or steel plate washer.
  - .3 For steel beams: manufactured beam clamps

**Part 3 Execution**

**3.1 EXAMINATION**

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

**3.2 GENERAL**

- .1 Do work in accordance SMACNA.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
  - .1 Insulate strap hangers 100 mm beyond insulated duct.
- .3 Support risers in accordance with SMACNA.
- .4 Install breakaway joints in ductwork on sides of fire separation.
- .5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

**3.3 HANGERS**

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with SMACNA as follows:

Duct Size	Spacing
(mm)	(mm)
to 1500	3000
1501 and over	2500

**3.4 WATERTIGHT DUCT**

- .1 Provide watertight duct for:
  - .1 Fresh air intake.
  - .2 Exhaust discharges
- .2 Form bottom of horizontal duct without longitudinal seams.
  - .1 Solder or weld joints of bottom and side sheets.
  - .2 Seal all other joints with duct sealer.
- .3 Slope horizontal branch ductwork down towards louvers served.
  - .1 Slope header ducts down toward risers.
  - .2 Provide drain piping to floor.

**3.5 SEALING AND TAPING**

- .1 Apply sealant in accordance with SMACNA.

**3.6 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: In accordance with 01 74 21 Construction Waste Management.

**END OF SECTION**

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**Part 1 General**

**1.1 SUMMARY**

.1 Section Includes:

- .1 Materials and installation for duct accessories including flexible connections, access doors, vanes and collars.

**1.2 REFERENCES**

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

- .1 Material Safety Data Sheets (MSDS).

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

- .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

.2 Product Data:

- .1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:

- .1 Flexible connections.
- .2 Duct access doors.
- .3 Turning vanes.
- .4 Instrument test ports.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

- .1 Certification of ratings: catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Manufacturer's Field Reports: manufacturer's field reports specified.

.7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

**1.4 QUALITY ASSURANCE**

.1 Health and Safety:

- .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

**1.5 DELIVERY, STORAGE AND HANDLING**

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

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect air duct accessories from damage.
  - .3 Replace defective or damaged materials with new.
- .1 Waste Management: In accordance with 01 74 21 Construction Waste Management.

## **Part 2 Products**

### **2.1 GENERAL**

- .1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

### **2.2 FLEXIBLE CONNECTIONS**

- .1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.
- .2 Material:
  - .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m<sup>2</sup>.

### **2.3 ACCESS DOORS IN DUCTS**

- .1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.
- .2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.
- .3 Gaskets: neoprene.
- .4 Hardware:
  - .1 Up to 300 x 300 mm: two sash locks.
  - .2 301 to 450 mm: four sash locks.
  - .3 451 to 1000 mm: piano hinge and minimum two sash locks.
  - .4 Hold open devices.

### **2.4 TURNING VANES**

- .1 Factory or shop fabricated double thickness with trailing edge, to recommendations of SMACNA and as indicated.

### **2.5 INSTRUMENT TEST**

- .1 1.6 mm thick steel zinc plated after manufacture.
- .2 Cam lock handles with neoprene expansion plug and handle chain.
- .3 28 mm minimum inside diameter. Length to suit insulation thickness.

- .4 Neoprene mounting gasket.

## **2.6 SPIN-IN COLLARS**

- .1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.
- .2 Sheet metal thickness to co-responding round duct standards.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

### **3.2 INSTALLATION**

- .1 Flexible Connections:
  - .1 Install in following locations:
    - .1 Inlets and outlets to supply air units and fans.
    - .2 Inlets and outlets of exhaust and return air fans.
    - .3 As indicated.
  - .2 Length of connection: 100 mm.
  - .3 Minimum distance between metal parts when system in operation: 75 mm.
  - .4 Install in accordance with recommendations of SMACNA.
  - .5 When fan is running:
    - .1 Ducting on sides of flexible connection to be in alignment.
    - .2 Ensure slack material in flexible connection.
- .2 Access Doors and Viewing Panels:
  - .1 Size:
    - .1 As indicated.
  - .2 Locations:
    - .1 Fire and smoke dampers.
    - .2 Control dampers.
    - .3 Devices requiring maintenance.
    - .4 Required by code.
    - .5 Reheat coils.
    - .6 Elsewhere as indicated.
- .3 Instrument Test Ports:
  - .1 General:
    - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
  - .2 Locate to permit easy manipulation of instruments.
  - .3 Install insulation port extensions as required.
  - .4 Locations:

- .1 For traverse readings:
  - .1 Ducted inlets to roof and wall exhausters.
  - .2 Inlets and outlets of other fan systems.
  - .3 Main and sub-main ducts.
  - .4 And as indicated.
- .2 For temperature readings:
  - .1 At outside air intakes.
  - .2 At inlet and outlet of coils.
  - .3 And as indicated.
- .4 Turning vanes:
  - .1 Install in accordance with recommendations of SMACNA and as indicated.

### **3.3 CLEANING**

- .1 Perform cleaning operations in accordance with manufacturer's recommendations.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Sheet Metal and Air Conditioning National Association (SMACNA)
  - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for dampers for incorporation into manual.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect dampers from damages.
  - .3 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 GENERAL**

- .1 Manufacture to SMACNA standards.

**2.2 SINGLE BLADE DAMPERS**

- .1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness.
- .4 Inside and outside nylon end bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

**2.3 MULTI-BLADED DAMPERS**

- .1 Factory manufactured of material compatible with duct.

- .2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
- .3 Maximum blade height: 100 mm.
- .4 Bearings: pin in bronze bushings.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

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

#### **3.2 INSTALLATION**

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.
- .4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- .5 Dampers: vibration free.
- .6 Ensure damper operators are observable and accessible.

#### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .1 Waste Management: In accordance with 01 74 21 Construction Waste Management.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Operating dampers for mechanical forced air ventilation and air conditioning systems.

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A653/A653M-04a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
  - .2 Indicate the following:
    - .1 Performance data.
- .2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
- .3 Closeout Submittals
  - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

**Part 2 Products**

**2.1 BACK DRAFT DAMPERS**

- .1 Automatic gravity operated, multi leaf, aluminum construction with nylon bearings, as indicated.

**2.2 INSULATED MOTORIZED DAMPERS**

- .1 Dampers shall be parallel blade action.
- .2 Extruded aluminum (6063-T5) damper frame shall not be less than 2 mm in thickness. Damper frame shall be 200 mm deep x 25 mm, with duct mounting flanges on both sides of frame. Damper frame shall have a 2" mounting flange on the rear of the damper, when installed as Extended Rear Flange install type. Frame to be assembled using zinc-plated steel mounting fasteners.

- .3 Blades shall be maximum 160 mm deep extruded aluminum (6063-T5) air-foil profiles with a minimum wall thickness of 1.5 mm. Blades shall be internally insulated with expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55.
- .4 Blade seals shall be extruded EPDM, secured in an integral slot within the aluminum blade extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Adhesive or clip-on type blade seals will not be approved.
- .5 Frame seals shall be extruded silicone, secured in an integral slot within the aluminum frame extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Metallic compression type jamb seals will not be approved.
- .6 Bearings shall be a dual bearing system composed of a Celcon inner bearing (fixed around a 11 mm aluminum hexagon blade pivot pin), rotating within a polycarbonate outer bearing inserted in the frame. Single axle bearing, rotating in an extruded or punched hole shall not be acceptable.
- .7 Hexagonal control shaft shall be 11 mm. It shall have an adjustable length and shall be an integral part of the blade axle. A field-applied control shaft shall not be acceptable. All parts shall be zinc-plated steel.
- .8 Linkage hardware shall be aluminum and corrosion-resistant zinc-plated steel, installed in the frame side, out of the airstream, and accessible after installation. Linkage hardware shall be complete with cup-point trunnion screws to prevent linkage slippage. Linkage that consists of metal rubbing metal will not be approved.
- .9 Dampers shall be designed for operation in temperatures ranging from -40°C to 100°C.
- .10 Dampers shall be AMCA rated for Leakage Class 1A at 250 Pa static pressure differential. Standard air leakage data to be certified under the AMCA Certified Ratings Program.
- .11 Dampers shall be custom made to required size, with blade stops not exceeding 31.75 mm in height.
- .12 Dampers mounting type: Flanged to Duct.
- .13 Installation of dampers must be in accordance with manufacturers current installation guidelines, provided with each damper shipment.
- .14 Intermediate or tubular steel structural support is required to resist applied pressure loads for dampers that consist of two or more sections in both height and width.
- .15 Sizes as indicated on drawings.
- .16 Acceptable Product: "Tamco", "Alumavent", "Greenheck" or approved equivalent.

## **2.3            MOTORIZED DAMPER ACTUATORS**

- .1 Control: On/Off.
- .2 Spring return. Fail Closed.
- .3 Torque: As recommended by motorized damper manufacturer.
- .4 Ambient Temperature Range: -30°C to 50°C.
- .5 Electrical: Maximum 10 W power consumption. Voltage: 120V/1Ph/60Hz.
- .6 Two built-in SPDT auxiliary switches for end position indication (interlock control, fan start-up).



- .7 The actuator shall have mechanical or electronic stall protection to prevent damage to the actuator throughout the rotation of the actuator.
- .8 An internal mechanical, spring-return mechanisms shall be built into the actuator housing.
- .9 Spring-return actuators with more than 7 Nm (60 in.-lb) torque capacity shall have a manual crank to allow manual positioning of the damper when the actuator is not powered.
- .10 Acceptable Product: "Belimo", "Ruskin", "Honeywell" or approved equivalent.

**Part 3 Execution**

**3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 INSTALLATION**

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.
- .3 Seal multiple damper modules with silicon sealant.
- .4 Install access door adjacent to each damper. See Section 23 33 00 - Air Duct Accessories.
- .5 Ensure dampers are observable and accessible.

**END OF SECTION**

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**Part 1            General**

**1.1            REFERENCE STANDARDS**

- .1        ASTM International
  - .1        ASTM C423-09a, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
  - .2        ASTM C916-85(2007), Standard Specification for Adhesives for Duct Thermal Insulation.
  - .3        ASTM C1071-12, Standard specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
  - .4        ASTM C1338-08, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
  - .5        ASTM G21-09, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- .2        National Fire Protection Association (NFPA)
  - .1        NFPA 90A-12, Standard for the Installation of Air Conditioning and Ventilating Systems.
  - .2        NFPA 90B-12, Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
- .3        North American Insulation Manufacturers Association (NAIMA)
  - .1        NAIMA AH116-2002, Fibrous Glass Duct Construction Standards.
- .4        Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
  - .1        SMACNA, HVAC Duct Construction Standards, Metal and Flexible-2005.
  - .2        SMACNA IAQ Guideline for Occupied Buildings Under Construction-2007.
- .5        Underwriter's Laboratories of Canada (ULC)
  - .1        CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

**1.2            ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3            CLOSEOUT SUBMITTALS**

- .1        Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2        Operation and Maintenance Data: submit operation and maintenance data for duct liners for incorporation into manual.

#### 1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect diffuser, registers and grilles from damages.
  - .3 Replace defective or damaged materials with new.

#### Part 2 Products

##### 2.1 DUCT LINER

- .1 Mat-faced glass mineral wool board insulation, 25 mm thickness, 48 kg/m<sup>3</sup> density. Will not sustain mold growth. Does not accelerate corrosion of steel. 25.4 m/s maximum air velocity. 121 °C maximum service temperature.
- .2 Sound Absorption Coefficients as follows, tested to ASTM C423, Type A mounting

Octave Band Center Freq.	125	250	500	1000	2000	4000	NRC
Sound Absorption Coefficient	0.13	0.24	0.56	0.83	0.92	0.98	0.65

- .3 Approvals: CAN/ULC S102
- .4 Acceptable Product: "KNAUF" Atmosphere Rigid Plenum Liner.

##### 2.2 ADHESIVE

- .1 Adhesive: to NFPA 90A, NFPA 90B, and ASTM C916.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 29 degrees C to plus 93 degrees C.
- .3 Water-based fire retardant type.

##### 2.3 FASTENERS

- .1 Weld pins 2.0 mm diameter, length to suit thickness of insulation. Nylon, Polymer, or Metal retaining clips, 32 mm square.

##### 2.4 JOINT TAPE

- .1 Poly-Vinyl treated open weave fiberglass membrane 50 mm wide.

##### 2.5 SEALER

- .1 Meet requirements of NFPA 90A and NFPA 90B.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 68 degrees C to plus 93 degrees C.

**Part 3 Execution**

**3.1 EXAMINATION**

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

**3.2 GENERAL**

- .1 Do work in accordance with SMACNA HVAC Duct Construction Standard except as specified otherwise.
- .2 Line inside of ducts where indicated.
- .3 Duct dimensions, as indicated, are clear inside duct lining.

