

ARCHITECTURAL SPECIFICATION FOR

**Maison Charron  
Building Rehabilitation**

Gatineau, Quebec

**DC-4080**

Issued for Tender  
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**Robertson Martin Architects & L+ D Architects**

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**1.2            RELATED SECTIONS**

- .1      Section 01 33 00 – Submittal Procedures
- .2      Section 01 77 00 – Closeout Procedures
- .3      Section 01 78 00 – Closeout Submittals

**1.3 RIGHT TO ACCEPT OR REJECT TENDERS**

- .1 Notwithstanding any other provision in this Contract, National Capital Commission shall have the right to:
  - .1 Reject any tender that does not conform to tender requirements or with justification, and
  - .2 reject all Tenders.
- .2 Acceptance of the Tender shall occur at the time National Capital Commission awards the Tender and not necessarily at the time the award is communicated to the successful Tenderer.

**1.4 EXAMINATIONS OF DOCUMENTS AND SITE**

- .1 Each Tenderer, before submitting their Tender, shall carefully examine the drawings and specifications to establish the extent of the work and shall visit and examine the site and fully inform himself/herself of all the existing conditions, limitations and difficulties which may arise and include in his/her Tender the cost of all labour, materials, equipment and services required to complete the Work.
- .2 Carefully examine existing conditions prior to submitting bid. No extras will be authorized for work which could have been determined by a thorough, careful examination of site conditions by an experienced person.
- .3 Drawings and Specifications are complementary. Items shown or mentioned in one and not in the other are deemed to be included as part of the contract.
- .4 In the event of any discrepancy between the Drawings and the Specifications, the Specifications shall apply. If any item is shown on the Drawings but not in the Specifications, this does not mean that the items shown on the Drawings only are not in the Contract. See .6 below.
- .5 In the event of any discrepancy between one drawing and another, the larger scale drawing shall apply. If an item is shown on a smaller scale Drawing but not on the larger it is part of the Contract. A request to the NCC Representative should be made for approval, if accepted a Site Instruction will be issued.
- .6 Where an item is shown on the Drawings but not in the Specifications, the Contractor shall supply and install to standard institutional quality.
- .7 The sequence and numbering of the drawings and details and the organization of the specifications into Divisions and Sections are established for convenient ordering of information. It must not be assumed that such ordering of information is intended to define or limit the scope of extent of the work of any particular subcontractor or supplier. The drawings and specifications as a whole must be fully read, in detail, to determine the extent of any portion of the Work. It is the responsibility of the Contractor to coordinate subcontractors and suppliers prices such that the stipulated Tender Price is all-inclusive as specified herein.
- .8 Sub-Contractors are responsible to familiarize themselves with the Contract Documents and the work of all trades therein. Sub-Contractors must base their quotations to the General Contractor on a thorough review of all of the contract Drawings and Specifications.

**1.5 WORK RESTRICTIONS**

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with NCC Representative to facilitate work as stated.
- .2 Provide schedule within 5 working days after contract award, showing schedule with project milestones, anticipated progress stages and final completion of work within time provide by contract documents.

- .3 Provide in form acceptable to NCC Representative, within 5 working days of Contract award, schedule showing dates:
  - .1 Submission of shop drawings, material list, and samples.
  - .2 Commencement and completion of work of each section of specifications.
  - .3 Final Completion date within time period required by Contract Documents.
- .4 Carry out work:
  - .1 Exterior Building works; Monday to Friday from 06:00 to 18:00 hours. Co-ordinate with National Capital Commission if after hours or weekend work will be required.
  - .2 Co-ordinate with National Capital Commission project manager if scheduled work affects the clients use of facility. Schedule work to minimize disruption to the tenants. Do not proceed with any work that affects the clients /tenants without approval from National Capital Commission project manager.
  - .3 Co-ordinate with National Capital Commission project manager for access to work area and the use of vehicular equipment.
- .5 Phasing of Work:
  - .1 The work will be implemented in two Phases as indicated on Phasing Table on drawing A-001 Schedules.
  - .2 Provide bid price for phases of work as requested in bid documents.
  - .3 Coordinate work to ensure no conflicts arise between the phases.
  - .4 Allow for costs of demobilizing and mobilizing between phases.
  - .5 In each Phase, organize exterior work that is affected by cold weather, to be done in optimal weather conditions to avoid the need for hoarding and heating to maintain required temperatures for application and curing of materials.
  - .6 When temperature and weather conditions necessitate the need to maintain required temperatures for application and curing of materials, the General Contractor will be responsible to provide the hoarding and heating.
  - .7 The Contractor may provide alternative materials to those specified, that can be applied and cured at lower temperatures, on review and approval by NCC Representative.

## 1.6 CODES

- .1 Perform work in accordance with *National Building Code of Canada (NBC), Quebec National Construction Code - 2005, CSA B651-04 Accessible Design for the built Environment* and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirement shall apply.
- .2 Meet or exceed requirement of:
  - .1 Contract Document.
  - .2 Specified standards, codes and Referenced documents
- .3 Where standards and referenced documents have changed, the most recent version shall apply.

## 1.7 DOCUMENTS REQUIRED

- .1 Maintain at the job site, one copy each of the following:
  - .1 Contact drawings.

- .2 Specifications.
- .3 Addenda.
- .4 Reviewed shop drawings
- .5 Change Orders
- .6 Other modifications to contract
- .7 Field test reports.
- .8 Copy of approved work schedule.
- .9 Manufacturers' installation and application instruction.
- .10 Site Specific Safety Plan including emergency procedures.

## **1.8 PROGRESS MEETINGS**

- 1.1 During course of Work and 1 weeks prior to project completion, schedule progress meetings Bi-Weekly.
- 1.2 Contractor, major Subcontractors involved in Work and NCC Representative and National Capital Commission Project Manger are to be in attendance.
- 1.3 Notify parties minimum 5 days prior to meetings.
- 1.4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 5 days after meeting.
- 1.5 Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems which impede construction schedule.
  - .5 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for affect on construction schedule and on completion date.
  - .12 Other business.

## **1.9 WORK SCHEDULE**

- .1 Provide Work Schedule within 5 working days after contract award, showing schedule with project milestones with anticipated progress stages and final completion of work within time provide by contract documents in coloured Gantt chart formatted in computer project software.
  - .1 Microsoft Project.
  - .2 OpenProj.
  - .3 or approved equal.
- .2 Provide in form acceptable to NCC Representative, within 5 working days of Contract award, schedule showing dates:
  - .1 Submission of shop drawings, material list, and samples.
  - .2 Delivery of following items of equipment and materials.
  - .3 Commencement and completion of work of each section of section of specifications.

- .4 Final Completion date within time period required by Contract documents.
- .3 Interim review of work progress based on work schedule will be conducted as decided by NCC Representative and schedule update by Contractor in conjunction with and to approval of NCC Representative.

## 1.10

### SUBSTITUTIONS

- .1 The Contract is based on Contract documents.
- .2 Specific materials, products and systems are specified to provide standard of acceptance. Equivalent materials, products or systems are accepted as substitutions only when approved by addendum.
- .3 Substitutions, which do not satisfy the above requirements, will be rejected by the NCC Representative. Materials, products and systems, which are so rejected, shall be replaced by the specified item at no cost to the project.
- .4 In the event that, prior to closing of tenders, tenderer wishes to offer a substitution or a proposal of work, materials or methods as an alternate to those described in contract documents, he/she shall submit a request in writing at least 7 calendar days prior to tender close date.
- .5 The request shall include:
  - .1 A description of the proposed substitutions; and
  - .2 In the case of materials, products or systems, a direct comparison between the properties and compliances of the specified materials, product or systems with properties and compliances of the proposed substitution, arranged in tabular form in the same sequence as specified herein or in the sequence listed in specified manufacturer's published literature, as applicable; and
  - .3 If requested by the NCC Representative, list of no less than five projects of comparable size where the substitution has been used in similar application. Such projects shall have been completed prior within the last five years and, where applicable, shall have been subjected to climate conditions similar to experienced in Ottawa. The list shall include the name and current telephone number of the Architect and Owner of each project.
- .6 In the event that the NCC Representative deems the information provided with the request for approval of a substitution to be inadequate, the request may be rejected.
- .7 Preference will be given to products of Canadian manufacture.
- .8 Approval of alternative proposal of work, materials or methods will be signified by the issue of an addendum.
- .9 The cost of additional work/or modification to design due to the use of alternative material, product or system shall be borne by the contractor.
- .10 Where the terms "or equal", "or equivalent" or terms of similar meaning are used in the specifications, this shall not be construed as acceptance of any alternative material, product or system to those specified. The use of these terms does not relieve the Contractor from his responsibility to follow the procedures for approval of substitutions specified herein (during tender period) or the procedures described in Section 01 00 10 - General Instructions (after award of Contract).
- .11 No substitutions will be permitted after award of the Contract except in accordance with General Conditions GC 6.1 "CHANGES" and the article Substitutions in Section 01 00 50 - General Instructions. For procedures regarding substitutions after the award of the Contract, refer to General Conditions GC 6.1 "CHANGES".

**1.11 COST BREAKDOWN**

- .1 Submit to NCC Representative, at least 14 days before first application for payment. Schedule of values for parts of Work, aggregating total amount of Contract Price, to facilitate evaluation of applications for payment. After approval by NCC Representative cost breakdown will be used a basis for progress payment.
- .2 Breakdown to follow the following format:

Item: Spec Section	Description of work	Contract value	% to Date	\$\$\$ to date	%Previous	\$ Previous	% This Claim	\$ This Claim	Balance to complete

- .3 If approved change order will become part of the breakdown under a new item heading.
- .4 The Cost will include a price of \$3000.00 for construction progress documentations and as built drawings. No progress claim can be made for this amount prior to total completion of construction progress documentations and as built drawings.

**1.12 PAYMENT PROCEDURES**

- 1.1 Refer to CCDC 2 2008.
- 1.2 Make applications for payment on account as monthly as Work progresses.
- 1.3 Date applications for payment last day of agreed monthly payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date.
- 1.4 Progress claim Invoice will contain the following information.
  - .1 Project description and NCC (National Capital Commission) project number.
  - .2 "Progress billing for Period Ending" "MM/DD/YYYY"
  - .3 Amounts showing:
    - .1 (\$\$\$) Total Progress This Period
    - .2 10% Holdback on Progress this period
    - .3 (\$\$\$) Subtotal (Total progress minus holdback)
    - .4 (\$\$\$) HST \_\_%
    - .5 (\$\$\$) Total payable this period.
  - .4 NCC Representative will issue to National Capital Commission project manager , no later than 10 days after receipt of an application for payment, certificate for payment in amount applied for or in such other amount as NCC Representative determines to be due. If NCC Representative amends application, NCC Representative will give notification in writing giving reasons for amendment.
- 1.5 Statutory Declaration:
  - .1 The Contractor or supplier shall submit, with 2nd and each subsequent progress payment claim, Statutory Declaration that indicates persons, organizations, suppliers and Sub-trades required to be paid have been paid.

**1.13 CONTRACTOR USE OF SITE**

- .1 Use of site: exclusive and complete for execution of work.
- .2 Coordinate with NCC Representative areas for work and storage.

- .3 Obtain and pay for use of additional storage containers on site. No on site storage is provided.

**1.14 SUBMITTAL PROCEDURES:**

- .1 Submit shop drawings, product Data and Samples in accordance with section 01 33 00 Submittal Procedures.
- .2 Certificates and Transcripts
  - .1 Immediately after award of Contract, submit Workers' Compensation Board status.
  - .2 Submit transcription of insurance immediately after award of Contract.

**1.15 PROJECT MEETINGS / QUALITY ASSURANCE**

- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial/Territorial regulations.
- .2 Site Meetings.
  - .1 Convene pre-installation meeting one week prior to beginning work and on-site.
  - .2 Verify project requirements.
  - .3 Review installation and substrate conditions.
  - .4 Co-ordination with other building subtrades.
  - .5 Review manufacturer's installation instructions and warranty requirements.
- .3 Hold project meetings bi-weekly.
- .4 Ensure key personnel, site supervisor, project manager and subcontractor representatives attend.
- .5 Record minutes of meetings, and distribute to participants with 5 working days.
- .6 Project Manager will arrange project meetings, notify participants and distributing final meeting minutes.
- .7 General Contractor must provide written report on status of waste diversion activity at each meeting.

**1.16 LOCATION OF EQUIPMENT AND FIXTURES**

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

**1.17 CONCEALMENT**

- .1 Conceal pipes, ducts and wiring in floors, wall and ceiling construction of finished areas except where indicated otherwise.

**1.18 CUTTING AND PATCHING**

- .1 Obtain NCC Representative's approval before cutting, boring or sleeving load-bearing members.
- .2 Make cuts with clean, true, smooth edges.

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

**1.19 ALTERATIONS / REPAIRS TO EXISTING BUILDING**

- .1 Execute work with least possible interference or disturbance to occupants, public and normal use of premises. Arrange with NCC Representative to facilitate execution of work.
- .2 Prior to any cutting, coring, or drilling, a scan or x-ray is required to locate conduits, pipes, and structural Steel. Contractor to carry the cost to perform scanning.
- .3 Where security has been reduced by work of Contract, provide temporary means to maintain security.
- .4 **Provide temporary protection, dust screens, barriers, warning signs and drop cloths in locations where renovation and alteration work is adjacent to areas used by public or tenant**

**1.20 ADDITIONAL DRAWINGS**

- .1 NCC Representative may furnish additional drawings for clarifications. These additional drawings have the same meaning and intent as if they are included with plans referred to in Contract documents.
- .2 Clarifications:
  - .1 Clarifications are issued for the purpose of recording any clarification or interpretation of the contract documents or giving direction on problems resulting from field conditions.
  - .2 Clarifications are subject to the provisions of the contract documents.
  - .3 Should the contractor require a change in contract price or project schedule resulting from a clarification, he shall submit to the NCC Representative with 5 days of the date hereof, an itemized proposal. If the proposal is accepted by the NCC Representative, the clarification will be superseded by a change order.
  - .4 If specifically co-authorized by the contractor and NCC Representative, clarifications can be issued for which is to proceed without delay and requires a change in contract amount. The cost of the work will be as submitted by the contractor upon completion, but less than the agreed 'not to exceed' amount stated on the clarifications. A Change order will be issued based on the final cost.

**1.21 TAXES**

- .1 Pay all taxes properly levied by law (including federal, provincial and municipal), except as noted elsewhere.

**1.22 FEES, PERMITS AND CERTIFICATES**

- .1 Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence the work conforms to the requirements of authority having jurisdiction.

**1.23 CAMERAS**

- .1 Progress document photographs as indicated 1.30.3 are to be reviewed and approved by National Capital Commission Project Manager."

**1.24 REGULATORY REQUIREMENTS/ ENVIRONMENTAL**

- .1 Hazardous Material Discovery

- .1 Demolition of spray or trowel-applied asbestos can be hazardous to health. Should material resembling spray or towel-applied asbestos be encountered in course demolition work stop and notify NCC Representative immediately. Do not proceed until written instruction has been received from NCC Representative.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify NCC Representative.
- .3 Mould: stop work immediately when material-resembling mould is encountered during demolition work. Notify NCC Representative.
- .2 Fires
  - .1 Fire and burning of rubbish on site are not permitted.
- .3 Disposal of waste:
  - .1 Do not bury rubbish and waste materials on site.
  - .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

**1.25 GUARANTEE / WARRANTY**

- .1 The guarantee / warranty is include necessary materials, labour and clean-up for repair or replacement of work under this contract resulting from faulty materials or workmanship.
- .2 Where conflicting guarantee / warranty period exist, the longer period will supersede the shorter.
- .3 For any item that is found defective and it the rectified or replaced during the guarantee / warranty period, the contractor shall extend the guarantee / warranty period a further twelve months from the date of the NCC Representative's written acceptance of the rectified work or new material or equipment.

**1.26 BUILDING SMOKING ENVIRONMENT**

- .1 Comply with smoking restrictions

**1.27 SUBSURFACE CONDITIONS**

- .1 Promptly notify NCC Representative in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- .2 After prompt investigation, should NCC Representative determine that conditions do differ materially; instructions will be issued for changes in Work as provided in Changes and Change Orders.

**1.28 HEALTH AND SAFETY REQUIREMENTS**

- .1 References
  - .1 CSA S269.1-1975 (R2003) False work for construction purposes
  - .2 CAN/CSA-S269.2-M87 Access Scaffolding for Construction Purposes.
  - .3 FC 301-2009-1-13 Standard for Construction operations
  - .4 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
  - .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .6 Material Safety Data Sheets (MSDS).
  - .7 Province of Quebec.

- .8 Quebec Act respecting occupational health and safety (AOHS), R.S.Q. c. S-2.1.
- .9 CAN/CSA-Z259.10.06 Full Body Harnesses
- .10 CAN/CSA-Z259.10.12- Connecting Components for personal fall arrest systems (PFAS)
- .11 Full Body Harnesses
  
- .2 Personal Fall Protection
  - .1 Contractor to follow Quebec Act respecting occupational health and safety (AOHS), R.S.Q. c. S-2.1.
- .3 Construction Safety measures
  - .1 Observe construction safety measures of national building code, part 8, province or Quebec Occupational Health and Safety Commission, workers compensation board and municipal authority provided that in any case of conflict or discrepancy more stringent requirement shall apply.
  - .2 Comply with requirements of FC301 Standard for Construction Purposes.
- .4 Overloading
  - .1 Ensure no part of work is subject to loading that will endanger its safety or will cause permanent damage.
- .5 Falsework
  - .1 Design and construct falsework in accordance with CSA S269.1
- .6 Scaffolding
  - .1 Design and construct scaffolding in accordance with CSA S269.2
- .7 Minimum work practice for Asbestos-containing products.
  - .1 In view of fact that inhalation of asbestos fibres may be hazardous to health, but without in any way guaranteeing their effectiveness as protected against health hazards, the following practices shall apply.
  - .2 When working with asbestos-containing materials workers shall wear respirators acceptable to labour Canada or provincial labour department as suitable for asbestos exposure in work area. Workers shall also be educated as to risks, and be trained in safe practices. Power tools shall be equipped with efficiency particulate air-filtered vacuum equipment.
  - .3 When working in a enclosed area separate work area from rest of project by barrier capable of preventing spread of asbestos fibres outside work area.
  - .4 When working with asbestos-cement pipe comply with recommendations of asbestos-cement pipe producers association "recommended work practices for A/C pipe" subject to more stringent requirements of 6.2 above.
  - .5 Upon completion of work, clean work areas using wet methods or high efficiency particulate air-filtered vacuum equipment. Remove waste asbestos-containing materials in sealed containers labelled as to contents to disposal area acceptable to authorities having jurisdiction.
  - .6 In event of conflict between these requirements and those of provincial governments, labour Canada, or Health Canada, more stringent requirements shall apply.
- .8 WHMIS
  - .1 Comply with the requirements of workplace hazardous materials information system (WHMIS) regarding use, handling, storage, and

- disposal of hazardous materials; and regarding labelling and provisions of material safety data sheets acceptable to labour Canada and health Canada.
- .2 Deliver copies of WHMIS data sheets to NCC Representative on delivery of materials.
- .9 Health and safety on site:
- .1 NCC will provide a security agent for the duration of the work
  - .2 Comply with the security agents instructions and pay for corrective work.
  - .3 Meet with security and sub-contractors prior to starting on work on site an co-ordinate:
    - .1 Labour relationships policies
    - .2 Site access control measures
    - .3 Safety measures on site
- .10 Comply with and pay all associated costs related to site access control measures:
- .1 No cards issued. Escorts will be provided.
  - .2 No onsite parking is available, only loading and unloading will be permitted. Parking is at the discretion of Project Manager and must be coordinated beforehand. Inform all workers of site rules: labour relationship policies, site access control measures and safety measures on the site. Ensure workers respect the rules.
- .11 Inform the security agent of all modifications concerning the workers teams on the site.
- .12 The NCC Representative reserves the right to verify all vehicle, parcels, ect. arriving or departing the site.
- .13 Health and Safety Submittals
- .1 Submit site-specific health and safety plan: Within 3 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
    - .2 Results of site specific safety hazard assessment.
    - .3 Results of safety and health risk or hazard analysis for site tasks and operation.
    - .4 Submit 3 copies of Contractor's authorized representative's work site health and safety inspection reports to NCC Representative.
    - .5 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
    - .6 Submit copies of incident and accident reports.
    - .7 NCC Representative will review Contractor's site specific Health and Safety Plan and provide comments to Contractor within 2 days after receipt of plan. Revise plan as appropriate and resubmit plan to NCC Representative.
    - .8 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.
- .14 General Requirements
- .1 Develop written site specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
  - .2 NCC Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

- .15 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.
- .16 Compliance Requirements
  - .1 Comply with Ontario Health and Safety Act, R.S.O.
- .17 Unforeseen Hazards
  - .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise NCC Representative verbally and in writing.
- .18 Health And Safety Coordinator
- .19 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
  - .1 Have site-related working experience specific to activities associated with demolition.
  - .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.
- .20 Posting Of Documents
  - .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with NCC Representative.
  - .2 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by NCC Representative.
- .21 Provide NCC Representative with written report of action taken to correct non-compliance of health and safety issues identified.
  - .1 NCC Representative may stop Work if non-compliance of health and safety regulations is not corrected.

## 1.29

### INSPECTION AND DECLARATION

- .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
  - .1 Notify NCC Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
  - .2 Request NCC Representative's Inspection.
- .2 NCC Representative's Inspection: NCC Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
  - .1 Completion: submit written certificate that following have been performed:

- .1 Work has been completed and inspected for compliance with Contract Documents.
  - .2 Defects have been corrected and deficiencies have been completed.
  - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
  - .4 Operation of systems have been demonstrated to Owner's personnel.
  - .5 Work is complete and ready for Final Inspection.
- .3 Final Inspection: when items noted above are completed, request final inspection of Work by NCC Representative, and Contractor. If Work is deemed incomplete by NCC Representative, complete outstanding items and request re-inspection.
  - .4 Declaration of Substantial Performance: when NCC Representative considers deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Substantial Performance.
  - .5 Commencement of Lien and Warranty Periods: date of NCC Representative acceptance of submitted declaration of Substantial Performance shall be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
  - .6 Final Payment: When NCC Representative considers final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. If Work is deemed incomplete by NCC Representative, complete outstanding items and request re-inspection.
  - .7 Payment of Holdback: After issuance of certificate of Substantial Performance of Work, submit an application for payment of holdback.

### **1.30**

#### **CONSTRUCTION PROGRESS DOCUMENTATION**

- .1 Construction Schedule.
  - .1 Completion Date
  - .2 Key Project Milestones and Partial completion dates.
- .2 As-built records
  - .1 Maintain precise and accurate as-built progress records by annotating a set of drawings and specifications set aside for this purpose.
  - .2 Update records daily to note all deviations from indicated and specified requirements, including actual locations of service lines, hidden construction and services, and materials installed in the finish work.
  - .3 Transfer records to two sets of drawings and specifications obtained from NCC Representative prior to NCC Representative's inspection for issuance of Final Certificate of Completion.
- .3 Construction Progress Photographs
  - .1 At start of construction, Contractor to take detailed photos of all project areas, surfaces and affected site area and transmit to NCC Representative for approval. Annotate a set of drawings set aside for this purpose, showing photographs locations and dates.
  - .2 During construction, Contractor to take a minimum 5 photographs per day, with additional as required for complex documentation.
  - .3 Contractor to maintain precise photographs records by organizing the photos by groupings and labelling the photos, showing photograph locations and dates.

- .4 Photographs to be in digital format.
- .5 Provide two hard copy photographs in three ring binder format and two binder format and two CD versions For NCC Representative's inspection for issuance of Final Certificate of Completion.

**1.31 QUALITY ASSURANCE**

- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial/Territorial regulations.
- .2 Site Meetings.
- .3 Convene pre-installation meeting one week prior to beginning work and on-site.
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Co-ordination with other building subtrades.
  - .4 Review manufacturer's installation instructions and warranty requirements.
- .4 Hold project meetings bi-week.
- .5 Ensure key personnel, site supervisor, project manager and subcontractor representatives attend.
- .6 General Contractor must provide written report on status of waste diversion activity at each meeting.

**1.32 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 NCC Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good work damaged by such removals or replacements promptly.
- .3 If in opinion of NCC Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, NCC 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 NCC Representative.

**1.33 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 NCC Representative.
- .3 Mock-up will be used:
  - .1 to judge workmanship, substrate preparation, operation of equipment and material application.
  - .2 When accepted, mock-up will demonstrate minimum standard of quality required for this Work.
- .4 Prepare mock-ups for NCC Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .5 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.
- .6 Allow 2 days for inspection by NCC Representative.
- .7 Mock-up may remain as part of work.
- .8 NCC project manager must be notified of all mock-ups, must be present for all review and approval of all mock-ups.

**END OF SECTION**

**Part 1            General**

**1.1            ACCESS AND EGRESS**

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

**1.2            USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with NCC Representative to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 NCC Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 Closures: protect work temporarily until permanent enclosures are completed.

**1.3            ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**

- .1 Execute work with least possible interference or disturbance to public and normal use of premises. Arrange with NCC Representative to facilitate execution of work.

**1.4            EXISTING SERVICES**

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

**1.5            SPECIAL REQUIREMENTS**

- .1 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .2 Keep within limits of work and avenues of ingress and egress.
- .3 Ingress and egress of Contractor vehicles at site is limited to .
- .4 Deliver materials outside of peak traffic hours 17:00 to 07:00 and 13:00 to 15:00 unless otherwise approved by NCC Representative.

**1.6 SECURITY**

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

**1.7 BUILDING SMOKING ENVIRONMENT**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                ADMINISTRATIVE**

- .1        Submit to NCC Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2        Do not proceed with Work affected by submittal until review is complete.
- .3        Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4        Where items or information is not produced in SI Metric units converted values are acceptable.
- .5        Review submittals prior to submission to NCC Representative . This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6        Notify NCC Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7        Verify field measurements and affected adjacent Work are co-ordinated.
- .8        Contractor's responsibility for errors and omissions in submission is not relieved by NCC Representative's review of submittals.
- .9        Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by NCC Representative review.
- .10      Keep one reviewed copy of each submission on site.

**1.2                SHOP DRAWINGS AND PRODUCT DATA**

- .1        Refer to CCDC 2 GC 3.11.
- .2        The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .3        Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Quebec, Canada.
- .4        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.
- .5        Allow 3 days for NCC Representative's review of each submission.

- .6 Adjustments made on shop drawings by NCC Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to NCC Representative prior to proceeding with Work.
- .7 Make changes in shop drawings as NCC Representative may require, consistent with Contract Documents. When resubmitting, notify NCC Representative in writing of revisions other than those requested.
- .8 Accompany submissions with transmittal letter, in duplicate, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .9 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.
- .10 After NCC Representative's review, distribute copies.
- .11 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as NCC Representative may reasonably request.
- .12 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by NCC Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .13 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by NCC Representative .

- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .2 Testing must have been within 3 years of date of contract award for project.
- .14 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by NCC 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.
- .15 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by NCC 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.
- .16 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by NCC Representative.
- .17 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .18 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by NCC Representative.
- .19 Delete information not applicable to project.
- .20 Supplement standard information to provide details applicable to project.
- .21 If upon review by NCC Representative, no errors or omissions are discovered or if only minor corrections are made, electronic copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

### **1.3 SAMPLES**

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to NCC Representative's business address.
- .3 Notify NCC 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 NCC Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to NCC Representative prior to proceeding with Work.
- .6 Make changes in samples which NCC Representative may require, consistent with Contract Documents.

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

**1.4 MOCK-UPS**

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

**1.5 PHOTOGRAPHIC DOCUMENTATION**

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

**1.6 CERTIFICATES AND TRANSCRIPTS**

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

**Part 2 Products**

**2.1 NOT USED**

**Part 3 Execution**

**3.1 NOT USED**

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1        Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2        Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1        Material Safety Data Sheets (MSDS).
- .3        Province of Quebec
  - .1        An Act Respecting Occupational Health and Safety, R.S.Q. 1997 (updated 26 July 2005).

**1.2                SUBMITTALS**

- .1        Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1        Results of site specific safety hazard assessment.
  - .2        Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3        Submit 3 copies of Contractor's authorized representative's work site health and safety inspection reports to NCC Representative.
- .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 in accordance with Section 01 33 00 - Submittal Procedures.
- .7        NCC Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to NCC Representative within 5 days after receipt of comments from NCC Representative.
- .8        NCC Representative review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9        Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to NCC Representative.
- .10      On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented 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 NCC Representative prior to commencement of Work.

**1.6 REGULATORY REQUIREMENTS**

- .1 Do Work in accordance with regulatory requirements.

**1.7 PROJECT/SITE CONDITIONS**

- .1 Work at site will involve contact with:
  - .1 Silica.

**1.8 GENERAL REQUIREMENTS**

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

**1.9 RESPONSIBILITY**

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

**1.10 COMPLIANCE REQUIREMENTS**

- .1 Comply with Occupational Health and Safety Act, Industrial and Commercial Establishments Regulation, R.R.Q.
- .2 Comply with Occupational Health and Safety Regulations, 1996.
- .3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

**1.11 UNFORSEEN HAZARDS**

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

**1.12 HEALTH AND SAFETY CO-ORDINATOR**

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

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

**1.13 POSTING OF DOCUMENTS**

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

**1.14 CORRECTION OF NON-COMPLIANCE**

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

**1.15 BLASTING**

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

**1.16 POWDER ACTUATED DEVICES**

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

**1.17 WORK STOPPAGE**

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

**1.18 NOT USED**

- .1 Not used.

**Part 2 Execution**

**2.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1            Canadian Construction Documents Committee (CCDC)
  - .1            CCDC 2-2008, Stipulated Price Contract.

**1.2                INSPECTION**

- .1            Refer to CCDC 2, GC 2.3 .
- .2            Allow NCC Representative    access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .3            Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by NCC Representative    instructions, or law of Place of Work.
- .4            If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .5            NCC 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, NCC Representative    shall pay cost of examination and replacement.

**1.3                INDEPENDENT INSPECTION AGENCIES**

- .1            Independent Inspection/Testing Agencies will be engaged by NCC Representative    for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by NCC 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 NCC Representative    at no cost to NCC Representative. Pay costs for retesting and re-inspection.

**1.4                ACCESS TO WORK**

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

**1.5                PROCEDURES**

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

- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

#### **1.6 REJECTED WORK**

- .1 Refer to CCDC, GC 2.4 .
- .2 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by NCC Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .3 Make good other Contractor's work damaged by such removals or replacements promptly.
- .4 If in opinion of NCC Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by NCC Representative.

#### **1.7 REPORTS**

- .1 Submit electronic copies of inspection and test reports to NCC Representative.
- .2 Provide copies to subcontractor of work being inspected or tested and manufacturer or fabricator of material being inspected or tested .

#### **1.8 TESTS AND MIX DESIGNS**

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

#### **1.9 MOCK-UPS**

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to NCC Representative.
- .3 Prepare mock-ups for NCC 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.

#### **1.10 MILL TESTS**

- .1 Submit mill test certificates as requested..

**1.11 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1    Canadian General Standards Board (CGSB)
  - .1        CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
  - .2        CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2    Canadian Standards Association (CSA International)
  - .1        CSA-O121-M1978(R2003), Douglas Fir Plywood.

**1.2                INSTALLATION AND REMOVAL**

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

**1.3                HOARDING**

- .1    Erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA O121.
- .2    Apply plywood panels vertically flush and butt jointed.
- .3    Provide one lockable truck entrance gate and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.
- .4    Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.
- .5    Paint public side of site enclosure in selected colours with one coat primer to CAN/CGSB 1.189 and one coat exterior paint to CGSB 1.59. Maintain public side of enclosure in clean condition.
- .6    Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

**1.4                GUARD RAILS AND BARRICADES**

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

**1.5                WEATHER ENCLOSURES**

- .1    Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
- .2    Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
- .3    Design enclosures to withstand wind pressure and snow loading .

**1.6 DUST TIGHT SCREENS**

- .1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Maintain and relocate protection until such work is complete.

**1.7 ACCESS TO SITE**

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

**1.8 PUBLIC TRAFFIC FLOW**

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

**1.9 FIRE ROUTES**

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

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

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

**1.11 PROTECTION OF BUILDING FINISHES**

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

**1.12 WASTE MANAGEMENT AND DISPOSAL**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1                Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1    Canadian Construction Documents Committee (CCDC)
  - .1    CCDC 2-2008, Stipulated Price Contract.
- .2    Within text of each specifications section, reference may be made to reference standards.
- .3    Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .4    If there is question as to whether products or systems are in conformance with applicable standards, NCC Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .5    Cost for such testing will be born by NCC Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

**1.2                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.
- .2    Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3    Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4    Should disputes arise as to quality or fitness of products, decision rests strictly with NCC Representative based upon requirements of Contract Documents.
- .5    Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6    Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

**1.3                AVAILABILITY**

- .1    Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify NCC Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2    In event of failure to notify NCC Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, NCC Representative

reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

#### **1.4 STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber and on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of NCC Representative .
- .9 Touch-up damaged factory finished surfaces to NCC Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

#### **1.5 TRANSPORTATION**

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

#### **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 NCC Representative in writing, of conflicts between specifications and manufacturer's instructions, so that NCC Representative will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes NCC 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 NCC 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. NCC 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 NCC 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.

**1.9 CONCEALMENT**

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform NCC Representative if there is interference. Install as directed by NCC Representative.

**1.10 REMEDIAL WORK**

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

**1.11 LOCATION OF FIXTURES**

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform NCC 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 IN PROGRESS**

- .1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of NCC 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, and/or building occupants and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1            REFERENCES**

- .1    Canadian Construction Documents Committee (CCDC)
  - .1    CCDC 2-2008, Stipulated Price Contract.

**1.2            PROJECT CLEANLINESS**

- .1    Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2    Remove waste materials from site at daily regularly scheduled times or dispose of as directed by NCC Representative. Do not burn waste materials on site.
- .3    Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .4    Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5    Provide on-site containers for collection of waste materials and debris.
- .6    Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .7    Dispose of waste materials and debris off site.
- .8    Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9    Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10    Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11    Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12    Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

**1.3            FINAL CLEANING**

- .1    When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2    Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3    Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4    Remove waste products and debris other than that caused by Owner or other Contractors.

- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by NCC Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors .
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Wax, seal or prepare floor finishes, as recommended by manufacturer.
- .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .14 Remove dirt and other disfiguration from exterior surfaces.
- .15 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .16 Sweep and wash clean paved areas.
- .17 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .18 Clean roofs, downspouts, and drainage systems.
- .19 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .20 Remove snow and ice from access to building.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1                Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                WASTE MANAGEMENT GOALS**

- .1        Prior to start of Work conduct meeting with NCC Representative to review and discuss Waste Management Plan and Goals.
- .2        Waste Management Goal 75 percent of total Project Waste to be diverted from landfill sites. Provide NCC Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .3        Accomplish maximum control of solid construction waste.
- .4        Preserve environment and prevent pollution and environment damage.

**1.2                RELATED SECTIONS**

- .1        Section 01 33 00 - Submittal Procedures

**1.3                DEFINITIONS**

- .1        Class III: non-hazardous waste - construction renovation and demolition waste.
- .2        Cost/Revenue Analysis Workplan (CRAW): based on information from WRW, and intended as financial tracking tool for determining economic status of waste management practices.
- .3        Demolition Waste Audit (DWA): relates to actual waste generated from project.
- .4        Inert Fill: inert waste - exclusively asphalt and concrete.
- .5        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.
- .6        Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .7        Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .8        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.
- .9        Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
  - .1        Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
  - .2        Returning reusable items including pallets or unused products to vendors.
- .10      Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .11      Separate Condition: refers to waste sorted into individual types.

- .12 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.
- .13 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.
- .14 Waste Management Co-ordinator (WMC) : contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .15 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).

#### **1.4 DOCUMENTS**

- .1 Maintain at job site, one copy of following documents:
  - .1 Waste Audit.
  - .2 Waste Reduction Workplan.
  - .3 Material Source Separation Plan.
  - .4 Schedules A, B, C, E completed for project.

#### **1.5 SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures .
- .2 Prepare and submit following prior to project start-up :
  - .1 Submit 2 copies of completed Waste Audit (WA): Schedule A.
  - .2 Submit 2 copies of completed Waste Reduction Workplan (WRW): Schedule B.
  - .3 Submit 2 copies of completed Demolition Waste Audit (DWA): Schedule C.
  - .4 Submit 2 copies of Materials Source Separation Program (MSSP) description.
  - .5 For each of the above submit also electronically.(email / CD-ROM).
- .3 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.
  - .1 Failure to submit could result in hold back of final payment.
  - .2 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled and separated off-site or disposed of.
  - .3 For each material reused, sold or recycled from project, include amount in tonnes quantities by number, type and size of items and the destination.
  - .4 For each material land filled or incinerated from project, include amount in tonnes of material and identity of landfill, incinerator or transfer station.

#### **1.6 WASTE AUDIT (WA)**

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

**1.7 WASTE REDUCTION WORKPLAN (WRW)**

- .1 Prepare WRW prior to project start-up.
- .2 WRW should include but not limited to:
  - .1 Destination of materials listed.
  - .2 Deconstruction/disassembly techniques and sequencing.
  - .3 Schedule for deconstruction/disassembly.
  - .4 Location.
  - .5 Security.
  - .6 Protection.
  - .7 Clear labelling of storage areas.
  - .8 Details on materials handling and removal procedures.
  - .9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.
- .3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .4 Describe management of waste.
- .5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.
- .6 Post WRW or summary where workers at site are able to review content.
- .7 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.
- .8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

**1.8 DEMOLITION WASTE AUDIT (DWA)**

- .1 Prepare DWA prior to project start-up.
- .2 Complete DWA: Schedule C.
- .3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

**1.9 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 NCC 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 which minimize material damage.
- .7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
  - .1 Transport to approved and authorized recycling facility to users of material for recycling.
- .8 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition.
  - .1 Ship materials to site operating under Certificate of Approval premises of Owner.
  - .2 Materials must be immediately separated into required categories for reuse or recycling.

**1.10 WASTE PROCESSING SITES**

- .1 Trail Waste Facility  
4475 Trail Road (Ottawa)  
311 /613-580-2401
- .2 Tomlinson Springhill Landfill  
Hyw 31 Springhill Road (Ottawa)  
613-822-1867
- .3 Waste Management Inc. Landfill  
2301 Carp Road (Ottawa)  
613-831-1281
- .4 WSI Waste Services  
3354 Navan Road (Ottawa)  
613-824-7289
- .5 Recuperation et recyclage de Outaouais  
15, Chemin Holmes (Cantley)  
819-457-2459
- .6 Thibault demolition  
135, Chemin Sainte-Antoine (Val-des-Monts)  
819-671-4112
- .7 Myral  
815, Rue Vernon (secteur d'Aylmer)  
819-772-9151

**1.11 STORAGE, HANDLING AND PROTECTION**

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by NCC Representative.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed for demolition from movement or damage.

- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify NCC Representative.
- .7 Protect surface drainage, mechanical and electrical from damage and blockage.
- .8 Separate and store materials produced during dismantling of structures in designated areas.
- .9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
  - .1 On-site source separation is recommended.
  - .2 Remove co-mingled materials to off-site processing facility for separation.
  - .3 Provide waybills for separated materials.

**1.12 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 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

**1.13 USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Maintain security measures established by existing facility .

**1.14 SCHEDULING**

- .1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 SELECTIVE DEMOLITION**

- .1 Reuse of Building Elements: this project has been designed to result in end of project rates for reuse of building elements as follows: do not demolish building elements beyond what is indicated on Drawings without approval by NCC Representative.

**3.2 APPLICATION**

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

**3.3 CLEANING**

- .1 Clean-up work area as work progresses.
- .2 Source separate materials to be reused/recycled into specified sort areas.