**3.3 DUCT LINER**

- .1 Install in accordance with manufacturer's recommendations.
- .2 In systems, where air velocity exceeds 20.3 m/s, install galvanized sheet metal nosing to leading edges of duct liner.

**3.4 JOINTS**

- .1 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:
  - .1 Bed tape in sealer.
  - .2 Apply 2 coats of sealer over tape.
- .2 Replace damaged areas of liner at discretion of Departmental Representative.
- .3 Protect leading and trailing edges of duct sections with sheet metal nosing having 15 mm overlap and fastened to duct.

**3.5 CLEANING**

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

**END OF SECTION**

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**Part 1 General**

**1.1 REFERENCES**

- .1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)
  - .1 ANSI/AMCA Standard 99, Standards Handbook.
  - .2 ANSI/AMCA Standard 210/(ANSI/ASHRAE 51-07), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
  - .3 ANSI/AMCA Standard 300, Reverberant Room Method for Sound Testing of Fans.
  - .4 ANSI/AMCA Standard 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for HVAC fans and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Provide:
    - .1 Fan performance curves showing point of operation, kW and efficiency.
    - .2 Sound rating data at point of operation.
  - .2 Indicate:
    - .1 Motors, sheaves, bearings, shaft details.

**1.3 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials:
  - .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
    - .1 Provide:
      - .1 Matched sets of belts.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 60 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to Site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect HVAC fans from damage.
  - .3 Replace defective or damaged materials with new.
- .1 Waste Management: In accordance with 01 74 21 Construction Waste Management.

**Part 2 Products**

**2.1 VENTILATION EXHAUST FANS**

- .1 General: Ceiling mounted, direct driven, centrifugal fan with forward curved wheel. Integral grille with 150 mm outlet duct collar. Two sided access panels permit access to all internal components. Statically and dynamically balanced in accordance with AMCA Standard 204-05. Spring hanging isolators sized to match the weight of the fan.
- .2 Materials of Construction: Aluminum fan housing.
- .3 Motor: DC electronic commutation type motor (ECM), permanently lubricated, ball bearings, internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor. Open drip proof motor enclosure. Motor speed shall be controllable down to 20% of full speed.
- .4 Fan shall be non-overloading at any point on the fan curve.
- .5 **Low sound levels are a critical requirement and as such sound levels specified on the schedules shall not be exceeded.**
- .6 Electrical: NEMA 4 rated disconnect switch.
- .7 Options and Accessories:
  - .1 Motor - EC motor w/Permanent Dial and 0-10VDC input
  - .2 Control - Dial on Exterior of Fan Housing, Mounted and Wired
  - .3 UL/cUL 705 Listed - "Power Ventilators"
  - .4 Switch, NEMA-1, Toggle, Shipped with Unit
  - .5 Junction Box Mounted & Wired
  - .6 Stainless Steel Fasteners - 300 Series
  - .7 Aluminum Housing
  - .8 Insulated Housing – 25mm (1 in.) Thick: Fan Housing
  - .9 Motor Cover, Aluminum
  - .10 Isolators & Brackets, Spring Hanging (1 Kit(s): Qty 4, PN: 850344)
- .8 Approvals: CSA Approved motor.
- .9 Fan Schedules:
  - .1 **Fur Loft:** See Exhaust Fan Schedule on drawings
  - .2 **Men's House:** See Exhaust Fan Schedule on drawings
  - .3 **Warehouse:** See Exhaust Fan Schedule on drawings
- .10 Acceptable Manufacturers: "Greenheck", "Cook", "Aerovent", or approved equal.

**2.2 WASHROOM EXHAUST FANS (EF-3 and EF-4) - MUSEUM**

- .1 General: Direct driven centrifugal inline fan. Forward curved wheel. Galvanized steel housing. Outlet duct collar with integral backdraft damper. Adjustable mounting brackets. Polypropylene wheel. Integral grille.
- .2 Motor: High Efficiency Electronically Commutated (EC) type. Dial on fan for speed adjustment. TEAO enclosure.
- .3 Approvals: cUL 507 Listed - Electric Fan.



**Museum**

Tag	Airflow (L/s)	External Static Pressure (Pa)	Input Power (Watts)	Fan Speed (RPM)	Sones	Voltage (V/Ph/Hz)	Dimensions (HxWxL) (mm)	Weight (kg)
EF-3	47	75	8	940	1.4	120/1/60	206x336x377	5.5
EF-4	47	75	8	940	1.4	120/1/60	206x336x377	5.5

- .4 Acceptable Manufacturers: "Greenheck", "Cook", "Broan", or approved equal.

**Part 3 Execution**

**3.1 EXAMINATION**

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

**3.2 FAN INSTALLATION**

- .1 Install fans as indicated, complete with flexible connections in accordance with Section 23 33 00 - Air Duct Accessories.
- .2 Provide sheaves and belts required for final air balance.
- .3 Bearings and extension tubes to be easily accessible.
- .4 Access doors and access panels to be easily accessible.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

**END OF SECTION**

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**Part 1 General**

**1.1 REFERENCE STANDARDS**

- .1 American National Standard Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
  - .1 ANSI/ASHRAE 52.2-12, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particulate Size (ANSI approved).
- .2 American National Standards Institute (ANSI)/CSA Group
  - .1 ANSI Z21.47/CSA 2.3-12, Gas-Fired Central Furnaces.
  - .2 ANSI Z83.8/CSA 2.6-13, Gas Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters and Gas-Fired Duct Furnaces.
- .3 CSA Group
  - .1 CGA 3.2-1976(R2009), Industrial and Commercial Gas-Fired Package Furnaces.
  - .2 CSA B149.1-10 Natural Gas and Propane Installation Code.
  - .3 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
  - .4 CSA C22.2 No.24-1993(R2008), Temperature-Indicating and Regulating Equipment.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for furnace units and parts and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit manufacturer's written recommendations.

**1.3 CLOSEOUT SUBMITTALS**

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

**1.4 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Extra Stock Parts:
  - .1 Spare filters: in addition to filters installed immediately prior to acceptance by Departmental Representative, supply one (1) complete set of filters for each filter unit or filter bank.

**1.5 DELIVERY, STORAGE AND HANDLING**

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

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect diffuser, registers and grilles from damages.
  - .3 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 NATURAL GAS FIRED UNIT HEATERS, UH-1 AND UH-2 (Large Storage Building)**

- .1 Performance: 22.0 kW Input, 18.0 kW Output, 550 L/s Airflow rate. 58 dBA sound pressure level at 5 ft.
- .2 Burner: Indirect fired tubular heat exchanger, 82% efficiency, individually fired tubes. 18 Ga. aluminized steel tubes and headers. 1.5 - 1.75 kPa natural gas pressure. Solid state ignition system shall directly light the gas by means of a direct spark igniter. Separated combustion such that combustion air is drawn from outside.
- .3 Construction: 22 Ga. aluminized steel casing, polyester powder paint for corrosion resistance. Horizontal air deflectors. Mounting brackets to allow for threaded rod suspension. 12 mm gas connection. 100 mm vent connector size.
- .4 Controls: Single-stage gas controls with ignition control. Time delay relay delays start and shut off of fan. Low voltage (24V) terminal board provided for direct wiring connection to an external thermostat. Automatic reset high limit switch.
- .5 Motor: 1/12 HP, Permanent Split Capacitor, 1625 RPM, single speed, open drip proof
- .6 Electrical: 115/1/60 Voltage, 115V to 24V step down transformer provided for unit controls.
- .7 Dimensions (HxWxL): 450 mm x 680 mm x 635 mm. Weight: 39 kg.
- .8 Approvals: CSA certified, Certified to ANSI Z83.8.
- .9 Venting: Vertical concentric vent kit shall be provided to allow vent outlet and combustion air inlet to penetrate the building roof through one opening. Vent kit shall be certified for use in Canada. Vent dimensions to be verified in field. Provide thimbles at ceiling, roof penetrations, conforming to distance to combustibles. Provide roof flashing.
- .10 Acceptable Manufacturers: "Modine", "Reznor", "Sterling HVAC", or approved equal.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for fuel-fired furnaces installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### **3.2 INSTALLATION**

- .1 Install in accordance with manufacturer's instructions, regulations of authorities having jurisdiction, Canadian Electric Code, and CSA B149.1.
- .2 Provide Departmental Representative written report of test results.
- .3 Provide ceiling/roof penetrations and flashing. Provide thimbles at penetrations per manufacturer's instructions. Seal roof penetration weather tight.
- .4 Provide adequate support bracing for portions of venting above roof.

### **3.3 CLEANING**

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

**END OF SECTION**

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**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for dehumidifiers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit shop drawings to indicate project layout, dimensions and extent of dehumidification system.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Manufacturer's Field Reports:
  - .1 Submit manufacturer's field reports specified.

**1.2 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for dehumidifiers for incorporation into manual.

**1.3 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00- Closeout Submittals.
  - .2 Provide following: one complete set of renewable evaporator media.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location, indoors, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect dehumidifiers from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

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**Part 2 Products**

**2.1 PORTABLE DEHUMIDIFIER (Big House)**

- .1 Performance: 62.6 L/day dehumidification at 32°C and 90% R.H., 30.0 L/day dehumidification at 27°C and 80% R.H., 107 L/s airflow rate, 1 - 38°C temperature operating range.
- .2 Features: Hot-gas bypass defrost, high airflow filters, rotary compressor, electronic touchpad controls, centrifugal water pump-out.
- .3 Construction: Rotomolded polyethylene housing, semi-pneumatic wheels, rigid handle, 40 ft drain hose length.
- .4 Electrical: 120V/1Ph power connection. 6.4 Amps.
- .5 Dimensions (HxWxD): 830 mm x 500 mm x 500 mm. Weight: 36 kg.
- .6 Acceptable Manufacturers: "Dri-Eaz 1200", "Ebac", "Phoenix" or approved equivalent.

**Part 3 Execution**

**3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- .1 Install in accordance with manufacturer's instructions.
- .2 Dehumidifier to be new and clean when project is accepted.
- .3 Drain: connect to existing drain.

**3.3 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its product and submit written reports, in acceptable format, to verify compliance of Work with Contract.
- .2 Performance Verification (PV):
  - .1 General: in accordance with Section 01 91 13- General Commissioning (Cx)  
Requirements: General Requirements, supplemented as specified.



- .3 Start-up:
  - .1 General: in accordance with Section 01 91 13- General Commissioning (Cx)  
Requirements: General Requirements, supplemented as specified.
  - .2 Verify:
    - .1 Drainage lines are sloped to ensure condensate is drained away from the dehumidifier.

### **3.4 CLEANING**

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

**END OF SECTION**

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**Part 1 General**

**1.1 SCOPE OF WORK**

- .1 All drawings and all sections of the specifications shall apply to and form an integral part of this section.
- .2 All electrical systems shall be fully tested and operational in accordance with applicable codes and bylaws.
- .3 Provide all labour and materials necessary for complete and operating systems as indicated on the drawings and specified herein. Any work and material, even if not shown or specified, which is obviously necessary or reasonably implied to complete the work shall be provided as if it was both shown and specified.
- .4 All materials, tools, appliances, scaffolding, apparatus and labour necessary for the execution, erection and completion of specified systems shall be furnished.
- .5 Contractor shall comply with all Department of Labour, Workplace and Health requirements at all times.
- .6 All Contractors shall have a valid Contractors license to operate in the Manitoba.
- .7 Electrical Contractor shall maintain the appropriate ratio of Journeymen Electricians & Apprentices required by Provincial Codes. Only qualified workmen shall be employed on this contract. Supervision shall be by Journeymen Electricians and work carried out by Journeymen and/or registered apprentices only.

**1.2 INSTALLATION RESPONSIBILITY**

- .1 The Contractor shall complete all electrical connections to equipment and accessories pertaining to this Contract and leave all in satisfactory condition.
- .2 The Contractor shall ascertain and obtain information from all other sub-trades as to the extent and details of any additional electrical work to complete all systems served with electrical power or controlled electrically and, where necessary, allow in his tender for such work. No extra claim will be accepted for work on such systems whether they are; as specified in architectural, structural, landscape or mechanical plans and specifications; or proposed and accepted as alternate systems.
- .3 Low voltage control system wiring may be performed by a Controls Contractor; all line voltage control wiring is this Contractor's responsibility. The Electrical Contractor shall work in close cooperation with the Controls Contractor and shall allow for any part of controls work in base tender. Refer to Mechanical Specification. This shall include but not limited to 120V power circuits, interconnection wiring, conduit, junction boxes, cover plates and device back boxes.
- .4 Any electrical and communication work carried out on behalf of, or by other contractors shall be in accordance with the Canadian Electrical Code and applicable clauses of this specification.
- .5 It shall be the Contractor's responsibility to ensure that all trade contractors and suppliers of electrical equipment observe the applicable clauses of the electrical specifications.
- .6 In case of differences between trade contractors regarding extent of work responsibilities, such matters shall be referred to the Departmental Representative through the Contractor.