**3.4 DIVERSION OF MATERIALS**

- .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by NCC Representative, and consistent with applicable fire regulations.
  - .1 Mark containers or stockpile areas.
  - .2 Provide instruction on disposal practices.
- .2 On-site sale of salvaged recovered reusable recyclable materials is permitted is not permitted.
- .3 Demolition Waste:

Material Type	Recommended Diversion %	Actual Diversion %
De-mountable Partitions- Toilet	100	
Electrical Equipment	80	
Furnishings-Washroom accessories	80	
Mechanical Equipment	100	
Metals	100	
Rubble	100	
Wood (uncontaminated)	100	
Cedar roofing	100	

.4 Construction Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Cardboard	100	
Plastic Packaging	100	
Rubble	100	
Steel	100	
Wood (uncontaminated)	100	
Other		

**3.5 WASTE AUDIT (WA)**

- .1 Schedule A - Waste Audit (WA):

(1) Material Category	(2) Material Quantity Unit	(3) Estimated Waste %	(4) Total Quantity of Waste (unit)	(5) Generation Point	(6) Recycled	%	(7) Reused	%
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**3.6 WASTE REDUCTION WORKPLAN (WRW)**

.1 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
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**3.7 DEMOLITION WASTE AUDIT (DWA)**

.1 Schedule C - Demolition Waste Audit (DWA):

(1) Material Description	(2) Quantity	(3) Unit	(4) Total	(5) Volume (cum)	(6) Weight (cum)	(7) Remarks and Assumptions
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**3.8 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT**

.1 Schedule E - Government Chief Responsibility for the Environment:

Province	Address	General Inquires	Fax
Ontario	Ministry of Environment and Energy, 135 St. Clair Avenue West Toronto ON M4V 1P5	416-323-4321 800-565-4923	800-416-323-4682

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1 Canadian Construction Documents Committee (CCDC)
  - .1        CCDC 2-2008, Stipulated Price Contract.

**1.2                ADMINISTRATIVE REQUIREMENTS**

- .1 Acceptance of Work Procedures:
  - .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
    - .1        Notify NCC Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    - .2        Request NCC Representative inspection.
  - .2 NCC Representative Inspection:
    - .1        NCC Representative and Contractor to inspect Work and identify defects and deficiencies.
    - .2        Contractor to correct Work as directed.
  - .3 Completion Tasks: submit written certificates for tasks have been performed as follows:
    - .1        Work: completed and inspected for compliance with Contract Documents.
    - .2        Defects: corrected and deficiencies completed.
    - .3        Equipment and systems: tested, adjusted and balanced and fully operational.
    - .4        Operation of systems: demonstrated to Owner's personnel.
    - .5        Commissioning Decommissioning of mechanical systems: completed in accordance with General Commissioning (Cx) Requirements and copies of final Commissioning Report submitted to NCC Representative.
    - .6        Work: complete and ready for final inspection.
  - .4 Final Inspection:
    - .1        When completion tasks are done, request final inspection of Work by NCC Representative, and Contractor.
    - .2        When Work incomplete according to Owner and NCC Representative, complete outstanding items and request re-inspection.
  - .5 Declaration of Substantial Performance: when NCC Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
  - .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
  - .7 Final Payment:
    - .1        When NCC Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
    - .2        Refer to CCDC 2: when Work deemed incomplete by NCC Representative , complete outstanding items and request re-inspection.

- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

**1.3 FINAL CLEANING**

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

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                ADMINISTRATIVE REQUIREMENTS**

- .1    Pre-warranty Meeting:
  - .1    Convene meeting one week prior to contract completion with contractor's representative and NCC Representative, in accordance with Section 01 00 10 General Conditions to:
    - .1    Verify Project requirements.
    - .2    Review manufacturer's installation instructions and warranty requirements.
  - .2    NCC Representative to establish communication procedures for:
    - .1    Notifying construction warranty defects.
    - .2    Determine priorities for type of defects.
    - .3    Determine reasonable response time.
  - .3    Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
  - .4    Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures .
- .2    Two weeks prior to Substantial Performance of the Work, submit to the NCC Representative three printed and electronic final copies of operating and maintenance manuals in English.
- .3    Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4    Provide evidence, if requested, for type, source and quality of products supplied.

**1.3                FORMAT**

- .1    Organize data as instructional manual.
- .2    Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3    When multiple binders are used correlate data into related consistent groupings.
  - .1    Identify contents of each binder on spine.
- .4    Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5    Arrange content by process flow, under Section numbers and sequence of Table of Contents.
- .6    Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7    Text: manufacturer's printed data, or typewritten data.
- .8    Drawings: provide with reinforced punched binder tab.

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

#### **1.4 CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Table of Contents for Each Volume: provide title of project;
  - .1 Date of submission; names.
  - .2 Addresses, and telephone numbers of NCC Representative, Sub-contractor, Contractors and name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control .
- .6 Training: refer to Section 01 79 00 - Demonstration and Training .

#### **1.5 AS -BUILT DOCUMENTS AND SAMPLES**

- .1 Maintain, in addition to requirements in General Conditions, at site for NCC Representative one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to Contract.
  - .5 Reviewed shop drawings, product data, and samples.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
  - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
  - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
  - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by NCC Representative.

**1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by NCC Representative.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
  - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .4 Field changes of dimension and detail.
  - .5 Changes made by change orders.
  - .6 Details not on original Contract Drawings.
  - .7 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

**1.7 EQUIPMENT AND SYSTEMS**

- .1 For each item of equipment and each system include description of unit or system, and component parts.
  - .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 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 manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control and General Commissioning (Cx) Requirements.
- .15 Additional requirements: as specified in individual specification sections.

## **1.8 MATERIALS AND FINISHES**

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
  - .1 Provide information for re-ordering custom manufactured products .
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specifications sections.

## **1.9 MAINTENANCE MATERIALS**

- .1 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 to location as directed; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to NCC Representative.
    - .2 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
  - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.

- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue items.
  - .1 Submit inventory listing to NCC Representative.
  - .2 Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
  - .1 Provide special tools, in quantities specified in individual specification section.
  - .2 Provide items with tags identifying their associated function and equipment.
  - .3 Deliver to location as directed; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to NCC Representative.
    - .2 Include approved listings in Maintenance Manual.

**1.10 DELIVERY, STORAGE AND HANDLING**

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by NCC Representative.

**1.11 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to NCC Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that NCC Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
  - .4 Verify that documents are in proper form, contain full information, and are notarized.
  - .5 Co-execute submittals when required.
  - .6 Retain warranties and bonds until time specified for submittal.

- .6 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .7 Conduct joint 5 month and 11 month warranty inspection, measured from time of acceptance, by NCC Representative.
- .8 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and commissioned systems such as fire protection, alarm systems, sprinkler systems, lightning protection systems, .
  - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
    - .1 Name of item.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.
    - .5 Names, addresses and telephone numbers of sources of spare parts.
    - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
    - .7 Cross-reference to warranty certificates as applicable.
    - .8 Starting point and duration of warranty period.
    - .9 Summary of maintenance procedures required to continue warranty in force.
    - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
    - .11 Organization, names and phone numbers of persons to call for warranty service.
    - .12 Typical response time and repair time expected for various warranted equipment.
  - .4 Contractor's plans for attendance at 5 and 11 month post-construction warranty inspections.
  - .5 Procedure and status of tagging of equipment covered by extended warranties.
  - .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .9 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .10 Written verification to follow oral instructions.
  - .1 Failure to respond will be cause for the NCC Representative to proceed with action against Contractor.

#### **1.12 WARRANTY TAGS**

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by NCC Representative.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.

- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
  - .1 Type of product/material.
  - .2 Model number.
  - .3 Serial number.
  - .4 Contract number.
  - .5 Warranty period.
  - .6 Inspector's signature.
  - .7 Construction Contractor.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1            ADMINISTRATIVE REQUIREMENTS**

- .1    Demonstrate scheduled operation and maintenance of equipment and systems to NCC Representative's personnel two weeks prior to date of substantial performance.
- .2    NCC Representative: 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 in accordance with manufacturer's written instruction.
  - .4    Ensure testing, adjusting, and balancing has been performed in accordance with Section General Commissioning (Cx) Requirements 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 scheduled agreed upon times, 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    Section 08 71 00 - Door Hardware: 30 minutes of instruction.
  - .2    Section 22 42 01 - Plumbing Specialties and Accessories: 30 minutes of instruction.
  - .3    Section 23 09 33 - Electric and Electronic Control System for HVAC: 30 minutes of instruction.
  - .4    Section 23 30 05 - Plumbing System: 30 minutes of instruction.
  - .5    Section 23 54 13 - Electric-Resistance Furnaces: 30 minutes of instruction.
  - .6    Section 26 09 23.02 - Lighting Control Devices – Photoelectric: 30 minutes of instruction.
  - .7    Section 26 09 23.04 - Lighting Control Devices - Fluorescent Dimming: 30 minutes of instruction.
  - .8    Section 26 27 26 - Wiring Devices: 30 minutes of instruction.
  - .9    Section 26 50 00 - Lighting: 30 minutes of instruction.

**1.2            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 NCC Representative's 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.

**1.3 QUALITY ASSURANCE**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1            CSA International
  - .1            CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .2            U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1            EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 - Submittal Procedures and 01 74 21 - Construction/Demolition Waste Management Disposal.
- .2            Submit demolition drawings:
  - .1            Submit for review and approval by NCC Representative shoring and underpinning drawings stamped and signed by professional engineer registered or licensed in the Province of Quebec, Canada, showing proposed method.

**1.3                SITE CONDITIONS**

- .1            Review "Designated Substance Report" and take precautions to protect environment.
- .2            If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify NCC Representative immediately.
  - .1            Proceed only after receipt of written instructions have been received from NCC Representative.
- .3            Notify NCC Representative before disrupting building access or services.

**Part 2            Products**

**2.1                NOT USED**

- .1            Not used.

**Part 3            Execution**

**3.1                EXAMINATION**

- .1            Inspect building and site with NCC Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2            Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3            Notify and obtain approval of utility companies before starting demolition.
- .4            Disconnect, cap, plug or divert, as required, existing public utilities within the property where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or

plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.

- .1 Immediately notify NCC Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.
- .2 Immediately notify the NCC Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

### **3.2 PREPARATION**

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to: requirements of authorities having jurisdiction sediment and erosion control drawings sediment and erosion control plan, specific to site, that complies 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 demolition.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work..
- .2 Protection of In-Place Conditions:
  - .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features and parts of building to remain in place. Provide bracing and shoring required.
  - .2 Keep noise, dust, and inconvenience to occupants to minimum.
  - .3 Protect building systems, services and equipment.
  - .4 Provide temporary dust screens, covers, railings, supports and other protection as required.
  - .5 Do Work in accordance with Section 01 00 10 General Instructions - Health and Safety Requirements.
- .3 Demolition/Removal:
  - .1 Remove items as indicated.
  - .2 Removal of Pavements, Curbs and Gutters:
    - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by NCC Representative.
    - .2 Protect adjacent joints and load transfer devices.
    - .3 Protect underlying and adjacent granular materials.
  - .3 Remove parts of existing building to permit new construction.
  - .4 Trim edges of partially demolished building elements to tolerances as defined by NCC Representative to suit future use.

### **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.
- .3 Refer to demolition drawings and specifications for items to be salvaged for reuse.
- .4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

- .5 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**Part 1            General**

**1.1                Related Sections**

- .1        Section 04 03 08 – Mortar.
- .2        Section 04 03 41 – Historic - Repairing Stone
- .3        Section 04 03 42 - Historic - Replacing Stone

**1.2                Measurement Procedures**

- .1        Work of this section will be measured by NCC Representative. It will be paid for under payment items:
  - .1        Inspecting and testing to identify unsound joints. This item will not be measured; payment will be according to one fixed lump sum price for work necessary to locate unsound joints.
  - .2        Pointing - per linear metre of joints raked and pointed.
- .2        Any work additional to what is shown in Drawings, will be paid for on a unit price basis according to pre-established unit prices. Measurement will be based on number of stones repaired.
- .3        Work necessary for completion of work of this section will not be paid for separately but will be considered as incidental to work of this section.

**1.3                References**

- .1        Canadian Standards Association (CSA International)
  - .1        CAN/CSA A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2        CAN/CSA A179-04, Mortar and Grout for Unit Masonry.
  - .3        CSA-A371-04, Masonry Construction for Buildings.

**1.4                Definitions**

- .1        Raking: the removal of loose/deteriorated mortar until sound mortar is reached to twice the joint width but no less than 20mm deep.
- .2        Deep raking: the removal of loose/deteriorated mortar until sound mortar is reached up to the full depth of the mortar joint.
- .3        Repointing: filling and finishing of masonry joints from which mortar is missing, has been raked out or has been omitted.
- .4        Tooling: finishing of masonry joints using tool to provide final contour.
- .5        Repair: using adhesives to rebond sections of fractured masonry.
- .6        Consolidation: strengthening masonry units to prevent deterioration (spalling).
- .7        Descaling: the removal of loose portions of the masonry (usually spalled area) through impact with a brush hammer or similar device.

## **1.5 System Description**

- .1 Work of this Section includes but is not limited to:
  - .1 Visually inspecting for obvious signs of deteriorated masonry and testing/verification of masonry joints.
  - .2 Raking identified unsound joints.
  - .3 Preparation of masonry surface including joints surface cleaning, flushing of voids and open joints, and masonry wetting.
  - .4 Repointing of identified masonry joints.
  - .5 Removal of loose portions on stone surface.
  - .6 Resetting of dislodged masonry units.
  - .7 Ensuring cure of mortar.
  - .8 Grouting by hand, small voids.
  - .9 Consolidation of fractured masonry units or spalled units.
  - .10 Replacement of deteriorated or missing units.

## **1.6 Submittals**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Provide labelled samples of materials used on project for approval before work commences.

## **1.7 Qualifications**

- .1 Masonry Contractor:
  - .1 Use single Masonry Contractor for all masonry work.
  - .2 Masonry contractor to have 10 years experience minimum in historic stone masonry work.
  - .3 Masonry contractor to have good level of understanding of structural behaviour of masonry walls when masonry work involves replacing or repairing stones which are part of structural masonry work.
- .2 Masons:
  - .1 Mason to have certificate of qualification with 10 years minimum experience in historic stone masonry work.
  - .2 Masons to have proof of license certification for propriety restoration mortars.
- .3 Cement grouting: grouting activities should be undertaken by experienced workers in manipulation and cement grouting methods.
- .4 One thoroughly experienced, reliable and competent workman shall be in charge of all mortar mixing for the duration of the project. Experience must include mixing mortar for a minimum of three projects similar to this project.
- .5 Obtain approval from NCC Representative for changes to qualified personnel.

## **1.8 Existing Conditions**

- .1 Investigate possible structural problems and report to NCC Representative before beginning masonry work.

- .2 Study pointing styles and methods of reproducing them, and submit sample for approval before starting work.
- .3 Examine horizontal and vertical joints to determine which were struck first and whether they are same style, as well as other aspects of workmanship which establish authenticity of original work.

### **1.9 Mock-ups**

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct mock-up 1 m x 1 m to demonstrate procedure for each type of masonry material specified.
- .3 Construct mock-up under supervision of NCC Representative to demonstrate a full understanding of specified procedures, techniques and formulations are achieved before work commences.
- .4 Construct mock-up where directed by NCC Representative.
- .5 Allow 24 hours for inspection of mock-up by NCC Representative before proceeding with masonry repointing and repair work.
- .6 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.

### **1.10 Delivery, Storage, Handling and Protection**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Store cementitious materials and aggregates in accordance with CAN/CSA A23.1.
  - .3 Store lime putty in plastic lined sealed drums.
  - .4 Keep material dry. Protect from weather, freezing and contamination.
  - .5 Ensure that manufacturer's labels and seals are intact upon delivery.
  - .6 Remove rejected or contaminated material from site.
  - .7 At end of each working day, cover unprotected work with waterproof membranes, tarpaulins and burlap, secured to prevent lifting in winds. 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.
  - .8 Protect adjacent finished work against damage which may be caused by on-going work.
  - .9 All methods of enclosure and protection shall be to the approval of the NCC Representative.
  - .10 Newly laid mortar shall be protected from excessive exposure to rain and full sunlight until the surface is thumb-print hardened.
  - .11 Provide and maintain protection for masonry walls at all times when work is suspended to prevent water from entering partially repointed masonry.
  - .12 Provide protection boards to exposed corners and all openings such as doors and windows which may be damaged by construction activities. Maintain protection for the duration of operations. Remove and dispose of protective materials as directed by the NCC Representative.
- .2 Waste Management and Disposal:

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

**1.11 Existing Conditions**

- .1 Report in writing, to NCC Representative areas of deteriorated masonry revealed during work. Obtain NCC Representative approval and instructions of repair and replacement of masonry units before proceeding with repair work.

**1.12 Ambient Conditions**

- .1 Maintain masonry temperature between 10 degrees C and 25 degrees C for duration of work.
- .2 When ambient temperature is 10 degrees C:
  - .1 Store cements and sands for immediate use within heated enclosure. Allow cement and sands to reach minimum temperature of 10 degrees C.
  - .2 Heat and maintain water to minimum of 20 degrees C and maximum of 30 degrees C:
    - .1 At time of use temperature of mortar to be minimum of 15 degrees C and maximum of 30 degrees C.
    - .2 Do not mix cement with water or with aggregate or with water-aggregate mixtures having higher temperature than 30 degrees C.
    - .3 Maintain aggregate temperature between 10 degrees C and 30 degrees.
    - .4 Maintain mortar mix between 10 degrees and 40 degrees.
    - .5 Provide hot water to a maximum 90 degrees C on site during cold weather.

**Part 2 Products**

**2.1 Materials**

- .1 Mortar: in accordance with CAN/CSA A179 and Section 04 03 08 - Masonry Mortaring.

**Part 3 Execution**

**3.1 Site Verification Of Conditions**

- .1 Report in writing to NCC Representative areas of deteriorated masonry not previously identified.
- .2 Obtain NCC Representative written approval and instructions for repair and replacement of masonry units before proceeding with repair work.
- .3 Stop work in that area and report to NCC Representative immediately evidence of mould.

**3.2 Examination/testing**

- .1 Procedure of testing: examine joints visually for obvious signs of deteriorated masonry.
- .2 Test joints not visually deteriorated as follows:
  - .1 Test for voids and weakness by using hammers or other approved means.

- .2 Perform testing in co-operation with NCC Representative so that unsound joints can be marked and recorded.

### **3.3 Repair**

- .1 Perform work in accordance with CSA-A371 and Section 04 03 41 Historic - Repairing Stone.

### **3.4 Raking Joints**

- .1 In no area can the joints be raked for more than four levels of scaffold in height, prior to repointing.
- .2 Use manual raking tools to remove deteriorated mortar to sound mortar and at least three times joint thickness, leaving square corners and a flat surface at back of cut. Clean out voids and cavities encountered.
- .3 Ensure that no masonry units are chipped, altered or damaged by work to remove mortar.
- .4 Clean joints to full depth of deteriorated mortar but in no case to less than 30 mm. Clean out voids and cavities encountered.
- .5 Fine joints (less than 4mm) need not be raked out more than 10mm, in order to reduce the danger of chipping the masonry edges. Cut these joints with power -saw, if necessary. When saw cutting vertical joints, stop saw but 50 to 75mm from end of joint. Do not saw cut stone.
- .6 Any stone damaged as a result of careless raking, or saw cutting, shall be replaced at no cost to the NCC Representative.
- .7 Clean with non-ferrous brush surfaces of joints without damaging texture of exposed joints or masonry units.
- .8 Clean by compressed air, surfaces of joints without damaging texture of exposed joints.
- .9 Flush open joints and voids; clean open joints and voids with low pressure water and, if not free draining, blow clean with compressed air.
- .10 Leave no standing water.

### **3.5 Repointing:**

- .1 Only once all required repair and replacement work is complete, carry out repointing.
- .2 Before repointing, wash walls to be repointed and allow to dry to damp-dry condition. Ensure that all dust, mortar particles, and other debris are removed from joints and wall surfaces before repointing.
- .3 Dampen joints and keep masonry damp while pointing is being performed.
- .4 Completely fill joint with mortar. If surface of masonry units has worn rounded edges keep pointing back from surface to keep same width of joint. Avoid feather edges. Pack mortar solidly into voids and joints.
- .5 Tool and compact using jointing tool to force mortar into joint.