Should any discrepancy between the specification and drawings leave the Contractor in doubt as to the true intent and meaning, a ruling shall be obtained from the Departmental Representative before the tender is submitted. If this is not done it will be the Contractor's responsibility to ensure that the more expensive alternate has been included.

- .7 Before tendering, the Contractor shall visit the site and report to the Departmental Representative any condition which may prevent him from performing his contract as specified. No extra will be allowed if this procedure is not followed.
- .8 Contractor shall make a reasonable allowance in his tender for rerouting or making good any conduit or equipment exposed or rendered useless during the course of demolition or construction.
- .9 The drawings show approximate locations of outlets and apparatus. This right is reserved to make changes in location as may be necessary to center lights or meet the exigencies of construction in any way. No extra will be allowed for such changes unless the distance moved exceeds 3000mm.
- .10 Should any work or material be needed which is not specified or shown on the drawings and is nevertheless necessary for properly carrying out the obvious intent, such work or materials shall be provided without additional cost.
- .11 Contractor shall complete installation in accordance with CSA C22.1 except where specified otherwise.
- .12 Contractor shall complete overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

### 1.3 DEFINITIONS

- .1 The following are definitions of terms and expressions used in the specification:

**INSPECTION AUTHORITY** – means agent of any authority having jurisdiction over construction standards associated with any part of electrical work on site.

**SUPPLY AUTHORITY** – means electrical power utility company responsible for delivery of electrical power to project (Manitoba Hydro).

**ELECTRICAL CODE** – means Canadian Electrical Code or Local Code in force at Project location.

**INDICATE** – means as shown on contract drawings or noted in Contract Documents.

**TYPE TESTED** – means that each piece of equipment produced by manufacturer is not fully tested. An original piece with similar arrangement has been fully tested and results of that test are available.

**PROVIDE** – means to supply, install and leave in working order all materials and necessary wiring, supports, access panels, etc., as necessary for equipment indicated.

**CONCEALED** – means hidden from normal sight in furred spaces, shafts, ceiling spaces, walls and partitions;

**EXPOSED** – means work normally visible, including work in equipment rooms, tunnels, and similar spaces;

**FINISHED** – means when in description of any area or part of an area or a product which receives a finish such as paint, or in case of a product may be factory finished;

**INSTALL** (and tenses of "install") – means secure in position, connect complete, test, adjust and verify;

**SUPPLY** – means to procure, arrange for delivery to site, distribute to floors, inspect, accept delivery and administer supply of manufacturer's products and/or systems, and includes manufacturer's supply of any special cables, standard on site testing, initial start-up, programming, basic commissioning, warranties and assistance to Contractor;

**DELETE or REMOVE** (and tenses of "delete" or "remove") – means to disconnect, make safe, remove including any back box and exposed conduits, patch and repair/finish surfaces to match adjoining similar construction, include for associated re-programming of systems and/or change of documentation identifications to suit deletions, and properly dispose of deleted products off site unless otherwise instructed by Departmental Representative;

**BAS** – means building automation system; "BMS" – means building management system, "FMS" – means facility management system; and "DDC" means direct digital controls; references to "BAS", "BMS", "FMS" and "DDC" generally mean same;

**ELECTRICAL DIVISIONS** – refers to Divisions 26, 27, 28 and other Divisions as specifically noted, and which work as defined in Specifications and /or on drawings is responsibility of Electrical Contractor, unless otherwise noted;

**MECHANICAL DIVISIONS** – refers to Divisions 20, 21, 22, 23, 25 and other Divisions as specifically noted, and which work as defined in Specifications and /or on drawings is responsibility of Mechanical Contractor, unless otherwise noted;

#### 1.4 DESIGN REQUIREMENTS

- .1 All electrical design drawings, details and specifications are diagrammatic, and unless specifically noted by figured dimensions, indicate the general arrangement of receptacles, light fixtures, switches, risers, panels, etc. Any information involving accurate dimensions, shall be obtained from detailed dimensioned drawings or by actual measurements at the building. If doubt exists as to the final location, the Contractor shall contact the Departmental Representative for clarification prior to installation. The location of switches, receptacles, outlets, etc., shall be coordinated with built-in units, Departmental Representative appliances and equipment, mechanical equipment, etc., as shown on the architectural and mechanical drawings and/or as existing.
- .2 Where space is indicated for future equipment, leave such space clear and install feeders and equipment pertaining to this contract in such a way that future equipment can be easily installed.
- .3 Operating voltages: to CAN3-C235.
- .4 Language operating requirements: provide identification nameplates and labels for control items in English.

#### 1.5 PLANS

- .1 The Contractor shall familiarize them self with the plans which show the approximate locations of outlets and apparatus. The right is reserved to make such changes in location as may be necessary to meet contingencies of construction. No extras will be allowed for such changes to any piece of electrical equipment, outlets, etc., unless the distance exceeds 3000mm.

- .2 Should a discrepancy appear between plans, specifications, or the actual conditions encountered on the site, which leaves the Contractor in doubt as to the true intention and meaning of the plans and specifications, a ruling shall be obtained in writing from the Departmental Representative which will be final.
- .3 Do not use Contract Drawing measurements for prefabrication and layout of raceways, conduits, ducts, bus ducts, luminaires, and other such work. Locations and routing are to be generally in accordance with Contract Drawings, however, prepare layout drawings for such work. Use established bench marks for both horizontal and vertical measurements. Confirm inverts, coordinate with and make allowances for work of other trades. Accurately layout work, and be entirely responsible for work installed in accordance with layout drawings. Where any invert, grade, or size is at variance with Contract Drawings, notify Departmental Representative prior to proceeding with work.
- .4 Prepare plan and interference drawings of work for submittal to General Contractor, who will then arrange for preparation of detailed section drawings of ceiling spaces of corridors and any other congested areas. Sections are to be cross referenced with Contractor's plan drawings so that trades may make use of section drawings. Section drawings indicate lateral and elevation dimensions of major services within ceiling space. Lateral dimensions are to be from grid lines and elevations from top of floor slab. Obtain from Departmental Representative, engineering drawings for this use. Prints and/or disks of Contractors' interference drawings are to be distributed among other Trade Contractors and General Contractor. Submit interference drawings to Departmental Representative for review.

#### **1.6 CONFLICT OF TRADES**

- .1 Contractor shall coordinate with all other sub-trades involved to confirm the locations of the various outlets and equipment and shall cooperate fully to ensure that no conflict arises during the installation. In case of any difference of opinion, the matter shall be referred to the Departmental Representative for final decision.
- .2 Unless otherwise directed by Departmental Representative, Mechanical Contractor is to determine final locations of major work within ceiling spaces, crawlspace and mechanical / electrical chases.

#### **1.7 COORDINATION WITH OTHER TRADES**

- .1 The Contractor is responsible for coordinating with other divisions specifications for possible restrictions on usage and placement of electrical equipment, i.e. conduits in slab, panels in walls, etc.

#### **1.8 PERMITS**

- .1 Prior to commencement of work, the Contractor shall obtain all electrical permits from the AHJ as required for this Contract and shall pay all associate fees for such permits as well as arranged for inspections. The Contractor shall pay all costs related to changes required by interpretation by all governing authorities.

#### **1.9 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Acts respecting manpower vocational training and qualification.

- .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
- .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

**1.10 SAFETY PRECAUTIONS**

- .1 The Contractor shall strictly adhere to all safety rules and regulations pertaining to electrical servicing of all sub-trades during construction. All safety precautions as outlined in General Conditions shall be observed.

**1.11 WORKMANSHIP**

- .1 The complete installation shall be carried out in a neat and workmanlike manner to the satisfaction of the Departmental Representative.
- .2 Only qualified workmen shall be employed on this contract. Supervision shall be by Journeymen Electricians and work carried out by Journeymen and/or registered apprentices only.

**1.12 SUBMITTALS**

- .1 In addition to the requirement set out below, the Contractor shall review and thoroughly understand the requirements for submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 The Contractor shall take the necessary steps to ensure that shop drawings for equipment with long lead-in or delivery time are expedited for review and approval so as to avoid impacting the construction schedule. The Departmental Representative shall take such reasonable steps to ensure the review process for these items is performed promptly. The Departmental Representative agrees to make time available to meet with suppliers and the Contractor to expedite the shop drawing process.
- .3 Prior to manufacturing any item required for this project, the Contractor shall submit detailed shop drawings of the item.
- .4 Contractor shall allow a minimum of ten (10) working days for shop drawing review by the Departmental Representative and time shall be incorporated in construction schedule so no delays occur due to late submission of shop drawings. Facsimile transmission of shop drawings will **NOT BE ACCEPTED**. Late submissions of shop drawings will be sufficient reason for stoppage of construction pending review, or removal and replacement of any unsatisfactory item at the Contractor's expense.
- .5 Any shop drawing stamped "revised & resubmit" shall be corrected and resubmitted so as not to delay construction.
- .6 Any item rejected must have new shop drawings reviewed and submitted before being manufactured. Any item installed without having shop drawings reviewed may be rejected and may have to be replaced with no cost to the Departmental Representative.
- .7 Corrections or comments made on the shop drawings by the Departmental Representative during this review do not relieve Contractor from compliance with requirements of the drawings and specifications. This review is only for the general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for confirming and correlating all quantities and

dimensions; selecting fabrication processes and techniques of construction; coordinating his or her work with that of all other trades and performing all work in a safe and satisfactory manner.

- .8 Shop drawings shall be provided for all system components.
- .9 Approved shop drawings, subject to meeting specifications, shall be included in the Operation and Maintenance Manuals specified elsewhere. Only shop drawings stamped "Reviewed" by the Departmental Representative are acceptable for inclusion in these manuals.
- .10 The Contractor shall ensure that shop drawings for electrical equipment supplied and installed by any and all trades are reviewed by the Departmental Representative.
- .11 The Contractor shall submit O&M and as-builts to the Departmental Representative upon completion of the project.

#### 1.13 SUBSTITUTIONS

- .1 Unless otherwise noted on the plans or specifications, substitutions may be allowed by the Departmental Representative, when requested by the Contractor or by equipment suppliers, for items specified by manufacturer and catalogue number.
- .2 Requests for review of such substitutions shall be submitted at least seven working days prior to the tender close date. Facsimile transmission of substitution drawings and/or specifications will **NOT BE ACCEPTED**.
- .3 Descriptive catalogue sheets accompanying the approval application which may show several items of varying specifications shall be conspicuously marked in such a manner that the offered substitute item may easily be recognized for comparison.
- .4 Proposed substitutions must be at least of equal quality to that of the specified item. The manufacturer's specification of the item shall apply for comparison if no other clause of this specification applies. The decision of the Departmental Representative to accept or reject will be final.
- .5 Off-the-shelf items which are specified by description only, without any manufacturer, model type or catalogue number, do not require approval prior to the tender date. However, Contractor shall submit to the Departmental Representative a request for review of such items prior to their use, in sufficient time to permit rejection if unsatisfactory.
- .6 All additional expenses incurred as a result of substitution will be the direct responsibility of the Contractor.

#### 1.14 EQUIPMENT LOADS

- .1 Supply equipment loads (self-weight, operating weight, housekeeping pad, inertia pads, etc.) to Departmental Representative, via shop drawing submissions, prior to construction.
- .2 When choice of specific equipment is made by Contractor, actual weight, location and method of support of equipment may differ from those initially given to Departmental Representative and thus from those assumed for design. Consequently, it is necessary to back-check equipment loads, location, and supports.



- .3 Where supporting structure consists of structural steel framing, it is imperative that equipment loads, location, and method of support be confirmed prior to fabrication of structural steel. Be responsible for confirming locations of equipment with Departmental Representative prior to construction.

#### **1.15 EQUIPMENT SUPPLIED BY DEPARTMENTAL REPRESENTATIVE**

- .1 On date of delivery, the Contractor shall sign for all items which are being supplied by the Departmental Representative and will be responsible for any loss or damage thereafter until the work is completed and accepted by the Departmental Representative. Sign delivery slips "Subject to Inspection". Keep all delivery slips.
- .2 Items supplied and delivered to the site by the Departmental Representative shall be examined by the Contractor, and any damage shall be reported immediately to the Departmental Representative who will enter a claim directly to the supplier and transportation company.
- .3 Belated damage claims on any equipment shall not be regarded as transport damage and will become the responsibility of the Contractor for repair or replacement.
- .4 All repairs or replacements shall be carried out by a Contractor to the satisfaction of the Departmental Representative.
- .5 Contractor is responsible for safe storage of all Departmental Representative supplied equipment

#### **1.16 APPROVAL AND CERTIFICATION**

- .1 Any electrical material and/or equipment supplied by any Contractor or subcontractor for installation must bear evidence of certification by authorized organization (e.g. CSA) or special certification acceptable to the Authority Having Jurisdiction.
- .2 Any material and/or equipment not complying with this requirement and found on the job site will be subject to rejection and replacement with approved equipment at no additional cost.
- .3 Contractor, upon receipt of equipment purchased by the Departmental Representative for installation on this project, shall examine it for compliance with the above requirements. Report any non-approved equipment to the Departmental Representative for action. Such equipment shall be returned to its packing crate until instructions are received from the Departmental Representative, unless otherwise directed in writing by the Departmental Representative.

#### **1.17 OPENINGS**

- .1 Supply opening sizes and locations to Departmental Representative to allow verification of their effect on design, and for inclusion on structural drawings where appropriate.
- .2 No openings are permitted through completed structure without written approval of Departmental Representative. Show required openings on a copy of structural drawings. Identify exact locations, elevations, and size of proposed openings and submit to Departmental Representative for review, well in advance of doing work.

**1.18 EXTRA WORK**

- .1 Any extra work ordered to be done shall be governed by the specification of the Contract unless specific instructions or clauses supersede those of the specification for this particular application only.

**1.19 DAMAGE**

- .1 Where existing structure, grade or pavement has to be removed, altered or otherwise defaced to facilitate electrical installation, Contractor shall arrange for breaking of openings or grooves in any building structure or breaking of pavement and/or digging of trenches.
- .2 Any equipment, structure, pavement or grade damaged by the execution of this Contract shall be repaired to its original condition. Any cost incurred for such work shall be allowed for in tender sum.
- .3 Irreparably damaged equipment shall be replaced at no cost to the Departmental Representative.
- .4 If the finish of new equipment is damaged, the Contractor shall, at the discretion of the Departmental Representative, either replace or restore the equipment to its original condition by re-spraying, refinishing, etc., at no cost to the Departmental Representative.
- .5 Openings and cutouts shall not be burned into panels. Oversize openings shall not be patched up with loose plates or oversize washers. Oversized openings will be considered damage to the equipment and are to be treated as specified above.
- .6 The Contractor shall use extreme care when working near existing services and any services disturbed shall be replaced by the contractor at no cost to the Departmental Representative to the satisfaction of the Departmental Representative.

**1.20 PAYMENT FOR SERVICES BY OTHERS**

- .1 Where, in the specifications, the Contractor is required to arrange with others to have certain installations carried out, or to have certain services performed, the Contractor shall allow for this work in their tender and pay all costs involved.

**1.21 WARRANTY OF CONTRACT**

- .1 The Contractor will guarantee all work and material covered in this Contract for a period of one year from the date of substantial performance of the contract. This is in addition to any manufacturer's warranty provided for supply of materials and equipment.

**1.22 SEPARATE PRICES**

- .1 The Contractor shall quote an all inclusive base price but will indicate the value of specific amounts of product or labour as called for herein or on the drawings.

**1.23 SYSTEM STARTUP**

- .1 Instruct Operating Personnel in operation, care and maintenance of systems, system equipment and components.

- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

#### **1.24 LETTERS OF SATISFACTION**

- .1 Where training is called for in the specification, the Contractor shall obtain a letter of satisfaction signed by the Departmental Representative. This letter shall state that sufficient training for the particular system was provided, and that the Departmental Representative is generally satisfied with the level and content of the session.

#### **1.25 FINAL ELECTRICAL ACCEPTANCE**

- .1 As the Departmental Representatives are required to give professional assurance that all electrical systems have been installed, tested, commissioned and verified in accordance with the current edition of the Manitoba Building Code and the Canadian Electrical Code, the following items are required from the Contractor prior to substantial performance acceptance and issuance of "Assurance of Field Review and Compliance."
  - .1 "Certificate of Final Electrical Inspection" certificate signed by the Electrical Inspector for the project (a declaration form signed by the Electrical Contractor is not acceptable);

### **Part 2 Products**

#### **2.1 MATERIALS AND EQUIPMENT**

- .1 Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

#### **2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS**

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 All motors and equipment name plate FLA and MOCP shall be verified with the manufacture and shop drawings prior to finalizing and supply or installation of feeders, breakers and safety disconnect switches.

#### **2.3 WARNING SIGNS**

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction and the Departmental Representative.
- .2 Decal signs, minimum size 175 x 250 mm.

#### **2.4 WIRING TERMINATIONS**

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminium conductors.

## 2.5 EQUIPMENT IDENTIFICATION

- .1 Provide Lamacoid nameplates, 3mm (1/8") thick plastic engraving sheet, black or red face, white core, mechanically attached (screwed or riveted) unless specified otherwise to energized Mechanical Equipment, Motors, Motor Starters, Motor Control Centers, Disconnect Switches, Panelboards and Control Panels. Sizes as follows:

### NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture. Submit schedule of nameplates and wording.
- .3 Allow for a minimum of twenty-five (25) letters per nameplate and label.
- .4 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .5 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .6 Update existing panel directories that have been altered with new equipment/component information.

## 2.6 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

## 2.7 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 5 m intervals.
- .3 Colours: 25 mm wide prime colour and 15 mm wide auxiliary colour.

	<u>Prime</u>	<u>Auxiliary</u>
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue

	<u>Prime</u>	<u>Auxiliary</u>
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

## 2.8 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
  - .1 Paint outdoor electrical equipment "equipment green" finish.
  - .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.

## Part 3 Execution

### 3.1 INSTALLATION OF ELECTRICAL EQUIPMENT IN HERITAGE BUILDINGS

- .1 The Contractor is advised that all buildings, with the exception of the visitor center, are heritage buildings (inside and out). All work that affects the buildings finishes shall be reviewed with Parks Canada before proceeding.
- .2 All electrical equipment installed in the heritage buildings shall be installed concealed out of view from the public and the exact installation locations shall be confirmed with input from Parks Canada. The Electrical Contractor shall utilizing existing chases, crawlspaces and attics to conceal wiring as most wall cavities are filled with concrete and stone.

### 3.2 NAMEPLATES AND LABELS

- .1 Manufacturer's nameplates and CSA labels shall be visible and legible after equipment is installed.
- .2 Provide warning signs on equipment, as required to meet the requirements of the AHJ, including indication of multiple power sources.

### 3.3 CONDUIT SLEEVES AND HOLES

- .1 Install conduit and sleeves prior to pouring concrete. Sleeves through concrete shall be sized for free passage of conduit.
- .2 Holes through exterior walls and roof shall be flashed and made weatherproof.
- .3 Make necessary arrangements for cutting of chases, drilling of holes and other structural work required to install electrical conduits, cables, pullboxes and outlet boxes.
- .4 Install cables, conduits, and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.
- .5 All coring in buildings with electrical in the slab shall be scanned to prevent damage at contractor's expense.

### 3.4 CUTTING AND PATCHING

- .1 Pay the costs of all cutting and patching required for the installation of electrical work. Payment for cutting and patching shall be made through the General Contractor.

- .2 Cutting and patching required for the installation of electrical work shall be done by the particular trade whose work is involved. No cutting or patching shall be carried out by the tradesman employed on the electrical work.
- .3 Obtain the approval of the Departmental Representative before arranging for any cutting. Patching shall restore the affected area to the original condition; materials and methods used for patching shall be in accordance with the requirements of the corresponding Divisions of the specification.

### **3.5 MOUNTING HEIGHTS**

- .1 Mounting height of equipment is from finished floor to centre line of equipment unless specified or indicated otherwise.
- .2 Panelboards and other equipment which are to be surface mounted shall be installed on minimum 3/4" (19 mm) fir plywood mounting backboards. Treat backboards with wood preservative prior to installation and paint with primer and two (2) coats gray enamel before any equipment is mounted. Provide plywood mounted boards unless specified otherwise in other sections.
- .3 Panelboards mounted on exterior concrete/block walls shall have minimum 3/4" air gap behind enclosure (to minimize condensation).

### **3.6 CO-ORDINATION OF PROTECTIVE DEVICES**

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

### **3.7 FIELD QUALITY CONTROL**

- .1 Conduct following tests:
  - .1 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
  - .2 Insulation resistance testing:
    - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
    - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
    - .3 Check resistance to ground before energizing.
- .2 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

### **3.8 PROTECTION**

- .1 Protect exposed live equipment during construction for personnel safety.
- .2 Shield and mark live part "LIVE ( ) VOLTS", with appropriate voltage.
- .3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision.
- .4 Provide guards for all electrical equipment in gymnasium or areas subject to damage.

**3.9 CLEANING**

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.
- .3 At time of final cleaning, clean lighting reflectors, lenses, and other lighting surfaces that have been exposed to construction dust and dirt.

**3.10 TRIAL USAGE**

- .1 The Departmental Representative reserves the right to use any piece of electrical equipment as required to make a complete and thorough check before the completion and acceptance of the work.

**3.11 CLEAN-UP**

- .1 The Contractor is responsible for clean-up of all debris, packaging, waste, etc., that is created by the Contractor and his workers or agents.

**3.12 REVIEW**

- .1 Word "Review" used in this specification or on the drawings means that the Departmental Representative reserves the right to call for revision and resubmission, rejection, furnish as submitted or furnish as corrected.

**END OF SECTION**

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**Part 1 General**

**1.1 RELATED WORK**

.1	Mechanical Specifications	Division 22 and 23
.2	Common Work Results	Section 26 05 00
.3	Wires and Cables (0-1000 V)	Section 26 05 21
.4	Outlet Boxes, Conduit Boxes and Fittings	Section 26 05 32
.5	Conduits, Conduit Fastenings and Conduit Fittings	Section 26 05 34
.6	Disconnect Switches - Fused and Non-Fused	Section 26 28 23
.8	Motor Starters to 600 V	Section 26 29 10

**1.2 SYSTEM DESCRIPTION**

- .1 Provide complete electrical power and control connections for mechanical equipment.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Include motor starters, lockable disconnects, conduit, wire, fittings, interlocks, outlet boxes, junction boxes, and all associated equipment required to provide line voltage wiring for mechanical equipment.
- .2 Include line voltage switches, humidity controllers, motor protective switches, interlocks, conduit, wire, devices, and fittings required to provide control wiring for mechanical equipment.
- .3 Unless otherwise noted, motors, motorized dampers and control devices shall be supplied by Division 22 and 23. Line voltage control devices shall be supplied by Division 26.

**2.2 EXTERIOR EQUIPMENT**

- .1 All equipment mounted on the exterior of the building shall be weatherproof.

**Part 3 Execution**

**3.1 POWER WIRING**

- .1 Install power feeders, starters, lockable disconnects, and associated equipment and make connections to all mechanical equipment.
- .2 Install branch circuit wiring for mechanical system control panels, time clocks, and control transformers.
- .3 Install main power feeders to control panels furnished by Division 22 and 23. Install branch wiring from control panels to controlled equipment such as motors, electric coils, etc.
- .4 Conduit, wire, devices and fittings required to wire and connect low voltage temperature control systems, shall be supplied and installed by the trade supplying the temperature control system. Control wiring shall be installed in conduit.
- .5 Wire and connect electrical interlocks for starters supplied by Division 22 and 23.

- .6 Flexible connections to motors shall not exceed 6 feet (1.83 m), unless approved by Departmental Representative, and shall be liquid tight flex with watertight connectors.

### **3.2 CONTROLS**

- .1 All low voltage control wiring shall be provided by the Mechanical Controls Contractor.

### **3.3 CO-ORDINATION**

- .1 Refer to mechanical drawings for the exact location of motor control devices, and other mechanical equipment requiring an electrical connection.
- .2 Obtain full information from Division 22 and 23, regarding wiring controls, overload heaters, equipment ratings and over-current protection. Notify the Division 22 and 23, at once, if any information provided is incorrect or unsatisfactory.
- 3. Coordinate control wiring requirements with Division 22 and 23 and provide all control wiring and connections as required to make the control systems operate as specified.
- .4 Refer to Division 22 and 23 specifications for any further electrical requirements.
- .5 Review both electrical and mechanical drawings and specifications and coordinate all controls with Mechanical Subtrades through the General Contractor. Report all discrepancies to the Departmental Representative before close of tender. No additional compensation will be justified for assumptions made on any duplication of information.

**END OF SECTION**

**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Materials and installation for wire and box connectors.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-C22.2No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
  - .2 CSA C22.2No.65, Wire Connectors.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

**Part 2 Products**

**2.1 MATERIALS**

- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper or copper alloy sized to fit copper or aluminum conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper or copper alloy sized to fit copper conductors 10 AWG or less.
- .3 Clamps or connectors for armoured cable, aluminum sheathed cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.Execution
- .4 All connections will be performed with approved connectors and in outlet boxes as specified.