- .6 Build-up pointing in layers not exceeding 20 mm in depth. Allow each layer to set before applying subsequent layers. Maintain joint width.
- .7 Allow mortar to set so that there is no free water that will cause run off on stone faces, then tool to match approved mock-up joints. Tool head joints, then horizontal joints. Do not overwork the face of the joints. Joints shall be uniform in appearance. Do not brush joints until they have set to the extent that brushing will not mark the joint surface.
- .8 Tool joints to match existing profile.
- .9 Tool joints behind masonry face with identical tools used for weathered joints. Match weathered joint.
- .10 Remove excess mortar from masonry face before it sets.

### **3.6 Resetting**

- .1 Fix dislodged masonry units in correct location with water soaked hardwood wedges.
- .2 Insert and compress firm mortar to within 50 mm of pointing surface. Allow mortar to set 24 hours.
- .3 Pull out wood wedges when dried and shrunken.
- .4 Point to surface in two layers.

### **3.7 Cleaning**

- .1 Clean surfaces of mortar droppings, stains and other blemishes resulting from work of this contract as work progresses.
- .2 Remove droppings and splashings using clean sponge and water.
- .3 Do further cleaning using stiff natural bristle brushes after mortar has obtained its initial set and has not fully cured.
- .4 Clean masonry with stiff natural bristle brushes and plain water only if mortar has fully cured.
- .5 Clean masonry with low pressure 15 to 45 psi clean water and soft natural bristle brush.
- .6 Obtain approval of NCC Representative prior to using other cleaning methods for persistent stains.

### **3.8 Protection of Completed Work**

- .1 Cover completed and partially completed work not enclosed or sheltered at end of each work day.
- .2 Cover with waterproof tarps to prevent weather from eroding recently repointed material.
  - .1 Maintain tarps in place for minimum of 4 weeks after repointing.
  - .2 Ensure that bottoms of tarps permit airflow to reach mortar in joints.
- .3 Anchor coverings securely in position.
- .4 Install and maintain wetted burlap protection during the curing process:

- .1 Minimum 7 days in summer.
- .2 Minimum 30 days in cold weather conditions using dry heated enclosures.
- .5 Wet mist burlap only - ensure no direct spray reaches surface of curing mortar.
- .6 Shade areas of work from direct sunlight during periods over 25 degrees C, and maintain constant dampness of burlap.
- .7 Maintain ambient temperature of 10 degrees C for minimum of 4 weeks after repointing masonry.

**END OF SECTION**

**Part 1            General**

**1.1                Related Work**

- .1            Repointing and Section 04 03 07 – Historic - Masonry Repointing.

**1.2                References**

- .1            ASTM C 579(1997) Specification for Quicklime for Structural Purposes.
- .2            ASTM C 207-91(1997) Specification for Hydrated Lime for Masonry.
- .3            ASTM C 348-97 Test Method for Flexural Strength of Hydraulic - Cement Mortars.
- .4            CAN/CSA-A371-R2009 Masonry Construction for Buildings.

**1.3                Samples**

- .1            Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Submit samples in quantity and size in accordance with CSAA179M.

**1.4                Test Reports**

- .1            Submit 2 sets of test results to show that properties are appropriate to particular mortar mix.

**1.5                Environmental Requirements**

- .1            Execute work when ambient temperature is above 5°C. When ambient temperature is below 5°C care and heat work as directed by NCC Representative.
- .2            Prepare and maintain temperature of mortar between 5°C and 50°C until used.

**1.6                Scheduling Of Work**

- .1            Submit work schedule indicating anticipated progress stages within time of final completion shown in bid document.
- .2            Take measures necessary to complete work within approved schedule time. Schedule may not be changed without approval.

**1.7                Alternatives**

- .1            Obtain NCC Representative 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.

**1.8                Measurement of Payment**

- .1            Payment for this work will be on lump sum basis and will include costs associated with supplying, mixing, testing and executing masonry work as specified.

## **Part 2 Products**

### **2.1 Materials**

- .1 Use same brands of materials and source of aggregates for entire project.
- .2 Sand: to CSA A179. Use well graded aggregate passing 4.75mm down to 300 micron sieve where joints are greater than 6mm. Use aggregate passing 1.18mm down to 300 micron sieve where 6mm thick joints or less are indicated
- .3 Water: potable or from approved non potable supply.
- .4 Lime:
  - .1 Processed Lime (Quicklime): to ASTM C5.
  - .2 Hydrated lime: ASTM C207. Type SA
- .5 Portland cement: CAN/CSA-A5, non staining, type 50
- .6 Masonry cement: CAN/CSA-A8.
- .7 White cement: use white silica sand and white Portland cement and lime masonry cement.
- .8 Colour: coloured sand to match the existing.
- .9 Non-staining mortar: use non-staining masonry cement for cementitious portion of specified mortar type. Use for all repointing work.
- .10 Additives:
  - .1 Calcium chloride is not to be used for any mortar
  - .2 Polymer Latex: organic polymer latex admixture of butadiene-styrene type non-emulsifiable bonding admixture.
- .11 Repair mortar for crack repair and patching of stone:
  - .1 Jahn Restoration Mortars by Cathedral Stone Products, Inc. For crack repair use M30, M40. For stone repair use M70 and M150. For grouting use M40 Mortar grout.
  - .2 Alternative materials: to be approved by Addendum prior to close of tender.

### **2.2 Properties**

- .1 Limestone: use 1:2:7 cement: lime: aggregate mix for severe exposure, such as all joints to 1200mm above grade, and below grade.
- .2 Limestone: use 1:2 1/2:8 cement: lime: aggregate mix, for all other locations.
- .3 Jahn restoration mortar; premix to manufacturer's instructions.
- .4 Vicat Cone Penetration; 15 to 25mm.
- .5 Allowable air content; 7% to 15%.

### **2.3 Mortar**

- .1 Repointing: new mortar to be used in repointing is to match the existing mortar as specified in paragraph 2.2.

- .2 Time limit: discard mix not used and placed within 2 hours.

### **Part 3 Execution**

#### **3.1 Preparation**

- .1 Slake processed lime in water for not less than 24hours or soak hydrated lime in water for not less than 12hours.
- .2 Place safety devices and signs near the work as directed by NCC Representative.

#### **3.2 Mixing**

- .1 Prepare mortar by:
  - .1 mixing lime, cement, sand and water in specified proportions.
  - .2 Mix using a regular paddle mixer. Only electric motor mixers are permissible. Mixers that run on hydrocarbons are not permitted. Mixing by hand must be preapproved by the NCC Representative.
  - .3 Add water slowly while mixing until all lumps are eliminated.

#### **3.3 Cleaning**

- .1 Remove droppings and splashings using clean sponge and water.
- .2 Clean masonry with low pressure clean water and soft natural bristle brush.

#### **3.4 Protection of Completed Work**

- .1 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each work day. Anchor securely in position.

**END OF SECTION**

**Part 1            General**

**1.1            Related Sections**

- .1    Section 04 03 07 – Historic - Masonry Repointing.
- .2    Section 04 03 08 – Mortar.
- .3    Section 04 03 41 – Historic - Repairing Stone.
- .4    Section 04 03 42 - Historic - Replacing Stone.

**1.2            References**

- .1    Canadian Standards Association (CSA International)
  - .1    CAN/CSA-A179-04, Mortar and Grout for Unit Masonry.
  - .2    CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .2    American Society for Testing and Materials International (ASTM)
  - .1    ASTM C940-98a, Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory

**1.3            Definitions**

- .1    Grout: cementitious mixture of liquid consistency suitable for pouring or pumping, to fill voids between masonry elements.

**1.4            Submittals**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
- .3    Provide cementitious grout samples to CAN/CSA A179.
- .4    Provide upon request of NCC Representative purchase orders, invoices, supplier's test certificates and documents to prove materials used in contract meet requirements of specification. Allow free access to source where materials procured.

**1.5            Delivery, Storage and Handling**

- .1    Packing, shipping, handling and unloading:
  - .1    Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
  - .2    Store materials in dry area and support free of ground.
  - .3    Deliver materials in sealed containers with labels legible and intact.
  - .4    Handle materials in safe manner in accordance with manufacturer's instructions. Avoid breaking container seals.
- .2    Waste Management and Disposal:
  - .1    Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**1.6 Ambient Conditions**

- .1 Maintain temperature of masonry elements to be grouted above 5 degrees C throughout their thickness, during and 48 hours after grouting.
- .2 Maintain temperature of elements to be grouted between 21 degrees C to 24 degrees C throughout its thickness during and 48 hours after grouting.
- .3 Provide temporary enclosure to maintain heating and/or cooling equipment to maintain specified temperatures.

**Part 2 Products**

**2.1 Materials**

- .1 Portland cement : to CAN/CSA-A3000.
- .2 Water: clean and free from contaminants and organic material in accordance to CAN/CSA A23.1/A23.2.
- .3 Grout to Stonework: Hydraulic lime based injection and reinforcement grout, conforming to CSA A179, ASTM C348 and ASTM C940. Control water content to conform to CSA A179, Clause 4.2.1.2 or Clause 4.3.1.5.
  - .1 Acceptable material: Grout F-20 by Daubois Inc.

**2.2 Equipment**

- .1 Mechanical mixer: size compatible with volume of mortar grout prepared and as per manufacturer's printed instructions.
- .2 Mechanical regulator to prevent segregation of ingredients after mixing and ensure injection continuity.

**Part 3 Execution**

**3.1 Site Verification of Conditions**

- .1 Report to NCC Representative before start of work possible structural masonry problems and conditions that do not conform to those specified including existing voids or possible openings which risk being compromised when grout will flow.

**3.2 Inspection**

- .1 Mixing operations: continuously inspected by NCC Representative. Provide required assistance to facilitate taking of grout samples and inspection work.

**3.3 Measurement and Mixing**

- .1 Make volume measurement using shovel batching.
- .2 Mix as per manufacturer's printed instructions.
- .3 Keep volume measures clean and free from crusting.

- .4 Mix cementitious materials, admixtures and aggregates in mechanical mixer for period of not less than 5 minutes nor more than 10 minutes with specified amount of water.

**3.4 Preparation**

- .1 Ensure substrate is free from loose material.
- .2 Prepare voids around doors and windows and to control flow of grout.
- .3 Prepare joints before grout injection:
  - .1 Insert hemp ropes into joints.
  - .2 Point joints.
- .4 Wet surfaces, deep into substrate.

**3.5 Installation**

- .1 Insert tubes.

**3.6 Field Quality Control**

- .1 Take 2 samples of grout and submit to NCC Representative for testing in accordance with paragraph 1.5 of this section.

**END OF SECTION**

**Part 1**

**General**

**1.1**

**Related Sections**

- .1 Section 04 03 07 - Masonry Repointing
- .2 Section 04 03 08 - Mortars
- .3 Section 04 03 09 – Grouting
- .4 Section 04 03 42 - Replacement of Stone

**1.2**

**Alternatives**

- .1 Obtain NCC Representative's approval before changing procedures, manufacturer's brands, sources of supply of materials during entire contract.

**1.3**

**REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM
- .2 Canadian Standards Association (CSA International)
  - .1 CAN/CSA A179-04, Mortar and Grout for Unit Masonry.

**1.4**

**Definitions**

- .1 Repair of Stone: mechanical or plastic repair, done to restore original appearance and function of partly deteriorated stones. Repairs include use of repair mortar for small chips and spalls, crack repair, Dutchman repair, fracture repairs and descaling.
- .2 Filling: material used to rebuild broken or deteriorated part of stone.
- .3 Adhesive: material used to fasten broken/fractured stone elements by direct application at fracture interface and/or by application to added reinforcing elements such as dowels.
- .4 Mortar: material used to repoint the adjacent mortar joints to stone element being repaired.

**1.5**

**Submittals**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Provide adhesive mortar filling samples to CAN/CSA A179.
- .4 Submit, upon request by NCC Representative, purchase orders, invoices, suppliers test certificates and documents to prove that materials used in contract meet requirements of specification. Allow free access to sources where materials were procured.

**1.6**

**QUALITY ASSURANCE**

- .1 Qualifications

- .1 One thoroughly experienced, reliable and competent workman must be in charge of all stone repairs.
- .2 Only Jahn mortar applicators certified in its use will be acceptable.
- .2 Mock-ups:
  - .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control and as follows:
    - .1 two crack repairs.
    - .2 two chip repairs using repair mortar.
    - .3 two Dutchman repairs.
    - .4 two in-situ fracture repairs.
    - .5 one fracture repair, with stone removed.
    - .6 one stone face descaled.
  - .2 Do not use existing stonework when constructing job mock-up.
  - .3 Construct mock-up where directed.
  - .4 Allow 72 hours for inspection of mock-up by NCC Representative, before proceeding with stone repair work.
  - .5 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work. Remove mock-up at completion of work as directed by NCC Representative.
  - .6 Clean mock-up to demonstrate cleaning operations to NCC Representative before starting cleaning work.

### **1.7 Delivery, Storage and Handling**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Keep material dry. Protect from weather, freezing and contamination. Store materials in a dry area and supported free of ground.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **1.8 Ambient Conditions**

- .1 Maintain a minimum temperature of 10 degrees C during and 48 hours after repair, throughout thickness of stone.
- .2 Allow materials to reach minimum temperature of 10 degrees C prior to use.
- .3 Maintain temperature between 21 degrees C and 24 degrees C during repair and 48 hours after, throughout thickness of stone.
- .4 Ensure epoxy resin compatible with humidity condition of stone as specified by manufacturer.
- .5 Provide temporary enclosures and heating equipment to maintain specified temperatures. Take precautions to avoid overheating masonry.
- .6 Refer to manufacturer's instructions for environmental requirements of products.

**Part 2 Products**

**2.1 Materials**

- .1 Portland cement: to CAN/CSA-A3000.
- .2 Sand: cleaned and graded in accordance to ASTM C144.
- .3 Epoxy mixture for adhesive:
  - .1 As per Section 04 03 08 Mortar
- .4 Water: clean and free of deleterious materials such as acid, alkali and organic material in accordance to CAN/CSA A179.
- .5 Dowels: stainless steel 12 mm diameter.
- .6 Deformed wire: bronze, copper, brass or stainless steel, 3 mm diameter.
- .7 Stone slabs: to have similar mechanical and aesthetic properties to existing.

**2.2 Mortar Mixes**

- .1 It is highly recommended for historic masonry to have a separate specification section specifying the mortar characteristics.
  - .1 Mortar:
    - .1 Proportion Specification:
      - .1 In accordance with CAN/CSA A179, Section 04 03 08 - Mortar

**2.3 Filling Mixes**

- .1 In accordance with Section 04 03 08 - Mortar
- .2 Submit samples for testing.

**2.4 Adhesive Mixes**

- .1 In accordance with Section 04 03 08 - Mortar
- .2 Submit samples for testing.

**Part 3 Execution**

**3.1 Site verification Of Conditions**

- .1 Report in writing, to NCC Representative areas of deteriorated stone not identified in the documents.
- .2 Obtain NCC Representative's approval and instructions for repair and replacement of masonry units before proceeding with repair work.
- .3 Stop work in that area and report to NCC Representative immediately any evidence of mould.

### **3.2 Preparation**

- .1 Remove deteriorated portions of stones using low impact removal methods until sound surface is reached.
- .2 Obtain NCC Representative's approval for methodology and tools to be employed before commencing this work.

### **3.3 Protection**

- .1 Prevent damage to building, fencing, trees, landscaping, natural features utility lines which are to remain. Make good damage.
- .2 Protect surrounding components from damage during work.
- .3 Take utmost care not to damage historic fabric. Make good any damage.

### **3.4 Crack Repair**

- .1 Drill 20 mm diameter injection ports as per injection grout manufacturer's specifications.
- .2 Clean out void with compressed air and potable water until water runs clear.
- .3 Seal joints and cracks to manufacturer's specifications.
- .4 Complete injection procedure as per manufacturer's instructions.
- .5 Seal injection ports to match the surrounding stone

### **3.5 Repair of a Fractured Stone**

- .1 Remove elements which require minor repair. Do not damage existing Work.
- .2 Drill 13 mm diameter holes, 80 mm long in each section at fracture, maximum spacing at 300mm on centre.
- .3 Insert 12 mm diameter dowels, 100 mm long, and apply specified adhesive to holes and interface. Let adhesive cure for 24 hours minimum.
- .4 Reinstall consolidated element into work and repoint with specified mortar. Joints to match existing.
- .5 Repair surface of fracture with cement-based restoration mortar to match the surrounding stonework.

### **3.6 Repair of a Fractured Stone In Situ**

- .1 Drill 13mm diameter holes, 80mm long in each section and fracture, spaced at 300o/c maximum.
- .2 Insert 12mm diameter stainless steel dowels, 100mm long and apply anchor setting mortar to holes and joints. Let set for 24 hours minimum.
- .3 Repair fracture as per Section 3.5 above.
- .4 Repair surface of fracture with cement-based restoration mortar to match the surrounding stonework.

**3.7 Refacing Partly Deteriorated Stone with Slab (Dutchman Repair)**

- .1 Remove decayed stone until sound surface is reached.
- .2 Drill 13 mm diameter holes, 80 mm long at interface of existing and new stone slabs.
- .3 Insert 12 mm diameter dowels, 100 mm long into existing stone and apply specified adhesive grout to holes and interface.
- .4 Make horizontal dovetailed grooves 12 mm deep at interface of existing and new stone slabs.
- .5 Apply specified adhesive grout to dovetailed grooves and interface of existing stone.
- .6 Fill dowel holes and dovetailed grooves of new stone slab with specified adhesive grout. Erect new stone slab into position. Secure stone temporarily to allow adhesive to set.
- .7 Repoint with specified mortar. Joints to match existing.

**3.8 Refacing Partly Deteriorated Stone With Filling (Including chips, voids, previous patches, spalls)**

- .1 Drill 10 mm holes into sound stone. Roughen stone surfaces to provide keys in back of cavity.
- .2 Wet surfaces.
- .3 Apply mortar to suit nature of stone being restored. Restore stone surfaces to match existing and bring to the same plane as adjacent existing stone surfaces that are not eroded.
- .4 Build up gradually new section in layers not exceeding 12 mm thickness allowing each layer to set 24 hours before proceeding with next.
- .5 Use wood float and avoid excessive trowelling to prevent crazing.
- .6 Form roughly to required shape with wood float, then chisel finish to final shape when mortar has set.
- .7 Moist cure restored surfaces for 4 days minimum. Apply moist cloth covered with plastic sheet. Maintain moisture in cloth by means of mist sprayer, for the entire curing period
- .8 Remove laitance with stiff, near-dry fibre brush.
- .9 Surface finish of patches must match existing stone in colour and texture.
- .10 Repoint with specified mortar. Joints to match existing.

**3.9 Mortar Joint Repair**

- .1 Make good any damage to mortar joints.

**3.10 Cleaning**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Obtain NCC Representative's approval of cleaning operations before starting cleaning work.

- .3 Protect plants, grass vegetation and adjacent grounds from excessive water accumulation
- .4 Clean stone work surfaces after repairs have been completed and mortar has set.
- .5 Clean stone surfaces of adhesive or mortar residue resulting from work performed without damage to stone or joints.
- .6 Clear site of debris, surplus material and equipment, leaving work area in clean and safe condition.

**3.11 Protection of Completed Work**

- .1 Protect finished work from impact damage for period of two weeks.

**END OF SECTION**

**Part 1            General**

**1.1            Related Sections**

- .1    Section 04 03 07 - Historic - Masonry Repointing.
- .2    Section 04 03 08 - Mortar.
- .3    Section 04 03 09 – Grouting.
- .4    Section 04 03 41 - Historic - Repairing Stone.

**1.2            References**

- .1    American Society for Testing and Materials International (ASTM)
  - .1    ASTM C97-M09, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
  - .2    ASTM C170-M09 Standard Test Method for Compressive Strength of Dimension Stone.
  - .3    ASTM C568-08a, Standard Specification for Limestone Dimension Stone.
- .2    Canadian Standards Association (CSA International)
  - .1    CAN/CSA A179-04, Mortar and Grout for Unit Masonry.

**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.

**1.4            Submittals**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1    Submit drawings stamped and signed by professional engineer registered or licensed in Provinces of Ontario, Canada.
  - .2    Submit shop drawings describing method of stone removal and replacement
- .3    Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
- .4    Provide samples of replacement stones not less than 30 working days before masonry work begins.
- .5    Samples from designated quarry: submit sample of replacement stones from quarry having similar stone as original quarry. Submit stones as follows:
  - .1    One stone sized and dressed to match existing stone units.
  - .2    Select samples from currently worked bed of quarry and accompanied by quarry certification.