**2.2 INSTALLATION**

- .1 Remove insulation carefully from ends of conductors and:
  - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
  - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2No.65.
  - .3 Install fixture type connectors and tighten. Replace insulating cap.
  - .4 Install bushing stud connectors in accordance with NEMA.
- .2 Joints in branch circuit wiring shall be made with insulated connectors, twist-on, of approved type and size.
- .3 Solderless pressure type connectors shall be used on conductors of size #8 AWG and larger. On underground wiring work they shall be permanent type "Burndy-Insulink".
- .4 Ground Fittings
  - .1 All direct buried grounding connections will be done with Cadweld connections only

**END OF SECTION**



**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 26 05 20 - Wire and Box Connectors - 0 - 600 V.

**1.2 PRODUCT DATA**

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

**1.3 SCOPE OF WORK**

- .1 Provide a complete system of wiring systems, making all required connections as indicated on the drawings, specified herein and as required. Unless noted as larger, install and rate all cables and conductors in accordance with the requirements of the current edition of the Canadian Electrical Code.
- .2 Unless otherwise noted, all systems in the building shall be wired in conduit (minimum 21mm Ø).

**Part 2 Products**

**2.1 WIRES (CONDUCTORS)**

- .1 All conductors to be copper only, unless otherwise shown or specified. All conductors shall be 98% conductivity copper 600 volt "RW90" X-link insulated, and be of minimum size #12 AWG.
- .2 Conductors up to #10 AWG may be solid. Conductors #8 AWG and larger shall be stranded, unless specifically mentioned to be solid.
- .3 Equipment bonding conductors shall be insulated.

**2.2 TECK90 CABLE**

- .1 Cable: to CAN/CSA-C22.2 No. 96-13.
- .2 Conductors:
  - .1 Circuit conductors: tinned copper, size as indicated.
- .3 Insulation:
  - .1 Cross-linked polyethylene XLPE, rating – 600 V.
- .4 Inner jacket: Polyvinyl Chloride (PVC) material.
- .5 Armour: Interlocked Aluminum Armor
- .6 Overall covering: Thermoplastic Polyvinyl Chloride (PVC) material.
- .7 Fastenings:
  - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

- .2 Channel type supports for two or more cables at 1500 mm centers.
- .3 Threaded rods: 6 mm dia. to support suspended channels.
- .8 Terminations:
  - .1 Terminate the cable using TECK connectors.
  - .2 The Contractor shall follow the manufacturer's recommended installation procedures.

## **2.3 CONTROL CABLES**

- .1 Type LVT: 2 soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket.
- .2 Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with PVC insulation type TW -40°C polyethylene insulation with shielding of tape coated with paramagnetic material wire braid over each conductor and overall covering of PVC jacket.

## **2.4 CONNECTORS AND TERMINALS**

- .1 Mechanical connectors and terminals are restricted to branch circuit wiring.
  - .1 Mechanical connectors shall be torqued to manufacturer's recommendations.
- .2 Connectors #8 AWG gauge and larger shall be compression type.
- .3 Terminals shall be compression type with spade type lugs.
- .4 Wire and cables shall be as manufactured by Canada Wire and Cable, Canadian General Electric, Alcan or Phillips Cable.
- .5 Use approved compression connectors and terminal (i.e. the type that are formed around the conductor using mechanical or hydraulic tools).
  - .1 Compression terminal for conductor sizes 350 MCM and larger shall have two holes.
  - .2 Attach compression type connections only with the manufacturer's approved tools and dies and in accordance with his recommendations.
  - .3 Watertight and/or type approved for TECK cable, as indicated.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Conductor length for parallel feeders to be identical.
- .2 Lace or clip groups of feeder conductors at all distribution centres, pull boxes, panel boards and termination points.
- .3 Provide permanent plastic name tag indicating load fed on all cable ends.
- .4 Provide required cable support system accessories which are not specified herein or shown on drawings but are required for proper installation.

- .5 Support flexible armoured cable in ceiling spaces and in stud wall construction with steel two (2) hole cable straps to Code requirements. Flexible armoured cables must run in a neat manner parallel to building lines. Utilize centralized conduit runs to maintain maximum permitted runs of flexible armoured cables as specified. Provide insulating grommet at cut ends of flexible armoured cable to protect conductor insulation.
- .6 All wiring shall be done concealed and in conduit except:
  - .1 Modular wiring where specified.
  - .2 Low voltage conductors not installed in conduit or raceways shall be fire insulated rated in accordance with latest governing Code Flame Spread requirements.
- .7 Generally, conductor sizes are indicated on drawings. Such sizes are minimum requirements and must be increased, where required, to suit length of run and voltage drop in accordance current edition of the Canadian Electrical Code.
- .8 Provide sizes of conductors as required by Canadian Electrical Code or as indicated on the drawings. Voltage drop from panels to farthest device must not exceed 3% at full load. Voltage drop from the main distribution to the panel board must not exceed 2%.
- .9 When pulling wires into conduit use lubricant and ensure that wires are kept straight and are not twisted or abraded.
- .10 Nylon or similar pulling rope only shall be used to pull conductors into metallic and/or non-metallic conduit.
- .11 Neatly secure exposed wire in apparatus enclosures with approved supports or ties.
- .12 Exposed wiring, where permitted, shall be installed neatly, parallel or at right angles to the building lines.
- .13 An allowance shall be made for re-routing conduits where they go from ceiling to the wall, so they do not appear on side of beams.
- .14 No reduction is permitted on neutral conductors.

### **3.2 IDENTIFICATION OF CONDUCTORS**

- .1 Line voltage conductors in conduit shall be colour coded to identify service voltage. Conductor colours for 120V circuits shall be:
  - 120/208 Volt
  - Phase A Red
  - Phase B Black
  - Phase C Blue
  - Neutral White
  - Ground Green
  - Control Orange.

600V conductor colour to be confirmed with Departmental Representative
- .2 Colour code conductors for communications systems in accordance with system component manufacturer's recommendations.

**3.3 WORKMANSHIP**

- .1 Before installing wire, ensure conduit is clean and dry. If moisture present, thoroughly dry out conduit; vacuum if necessary. To facilitate pulling, recognized specially manufactured wire pulling lubricants may be used. Do not use grease. Employ suitable techniques to prevent damage to wire when ambient temperature is below the minimum permitted for each insulation type.
- .2 Installation to be free of opens and grounds. Before energization, megger each feeder to ensure that insulation resistance complies with C.E.C. requirements
- .3 Do not install any conductor smaller than #12 AWG gauge, except where specifically indicated otherwise.

**3.4 Insulation Test**

- .1 The insulation resistance between wires and between any wire and ground shall not be less than the "Canadian Electrical Code" requirements with all circuits complete and connected. Include tests results in maintenance manual.

**END OF SECTION**



**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 26 05 00 - Common Work Results - Electrical.

**1.2 REFERENCES**

- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
  - .1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.
- .2 Canadian Standards Association, (CSA International)

**1.3 SCOPE OF WORK**

- .1 Securely and adequately ground all components of the electrical system in accordance with the requirements of the Canadian Electrical Code and additional requirements set up in the contract documents.

**Part 2 Products**

**2.1 CONDUCTORS**

- .1 Unless otherwise shown, the ground conductor of a system shall have a minimum size of that shown on Table 16A of the Canadian Electrical Code.

**Part 3 Execution**

**3.1 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous grounding system including conductors, connectors, and accessories. Where EMT is used, run ground wire in conduit.
- .2 All locknuts, connectors and couplings shall be tight fitting and properly cinched, throughout the entire electrical distribution system for grounding and bonding purposes as required by the CEC.
- .3 All joints between conductors of #6 AWG and larger shall be made with "Cadweld" process. Special permission from Departmental Representative is required where bolted pressure lugs or screw type "Hydent" connectors are installed.
- .4 All bolted ground connections must be accessible.
- .5 Install rigid PVC conduit sleeves where ground wires pass through concrete slabs.
- .6 Conduits installed buried in earth, installed in or under grade floor slabs shall have a separate ground wire installed in each and every conduit.
- .7 Connect grounding conductors to motors 10 hp and above or circuits 20A or above, with a solderless terminal and a bolt tapped to motor frame or equipment housing. Connect to smaller motors or equipment by fastening terminal to a connection box. Connect junction boxes to equipment grounding system with grounding clips mounted directly on box or with

machine screws. Completely remove paint, dirt, or other surface coverings at grounding conductor connection points so good metal-to-metal contact is made.

- .8 Install bonding wire in all flexible conduit connected at each end to a grounding bushing by a solderless lug, clamp, cup washer and screw. Soldered joints not permitted.
- .9 Ground conductors not sized on drawings are to be sized in accordance with local governing electrical authority requirements. Ground conductor size is to be no smaller than requirements specified herein this article or on drawings.
- .10 Install connectors in accordance with manufacturer's instructions.
- .11 Install bonding wire for flexible conduit.

### **3.2 TESTS**

- .1 Perform tests in accordance with 26 05 00 - Common Work Results - Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of the local inspection authority. A report shall be submitted to the Departmental Representative from the testing agency.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator, if provided, during tests.

**END OF SECTION**

**Part 1 General**

- .1 Not Used

**Part 2 Products**

- .1 Not Used

**Part 3 Execution****3.1 INSTALLATION**

- .1 Secure equipment to masonry, tile and plaster surfaces with lead shields. Use Aluminum shields or as approved by anchoring manufactures recommendations for specific surfaces.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
  - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller where above 2700mm.
  - .2 Two-hole steel straps to secure surface conduits and cables 50 mm and smaller where below 2700mm.
  - .3 Two-hole steel straps for conduits and cables larger than 50 mm.
  - .4 Beam clamps to secure conduit to exposed steel work.
- .7 Suspended support systems.
  - .1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.
  - .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels at 2 m on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

- .11 Luminaires recessed in T-Bar ceilings shall be supported independent of T-Bar system via aircraft cable and shall be firmly attached directly to the existing or new roof building structure.
- .12 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .13 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .14 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 CSA C22.1-2015, Canadian Electrical Code, Part 1.

**Part 2 Products**

**2.1 OUTLET AND CONDUIT BOXES GENERAL**

- .1 All outlet boxes shall be of sizes suitable for the application and in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required for special devices.
- .3 Outlet boxes shall be ganged as required. Sectional boxes shall not be used. Gang boxes to be used where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped. Boxes shall be c/w trims and coverplates to suit installation.

**2.2 SHEET STEEL OUTLET BOXES**

- .1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .2 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .3 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished tile walls.

**2.3 CONDUIT BOXES**

- .1 Cast FS or FD boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle. This is only allowed in mechanical spaces.

**2.4 FITTINGS - GENERAL**

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Support boxes independently of connecting conduits.

- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 All outlet boxes to be installed flush except where exposed wiring is permitted. Wiring terminated in an outlet box for future lighting or power shall have 9" of slack and each cable shall be terminated in a connector.
- .4 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .5 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.
- .6 Coordinate with all subtrades and confirm locations and method of connection to the various outlets and equipment. Coordinate fully to ensure that no conflict arises during the installation. In case of difference of opinion, the Departmental Representative shall be informed without delay.
- .7 Metal hangers may be used to secure outlet boxes to the building only with Departmental Representative's permission.
- .8 Care shall be taken to locate outlets so they do not conflict with architectural lines or joints in materials, such as acoustic tiles, wood panels, etc.
- .9 Position of outlets which do not appear to be properly centered shall be confirmed before installation.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

.1 Section includes:

.1 Electrical Heat Trace (EHT) cables for pipes including controls and installation.

**1.2 RELATED SECTIONS**

.1 Section 26 05 00 - Common Work Results - Electrical

.2 Section 01 33 00 - Submittal Procedures.

**1.3 REFERENCES**

.1 The following codes, standards and specifications shall apply except as specified in the Design Specification

.1 Canadian Standard Association (CSA)

.1 C22.2, No. 130 Heating Cable and Heating Cable Sets

**1.4 SUBMITTALS**

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittals Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 – Submittal Procedures.

.2 Quality Assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Instructions: submit manufacturer's installation instructions.