- .6 Samples of used or previously quarried stone: submit one stone, sized and dressed to match existing stone units. Make supply of stone accessible to NCC Representative NCC Representative to select number of stones for sampling and request sizing and dressing according to requirements.
- .7 Provide maintenance data for masonry work for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

### **1.5 Quality Assurance**

- .1 Allow NCC Representative access to mason's workshop for inspection of current work-in-progress.
- .2 Execute work by personnel experienced in preservation of historic masonry.
- .3 Masons engaged by Masonry Contractor to have minimum of 5 years experience with historic masonry.
- .4 NCC Representative has right to reject masons who do not demonstrate appropriate abilities or experience. Refer to Section 01 61 00 - Common Product Requirements.
- .5 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.
- .6 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .7 Construct mock-up 1 m<sup>2</sup> minimum of stonework to be refaced with specified materials and methods.
- .8 Do not use existing stonework when constructing job mock-up.
- .9 Construct mock-up where directed.
- .10 Allow 72 hours for inspection of mock-up by NCC Representative before proceeding with stone repair work.
- .11 Clean mock-up to demonstrate cleaning operations to NCC Representative.
- .12 When accepted, mock-up will demonstrate minimum standard for this work.
- .13 Remove mock-up at completion of work as directed by NCC Representative.
- .14 Cover top of completed and partially completed wall, not enclosed or sheltered, with weatherproof coverings at end of each working day. Drape cover over wall and extend 0.5 m down both sides. Anchor securely in position. Prevent finished work from curing too quickly.
- .15 Protect adjacent work from marking or damage due to work.
- .16 Provide temporary bracing of masonry work during erection until permanent structure provides adequate bracing.

### **1.6 Delivery, Storage and Handling**

- .1 Packing, shipping, handling and unloading:

- .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **Part 2 Products**

### **2.1 Materials**

- .1 Dressed Limestone: St. Marc Limestone (formerly known as Deschambeau Limestone), Graymont (Portneuf) Inc. 595 Boul. Dussault, St-Marc, Québec. GOA 4B0. Telephone: (418) 268-3584, Fax: (418) 268-5655.

### **2.2 Stone Characteristics**

- .1 Stratification: low, bedding plane to within 15% the horizontal trim of work.

### **2.3 Anchors, Ties, Sealants**

- .1 Anchors, cramps, dowels: yellow brass commercial bronze stainless steel Type 304.
- .2 Sealants: in accordance with Section 07 92 00 - Joint Sealants.

### **2.4 Mortar**

- .1 As per Section 04 03 08 – Mortar.

## **Part 3 Execution**

### **3.1 Site Verification of Conditions**

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

### **3.2 Preparation**

- .1 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 NCC Representative for inspection and approval. Do not make holes or indentations for Lewises or dogs on face or top side of stone.
- .3 Indicate bedding planes of stone units. Duplicate bedding marks on usable pieces of cut stone.
- .4 Place safety devices and signs near work area as directed in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

- .5 Install and remove self-supporting scaffolding in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
- .6 Cover adjacent plant material and fragile surfaces.

### **3.3 Stone Removal**

- .1 Rake out mortar joints of stones which are split through, have failed in compression and been crushed, are spalling, have eroded to less than 3/4 their original depth or are indicated on the accompanying drawings.
- .2 Remove loose material from deteriorated stones. Create level surface 50 mm from masonry face for setting of stone face plates.
- .3 Clean dust, mortar and stone fragments from slot.

### **3.4 Cutting/sizing Of Stone**

- .1 Use calipers, squares and levels to measure hole for new stone. Allow for mortar joints of 6 mm thickness maximum. Where existing joints are wider, confirm joint thickness with NCC Representative.

### **3.5 Moving Stones**

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

### **3.6 Inserting Replacement Stone**

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

- .9 Grout all voids behind stone using specified grout.
- .10 Prior to finish pointing, provide light sandblast finish to limestone face to lighten colour of new stone.

**3.7 Filling Joints/pointing**

- .1 Fill joints and point: in accordance with Section 04 03 07 - Historic - Masonry Repointing.

**3.8 Cleaning**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Confirm acceptance of mock-up cleaning operations to demonstration from NCC Representative before starting cleaning work.
- .3 Protect vegetation and adjacent grounds from water accumulation.
- .4 Clean stone work surfaces after repairs have been completed and mortar has set.
- .5 Clean stone surfaces of adhesive or mortar residue resulting from work performed without damaging stone or joints.
- .6 Clear site of debris, surplus material and equipment, leaving work area in clean and safe condition.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 04 03 08 – Mortar.
- .2            Section 04 03 31 - Masonry Brickwork.
- .3            Section 04 03 41 – Historic - Repairing Stone.
- .4            Section 04 03 42 - Historic - Replacing Stone.

**1.2                ADMINISTRATIVE REQUIREMENTS**

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

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.4                CLOSEOUT SUBMITTALS**

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

**1.5                QUALITY ASSURANCE**

- .1            Quality assurance in accordance with Section 00 01 10 – General Instructions: Quality Assurance.
- .2            Qualifications:
  - .1            Masonry Contractor:
    - .1            Work of this Section: executed by contractor specializing in historic stone conservation work, using similar stone dismantling techniques, and with a minimum 10 year record of successful performance.
  - .2            Foreperson:
    - .1            Provide competent trade foreperson specializing in type of work required.
    - .2            Experience: minimum 10 years successful experience in deconstruction of historic stone masonry. Must be present on site throughout Work.

- .3 Dismantlers:
  - .1 Experience: minimum 5 year record of successful masonry dismantling.
- .3 Mock-ups:
  - .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
  - .2 Perform mock-up 1000 m x 100 m to demonstrate dismantling procedures.
  - .3 Notify NCC Representative minimum of 24 hours prior to construction of mock-up.
  - .4 Perform mock-up under supervision of NCC Representative to demonstrate a full understanding of specified procedures and techniques is achieved before work commences.
  - .5 Perform mock-up where directed by NCC Representative.
  - .6 Work not to proceed prior to approval of mock-up. Allow 24 hours for inspection of mock-up by NCC Representative before proceeding with masonry dismantling work.
  - .7 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may not remain as part of finished work.

## **1.6 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 Protect and store stones to facilitate their resetting.
  - .1 Store dismantled masonry units on wood platforms pallets , protected from exposure to water, elements, and potential mechanical damage within a shed fully covered under polyethylene.
  - .2 Submit storage and identification system to NCC Representative for review approval.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **1.7 AMBIENT CONDITIONS**

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

## **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 NCC Representative in writing of conditions detrimental to acceptable and timely completion of Work.

### **3.2 SITE VERIFICATION OF CONDITIONS**

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

### **3.3 PREPARATION**

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

### **3.4 PROTECTION**

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

### **3.5 SPECIAL TECHNIQUES**

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

- .3 To manage work and storage areas.
- .2 Keep chart or card index up-to-date and, if required, produce copy every day.
  - .3 Prepare chart or card index or drawing to contain relevant information.
- .5 Ensure that temporary marking will remain in use resistant to weather, handling and cleaning until final marking of stones.
- .6 Remove markings and adhesive without damaging units:
  - .1 Brush with vegetable fibre brush: either dry or with water.
  - .2 Use no solvent, acid or other chemical product

### **3.6 STRUCTURAL SUPPORT**

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

### **3.7 METHOD FOR LOOSENING STONES**

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

### **3.8 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 separators or wood shims to isolate units from hoisting belts.
- .6 Where damage occurs to stone, report to NCC Representative and repair stone in accordance with Section 04 03 41 - Historic - Repairing Stone specified procedures.
- .7 Make good damage incurred at no additional cost to Contract.
- .8 Obtain review and approval of repaired damage by NCC Representative.

### **3.9 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.

### **3.10 TEMPORARY STORAGE STAGING AREA**

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

### **3.11 CLEANING**

- .1 Clean in accordance with Section 04 03 06 - Historic - Cleaning Historic 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 NCC Representative .
  - .1 Do not use high pressure water jet.
- .4 Use chemical cleaning methods only with prior written approval of NCC Representative.

### **3.12 FINAL MARKING**

- .1 Do final marking after cleaning, on surface that supports good adhesion and legibility and will not be visible after resetting.
- .2 Do marking in colour. Dimensions: legible from distance of 2 metres.
- .3 Ensure that marking product used will not affect mortar to stone adhesion when resetting.
- .4 Ensure marking product used will survive storage until resetting of stone.

### **3.13 FINAL STORAGE**

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

**END OF SECTION**

**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1    Section 01 00 10 – General Instructions.
- .2    Section 01 33 00 – Submittal Procedures.
- .3    Section 07 62 00 – Sheet Metal Flashing and Trim.

**1.2            REFERENCES**

- .1    ASTM International
  - .1    ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2    ASTM A269-08, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .3    ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2    CSA International
  - .1    CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2    CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3    CSA S16-09, Design of Steel Structures.
  - .4    CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .5    CSA W59-M03(R2008), Welded Steel Construction (Metal Arc Welding) Metric.
- .3    Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1    Material Safety Data Sheets (MSDS).
- .4    The Master Painters Institute (MPI)
  - .1    Architectural Painting Specification Manual - current edition.

**1.3            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 sections plates pipe tubing bolts and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2    Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.
    - .1    For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.
- .3    Shop Drawings:
  - .1    Submit drawings.
  - .2    Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

- .3 Coordinate with Section 07 62 00 – Sheet Metal Flashing and Trim to confirm overall heights and connection details.

#### **1.4 QUALITY ASSURANCE**

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certifications: submit 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 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, in 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 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W and 350W.
- .2 Welding materials: to CSA W59.
- .3 Welding electrodes: to CSA W48 Series.
- .4 Bolts and anchor bolts: to ASTM A307.

#### **2.2 FABRICATION**

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof round headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

#### **2.3 FINISHES**

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m<sup>2</sup> to CAN/CSA-G164.

#### **2.4 ISOLATION COATING**

- .1 Isolate aluminum from following components, by means of bituminous paint:

- .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
- .2 Concrete, mortar and masonry.
- .3 Wood.

**2.5 GUTTER SYSTEM DOWNPIPES**

- .1 Fabricate from steel sections and plate formed to shapes and sizes as indicated.
- .2 Galvanize downpipes after fabrication.

**Part 3 Execution**

**3.1 EXAMINATION**

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

**3.2 ERECTION**

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to NCC Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CSA S16.
- .7 Touch-up galvanized surfaces with zinc rich primer.
  - .1 Primer: maximum VOC limit 250 g/L to GS-11.

**3.3 GUTTER SYSTEM DOWNPIPES**

- .1 Hand over downpipes to Section 07 62 00 – Sheet Metal Flashing and Trim for installation as indicated.

**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.

**3.5 PROTECTION**

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

**END OF SECTION**

## 1.1 REFERENCES

- .1 ASTM International
  - .1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 CSA International
  - .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
  - .2 CSA O121-08, Douglas Fir Plywood.
  - .3 CSA O141-05(R2009), Softwood Lumber.
  - .4 CSA O151-09, Canadian Softwood Plywood.
  - .5 CSA O153-M1980 (R2003), Poplar Plywood.
  - .6 CSA O325-07, Construction Sheathing.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .4 National Lumber Grades Authority (NLGA)
  - .1 Standard Grading Rules for Canadian Lumber 2010.

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

## 1.3 QUALITY ASSURANCE

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by grade mark in accordance with applicable CSA standards.
- .3 Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

## 1.4 DELIVERY, STORAGE, AND HANDLING

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

## Part 2 Products

### 2.1 LUMBER MATERIAL

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
  - .1 CSA O141.
  - .2 NLGA Standard Grading Rules for Canadian Lumber.
  - .3 CAN/CSA-Z809 or FSC or SFI certified.

- .2 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:
  - .1 S2S is acceptable ].
  - .2 Board sizes: "standard" or better grade.
  - .3 Dimension sizes: "standard" light framing or better grade.
  - .4 Post and timbers sizes: "standard" or better grade.

## **2.2 PANEL MATERIALS**

- .1 Douglas fir plywood: to CSA O121, standard construction .
  - .1 Urea-formaldehyde free.
  - .2 CAN/CSA-Z809 or FSC or SFI certified. Canadian softwood plywood (CSP): to CSA O151, standard construction.
  - .3 Urea-formaldehyde free.
  - .4 CAN/CSA-Z809 or FSC or SFI certified.
- .2 Poplar Plywood: to CSA O153, standard construction, urea-formaldehyde free.
  - .1 Urea-formaldehyde free.
  - .2 CAN/CSA-Z809 or FSC or SFI certified.

## **2.3 ACCESSORIES**

- .1 Nails, spikes and staples: to CSA B111.
- .2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .3 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs , recommended for purpose by manufacturer.

## **2.4 FINISHES**

- .1 Galvanizing: to ASTM A123/A123M ASTM A653/A653M, use galvanized fasteners for exterior work interior highly humid areas.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Treat surfaces of material with wood preservative, before installation.
- .2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.
- .3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.
- .4 Treat material as follows:
  - .1 Wood cants, fascia backing, curbs, nailers, sleepers on roof deck.
  - .2 Wood furring on outside surface of exterior masonry and concrete walls.
  - .3 Wood sleepers supporting wood subflooring over concrete slabs in contact with ground or fill.

**3.2           INSTALLATION**

- .1       Comply with requirements of NBC, supplemented by the following paragraphs.
- .2       Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.
- .3       Align and plumb faces of furring and blocking to tolerance of 1:600.
- .4       Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .5       Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.
- .6       Install sleepers, blocking and strapping as indicated and as coordinated with Section 07 31 29 - Wood Shingles And Shakes.
- .7       Use caution when working with particle board. Use dust collectors and high quality respirator masks.

**3.3           ERECTION**

- .1       Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2       Countersink bolts where necessary to provide clearance for other work.

**END OF SECTION**

## 1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM D226 / D226M - 09 Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
  - .2 ASTM D1970 / D1970M - 11 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protectiond.
  - .3 ASTM D5116-97, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.
- .2 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
- .3 Canadian Standards Association (CSA International).
  - .1 CSA A123.3-98, Asphalt Saturated Organic Roofing Felt.
  - .2 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
  - .3 CSA 0118.1-97(R2002), Western Cedars Shakes and Shingles.
- .4 Cedar Shake and Shingle Bureau (CSSB).
  - .1 CSSB-97, Cedar Shake and Shingle Grading Rules.
  - .2 CSSB New Roof Construction Manual for Roof Application Details 2002.
  - .3 CSSB Exterior and Interior Wall Manual for Sidewall Application Details 2002.

## 1.2 DEFINITIONS

- .1 Shingle: tapered slice of wood sawn from block with taper in direction of grain or axial direction.
- .2 Shake: split shingle of 9.5 mm thickness with or without taper occurring in direction of grain or axial direction.

## 1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's for caulking materials during application and curing.
- .2 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Indicate details of flashing installation.
- .3 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Submit duplicate full size shingles and shakes, of finish and profile specified.
- .4 Manufacturer's Instructions:
  - .1 Submit manufacturer's installation instructions.

## **1.4 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: company or person specializing in shingle and shake work installations with 10 years documented experience in wood roofing work, especially for historic wood roofing.
  - .2 Submit evidence of this experience for NCC Representative's approval prior to engagement and mobilization on site.
- .2 Job Mock-up:
  - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
    - .1 Provide 1200 mm x 1200 mm mock-up including components as follows:
      - .1 Roof 1 eave including gable.
      - .2 Roof 2 eave.
      - .3 Roof 3 eave.
      - .4 Roof 1 ridge.
      - .5 Roof 1 and 2 valley.
      - .6 Roof 1 dormer side wall including roof juncture and roof edge.
      - .7 Roof 1 dormer gable, trim and apron flashing.
    - .2 Construct portion of roof shingling including ridge showing repetitive pattern, weather exposure, fitting and dressing and nailing'
    - .3 Mock-up will be used:
      - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
      - .4 Allow 48 hours for inspection of mock-up before proceeding with work.
      - .5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may not remain as part of finished work. Remove mock-up and dispose of materials when no longer required and when directed by NCC Representative .
  - .3 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
  - .4 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
  - .5 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Packing, Shipping, Handling and Unloading:
  - .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Remove only in quantities required for same day use.
- .2 Storage and Protection:
  - .1 Provide and maintain dry, off-ground weatherproof storage.

**1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert unused wood materials from landfill to recycling reuse composting facility approved by NCC Representative.

**1.7 UNUSED MATERIALS**

- .1 Unused shingles remain property of NCC Representative.
- .2 Return unused shingles to NCC Representative. Retain packaging or rewrap shingles to form complete bundles.
- .3 Label packages to identify product, quantity and manufacturer/supplier.
- .4 Deliver and store in location designated by NCC Representative.

**1.8 MAINTENANCE**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
  - .2 Provide information on preservation and restoration of shingles .

**Part 2 Products**

**2.1 MATERIALS**

- .1 Circular saw shingles:
  - .1 Species: western red cedar.
  - .2 Grade: No.1 Blue Label with impregnated fire-retardant CERTIGUARD treatment.
  - .3 Profile: 19 mm at butt.
  - .4 Widths: random widths 100 mm minimum 200 mm maximum dimension.
  - .5 Lengths: 457 mm.
  - .6 Grain: edge grain.
  - .7 Wood: 100% heartwood, free of knots.
  - .8 Preparation: unsanded face.
- .2 Underlayment/eave protection:
  - .1 Roofing felt: Type. 30, asphalt-saturated organic felt to CSA A123.6.
- .3 Wood Strapping and cross purlins:
  - .1 Install as per drawings
- .4 Ice and waterproofing Membrane:
  - .1 Self-adhered roofing underlayment: rubberized asphalt adhesive on cross laminated polyethylene
  - .2 Thickness: 1.02 mm
  - .3 Tensile Strength: 1720 KN/m<sup>2</sup>
  - .4 Elongation: 250%

- .5 Permeability: max 0.05 Perms
- .5 Flashing:
  - .1 All flashings as per Section 07 62 00 Sheet Metal Flashing and Trim
- .6 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.
- .7 Shingle nails:
  - .1 Ring shank stainless steel nails:
- .8 Ventilation and Rainscreen Drainage Layer:
  - .1 Three dimensional nylon matrix, eight channels per 100mm, with edge screen, 50 year warranty.
- .9 Vapour permeable water proof membrane:
  - .1 Nominal weight: 170g/m<sup>2</sup>.
  - .2 Nominal Thickness: 0.6 mm.
  - .3 Water Vapour Transmission: minimum 3,400 ng/Pa/s/m<sup>2</sup> (60 perms) Procedure A.
  - .4 Moisture Vapour Transmission Rate (MVTR): minimum 1500 gm/m<sup>2</sup> / 24 hrs.
  - .5 Vapour Resistance: 0.21 MNsg.
  - .6 Hydrostatic pressure: 7160mm.
  - .7 Tensile Strength: MD – 330 N/50mm, CD – 250 N/50mm.
  - .8 Burst Strength: 708kNm.
  - .9 Low/High Temperature Unrolling: ASTM D1970: Pass.
  - .10 Pliability: to ASTM D226: MD – Pass, XMD – Pass.
  - .11 Liquid Water Transmission: ASTM 4869: pass.

### **Part 3 Execution**

#### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

#### **3.2 STRIPPING OFF OF EXISTING FINISHES**

- .1 Remove existing roof and dormer finishes, flashings and underlay, and expose sheathing of roof and dormer wall sheathing.
- .2 Withdraw existing shingle and flashing nails, setting those nails which break off. Leave surfaces free from dirt and loose material.
- .3 NCC Representative to inspect roof sheathing. Take up, cut out, remove burn out portion of sheathing boards affected by fungal or insect attack as directed on site by NCC Representative
- .4 Report to NCC Representative unforeseen deficiencies and deterioration. Repair as directed.