**Part 2 Products**

**2.1 MANUFACTURERS**

.1 Acceptable manufacturers: Pentair XL-Trace Series, Thermon and 3M

**2.2 SELF-REGULATING HEAT TRACE CABLES**

.1 Application: Commercial Grade HDPE Pipe Freeze Protection

.2 Voltage: 120 VAC

.3 Power Density: 5 W / FT

.4 Warranty 10-Year limited warranty

.5 Conductors: Nickel-plated copper bus wire

.6 Core: Self-regulating conductive core

.7 Inner Jacket: Modified Polyolefin covered by a tinned-copper braid

.8 Outer: Modified polyolefin or fluoropolymer

**2.3 CIRCUIT PROTECTION**

- .1 Provide GFCI protection for all heat trace circuits.
  - .1 Sensitivity: 30mA

**2.4 CONTROLS**

- .1 Provide an accessible weather-proof local 20A disconnect switch for all heat trace systems.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Pipe and equipment that is to be heat traced shall have external scale, rust and dirt removed to maximize heat transfer.
- .2 Coordinate the installation of the ETC with the Mechanical and Civil Contractors.
- .3 The EHT shall be in continuous firm contact with the piping or equipment.
- .4 Secure EHT to pipe with Fiberglass tape (12" increments minimum).
- .5 EHT cable shall be placed as much as possible, on the lower half of pipe while maintaining required spacing.
- .6 Extra EHT length shall be provided at fittings, flanges, orifices, pumps, elbows, etc., to allow for heat losses at these locations and also access to these items to unfasten and remove them without risking damage to the EHT.
- .7 EHT controllers shall be installed as shown on drawings.
- .8 Cold leads or thermostat wiring must egress from the lower half the pipe insulation to prevent the entrance of moisture

**3.2 FIELD QUALITY CONTROL**

- .1 EHT equipment shall not be insulated until the EHT installation has been inspected and tested.
- .2 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

**END OF SECTION**



**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
  - .2 CSA C22.2 No. 45-M1981, Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56-1977, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83-M1985, Electrical Metallic Tubing.
  - .5 CSA C22.2 No. 211.2-M1984, Rigid PVC (Unplasticized) Conduit.
  - .6 CAN/CSA C22.2 No. 227.3-M91), Flexible Nonmetallic Tubing.

**1.2 SCOPE OF WORK**

- .1 Provide a complete conduit system as indicated herein, on the drawings and as required.
- .2 All wiring in the building shall be installed in conduits (minimum 21mm Ø) unless otherwise noted.

**Part 2 Products**

**2.1 RIGID STEEL CONDUIT**

- .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.
- .2 Galvanized with threaded joints and connections.
- .3 Connections in dry locations: steel or malleable iron lock nuts inside and outside enclosures.
- .4 Connectors subject to moisture: Liquid and dust tight with insulated throat.
- .5 Fittings: steel

**2.2 EMT CONDUIT**

- .1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .2 Fittings in dry locations: steel or malleable iron set screw type fastener with insulated throats or non-metallic bushings.
- .3 Fittings in wet locations: steel or malleable iron in rain tight, compression-type, with insulated throat or non-metallic bushings.

**2.3 RIGID PVC CONDUIT**

- .1 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .2 Conduit: rigid non-metallic conduit of non-plasticized polyvinyl chloride, Sceptre Rigid Conduit made by IPEX.
- .3 Fittings: threaded male or female solvent weld connectors and solvent weld couplings.

- .4 Solvent: as recommended by conduit manufacturer.

## **2.4 RIGID PVC DUCT**

- .1 Duct: rigid, non-metallic conduit of un-plasticized polyvinyl chloride, type EB-1 or DB-2 (as approved by the C.E.C.) requiring concrete encasement, conforming to CSA standards.
- .2 Accessories: bell ends, coupling adapters, bends and other fittings of same material as duct. Use solvent recommended by manufacturer. Horizontal, vertical and foundation spacers as recommended by manufacturer.

## **2.5 FLEXIBLE CONDUIT**

- .1 Conduit: spiral wound, interlocking flexible.
- .2 Connectors: slip-proof insulated throat or non-metallic bushings, steel type.

## **2.6 LIQUID TYPE FLEXIBLE CONDUIT**

- .1 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
- .2 Conduit: flexible metal conduit with PVC liquid type jacket.
- .3 Connectors: captive sealing jacket with ground cone insulated throat, steel. Provide sealing rings at all box entries.

## **2.7 CONDUIT FASTENINGS**

- .1 Two hole steel straps for conduits larger than 50 mm. One hole steel straps to secure surface conduits 50 mm and smaller where mounted above 2700mm. Two hole steel straps for conduits smaller than 50 mm in all other areas.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 2 m oc.
- .4 Threaded rods, 6 mm dia., to support suspended channels.

## **2.8 CONDUIT FITTINGS**

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

## **2.9 EXPANSION FITTINGS FOR RIGID CONDUIT**

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Weatherproof expansion fittings with integral bonding jumper suitable for linear expansion and 21 mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

**2.10 FISH CORD OR WIRE**

- .1 Polypropylene.

**Part 3 Execution**

**3.1 GENERAL**

- .1 Flexible conduit shall be used for line and low voltage circuit connections to all motors or equipment subject to vibration and shall be metal PVC coated water tight, except for lighting fixture drops. Connectors shall be approved for flexible liquid tight conduits.
- .2 Unless otherwise noted, water tight Electrical Metallic Tubing (EMT) shall be utilized in the buildings.
- .3 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .4 Where conduit is run exposed and in accessible ceiling spaces, run parallel to building lines. Where conduits are grouped (two or more), space evenly, make bends concentric and mount on racks.
- .5 Lay out conduit to avoid interference with other work. Maintain a minimum clearance of 150mm from steam or hot water piping, etc.
- .6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment.
- .7 Use explosion proof flexible connection for connection to explosion proof motors.
- .8 Install conduit sealing fittings in hazardous areas. Fill with compound.
- .9 Minimum conduit size for lighting and power circuits: 21 mm.
- .10 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .11 Mechanically bend steel conduit over 21 mm dia. Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .12 Dry conduits out before installing wire.
- .13 Conduit ends emerging from concrete slab, which are to remain as exposed conduit, shall be rigid galvanized steel. Provide rigid steel oversized sleeve over the exposed PVC portion of conduit.
- .14 All rigid PVC conduit installed under slab on grade shall include a bonding wire sized as required by Canadian Electrical Code.
- .15 An allowance shall be made for re-routing conduits so they do not appear on the side of beams where they go from ceiling to walls.
- .16 Install a separate ground wire in conduit installed underground or in concrete or masonry slab in contact with the earth.

- .17 For all runs of conduit, do not include more than the equivalent of four 90 degree bends, including bends located immediately adjacent to an outlet box or fitting. Provide pulling elbows, pull boxes and/or junction boxes where necessary.
- .18 Where possible, install conduits so that they are not trapped. Cap turned up conduits to prevent the entrance of any dirt or moisture during construction. If necessary, swab out conduit and thoroughly clean internally before wires and cables are pulled.
- .19 Take extreme care in reaming ends of all conduit to ensure a smooth, interior finish that will not damage the insulation of the wires.
- .20 Use insulated non-metallic bushings on all conduit terminators. Ensure electrical continuity in all conduit systems. All conduits shown exposed in finished areas are to be free of labels and trade marks. Install a 45kg test line in all empty conduits. Conduits and ducts crossing building expansion joints shall have conduit expansion fittings to suit the type of conduit used. Seal conduits with duct seal where conduits are run between heated and unheated areas or into freezers. Where conduits, cables, or cable trays pierce fire separations, seal openings with approved sealing compound.
- .21 Where conduits enter the top or side of exposed equipment; panels, etc. provide seal rings and water resistant connectors (i.e. in Electrical and Mechanical Rooms).

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No. 100, Motors and Generators.
  - .2 CSA C22.2 No. 145-M1986, Motors and Generators for Use in Hazardous Locations.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1 EEMAC M1-7-1992 or latest revision, Standard for Motors and Generators.

**1.2 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Indicate product characteristics, performance criteria, physical size, horsepower, watt rating, limitations and finish.
- .3 Shop drawings:
  - .1 Indicate dimensions, recommended installation procedure, wiring diagrams, sizes and location of mounting bolt holes and recommended support method.
- .4 Quality Assurance Submittals:
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Manufacturer's Instructions: submit manufacturer's installation instructions.
- .5 Closeout Submittals:
  - .1 Provide maintenance data for fractional horsepower motors for incorporation into manual specified.

**Part 2 Products**

**2.1 FRACTIONAL HORSEPOWER MOTOR**

- .1 Non-hazardous locations: to CSA C22.2 No. 100 and EEMAC M1-7.
  - .2 Hazardous locations: to CSA C22.2 No. 145.
    - .1 Rating: As indicated.
    - .2 Type: As indicated.
    - .3 Bearings: As indicated.
    - .4 Frame size: As indicated.
    - .5 Enclosure: As indicated.
    - .6 Mounting: As indicated.
  - .3 Overload Protection: Integral.
-

**Part 3            Execution**

**3.1                MANUFACTURER'S INSTRUCTIONS**

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

**3.2                INSTALLATION**

- .1        Install wiring, flexible connections and grounding.
- .2        Check rotation before coupling to driven equipment.
- .3        Provide Iamacoil label in accordance with section 25 05 00 – Common Work Results – Electrical.

**3.3                CLEANING**

- .1        On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Switches, receptacles, wiring devices, cover plates and their installation.

**1.2 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 26 05 00 - Common Work Results - Electrical.

**1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.
  - .2 CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
  - .3 CSA-C22.2 No.55-M1986, Special Use Switches.
  - .4 CSA-C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20).

**1.4 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

**Part 2 Products**

**2.1 SWITCHES**

- .1 Manually-operated general purpose AC switches
  - .1 15 or 20 A, 120 V, single pole, three-way, or four-way switches to: CSA-C22.2 No.55 and CSA-C22.2 No.111.
  - .2 Manually-operated general purpose ac switches with following features:
    - .1 Terminal holes approved for No. 10 AWG wire.
    - .2 Silver alloy contacts.
    - .3 Urea or melamine moulding for parts subject to carbon tracking.
    - .4 Suitable for back and side wiring.
    - .5 White toggle.
    - .6 Framed toggle
    - .7 0-10VDC Dimmer where indicated
  - .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .2 Ceiling Mounted Occupancy Sensor
  - .1 15 or 20 A, 120 V, single pole to: CSA C22.2: No. 184.1.
  - .2 Ceiling mounted 120VAC occupancy sensors shall have the following features:

- .1 Dual Technology (PIR and ultrasonic)
  - .2 Contact Rating: 1200VA at 120 V Electronic Ballast, 800W at 120V INC
  - .3 Single pole relay
  - .4 Adjustable Time Delay: 30s, 5min, 10min, 20min, 30min
  - .5 During commissioning set to 30min
  - .6 White
  - .7 5 year warranty
  - .8 Zero-Cross Relay switches
  - .9 Field of view to suit the application provide masking as required
- .3 Devices to be of one manufacturer throughout project.
- .4 Acceptable materials: Specification Grade.

## **2.2 RECEPTACLES**

- .1 Duplex receptacles, CSA type 5-15 R 5-20R and 6-50R, 125/250V V, 15/20/50 A, U ground, to: CSA-C22.2 No.42 with following features:
- .1 White urea moulded housing for normal switches. Co-ordinate with Departmental Representative for all unique coloured receptacles.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Break-off links for use as split receptacles.
  - .4 Eight back wired entrances, four side wiring screws.
  - .5 Triple wipe contacts and riveted grounding contacts.
  - .6 Nylon face
- .2 Other receptacles with ampacity and voltage as indicated.
- .3 Receptacles of one manufacturer throughout project.
- .4 Acceptable materials: Specification Grade.

## **2.3 COVER PLATES**

- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Cover plates from one manufacturer throughout project.
- .3 Match existing cover plates for wiring devices mounted in flush-mounted outlet box.
- .4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .5 In-use weatherproof receptacle covers for exterior convenience receptacles.
- .6 Weatherproof receptacle covers for crawlspaces.



**Part 3            Execution**

**3.1                INSTALLATION**

- .1        Switches:
  - .1        Install single throw switches with handle in "UP" position when switch closed.
  - .2        Install switches in gang type outlet box when more than one switch is required in one location.
  - .3        Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2        Receptacles:
  - .1        Install receptacles in gang type outlet box when more than one receptacle is required in one location.
  - .2        Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results - Electrical.
  - .3        Test all receptacles with a circuit analyzer to verify wiring.
  - .4        Arrange for field testing of GFCI receptacles using both external and internal test tripping mechanism.
- .3        Cover plates:
  - .1        Protect stainless steel cover plate finish with paper or plastic film until painting and other Work is finished.
  - .2        Install suitable common cover plates where wiring devices are grouped.
  - .3        Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

**END OF SECTION**

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**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Materials and installation for fused and non-fused disconnect switches.

**1.2 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 26 05 00 - Common Work Results - Electrical.

**1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CAN/CSA C22.2 No.4-M89, Enclosed Switches.
  - .2 CSA C22.2 No.39-M89, Fuseholder Assemblies.

**1.4 SUBMITTALS**

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

**Part 2 Products**

**2.1 DISCONNECT SWITCHES**

- .1 Non-fusible, horsepower rated disconnect switch in NEMA 4 Enclosure, to CAN/CSA C22.2 No.4. Where the disconnect size indicated on the drawing exceeds the minimum horsepower rating the Contractor shall supply the disconnect switch to meet the specification on the drawing.
- .2 Provision for padlocking in off switch position.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Quick-make, quick-break action.
- .5 ON-OFF switch position indication on switch enclosure cover.