### **3.3 ROOF DECK PREPARATION**

- .1 Replace cut out portions of sheathing boards with boards of equal sectional dimensions, of specified grade.
  - .1 Seat each end of board on rafter, with 25 mm minimum bearing.
  - .2 Secure to rafter with nails.
- .2 Install plywood sheathing with all fasteners flush with or below surface
- .3 Install continuous waterproofing membrane with joints lapped 150 mm to shed water.
- .4 Shingle lath: lath members same as shingle exposure. Lay one roof boards 250 mm in width along eaves to receive first courses of shingles. Lay similar amount at hips and ridges. Lay one board on each side of valleys. At chimneys and ventilators, board roof to first rafter on each side; lay additional boarding front and back (in addition to any chimney saddle).
- .5 Inform NCC Representative when work is completed and ready for inspection.

### **3.4 INSTALLATION OF FLASHINGS**

- .1 Valley flashings:
  - .1 Intersecting roof planes of equal pitch: valley sheets to extend from centre line of valley, up each side a distance of at least 450 mm.
- .2 Change of slope:
  - .1 Extend exposed change of slope on upper slope flashing as far as possible without being punctured by nails and cleated. On lower slope, extend change of slope minimum 150 mm over shingles. Insert wood cant held by soldered metal straps 25 mm above butts of first course of upper slope.
- .3 Hip and ridge:
  - .1 Install hip and ridge flashing beneath last course of shingles. Flashing to extend on each side of ridge to depth of last course.
  - .2 Extend hip and ridge flashing over centre line of hip or ridge on each side for distance of not less than 75 mm.
- .4 Base:
  - .1 Flashings:
    - .1 Minimum height 200 mm.
    - .2 Minimum projection 150 mm out on roof.
  - .2 Where base flashing is stepped, ensure steps are equal, horizontal width between 230 and 300 mm and vertical height between 2 and 4 courses.
  - .3 On sloped intersections, ensure sheets are lapped minimum 75 mm.
  - .4 When run horizontally, ensure sheets are flat locked and soldered.
  - .5 Ensure lock seam joints at vertical corners of chimney.
- .5 Cap flashings or counter flashings:
  - .1 Turn cap flashings down over base flashings not less than mm 100 mm. Extend to within 25 mm of surface of finished roof.
  - .2 Extend wood wall coverings up under exterior coverings such as wood siding and shingles at least 50 mm above butt of second shingle course.
  - .3 Chimney and vent flashings: flash and counter-flash.

- .4 Mechanical venting: flash around all penetrations. Shingles to extend within 25 mm of flashings.
- .6 Continuous flashings:
  - .1 Flashings:
    - .1 Heights: as indicated
    - .2 Minimum projection out on roof: 150 mm
  - .2 Lap sheets minimum 100 mm and solder only on top.
- .7 Sidewall:
  - .1 Provide window caps and other projections with flashings at points where rain water accumulates or snow piles. Extend flashings up under cladding of side walls at least 150 mm.
  - .2 Ensure mitred corners or jointed corners with square strip or moulding have continuous narrow metal flashing strip. Step flash woven inside corners.

### **3.5 ROOF AND SIDEWALL APPLICATION**

- .1 Install shingles over dry substrate with water proof membranes, vapour permeable waterproof membranes and rainscreen breather membrane as indicated.
- .2 Spacing:
  - .1 Roof application:
    - .1 Shingles under 130 mm wide min. 3 mm joints.
    - .2 Shingles over 130 mm wide 6-13 mm joints.
    - .3 Rived or sawn shingles, generally approx. 6 mm joints.
- .3 Joints:
  - .1 Stagger joints maximum of 32mm in succeeding courses.
- .4 Nailing:
  - .1 For concealed nailing, typical roof, use 2 nails per shingle per shingle up to 200 mm wide 3 nails per shingle in excess of 200 mm wide. Space nails 25 mm from edge with additional nails 100 mm apart across face of shingle and 40 mm above butt line of following course.
  - .2 Bottom shingles of double starter course to have additional line of nailing 13 mm back from overhang. Spacing to be similar to that of typical roof course.
  - .3 Provide extra nailing to final course of shingles at ridge, 25 mm plus down from ridge for sawing off, in situ, is required.
  - .4 Drive nails flush but do not crush shingles.
- .5 Rainscreen
  - .1 Install as per manufacturer's printed instructions and details.

### **3.6 SHINGLE ROOFING**

- .1 Install water proof membranes and vapour permeable waterproof membranes as indicated.
- .2 Install wood furring and strapping as indicated, Adjust spacing of strapping to exposure of shingles to match previous roof shingle exposure.
- .3 Underlayment:
  - .1 Install asphalt-saturated organic felt under shingle roof.

- .2 Install parallel to eaves with head and end lap of not less than 50 mm.
  - .3 Top edge of each strip to be fastened with sufficient roofing nails to hold it in place until shingles are applied.
  - .4 After each course of shakes is applied, lay 450 mm wide strip of No. 30 of felt reinforced over top portion of shakes, extending onto strapping, with bottom edge of felt positioned at minimum distance above butt equal to twice weather exposure.
- .4 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 25 mm from first sheathing board or face of crown moulding.
- .5 Typical course:
- .1 Install shingles with weather exposure and having triple thickness of shingles at any given point.
  - .2 Lay shingles with grain perpendicular to eaves.
  - .3 In laying mixed flat and vertical grain shingles, avoid lining up joints with centre-lines of "hearts" and never break a joint directly below centre-lines of "hearts".
  - .4 Keep shingles shakes 25 mm clear of any vertical flashing.
- .6 Finishing open valleys:
- .1 Sheathing to be blocked out at base of valley where and as indicated.
  - .2 Tilting fillets to run along both sides of all valleys.
  - .3 Do not lay shingles with grain parallel to centre line of valleys.
  - .4 Cut to proper mitre shingles extending into valleys.
  - .5 Joints shall not be broken into valleys.
  - .6 Line up at least 25 mm farther back from centre line of valley on lower slope side, shingles extending into valleys formed by roofs of unequal pitch.
  - .7 Open portion of valley should be at least 100 mm tapered from width of at least 50 mm where it starts to wider width as it descends at rate of 5 mm/m of length.
- .7 Finishing ridges:
- .1 "Boston" lap, site applied shingles:
    - .1 Apply as above for finishing hips
    - .2 Coordinate installation with ventilated ridge.

### **3.7 CLEANING**

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.
- .2 Remove roofing nails that have fallen on ground using high powered, earth magnets or other collection devices. Nail pickup to NCCRepresentative's approval.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 01 00 10 – General Instructions.
- .2    Section 05 50 00 – Metal Fabrications.
- .3    Section 07 31 29 - Wood Shingles And Shakes.
- .4    Section 07 92 00 - Joint Sealing.

**1.2                REFERENCES**

- .1    The Aluminum Association Inc. (AAI)
  - .1    AAI-Aluminum Sheet Metal Work in Building Construction-2002.
  - .2    AAI DAF45-03, Designation System for Aluminum Finishes.
- .2    American Society for Testing and Materials International (ASTM)
  - .1    ASTM A167-99(2004), Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - .2    ASTM A240/A240M-07e1, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - .3    ASTM A606-04, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
  - .4    ASTM A653/A653M-07, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .5    ASTM A792/A792M-06a, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
  - .6    ASTM B32-04, Standard Specification for Solder Metal.
  - .7    ASTM B370-03, Standard Specification for Copper Sheet and Strip for Building Construction.
  - .8    ASTM D523-89(1999), Standard Test Method for Specular Gloss.
  - .9    ASTM D822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .3    Canadian Copper & Brass Development Association (CCBDA).
  - .1    Copper in Architecture Handbook, 1995.
- .4    Canadian Roofing Contractors Association (CRCA)
  - .1    Roofing Specifications Manual 1997.
- .5    Canadian General Standards Board (CGSB)
  - .1    CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
  - .2    CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.
- .6    Canadian Standards Association (CSA International)
  - .1    CSA A123.3-05, Asphalt Saturated Organic Roofing Felt.
  - .2    CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

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

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 00 10 General Instructions.
- .3 Shop Drawings:
  - .1 Shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Coordinate with Section 05 50 00 – Metal Fabrications for sizes and fabrication of gutter system downpipes.
- .4 Samples:
  - .1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes and colours.
  - .2 Submit duplicate samples of gutter system pieces, and 2 x 400mm lengths of gutter profile with outlet, end gaps and gutter guard installed.
- .5 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
  - .1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and .
  - .2 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3, FIELD QUALITY CONTROL.

### **1.4 QUALITY ASSURANCE**

- .1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with contractor's representative and NCC Representative in accordance with Section 01 00 10 General Instructions to:
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Co-ordination with other building subtrades.
  - .4 Review manufacturer's installation instructions and warranty requirements.

### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2 Products**

**2.1 SHEET METAL AND Metal MATERIALS**

- .1 Lead coated copper: to B101-02 Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction.
  - .1 "20 oz" sheet, 0.655mm thick, for general work.
  - .2 "32 oz" Sheet, 1.04 mm thick for chimney cap.
- .2 Bronze bar stock and shapes as indicated.
- .3 Aluminum sheet: prefinished.
  - .1 For gutter systems as indicated on drawings and noted.
  - .2 Thickness: 0.8mm thick for gutter and 0.60mm for elbows and outlets
  - .3 Colour: manufactured with pre-finished white selected from standard manufacturer's colour range.

**2.2 ACCESSORIES**

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CAN/CGSB 37.5.
  - .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168 to GSES GS-36.
- .3 Underlay for metal flashing: dry sheathing to CAN/CGSB-51.32 No. 15 perforated asphalt felt to CSA A123.3.
- .4 Sealants: in accordance with Section 07 92 00 - Joint Sealing or as recommended by the manufacturer.
- .5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness mm same as sheet metal being secured.
- .6 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application. For gutter system use stainless steel fasteners. Stainless steel fasteners to have heads colour matched to gutter system where visible.
- .7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .8 Flux: rosin, cut hydrochloric acid, or commercial preparation suitable for materials to be soldered.

**2.3 FABRICATION**

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details and Copper in Architecture Handbook details, and as indicated.
- .2 Fabricate aluminum flashings and other sheet aluminum work in accordance with AAI-Aluminum Sheet Metal Work in Building Construction.
- .3 Form pieces in maximum lengths.
  - .1 Make allowance for expansion at joints.
- .4 Hem exposed edges on underside 12 mm.

- .1 Mitre and seal corners with sealant.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
- .7 Solder assemblies together, use lock joints and hidden fasteners to minimize soldering.

## **2.4 METAL FLASHINGS**

### **2.5 Form flashings, copings and fascias to profiles indicated.**

## **2.6 CHIMNEY CAP**

- .1 Verify size of chimneys before preparation of shop drawings.
- .2 Fabricate to shapes as indicated.

## **2.7 EAVES TROUGHS AND DOWNPIPES**

- .1 Form eaves troughs and downpipes from prefinished aluminum sheet to form seamless gutters.
- .2 "K" style gutter profile, 125mm throat.
- .3 Provide goosenecks, outlets, strainer baskets, leaders, hangers and elbows, and necessary fastenings.
- .4 Provide aluminum perforated gutter guard made from hi-temper aluminum. Gutter guard designed to provide additional rigidity and strength to the gutter.
- .5 Coordinate with Section 05 50 00 – Metal Fabrications for fabrication of the downpipes to ensure heights work with site conditions.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

### **3.2 INSTALLATION**

- .1 Install sheet metal work in accordance with CRCA FL series details, Copper in Architecture Handbook and as detailed.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal.
  - .1 Secure in place and lap joints 100 mm.
- .4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.
  - .1 Flash joints using S-lock forming tight fit over hook strips.
- .5 Lock end joints and caulk with sealant.

- .6 Install surface mounted reglets true and level, and caulk top of reglet with sealant.
- .7 Insert metal flashing into reglets under cap flashing to form weather tight junction.
- .8 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.
- .9 Caulk flashing at reglet cap flashing with sealant.
- .10 Install pans, where shown around items projecting through roof membrane.

### **3.3 EAVES TROUGHS AND DOWNPIPES**

- .1 Install eaves troughs and secure to building at 400 mm max on centre.
  - .1 Slope eaves troughs to downpipes as indicated.
  - .2 Seal joints watertight.
- .2 Install downpipes and provide goosenecks back to wall.
  - .1 Obtain downpipes from Section 05 50 00 – Metal Fabrications.
  - .2 Secure downpipes to wall and post with brackets and fasteners as indicated.
  - .3 Connect to underground drainage as indicated.
- .3 Install splash pans as indicated.

### **3.4 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 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.

### **3.5 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Leave work areas clean, free from grease, finger marks and stains.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
  - .2 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Manufacturer's product to describe:
    - .1 Caulking compound.
    - .2 Primers.
    - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
  - .3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 00 10 General Instruction - Health and Safety Requirements.
- .3 Samples:
  - .1 Submit 2 samples of each type of material and colour.
  - .2 Cured samples of exposed sealants for each colour where required to match adjacent material.
- .4 Manufacturer's Instructions:
  - .1 Submit instructions to include installation instructions for each product used.
  - .2 Construction Waste Management:
    - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

**1.3                CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with 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 off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

## **1.5 SITE CONDITIONS**

- .1 Ambient Conditions:
  - .1 Proceed with installation of joint sealants only when:
    - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
    - .2 Joint substrates are dry.
    - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
  - .2 Joint-Width Conditions:
    - .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.
  - .3 Joint-Substrate Conditions:
    - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

## **1.6 ENVIRONMENTAL REQUIREMENTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Health Canada.
- .2 Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

## **Part 2 Products**

### **2.1 SEALANT MATERIALS**

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.
- .3 Where sealants are qualified with primers use only these primers.

### **2.2 SEALANT MATERIAL DESIGNATIONS**

- .1 Type 1: Polyurethane one part:

- .1 Self-levelling: to CAN/CGSB-19.13, Type 1, colour selected from manufactures standard range.
- .2 Acceptable product:
  - .1 Tremco- Dymonic or approved equal.
- .2 Type 2: Silicones one part: to CAN/CGSB-19.13.
  - .1 Mildew resistance.
- .3 Type 3 :Acrylic latex one part: to CAN/CGSB-19.17.
- .4 Preformed compressible and non-compressible back-up materials:
  - .1 Polyethylene, urethane, neoprene or vinyl foam:
    - .1 Extruded closed cell foam backer rod.Size: oversize 30 to 50 %.
  - .2 Neoprene or butyl rubber:
    - .1 Round solid rod, Shore A hardness 70.
  - .3 High density foam:
    - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m<sup>3</sup>; density, or neoprene foam backer, size as recommended by manufacturer.
  - .4 Bond breaker tape:
    - .1 Polyethylene bond breaker tape which will not bond to sealant.

### **2.3 SEALANT SELECTION**

- .1 Perimeters of exterior openings where frames meet exterior facade of building (i.e. stucco, precast masonry): sealant type: 1.
- .2 Coping joints and coping-to facade joints: sealant type: 1.
- .3 Exterior joints in horizontal wearing surfaces (as itemized): sealant type:1 .
- .4 Interior control and expansion joints in floor surfaces: sealant type:2 .
- .5 Perimeters of interior frames, as detailed and itemized: sealant type:3 .
- .6 Interior masonry vertical control joints (block-to-block, block-to-concrete, and intersecting masonry walls): sealant type:1 .
- .7 Joints at tops of non-load bearing masonry walls at the underside of poured concrete: sealant type:1 .
- .8 Perimeter of bath fixtures (e.g. sinks, tubs, urinals, stools, water closets, basins, vanities): sealant type:2 .
- .9 Wood trim and assemblies sealant type: 1.
- .10 Gutter system: Waterproof as recommended by the manufacturer.

### **2.4 JOINT CLEANER**

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.
- .2 Primer: in accordance with sealant manufacturer's written recommendations.

**Part 3 Execution**

**3.1 EXAMINATION**

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

**3.2 SURFACE PREPARATION**

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

**3.3 PRIMING**

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

**3.4 BACKUP MATERIAL**

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

**3.5 MIXING**

- .1 Mix materials in strict accordance with sealant manufacturer's instructions.

**3.6 APPLICATION**

- .1 Sealant:
  - .1 Apply sealant in accordance with manufacturer's written instructions.
  - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
  - .3 Apply sealant in continuous beads.
  - .4 Apply sealant using gun with proper size nozzle.

- .5 Use sufficient pressure to fill voids and joints solid.
- .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
- .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
- .8 Remove excess compound promptly as work progresses and upon completion.
- .2 Curing:
  - .1 Cure sealants in accordance with sealant manufacturer's instructions.
  - .2 Do not cover up sealants until proper curing has taken place.

### **3.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day. Clean adjacent surfaces immediately.
  - .2 Remove excess and droppings, using recommended cleaners as work progresses.
  - .3 Remove masking tape after initial set of sealant.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.8 PROTECTION**

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

**END OF SECTION**

**PART 1 GENERAL**

**1.1 SUMMARY**

- .1 Related Sections:
  - .1 Section 06 40 00 - Architectural Woodwork.
  - .2 Section 07 92 00 - Joint Sealants.
  - .3 Section 08 61 20 - Wood Epoxy Consolidation.
  - .4 Section 08 61 30 - Wood Epoxy Patching.
  - .5 Section 09 91 13 - Exterior Re-Painting.
  - .6 Section 09 91 23 - Interior Re-Painting.

**1.2 DEFINITIONS**

- .1 Severe Deterioration: Deteriorated of the whole or part of an element to include voids and where the structural integrity of the element or the assembly in which the element is located is jeopardized.
- .2 Moderate Deterioration: Deterioration of the whole or part of an element to include voids and where the element is punctured under moderate pressure from a screwdriver, but where the structural integrity of the element or the assembly in which the element is located is not jeopardized.
- .3 Minor Deterioration: Deterioration of the whole or part of an element to the point where it feels soft but is not punctured under light pressure from a screwdriver, and voids do not exist.

**1.3 SUBMITTALS**

- .1 Shop Drawings:
  - .1 Include locations, dimensions, profiles, relationship to adjacent construction, hardware, weatherstripping, and attachments.
  - .2 Illustrate weatherstripping in relationship to each frame and sash profile.
- .2 Samples: 150mm long samples of each weatherstripping profile and replacement hardware.
- .3 Provide data and other product information per Section 01 33 00 - Submittal Procedures.
- .4 Qualification Statement: Restorer qualifications, including previous projects.

**1.4 QUALITY ASSURANCE**

- .1 Restorer Qualifications:
  - .1 Minimum 3 years experience in work of this Section.
  - .2 Successful completion of at least 3 projects of similar scope and complexity within past 5 years.
- .2 Mockups:

- .1 Stripped paint 300mm x 300mm.
- .2 Epoxy consolidated wood surface 300mm x 300mm.
- .3 Epoxy patched wood surface 300mm x 300mm.
- .4 Dutchman repair 50mm x 100x x 25mm.
- .5 Replacement mouldings and trim.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Replacement woods:
  - .1 Kiln dried white oak, free of any knots or other natural imperfections and free of any machining imperfections, for sills.
  - .2 Kiln dried eastern white pine-B select or better
  - .3 Orientation of grain to match that of original
  - .4 Use edge grain only on exterior
- .2 Adhesives:
  - .1 Exterior: Resorcinol™ resin adhesive (CSA 0112.7.7-M19777 Class II Type 1) or 2part epoxy 'G2' by Industrial Formulators of Canada Ltd.
  - .2 Interior: PVA (white carpenter's glue adhesive CSA 0112.7.7-M19777) is permitted only on the interior.
- .3 Linseed oil: Double boiled type
- .4 Sealant: As per Section 07 92 00 – Joint Sealants.
- .5 Isolation coating: alkali resistant bituminous paint.
- .6 Nails: All exterior use to be hot-dipped galvanised or stainless steel.
- .7 Primer (for back priming): Alkyd Primer.
- .8 Hardware:
  - .1 Hardware, heavy duty, commercial quality for heritage restoration and to suit styles installed on site.
  - .2 See schedule on drawings for additional information. .
- .9 Weatherstripping: Spring bronze profile or other profile used on site; Accurate Metal Weatherstripping Company Inc. or approved equal. Provide matching metal nails/fasteners.

**PART 3 EXECUTION**

**3.1 RESTORATION**

- .1 This Section describes the overall restoration of existing windows, shutters, doors related wood trim, hardware, and glass. Other sections referenced under "Related Sections" specify certain aspects of Work in more detail.

**3.2 REPAIR AND REPLACEMENT OF WOOD**

- .1 Severe Deterioration:
  - .1 Replace deteriorated wood sash and trim members with new wood.
  - .2 Match new wood to profile and grain of existing wood.
  - .3 Fabricate frame and sash members with mortised and tenoned joints. Fit to hairline joint, glue and nail. Stapling not permitted.
- .2 Moderate Deterioration:
  - .1 Epoxy patch voids as specified in Section 08 61 30 - Wood Windows Epoxy Patching.
  - .2 Consolidate soft wood as specified in Section 08 61 20 - Wood Windows Epoxy Consolidation.
- .3 Minor Deterioration: Consolidate soft wood as specified in Section 08 61 20 Wood Windows Epoxy Consolidation.
- .4 Missing Elements:
  - .1 Replace missing wood sash, door panel, frames and trim members with new wood.
  - .2 Match new wood to profile and grain of original wood.
  - .3 Fabricate frame and sash members with mortised and tenoned joints. Fit to hairline joint, glue and nail. Stapling not permitted.

**3.3 DISMANTLING**

- .1 All necessary dismantling, such as removal of mouldings, parting strips, sash, glass etc. shall be done with extreme care. Contractor is to use methods and means so as not to damage adjacent material or other window components.
- .2 Care must be taken with hammers, pry bars and other equipment so as not to mar visible surfaces and to avoid crushing, denting splitting and scuffing any window component and/or adjacent surface.
- .3 All window and door components which are dismantled shall be labelled according to the Window Schedule and retained for the duration of the project.
- .4 Labels are to be waterproof marker on gasket paper stapled to the removed window component, on a hidden surface and shall be applied as components are removed.
- .5 Store labelled components in logical fashion to allow easy location and to prevent component loss.
- .6 Use adequate support and padding for sashes and other window components to prevent warping or any other forms of deterioration.
- .7 Dismantle doors to repair cracks in panels.

**3.4 SPLICING AND DUTCHMEN**

- .1 Spliced material shall be the same as adjacent and original pieces with orientation and direction of grain to match.
- .2 Joints shall be tight so that, after finishing, only visible from close inspection
- .3 Backcut all spliced joints to prevent weather entry at join.
- .4 All material spliced in shall be attached to original and/or remaining component and not to adjacent component.
- .5 Use resorcinol glue for all exterior work.

**3.5 REPAIR AND REPLACEMENT OF HARDWARE**

- .1 Restore existing operable items to working condition.
- .2 Replace damaged and missing hardware.
- .3 Replace missing fasteners with new to. original. Tighten existing fasteners.
- .4 Lubricate operable parts.
- .5 Adjust for smooth operation.

**3.6 REPLACEMENT OF WEATHERSTRIPPING**

- .1 Replace damaged and missing weatherstripping.
- .2 Adjust window for smooth operation.

**3.7 REFINISHING WOOD**

- .1 Refinish wood as specified in Section 09 91 13 and 09 91 23.
- .2 Refinish exterior and interior wood as indicated.

**3.8 CAULKING**

- .1 Seal one window under direct review of NCC Representative before beginning remainder of work. Provide three days notice of start of work on sample window.
- .2 Carefully clean joints and spaces to be sealed with non-metallic brush and damp, lint free cloths. Ensure that locations to be caulked are dry, free of dust, loose mortar and other foreign material. Review proposed methods with NCC Representative prior to removing any material.
- .3 Mask adjacent historic fabric to protect from coating and staining with sealant. Upon completion remove masking and remove sealant smears or droppings.
- .4 Install backer rods where required so that depth of joint equals width
- .5 Form sealant smooth, concave, free from ridges, wrinkles, sags, air pockets and embedded foreign matter.

**END OF SECTION**

## **1 GENERAL**

### **1.1 DESCRIPTION**

- .1 General intent: The intent of this work covers:
  - .1 Consolidation of deteriorated wood using epoxy.
  - .2 Consolidate the severely weathered and checked wood surfaces, and any areas of fungal decay.
  - .3 Dents, gouges on the wood shall be consolidated in preparation for epoxy patching and tooling.

### **1.2 QUALITY INSURANCE**

- .1 Work to be completed by a company with a minimum of three years proven experience with this type of work.

### **1.3 SAMPLES**

- .1 Provide samples and data sheets of epoxy consolidant for review by NCC Representative.

### **1.4 MOCKUP**

- .1 Contractor will complete work one sample repair area as selected by NCC Representative. The work shall be performed under direct review by the NCC Representative. Acceptance of the sample repair is necessary before further consolidation work proceeds.
- .2 Provide three days notice to NCC Representative prior to undertaking sample window work.

### **1.5 STORAGE AND PROTECTION**

- .1 Deliver epoxies in manufacturer's original, unopened containers and store inside at room temperature or as recommended by manufacturer.
- .2 Flammable solvents may not be stored in or brought within 6.0 metres of a historic building.
- .3 Follow all safety precautions of epoxy as listed by product manufacturer.

### **1.6 SITE CONDITIONS**

- .1 Epoxy applications are to be performed in environmental conditions as listed below and as defined by manufacturer. Temperature within the work area and the temperature of the epoxy itself is to be between 15°C and 32°C. Wood within 10 cm of the consolidation area is to be within a temperature range of 7°C and 32°C. Construct temporary heated enclosures if required.
- .2 Areas to be consolidated must be dry with total moisture content below 18%.
- .3 Follow all safety precautions of epoxy as listed by product manufacturer.
- .4 Protect all surrounding heritage fabric from activities associated with this work. All fastenings into historic material associated with enclosures are to be approved by NCC Representative.

## **2 PRODUCTS**

### **2.1 MATERIALS**

#### **.1 Materials:**

##### **.1 Epoxy Consolidant:**

<<Conserv Flexible Epoxy Consolidant 100>> . .

## **3 EXECUTION**

### **3.1 INSPECTION**

- .1 All fungally deteriorated wood must be removed so as to more accurately define treatment. Exact parameters for consolidation may vary for each location and will require review with NCC Representative

### **3.2 PREPARATION**

- .1 All loose wood and soft wood decay must be removed down to sound wood prior to application of consolidant. Remove all loose wood fragments and **thoroughly** vacuum out all dust or blow out with compressed air.
- .2 Remove paint from areas being treated by careful use of heat guns, scraping chemical paint remover and sanding. No open flame devices shall be allowed.

### **3.3 APPLICATION**

- .1 Epoxy consolidant may be applied by pouring or with a brush.
- .2 Apply liberally to prepared decay area. Do not allow consolidant to touch adjacent areas or heritage fabric. Repeat applications until surfaces do not accept more consolidant (4-6 times). Allow approximately one hour between applications.
- .3 Keep epoxy consolidant out of direct sunlight and at temperatures above 15 degrees Celsius.

**END OF SECTION**

## **1 GENERAL**

### **1.1 DESCRIPTION**

- .1 General intent: The intent of this work covers:
  - .1 Patching of deteriorated wood using epoxy.
  - .2 Epoxy Patching for filling and making non-structural repairs on wood which has been previously treated with epoxy consolidant.
  - .3 Restore original profile of deteriorated components by filling and/or forming.

### **1.2 QUALITY INSURANCE**

- .1 Work to be completed by a company with a minimum of three years proven experience with this type of work. Provide evidence of this experience to NCC Representative when requested.

### **1.3 SAMPLES**

- .1 Provide samples of epoxy patch for review by NCC Representative

### **1.4 MOCKUP**

- .1 Contractor will complete work on one sample repair area as selected by NCC Representative. The work shall be performed under direct review by the NCC Representative. Acceptance of the sample window is necessary before further consolidation work proceeds.
- .2 Provide three days notice to NCC Representative prior to undertaking sample window work.

### **1.5 STORAGE AND PROTECTION**

- .1 Deliver epoxies in manufacturer's original, unopened containers and store inside at room temperature or as recommended by manufacturer.
- .2 Flammable solvents may not be stored in or brought within 6.0 metres of a historic building.
- .3 Follow all safety precautions of epoxy as listed by product manufacturer.

### **1.6 SITE CONDITIONS**

- .1 Epoxy applications are to be performed in environmental conditions as listed below and as defined by manufacturer. Temperature within the work area and the temperature of the epoxy itself is to be between 15°C and 32°C. Wood within 10 cm of the consolidation area is to be within a temperature range of 7°C and 32°C. Construct temporary heated enclosures if required.
- .2 Areas to be consolidated must be dry with total moisture content below 18%.
- .3 Follow all safety precautions of epoxy as listed by product manufacturer.
- .4 Protect all surrounding heritage fabric from activities associated with this work. All fastenings into historic material associated with enclosures work are to be approved by NCC Representative.

## **2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Epoxy Materials:
  - .1 Epoxy Patch:  
Conserv Flexible Epoxy Patch 200.
- .2 Fumed silica:
  - .1 Fumed silica or equal may be used to thicken the patch to enhance the tooling and application.

## **3 EXECUTION**

### **3.1 INSPECTION**

- .1 Wood must have been previously treated with epoxy consolidant before patching. Verify conditions and proposed treatment with NCC Representative.

### **3.2 PREPARATION**

- .1 Refer to Section 08 61 20 for epoxy consolidation preparation and application.
- .2 Protect all building fabric from spills or drips by means of drop cloths.

### **3.3 APPLICATION**

- .1 Epoxy patch may be applied with a putty knife, trowel or similar.
- .2 Apply patch to previously prepared cavities or checks. Do not apply in thicknesses greater than 38 mm or in any one area exceeding one litre at a time. Allow epoxy to set prior to applying subsequent layers.
- .3 For locations, such as at the outside corner of window sills, where the edge has been abraded away, the patch material shall be mixed at a low viscosity and cast to form the desired shape. Use butcher's wax as a release on the form. After the patch has cured remove all traces of the release wax with varsol to ensure adhesion of paint films.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            Division 1
- .2            Section 08 59 20 Wood Window and Door Restoration

**1.2                REFERENCES**

- .1            American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
  - .1            ANSI/BHMA A156.2-2003, Bored and Preassembled Locks and Latches.
  - .2            ANSI/BHMA A156.4-2000, Door Controls - Closers.
  - .3            ANSI/BHMA A156.10-1999, Power Operated Pedestrian Doors.
  - .4            ANSI/BHMA A156.18-2006, Materials and Finishes.
  - .5            ANSI/BHMA A156.19-2002, Power Assist and Low Energy Power - Operated Doors.
- .2            Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
  - .1            CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 - Submittal Procedures.
  - .1            Product Data:
    - .1            Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2            Samples:
    - .1            Submit for review and acceptance of each unit.
    - .2            Samples will be returned for inclusion into work.
    - .3            Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
    - .4            After approval samples will be returned for incorporation in Work.
  - .3            Hardware List: Submit contract hardware list.
    - .1            Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
  - .4            Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
  - .5            Manufacturer's Instructions: submit manufacturer's installation instructions.
  - .6            Construction Waste Management:
    - .1            Submit project Waste Management Plan highlighting recycling and salvage requirements.
  - .7            Recycled Content:
    - .1            Submit listing of recycled content products used, including details of required percentages or recycled content materials and products.

- .8 Regional Materials: submit evidence that project incorporates required percentage 10% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

#### **1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

#### **1.5 MAINTENANCE MATERIALS SUBMITTALS**

- .1 Extra Stock Materials:
  - .1 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Tools:
  - .1 Supply 2 sets of wrenches for door closers ,locksets and exit hardware.

#### **1.6 QUALITY ASSURANCE**

- .1 Regulatory Requirements:
  - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
  - .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

#### **1.7 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 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .4 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect door hardware from nicks, scratches, and blemishes.
  - .3 Protect prefinished surfaces with wrapping.
  - .4 Replace defective or damaged materials with new.

### **Part 2 Products**

#### **2.1 HARDWARE ITEMS**

- .1 Use one manufacturer's products only for similar items.

## 2.2 DOOR HARDWARE

- .1 Locks and latches:
  - .1 Bored and preassembled locks and latches: to ANSI/BHMA A156.2, designed for function as follows:
    - .1 Lever type L, Non –cylinder function, latchbolt by either lever, AANSI F75. Finished to 626.
    - .2 Acceptable products: SARGENT® 10 Line 11-73-7P, or preapproved equivalent.
- .1 Door Operators:
  - .1 Power-operated pedestrian doors: to CAN/CGSB-69.26.
    - .1 Acceptable Products: Hunter HA-8, or approved equivalent.
    - .2 Acceptable Products: CAMDEN DOOR CONTROLS (905.366.1455) wireless (RF) switches, for Glazed Aluminum doors, or preapproved equivalent.
  - .2 Refer to hardware schedule for model numbers and descriptions of work. Auto operators are to be supplied and installed by Hardware supplier.
  - .3 Location of Switches to be confirmed on site.
  - .4 Auxiliary locks and associated products: to ANSI/BHMA A156.5, as listed below:
    - .1 Dead bolt, finished to 10BL. Key into keying system as directed.
    - .2 Acceptable Products: SARGENT® ASSA ABLOY 470 Series, Model 475-BR, grade 2 Standard, or preapproved equivalent.
  - .5 Cylinders: finished to 10B, for installation in deadlocks provided with. Key into keying system as directed.
    - .1 Acceptable Products: ASSA® 6000 Series deadbolt
- .2 Thresholds: full width of door opening, extruded aluminum mill finish, serrated surface, with oak species block.
  - .1 Acceptable products: Frost King Adjustable aluminum and oak sill threshold, or preapproved equivalent.

## 2.3 FASTENINGS

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply manufacturers' instructions for proper installation of each hardware component.
- .3 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
- .4 Use only manufacturer's supplied fasteners.
- .5 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

**3.2 ADJUSTING**

- .1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .2 Lubricate hardware, operating equipment and other moving parts.
- .3 Adjust door hardware to ensure tight fit at contact points with frames.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .2 Leave Work area clean at end of each day.
- .3 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
- .4 Remove protective material from hardware items where present.
- .5 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .6 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .7 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.4 DEMONSTRATION**

- .1 Maintenance Staff Briefing: Brief maintenance staff regarding:
  - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
  - .2 Use, application and storage of wrenches for door closers locksets and exit hardware.
  - .3 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

**3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.

- .2 Repair damage to adjacent materials caused by door hardware installation.

**3.6 SCHEDULE**

- .1 Install door operator and new wireless paddles at main entrance door. Exact location of components to be confirmed on site.
- .2 Install new bored locks on two exterior washroom doors, replacing existing.
- .3 Install new deadbolt & cylinder on one interior washroom door, replacing existing.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1        Section 04 03 07 - Historic - Masonry Repointing.
- .2        Section 09 91 13 - Exterior Repainting.

**1.2                REFERENCES**

- .1        American Society for Testing and Materials (ASTM International)
  - .1        ASTM C35-01, Specification for Inorganic Aggregates for Use in Gypsum Plaster.
  - .2        ASTM C206-84(1997), Specification for Finishing Hydrated Lime.
  - .3        ASTM C841-99, Specification for Installation of Interior Lathing and Furring.
- .2        Canadian Standards Association (CSA International)
  - .1        CAN/CSA-A3000-[98], Cementitious Materials Compendium.

**1.3                QUALITY ASSURANCE**

- .1        Qualifications: Work to be undertaken by skilled personal with a minimum 10 years experience, references to be made available upon request.
- .2        Mock-up: construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .3        Locate where directed.
- .4        Before application of plaster coat, at location designated by NCC Representative prepare 1 m<sup>2</sup> representative sample plastering coat showing stages of installation.
- .5        Allow 48 hours for inspection of mock-up by NCC Representative before proceeding with plaster work.
- .6        When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work on approval of NCC Representative

**1.4                DELIVERY, STORAGE, AND HANDLING**

- .1        Deliver, store and handle in accordance with the provision of Section 01 61 00 - Common Product Requirements.
- .2        Ensure bagged materials are delivered to site and stored in original containers.
- .3        Ensure loose material is delivered, clean, and stored to prevent contamination by foreign material.
- .4        Protect material from damage by moisture and freezing.

**1.5                ENVIRONMENTAL REQUIREMENTS**

- .1        Do plaster work when ambient temperature is between 13°C and 21°C under conditions specified in ASTM C842.

- .2 Ventilate to facilitate proper application and curing of plaster in accordance with Section 01 51 00 - Temporary Utilities.

## **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material, in appropriate on-site for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility.
- .5 Divert unused aggregate materials from landfill.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Fasteners: stainless
- .2 Metal Lath: Use self-furring stainless steel metal lath to ASTM C841 of type and weight to suit plaster system.
- .3 Hydrated Lime: to [STM C206].
- .4 Gypsum Plaster: to ASTM C842.
- .5 Gypsum Gauging Plaster to ASTM C842.
- .6 Cement: to CAN/CSA-A3000.
- .7 Portland Cement: to CAN/CSA-A3000.
- .8 Sand: to ASTM C35. Clean, sharp, free from deleterious matter.
- .9 Water: potable, free of substances that would affect set of plaster.
- .10 Admixtures: use only with written approval of NCC Representative.
- .11 Bonding agent.

### **2.2 MIXES**

- .1 Stucco plaster mix:
  - .1 Base coat: exterior grade, premixed plastering cement.
  - .2 Scratch coat: exterior grade, premixed, white finishing plaster.
  - .3 Finishing coat: exterior grade, premixed, finishing plaster.
- .2 Mix plaster in accordance with [ASTM C842 unless otherwise specified and premixed plaster manufacturer's written recommendations.

- .3 Accurately maintain measuring proportions from batch to batch.
- .4 Have materials batch mixed.
- .5 Slake lime in metal bin.
- .6 Keep mixing tools and bins free of hardened residue.
- .7 Time limit: discard mix that is not used and placed within 2 hours or as directed by manufacturer.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

- .1 Examine existing plaster surfaces and methods of reproducing texture and finish.

#### **3.2 PROTECTION**

- .1 Protect any fittings and surfaces adjacent to work by covering or masking.

#### **3.3 PREPARATION**

- .1 Remove plaster in areas indicated down to masonry, clean masonry.
- .2 Cut out perimeter with saw blade set to depth so as not to cut into stone. If cutting of stone occurs, then hand tools will have to be used.
- .3 Leave edges undercut with back bevel and slightly rough.

#### **3.4 INSTALLATION**

- .1 Install to ASTM C842.
- .2 Use bonding agents on masonry.

#### **3.5 APPLICATION**

- .1 Ensure that plaster finish follows surface irregularities to maintain authenticity of original work.
- .2 Do plaster work to ASTM C842, unless otherwise specified.
- .3 Base Coat:
  - .1 Apply first coat, thickness 9 mm minimum, with trowel, using sufficient pressure to force it between gaps of lath. Ensure even surface.
  - .2 Scratch surface with broom when initial set is obtained (2-4 days).
  - .3 Keep base coat damp for 3 days.
  - .4 Cure base coat 10 days in ventilated surroundings.
- .4 Intermediate scratch coat:
  - .1 Wet base coat 1 hours before application of scratch coat.
  - .2 Apply scratch coat to 6 mm thickness.
  - .3 Keep scratch coat damp for 2 days.

- .4 Cure 5 days.
- .5 Finish coat:
  - .1 Wet intermediate coat thoroughly.
  - .2 Apply finish coat to 3 mm thickness minimum.
  - .3 Smooth finish coat with wood trowel to achieve desired texture and appearance.
  - .4 Cure 3 days.
  - .5 Trowel patch work to smooth surface, even with adjacent work.

**3.6 CLEANING**

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

**3.7 PROTECTION**

- .1 Protect finished adjoining work, during execution of plaster work, with polyethelene sheets or building paper.
- .2 Remove surplus material, tools, equipment and debris from work area on completion of work.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1      Division 1
- .2      Section 09 03 51 Historic Plaster
- .3      Section 09 21 16 Gypsum Board Assemblies
- .4      Section 09 21 99 Partitions for Minor Works
- .5      Section 09 64 29 Wood Strip and Plank Flooring
- .6      Section 09 91 13.01 Exterior Repainting

**1.2                REFERENCES**

- .1      Environmental Protection Agency (EPA)
  - .1      Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings).
- .2      Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1      Material Safety Data Sheets (MSDS).
- .3      The Master Painters Institute (MPI)
  - .1      Architectural Painting Specification Manual - February 2004.
  - .2      Standard GPS-1-05, MPI Green Performance Standard for Painting and Coatings.
- .4      National Fire Code of Canada.
- .5      Society for Protective Coatings (SSPC)
  - .1      Systems and Specifications, SSPC Painting Manual 2005.