**2.2 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Install disconnect switches.

**END OF SECTION**



**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Materials and installation for industrial control devices including pushbutton stations, control panels and relay panels.

**1.2 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 26 05 00 - Common Work Results - Electrical.

**1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.14-95, Industrial Control Equipment.
- .2 National Electrical Manufacturers Association (NEMA)
  - .1 NEMA ICS 1, Industrial Control and Systems: General Requirements.

**1.4 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 01 33 00 Submittal Procedures.
- .2 Include schematic, wiring, interconnection diagrams.

**Part 2 Products**

**2.1 AC CONTROL RELAYS**

- .1 Control Relays: to CSA C22.2 No.14 and NEMA ICS 1.
- .2 Convertible contact type: contacts field convertible from NO to NC, electrically held solid state. Contact rating: as required.
- .3 Pre-Approved Manufacturers: Eaton, Allen Bradley and Omega.

**2.2 RELAY ACCESSORIES**

- .1 Standard contact cartridges: normally-open - convertible to normally-closed in field.

**2.3 OPERATOR CONTROL STATIONS**

- .1 Enclosure: NEMA 4, flush mounting:

**2.4 PUSHBUTTONS**

- .1 LED Illuminated, heavy duty oil tight. Operator flush type, as indicated. With 1-NO and 1-NC contacts rated at as required.

**2.5 SELECTOR SWITCHES**

- .1 Maintained 3 position labelled as indicated heavy duty oil tight, operators standard, contact arrangement.

**2.6 INDICATING LIGHTS**

- .1 Heavy duty Oil tight, full voltage, LED type.

**2.7 CONTROL AND RELAY PANELS**

- .1 NEMA 4 enclosure with hinged padlockable access door, accommodating relays timers, labels, as indicated, factory installed and wired to identified terminals.

**2.8 HUMIDISTAT**

- .1 Relative Humidity Range: 20 – 80 %
- .2 Temperature Range: 10 C to 50 C
- .3 Contact Rating: 7.5 FLA, 120 VAC
- .4 Adjustable Knob
- .5 Wall Mount
- .6 Contact Closes with Increased Humidity.
- .7 Pre-Approved Manufacturers: Johnson Controls, Eaton and Honeywell.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Install as required.

**3.2 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section.
- .3 Upon completion of sectional test, undertake group testing.
- .4 Check out complete system for operational sequencing.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 National Electrical Manufacturer's Association (NEMA)
  - .1 NEMA Standards Publication ICS 2-2000: Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.
- .2 International Electrotechnical Commission (IEC)
  - .1 IEC 947-4-1-1990, Part 4: Contactors and motor-starters.

**1.2 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate:
  - .1 Mounting method and dimensions.
  - .2 Starter size and type.
  - .3 Layout of identified internal and front panel components.
  - .4 Enclosure types.
  - .5 Wiring diagram for each type of starter.
  - .6 Interconnection diagrams.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Provide operation and maintenance data for motor starters for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Include operation and maintenance data for each type and style of starter.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Starters: to NEMA ICS 2-2000.

**2.2 MANUAL MOTOR STARTERS**

- .1 Single phase motors running at not more than 120 volts shall be controlled and protected with manual motor starter switch overloads and over-current protection except where otherwise specified.
- .2 Single phase manual motor protection switches to be toggle switch style with red pilot light. Flush and/or surface mounted as indicated.

**2.3 FULL VOLTAGE NON-REVERSING (FVNR) MAGNETIC STARTERS**

- .1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
  - .1 Contactor solenoid operated, rapid action type.
  - .2 Motor overload protective device in each phase, manually reset from outside enclosure.
  - .3 Wiring and schematic diagram inside starter enclosure in visible location.

- .4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
- .2 Accessories:
  - .1 Indicating lights: red run light, heavy duty, oil tight and LED type.
  - .2 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

## **2.4 CONTROL TRANSFORMER**

- .1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with secondary fuse, installed in with starter.
- .2 Size control transformer for control circuit load plus 20% spare capacity.

## **2.5 FINISHES**

- .1 Apply finishes to enclosure in accordance with Section 26 05 00 - Common Work Results - Electrical.

## **2.6 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Magnetic starter designation label, white plate, black letters, size 3 engraved.

## **2.7 MANUFACTURERS**

- .1 Pre-approved Manufacturers: Allen Bradley, Eaton and Square D.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install starters, connect power and control.
- .2 Ensure correct fuses and overload devices elements installed.

### **3.2 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical and manufacturer's instructions.
- .2 Operate switches, contactors to verify correct functioning.
- .3 Perform starting and stopping sequences of contactors and relays.
- .4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as required.

**END OF SECTION**



**Part 1 General**

**1.1 REFERENCES**

- .1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
  - .1 ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .2 ASTM International Inc.
  - .1 ASTM F1137, Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .3 Canadian Standards Association (CSA International)
- .4 ICES-005, Radio Frequency Lighting Devices.
- .5 Underwriters' Laboratories of Canada (ULC)

**1.2 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 26 05 00 – Common Work Results Electrical.

**1.3 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval by Departmental Representative.
- .3 Quality assurance submittals:
  - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, and cleaning procedures.

**Part 2 Products**

**2.1 LED LIGHTING**

- .1 LED Fixtures.
  - .1 Rating: Voltage shall be 120 to 277 VAC, 60 Hz or as indicated on the luminaire schedule.
  - .2 A minimum of 50,000 operating hours before reaching the L70 lumen output degradation point without catastrophic failure, or as indicated on the luminaire schedule.
  - .3 Colour Temperature shall be 4000K or as indicated on the luminaire schedule.

- .4 Minimum five (5) year warranty.
- .5 Minimum CRI: >70 or as indicated on the luminaire schedule.
- .2 LED Driver
  - .1 Must operate input voltage between 120 to 277 VAC, or as indicated on the luminaire schedule.
  - .2 Operating frequency must be 60 Hz.
  - .3 Must be rated to operate between -40C and +50C.
  - .4 Must have a minimum efficiency of 85%.
  - .5 Self protected, including short circuit protection.

## **2.2 LUMINAIRES**

- .1 As per design basis material specified.

## **2.3 LUMINAIRE ACCESSORIES**

- .1 Provide all luminaire accessories including trim rings, stems, canopies, cords, mounting hardware, restraints, etc., necessary to mount the fixture in a complete and approved method.
- .2 Provide any seismic bracing and / or restraints required by the AHJ.
- .3 Provide chain hangers for all suspended channels supporting luminaires and / or strip lights in unfinished areas.
- .4 Provide drywall frames for all luminaires that are recessed into drywall ceilings
- .5 Provide extensions for recessed luminaires where required by the ceiling thickness.
- .6 Provide IC-rated luminaires where luminaires are recessed into insulated ceilings. If the luminaires cannot be provided with an IC rating provide ceiling boxes to maintain minimum clearances from ceiling insulation
- .7 Where required provide fire-rated luminaire covers for luminaires installed in fire-rated ceiling assemblies or provide fire-rated boxes around each luminaire.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.

### **3.2 WIRING**

- .1 Connect luminaires to lighting circuits.

### **3.3 LUMINAIRE SUPPORTS**

- .1 For suspended ceiling installations support luminaires independently of ceiling.

- .2 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors (Nylon shields not acceptable) or as recommended by Anchor Construction Industrial Building Products Ltd for the specific surface & equipment being installed.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 If there is potential of Asbestos Electrical Subcontractor must use a proper collection boot and HEPA vacuum whenever drilling of holes in facility.

**3.4 LUMINAIRE ALIGNMENT**

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

**3.5 PROTECTION OF FINISHED WORK**

- .1 Protect installed products as needed until completion of project.
- .2 Repair or replace damaged products before Substantial Completion.

**END OF SECTION**

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**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.46-M1988, Electric Air-Heaters.

**1.3 PRODUCT DATA**

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data sheets for unit heaters. Include:
  - .1 Product characteristics.
  - .2 Performance criteria.
  - .3 Mounting methods.
  - .4 Physical size.
  - .5 kW rating, voltage, phase.
  - .6 Cabinet material thicknesses.
  - .7 Limitations.
  - .8 Colour and finish.
- .3 Submit product data sheets for unit heaters and ceiling fan heaters.
  - .1 Include product characteristics, performance criteria, physical size, limitations and finish.
- .4 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, and cleaning procedures.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Provide operation and maintenance data for unit heaters for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

**Part 2 Products**

**2.1 MANUFACTURERS**

- .1 Acceptable manufacturers:
  - .1 Unit Heater:
    - .1 Ouellet OAS Series
    - .2 Reznor EGW Series
    - .3 Stelpro RUH Series
  - .2 Ceiling Fan Heater:
    - .1 Ouellet OFM series or approved equivalent
    - .2 Reznor ECS Series
    - .3 Stelpro Dragon Series

**2.2 ELECTRIC UNIT HEATERS**

- .1 Unit heater: to CSA C22.2 No.46, horizontal discharge complete with adjustable louvers finished to match cabinet.
- .2 Size: As indicated on the drawings.

- .3 Voltage: 208V Single Phase (2 Pole).
- .4 Control: Integral thermostat.
- .5 Disconnect: Provide local stand-alone disconnect switch.
- .6 Grade: Commercial
- .7 Fan type unit heaters with built-in high-heat limit protection, auto reset, fan-delay switches.
- .8 Fan motor: totally enclosed permanently lubricated ball bearing type.
  - .1 Built-in fan motor thermal overload protection.
- .9 Hangers: As required.
- .10 Mounting: Ceiling Mount
- .11 Cabinet: almond epoxy-polyester powder-coat finish, 20-gauge steel.
- .12 Warranty: 3-Year warranty against defects / 10-Year warranty on the heating elements.

### **2.3 ELECTRIC CEILING FAN HEATERS**

- .1 Unit heater: to CSA C22.2 No.46, horizontal discharge complete with adjustable louvers finished to match cabinet.
- .2 Size: As indicated on the drawings.
- .3 Voltage: 208V Single Phase (2 Pole).
- .4 Control: Integral thermostat.
- .5 Disconnect: Integral factory 2-pole disconnect switch.
- .6 Grade: Commercial
- .7 Fan type unit heaters with built-in high-heat limit protection, auto reset, fan-delay switches.
- .8 Fan motor: totally enclosed permanently lubricated ball bearing type.
  - .1 Built-in fan motor thermal overload protection.
- .9 Hangers: As required.
- .10 Mounting: Ceiling mount
- .11 Cabinet: White epoxy-polyester powder-coat finish, 20-gauge steel.
- .12 Warranty: 3-Year warranty against defects / 10-Year warranty on the heating elements.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Suspend unit heaters from ceiling or mount on wall as indicated.
- .2 Install thermostats in locations as indicated on electrical drawings.
- .3 Make power and control connections.

### **3.2 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Test cut-out protection when air movement is obstructed.
- .3 Test fan delay switch to assure dissipation of heat after element shut down.
- .4 Test unit cut-off when fan motor overload protection has operated.
- .5 Ensure heaters and controls operate correctly.

**END OF SECTION**

**Part 1 General**

**1.1 MEASUREMENT PROCEDURES**

- .1 Excavation shall not be measured. It shall be incidental to the installation of the various underground infrastructure components.

**1.2 EXISTING CONDITIONS**

- .1 Buried services:
- .1 Before commencing work verify location of buried services on and adjacent to site.
  - .2 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .3 Prior to beginning excavation Work, notify Departmental Representative of Parks Canada.
  - .4 If there is uncertainty as to the locations of buried utilities, soft dig to confirm locations as appropriate.
  - .5 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
  - .6 Where utility lines or structures exist in area of excavation, exercise caution and protect said utilities and structures from damage.
  - .7 Record location of maintained, re-routed and abandoned underground lines.
  - .8 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
- .1 Conduct, with Parks Canada, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Parks Canada
- .3 Before commencing work verify with Parks Canada the locations of known buried archaeological features

**Part 2 Products**

**2.1 MATERIALS**

- .1 Type 1 and Type 2 fill: properties the following requirements:
- .1 Crushed, pit run or screened stone, gravel or sand.
  - .2 Gradations to be within the following limits: SPEC NOTE: Gradations given are typical requirements and may be edited to suit local practices. If Canadian metric sieve standard CAN/CGSB-8.2 is chosen edit Table below to suit project.
  - .3 Table:

Sieve Designation	% Passing	
	Type 1	Type 2
75 mm	-100	-
50 mm	-	-

37.5 mm	-80-100	-
25 mm	-	-
19 mm	[75-100]	-100
12.5 mm	-	-
9.5 mm	-	-
4.75 mm	40-80	-40-70
2.00 mm	-	-25-60
0.425 mm	10-35	-8-25
0.180 mm	-	-
0.075 mm	5-30	-6-17

- .2 Type 3 fill: selected material from excavation or other sources, approved by [Departmental Representative] for use intended, unfrozen and free from rocks larger than [75] mm, cinders, ashes, sods, refuse or other deleterious materials.

### **Part 3 Execution**

#### **3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways. Comply with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

#### **3.2 SITE PREPARATION**

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

#### **3.3 PREPARATION/PROTECTION**

- .1 Protect existing features.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

#### **3.4 EXCAVATION**

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Excavation at the existing storm sewer and manholes shall be confined to the previous storm sewer trench.
- .3 Excavation at building foundations shall be kept to the smallest and narrowest trench necessary to perform the work.



- .4 Trenches shall be excavated with walls as nearly vertical as possible, and with shoring and bracing where required. Shoring and bracing shall be constructed at Contractor's expense and in accordance with current standards. Placing and removal of shoring, bracing, sheet piling or cages shall be undertaken in a manner that permits proper backfilling.
- .5 Trenching between the existing storm sewer system and the buildings is not allowed. Pipe installation between the two shall be performed via trenchless installation techniques.
- .6 Excavation must not interfere with bearing capacity of adjacent foundations.
- .7 Do not disturb soil within branch spread of trees or shrubs that are to remain.
  - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .8 Keep excavated and stockpiled materials safe distance away from edge of trench. Implement ground protection underneath striped, excavated or stockpiled materials.
- .9 Restrict vehicle operations directly adjacent to open trenches.
- .10 Dispose of surplus and unsuitable excavated material as indicated by Departmental Representative.
- .11 Do not obstruct flow of surface drainage or natural watercourses.
- .12 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .13 Remove unsuitable material from trench bottom including those that extend below required elevations

### **3.5 ARTIFACTS**

- .1 If any cultural or archeological artifacts are encountered, (bone fragments, stone, bone or wooden tools or any items that show human workmanship or manipulation), cease excavation and notify the Departmental Representative immediately. The Contractor shall only resume activity when permitted to proceed with authorization of Parks Canada.

### **3.6 FILL TYPES AND COMPACTION**

- .1 Use types of fill as indicated or specified below.
  - .1 Unpaved areas more than 1 m away from roads, buildings or paved surfaces and features: use Type [3] fill to subgrade level. Compact to [95]% of corrected maximum dry density.
  - .2 Under paved surfaces or within 1 m of roads, buildings or paved surfaces: use Type [2] to underside of base course for floor slabs. Compact to [100] % of corrected maximum dry density.

### **3.7 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services as specified in Section 33 11 16 - Site Water Utility Distribution Piping and Section 33 31 13 - Public Sanitary Utility Sewerage Piping
- .2 Place bedding and surround material in unfrozen condition.

**3.8 BACKFILLING**

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Inspection, and recording location of underground utilities.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding [150] mm compacted thickness up to underside of surface finishes (roads or sod). Compact each layer before placing succeeding layer.

**3.9 RESTORATION**

- .1 Upon completion of Work, remove all waste materials and, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Upon closure of excavation replace topsoil where required.
- .3 Reinstall lawns to elevation which existed before excavation.
- .4 Reinstall pavements [and sidewalks] disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstall areas affected by Work as directed by Departmental Representative.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.
- .7 In areas where sod is placed or grass is seeded, water and maintain area until grass is established. If seeded use weed-free seeds. If weeds grow in remove the weeds until grass is established.

**END OF SECTION**

**Part 1            General**

**1.1            MEASUREMENT AND PAYMENT**

- .1      Measure supply and installation of sanitary sewer including granular bedding, trenching and backfilling horizontally from manhole face to manhole face in metres of each size pipe installed.
- .2      Cost of video inspection shall be included in the price for sanitary sewer

**1.2            ADMINISTRATIVE REQUIREMENTS**

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

**Part 2           Products**

**2.1           PLASTIC PIPE**

- .1      Type Polyvinyl Chloride (PVC): to ASTM D3034 and CSA B182.2.
  - .1      Standard Dimensional Ratio SDR: 35.
  - .2      Gasketed bell and spigot pipe.

**2.2           SERVICE CONNECTIONS**

- .1      Plastic pipe: to CSA B182.1, with push-on joints.

**2.3           CEMENT MORTAR**

- .1      Cement mortar to be used only as required at connections to the existing storm sewer collection system. Sealing of connections at building foundations shall be done in accordance with structural and mechanical specifications.
- .2      Portland cement: to CSA A3000, normal type 10.
- .3      Mix mortar 1 part by volume of cement to two parts of clean, sharp sand mixed dry.
  - .1      Add only sufficient water after mixing to give optimum consistency for placement.
  - .2      Do not use additives.

**2.4           PIPE BEDDING AND SURROUND MATERIALS**

- .1      Granular material to: Section [31 05 16 - Aggregate Materials] and the following requirements:
  - .1      Crushed or screened stone, gravel or sand.
  - .2      Gradations to be within limits specified when tested to [ASTM C136] [ASTM C117].
    - .1      Sieve sizes to [CAN/CGSB-8.1] [CAN/CGSB-8.2].

.2 Table:

Sieve Designation	% Passing Stone/Gravel	% Passing Gravel/Sand
200 mm	-	-
75 mm	-	-
50 mm	-	-
38.1 mm	-	-
25 mm	[100]	-
19 mm	-	-
12.5 mm	[90-100]	[100]
9.5 mm	-	-
4.75 mm	-	[50-100]
2.00 mm	[25-60]	[30-90]
0.425 mm	-	[10-50]
0.180 mm	-	-
0.075 mm	[0-8]	[0-10]

## 2.5 BACKFILL MATERIAL

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

## Part 3 Execution

### 3.1 PREPARATION

.1 Clean and dry pipes and fittings before installation.

### 3.2 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Protect trench from contents of sewer or sewer connection.

### 3.3 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding materials in uniform layer[s] not exceeding [150] mm compacted thickness [to depth of [150] mm].

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least [95]% [corrected maximum dry density].

### 3.4 INSTALLATION

.1 Lay and join pipes to manufacturer's standard instructions and specifications.

.2 Handle pipe using methods recommended by pipe manufacturer.

.1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.3 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

- .4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Joint deflection permitted within limits recommended by pipe manufacturer.
- .6 Water to flow through pipe during construction.
- .7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Install plastic pipe and fittings in accordance with [CSA B182.11].
- .9 Pipe jointing:
  - .1 Install gaskets [in accordance with manufacturer's written recommendations].
  - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
  - .3 Align pipes before joining.
  - .4 Maintain pipe joints free from mud, silt, gravel and foreign material.
  - .5 Avoid displacing gasket or contaminating with dirt or foreign material. Gaskets so disturbed to be removed, cleaned and lubricated and replaced before joining is attempted.
  - .6 Complete each joint before laying next length of pipe.
  - .7 Minimize joint deflection after joint has been made to avoid joint damage.
- .10 When stoppage of Work occurs, block pipes to prevent creep during down time.
- .11 Plug lifting holes with pre-fabricated plugs set in shrinkage compensating grout.
- .12 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .13 Make watertight connections to manholes.
  - .1 Use shrinkage compensating grout when suitable gaskets are not available.
- .14 Use prefabricated saddles or field connections approved by Departmental Representative, for connecting pipes to existing sewer pipes.
  - .1 Joints to be structurally sound and watertight.

### **3.5 PIPE SURROUND**

- .1 Place surround material in unfrozen condition.
- .2 Hand place surround material in uniform layers not exceeding [150] mm compacted thickness as indicated.
- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Compact each layer from pipe invert to mid height of pipe to at least 95% corrected maximum dry density.
- .5 Compact each layer from mid height of pipe to underside of backfill to at least 95% corrected maximum dry density.

### **3.6 BACKFILL**

- .1 Place backfill material in unfrozen condition.

- .2 Place backfill material, above pipe surround in uniform layers not exceeding [150] mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least [100]% [corrected maximum dry density].
  - .1 In other areas, compact to at least [95]%].

### **3.7 SERVICE CONNECTIONS**

- .1 Install pipe to CSA B182.11 manufacturer's instructions and specifications.
- .2 Maintain minimum 2% grade.
- .3 Service connections to main sewer:
  - .1 Gasketed push-on style PVC injection molded fittings in accordance with CAN/CSA B182.2 and ASTM D 3034, PVC, SDR 35.
- .4 Service connection pipe: not to extend into interior of main sewer.
- .5 Make up required horizontal and vertical bends from 45 degrees bends or less, separated by straight section of pipe with minimum length of 4 pipe diameters.
  - .1 Use long sweep bends where applicable.
- .6 Plug service laterals with water tight caps or plugs.

### **3.8 FIELD TESTING**

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 Television and photographic inspections:
  - .1 Carry out inspection of installed sewers by video camera, digital camera or by other related means.

### **3.9 CLEANING**

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

**END OF SECTION**

**Part 1            General**

**1.1            SECTION INCLUDES**

- .1      Foundation drainage panels
- .2      Weeping tile

**1.2            RELATED REQUIREMENTS**

- .1      Division 31, for excavation and backfill requirements

**1.3            REFERENCES**

- .1      ASTM International (ASTM)
  - .1      ASTM D1621-16, Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.
  - .2      ASTM D3034-08 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
  - .3      ASTM D4491/D4491M-17, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - .4      ASTM D4632/D4632M-15a, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
  - .5      ASTM D4716/D4716M-14, Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
- .2      CSA International (CSA)
  - .1      CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete

**1.4            ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Action Submittals:
  - .1      Product Data: Submit printed product literature and data sheets for drainage panel, pipes, pipe fittings, integral filter sock.

**1.5            DELIVERY, STORAGE AND HANDLING**

- .1      Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

**1.6            WASTE MANAGEMENT AND DISPOSAL**

- .1      Separate waste materials for recycling in accordance with Section 01 74 21 – Construction Waste Management and Disposal.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Drainage Panel: 10 mm thick dimple-raised core bonded to needle-punched non-woven polypropylene geotextile fabric, and polyethylene sheet on back-side of dimples.
  - .1 Core Compressive Strength: 718 kPa to ASTM D6364 or ASTM D1621.
  - .2 Core In-Plane Flow Rate: 211 Lpm/m to ASTM D4716.
  - .3 Fabric Grab Tensile Strength: 440 N to ASTM D4632.
  - .4 Fabric Grab Elongation: 65 to 70 percent to ASTM D4632.
  - .5 Fabric CBR Puncture: 1.22 N to ASTM D6241.
  - .6 Fabric Water Flow Rate: 6,100 to 6,800 L/min/m<sup>2</sup> to ASTM D4491.
- .2 Metal Termination Bars: Predrilled stainless-steel or aluminum termination bars; approximately 1-inch wide by 1/8-inch thick with flared edges for termination sealant application; with anchors.
- .3 Flexible plastic tubing and fittings: Corrugated, perforated and non-perforated, nominal inside diameter indicated, complete with couplers, sleeves, and elbows to suit, and integral geotextile filter sock.
- .4 Cleanouts: to ASTM D3034, PVC cleanout threaded plug and threaded pipe hub.
- .5 Filter gravel: coarse filter aggregate to CSA-A23.1/A23.2, Group 1, 20 to 5 mm.
- .6 Backfill: As specified in Division 31.

**Part 3 Execution**

**3.1 INSTALLATION - DRAINAGE PANEL**

- .1 Place drainage panel directly against membrane with geotextile fabric facing outwards. Place bottom of panel behind weeping tile.
- .2 Scribe and cut panels around projections, penetrations, and interruptions.
- .3 Apply vertically or horizontally in accordance with manufacturer's instructions, including location of flanges and laps.
- .4 Form corners in accordance with manufacturer's instructions.
- .5 Mechanically fasten top of membrane with termination bar.

**3.2 INSTALLATION - WEEPING TILE**

- .1 Shape subgrade to elevation 100 mm to 150 mm below intended elevation of pipe bottom on a minimum slope of 1:200 before placing bedding.
- .2 Prepare bed using 100 mm to 150 mm layer of compacted filter gravel.
- .3 Lay and join corrugated plastic drainage tubing to manufacturer's instructions.
- .4 Connect pipe to sump pits with appropriate adapters manufactured for this purpose.
- .5 Provide friction fit end plugs at open ends of pipe runs.
- .6 Enclose drainage pipe with filter gravel as follows:
  - .1 Top: minimum 300 mm.
  - .2 Bottom: minimum 100 mm.



- .3 Sides: minimum 300 mm.
- .7 Carry out installation as a continuous operation so that pipe is not left exposed for more than two days.

### **3.3 PROTECTION**

- .1 Obtain Departmental Representative review before backfilling.
- .2 Carefully backfill to avoid damaging drainage panel.

**END OF SECTION**