**1.3                QUALITY ASSURANCE**

- .1      Qualifications:
  - .1      Contractor: to have a minimum of five (5) years proven satisfactory experience. When requested, provide list of last three (3) comparable jobs including, job name and location, specifying authority, and project manager.
  - .2      Qualified journeypersons as defined by local jurisdiction to be engaged in painting work
  - .3      Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.
  - .4      Conform to latest MPI requirements for exterior painting work including preparation and priming.
  - .5      Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.
  - .6      Paint materials such as linseed oil, shellac, and turpentine to be highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and to be compatible with other coating materials as required.

- .7 Retain purchase orders, invoices and documents to prove conformance with noted MPI requirements when requested by NCC Representative.
- .2 Standard of Acceptance:
  - .1 Walls: No defects visible from a distance of 1000 mm at 90 degrees to surface.
  - .2 Soffits: No defects visible from floor at 45 degrees to surface when viewed using final lighting source.
  - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

#### **1.4 PERFORMANCE REQUIREMENTS**

- .1 Environmental Performance Requirements:
  - .1 Provide paint products meeting MPI "Environmentally Friendly" E2 ratings based on VOC (EPA Method 24) content levels.
- .2 Green Performance in accordance with MPI Standard GPS-1.

#### **1.5 SCHEDULING**

- .1 Submit work schedule for various stages of painting to NCC Representative for approval. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from NCC Representative for changes in work schedule.
- .3 Schedule painting operations to prevent disruption of occupants in and about building.

#### **1.6 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
  - .3 Upon completion, submit records of products used. List products in relation to finish system and include the following:
    - .1 Product name, type and use.
    - .2 Manufacturer's product number.
    - .3 Colour numbers.
    - .4 MPI Environmentally Friendly classification system rating.
    - .5 Manufacturer's Material Safety Data Sheets (MSDS).
- .3 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating and special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:
    - .1 3 mm plate steel for finishes over metal surfaces.

- .2 13 mm birch plywood for finishes over wood surfaces.
- .3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
- .4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
- .5 10 mm plywood for finishes over wood surfaces.
- .2 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.
- .3 Submit full range of available colours where colour availability is restricted.

### **1.7 QUALITY CONTROL**

- .1 Provide mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 When requested by NCC Representative or Paint Inspection Agency, prepare and paint designated surface, area, room or item to requirements specified herein, with specified paint or coating showing selected colours, number of coats, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.

### **1.8 MAINTENANCE**

- .1 Extra Materials:
  - .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
  - .2 Submit one (1) one-litre can of each type and colour of primer, stain and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

### **1.9 SUSTAINABLE REQUIREMENTS**

- .1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

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

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements, supplemented as follows:
- .2 Deliver and store materials in original containers, sealed, with labels intact.
- .3 Labels: to indicate:
  - .1 Manufacturer's name and address.
  - .2 Type of paint or coating.
  - .3 Compliance with applicable standard.
  - .4 Colour number in accordance with established colour schedule.
- .4 Remove damaged, opened and rejected materials from site.
- .5 Provide and maintain dry, temperature controlled, secure storage.

- .6 Observe manufacturer's recommendations for storage and handling.
- .7 Store materials and supplies away from heat generating devices.
- .8 Store materials and equipment in well-ventilated area with temperature range 7 degrees C to 30 degrees C.
- .9 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .10 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of NCC Representative. After completion of operations, return areas to clean condition to approval of NCC Representative.
- .11 Remove paint materials from storage only in quantities required for same day use.
- .12 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .13 Fire Safety Requirements:
  - .1 Provide one 9 kg Type ABC dry chemical 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.
- .14 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .2 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
  - .3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
  - .4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
  - .5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:
    - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
    - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
    - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
    - .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
    - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
  - .6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

- .7 Set aside and protect surplus and uncontaminated finish materials. Deliver to or arrange collection by organizations for verifiable re-use or re-manufacturing.
- .8 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

## 1.11 AMBIENT CONDITIONS

- .1 Heating, Ventilation and Lighting:
  - .1 Ventilate enclosed spaces in accordance with Division 23.
  - .2 Do not perform painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
  - .3 Where required, provide continuous ventilation for seven days after completion of application of paint.
  - .4 Co-ordinate use of existing ventilation system with NCC Representative and ensure its operation during and after application of paint as required.
  - .5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
  - .6 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities to be provided by General Contractor.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
  - .1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, perform no painting work when:
    - .1 Ambient air and substrate temperatures are below 10 degrees C.
    - .2 Substrate temperature is over 32 degrees C unless paint is specifically formulated for application at high temperatures.
    - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
    - .4 Relative humidity is above 85 % or when dew point is less than 3 degrees C variance between air/surface temperature.
    - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
  - .2 Perform no painting work when maximum moisture content of substrate exceeds:
    - .1 12% for concrete and masonry (clay and concrete brick/block).
    - .2 15% for wood.
    - .3 12% for plaster and gypsum board.
  - .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.
- .3 Surface and Environmental Conditions:
  - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
  - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.

- .3 Apply paint when previous coat of paint is dry or adequately cured.
- .4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.
- .5 Do not apply paint when:
  - .1 Temperature is expected to drop below 10 degrees C before paint has thoroughly cured.
  - .2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
  - .3 Surface to be painted is wet, damp or frosted.
- .6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
- .7 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
- .8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.
- .9 Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of NCC Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Paint materials listed in latest edition of MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Paint materials for paint systems: to be products of single manufacturer.
- .3 Only qualified products with E2 "Environmentally Friendly" ratings are acceptable for use on this project.
- .4 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids, to be as follows:
  - .1 Be water-based water soluble water clean-up.
  - .2 Be non-flammable biodegradable.
  - .3 Be manufactured without compounds which contribute to ozone depletion in upper atmosphere.
  - .4 Be manufactured without compounds which contribute to smog in the lower atmosphere.
  - .5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
- .5 Water-borne surface coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).
- .6 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .7 Water-borne surface coatings and recycled water-borne surface coatings must have flash point of 61.0 degrees C or greater.

- .8 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:
- .9 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
- .10 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
- .11 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.
- .12 Recycled water-borne surface coatings must contain 50 % post-consumer material by volume.
- .13 Recycled water-borne surface coatings must not contain:
  - .1 Lead in excess of 600.0 ppm weight/weight total solids.
  - .2 Mercury in excess of 50.0ppm weight/weight total product.
  - .3 Cadmium in excess of 1.0ppm weight/weight total product.
  - .4 Hexavalent chromium in excess of 3.0 ppm weight/weight total product.
  - .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.
- .14 The following must be performed on each batch of consolidated post-consumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.
  - .1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
  - .2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
  - .3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

## **2.2 COLOURS**

- .1 NCC Representative will provide Colour Schedule after Contract award.
- .2 Colour schedule will be based upon selection of three (3) base colours and one (1) accent colours. No more than eight colours will be selected for entire project and no more than three colours will be selected in each area.
- .3 Selection of colours will be from manufacturer's full range of colours.
- .4 Where specific products are available in restricted range of colours, selection will be based on limited range.
- .5 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.
- .6 For stucco coating, provide full manufacturer's colour range for selection of colour of colours. NCC Representative will select three colours. Submit the three colours for review on 600mm x 600mm cement board for review on site. One colour will be chosen for stucco coating.

### 2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with NCC Representative's written permission.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Add thinner to paint manufacturer's recommendations. Do not use kerosene or organic solvents to thin water-based paints.
- .4 Thin paint for spraying according in accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to NCC Representative.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

### 2.4 GLOSS/SHEEN RATINGS

- .1 Paint gloss: defined as sheen rating of applied paint, in accordance with following values:

Gloss Level Category/	Units @ 60 Degrees/	Units @ 85 Degrees/
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 Gloss level ratings of painted surfaces as specified

### 2.5 EXTERIOR PAINTING SYSTEMS

#### 1 Cementitious Composition Board Surfaces: (vertical surfaces, horizontal soffits)

- .1 EXT 3.3A - Latex insert gloss level finish.
- .2 EXT 3.3B - Alkyd insert gloss level finish.
- .3 EXT 3.3C - Waterborne light industrial insert gloss level coating.
- .4 EXT 3.3D - Waterborne epoxy finish.
- .5 EXT 3.3E - Epoxy finish.
- .6 EXT 3.3F - Pigmented polyurethane finish (over epoxy).
- .7 EXT 3.3G - Latex insert gloss level insert texture type aggregate finish.
- .8 EXT 3.3H - High-build latex finish.
- .9 EXT 3.3J - Latex insert gloss level finish (over alkali resistant primer).

#### 2 Structural Steel and Metal Fabrications:

- .1 EXT 5.1B - Waterborne light industrial insert gloss level coating (over inorganic zinc).

#### 3 Dressed Lumber: doors, door and window frames, casings, battens, smooth facias, etc.

- .1 EXT 6.3A - Latex insert gloss level finish. do not use flat finish on doors.

- .2 EXT 6.3B - Alkyd insert gloss level finish do not use flat finish on doors.
- .3 EXT 6.3C - Solid colour stain finish do not use in high contact areas or on doors.
- .4 EXT 6.3D - Semi-transparent stain finish do not use on doors.
- .5 EXT 6.3E - Varnish gloss semi-gloss finish (over stain).
- .6 EXT 6.3F - Varnish gloss semi-gloss finish.
- .7 EXT 6.3G - Clear (2 component) polyurethane finish.
- .8 EXT 6.3H - Pigmented polyurethane finish.
- .9 EXT 6.3J - Waterborne light industrial insert gloss level coating use gloss or semi-gloss finish on doors and frames only.
- .10 EXT 6.3K - Waterborne solid colour stain finish do not use flat finish on doors and frames.
- .11 EXT 6.3L - Latex insert gloss level finish (over latex primer) do not use flat finish on doors.

**4 Wood Panelling: plywood siding, fascias, soffits, etc.**

- .1 EXT 6.4A - Waterborne solid colour stain finish.
- .2 EXT 6.4B - Alkyd insert gloss level finish.
- .3 EXT 6.4C - Solid colour stain finish.
- .4 EXT 6.4D - Semi-transparent stain finish.
- .5 EXT 6.4E - Pigmented fire retardant coating.
- .6 EXT 6.4F - Clear fire retardant penetrating wood preservative coating.
- .7 EXT 6.4G - Latex insert gloss level finish (over alkyd primer).
- .8 EXT 6.4H - Varnish gloss semi-gloss finish.
- .9 EXT 6.4J - Varnish gloss semi-gloss finish (over stain).
- .10 EXT 6.4K - Latex insert gloss level finish (over latex primer).
- .5 Wood Decks: using spaced lumber
  - .1 EXT 6.5E - Latex porch and floor finish with anti-skid additive.
    - .1 Acceptable Products: Liquiguard Solid StepCote 04, or preapproved equivalent.

**2.6 SPECIAL FINISHES**

- .1 Stucco coating: Limewash based on mineral silicate paint system.
  - .1 Vapor permeable.
  - .2 Water repellent.
  - .3 Non-peeling.
  - .4 Non-fading.
  - .5 Non-blistering.
  - .6 Made from waterglass (potassium silicate).
  - .7 Colouring using inorganic mineral colour pigments.
  - .8 Company experienced in manufacturing mineral silicate paints for minimum 10 years.

### **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 EXAMINATION**

- .1 Exterior repainting work: inspected by MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor to notify Paint Inspection Agency minimum of one week prior to commencement of work and provide copy of project repainting specification and Finish Schedule.
- .2 Exterior surfaces requiring repainting: inspected by both painting contractor and Paint Inspection Agency who will notify NCC Representative in writing of defects or problems, prior to commencing repainting work, or after surface preparation if unseen substrate damage is discovered.
- .3 Where assessed degree of surface degradation of DSD-1 to DSD-3 before preparation of surfaces for repainting is revealed to be DSD-4 after preparation, repair or replacement of such unforeseen defects discovered are to be corrected, as mutually agreed, before repainting is started.
- .4 Where "special" repainting or recoating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer to provide as part of work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to NCC Representative.

### **3.3 PREPARATION**

- .1 Perform preparation and operations for exterior painting in accordance with MPI Maintenance Repainting Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.
- .3 Clean and prepare exterior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements. Refer to the MPI Manual in regard to specific requirements and as follows:
  - .1 Remove dust, dirt, and surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
  - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
  - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
  - .4 Allow surfaces to drain completely and allow to dry thoroughly. Allow sufficient drying time and test surfaces using electronic moisture meter before commencing work.
- .4 Use water-based cleaners in place of organic solvents where surfaces will be repainted using water based paints.
- .5 Many water-based paints cannot be removed with water once dried. Minimize use of kerosene or such organic solvents to clean up water-based paints.
- .6 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with MPI requirements. Remove such contaminants from

surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.

- .7 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .8 Do not apply paint until prepared surfaces have been accepted by NCC Representative.
- .9 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.

### **3.4 EXISTING CONDITIONS**

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to NCC 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, except test concrete floors for moisture using a simple "cover patch test" and report findings to NCC Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Maximum moisture content as follows:
  - .1 Stucco: 12%.
  - .2 Concrete: 12%.
  - .3 Clay and Concrete Block/Brick: 12%.
  - .4 Wood: 15%.

### **3.5 PROTECTION**

- .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by NCC Representative.
- .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .3 Protect factory finished products and equipment.
- .4 Protect passing pedestrians, building occupants and general public in and about building.
- .5 Remove light fixtures, surface hardware on doors, and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Store items and re-install after painting is completed.
- .6 Move and cover exterior furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .7 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of NCC Representative.

### **3.6 APPLICATION**

- .1 Method of application to be as approved by NCC Representative. Apply paint by brush, roller, air sprayer and/or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

- .2 Brush and Roller Application:
  - .1 Apply paint in a uniform layer using brush and/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 and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by NCC Representative.
  - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray Application:
  - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
  - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
  - .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
  - .4 Brush out immediately runs and sags.
  - .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by NCC Representative.
- .5 Apply coats of paint as 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 to remove visible defects.
- .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.
- .9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

### **3.7 MECHANICAL/ELECTRICAL EQUIPMENT**

- .1 Unless otherwise specified, paint exterior exposed conduits, piping, hangers, duct work and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.
- .2 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .3 Do not paint over nameplates.
- .4 Paint fire protection piping red.
- .5 Paint steel electrical light standards. Do not paint outdoor transformers and substation equipment.

**3.8 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

**3.9 RESTORATION**

- .1 Clean and re-install 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 Protect freshly completed surfaces from paint droppings and dust to approval of NCC Representative. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by NCC Representative.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            Section 01 10 10 - General Instructions

**1.2                REFERENCES**

- .1            The Master Painters Institute (MPI)
  - .1            Maintenance Repainting Manual 2004, Master Painters Institute (MPI), including Identifiers, Evaluation, Systems, Preparation and Approved Product List.
- .2            Environmental Protection Agency (EPA)
  - .1            Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings).
- .3            Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1            Material Safety Data Sheets (MSDS).
- .4            South Coast Air Quality Management District (SCAQMD), California State
  - .1            SCAQMD Rule 1113-04, Architectural Coatings.

**1.3                QUALITY ASSURANCE**

- .1            Qualifications:
  - .1            Contractor: to have a minimum of five (5) years proven satisfactory experience. Provide a list of last three (3) comparable jobs including, job name and location, specifying authority, and;
  - .2            Qualified journeypersons as defined by local jurisdiction to be engaged in repainting work.
  - .3            Apprentices: may be employed provided they work under the direct supervision of qualified journeyperson in accordance with applicable trade regulations.
- .2            Conform to latest MPI requirements for interior repainting work including cleaning, preparation and priming.
- .3            Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners and solvents) shall be in accordance with the latest edition of the MPI Approved Product List and shall be from a single manufacturer for each system used.
- .4            Paint materials such as linseed oil, shellac, reducers and turpentine shall be the highest quality product of an approved manufacturer listed in MPI Maintenance Repainting Manual and shall be compatible with other coating materials as required.
- .5            Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by NCC Representative.
- .6            Standard of Acceptance: when viewed using final lighting source surfaces shall indicate the following:
  - .1            Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
  - .2            Ceilings: no defects visible from floor at 45 degrees to surface.

- .3 Final coat to exhibit uniformity of colour and sheen across full surface area.
- .7 Mock-ups: construct mock-ups in accordance with Section 01 45 00 - Quality Control.
  - .1 Provide a mock-up in accordance with requirements of Section 01 45 00 - Quality Control to NCC Representative.
  - .2 Prepare and repaint mock-up designated interior room, surface or item to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Maintenance Repainting Manual standards for review and approval.
  - .3 When approved, repainted room, surface and/or item shall become acceptable standard of finish quality and workmanship for similar on-site interior repainting work.

#### **1.4 PERFORMANCE REQUIREMENTS**

- .1 Environmental Performance Requirements:
  - .1 Provide paint products meeting MPI "Environmentally Friendly" E2 ratings based on VOC (EPA Method 24) content levels.
  - .2 Where indoor air quality (odour) is a problem, use only MPI listed materials having a minimum E2 rating.

#### **1.5 SCHEDULING**

- .1 Submit work schedule for various stages of painting to NCC Representative for review. Submit schedule a minimum of 48 hours in advance of proposed operations.
- .2 Paint occupied facilities in accordance with approved schedule. Schedule operations to approval of NCC Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.
- .3 Obtain written authorization from NCC Representative for changes in work schedule.
- .4 Schedule repainting operations to prevent disruption by other trades if applicable and by occupants in and about building.

#### **1.6 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide product data and manufacturer's installation/application instructions for each paint and coating product to be used in accordance with the requirements of Section 01 33 00 - Submittal Procedures.
- .2 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Submit full range colour sample chips for review and selection. Indicate where colour availability is restricted.
- .4 Submit WHMIS MSDS - Material Safety Data Sheets for paint and coating materials in accordance with Section 02 81 01 - Hazardous Materials.
- .5 Closeout Submittals:
  - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
  - .2 Submit records of products used. List products in relation to finish system and include following:

- .1 Product name, type and use (i.e. materials and location).
- .2 Manufacturer's product number.
- .3 Colour code numbers.
- .4 MPI Environmentally Friendly classification system rating.
- .5 Manufacturer's Material Safety Data Sheets (MSDS).

## **1.7 SUSTAINABLE REQUIREMENTS**

- .1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

## **1.8 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements, supplemented as follows:
  - .1 Deliver and store materials in original containers, sealed, with labels intact.
  - .2 Labels to indicate:
    - .1 Manufacturer's name and address.
    - .2 Type of paint or coating.
    - .3 Compliance with applicable standard.
    - .4 Colour number in accordance with established colour schedule.
  - .2 Remove damaged, opened and rejected materials from site.
  - .3 Store and handle in accordance with manufacturer's recommendations.
  - .4 Store materials and equipment in secure, dry, well-ventilated area with temperature range between 7 degrees C to 30 degrees C. Store materials and supplies away from heat generating devices and sensitive products above minimum temperature as recommended by manufacturer.
  - .5 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of NCC Representative. After completion of operations, return areas to clean condition to approval of NCC Representative.
  - .6 Remove paint materials from storage in quantities required for same day use.
  - .7 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
  - .8 Fire Safety Requirements:
    - .1 Provide one 9 kg Type ABC dry chemical 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 daily.
    - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada.
  - .9 Waste Management and Disposal:
    - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

- .2 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
- .3 Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:
  - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
  - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
  - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
  - .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
  - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
  - .6 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.
- .6 Where paint recycling is available, collect waste materials by type and provide for delivery to recycling or collection facility.
- .7 Set aside and protect surplus and uncontaminated finish materials. Deliver to or arrange collection by organizations for verifiable re-use or re-manufacturing.

## **1.9 SITE CONDITIONS**

- .1 Heating, Ventilation and Lighting:
  - .1 Do not perform repainting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application and until paint has cured sufficiently.
  - .2 Ventilate enclosed spaces in accordance with Division 23. Where required, provide continuous ventilation for seven days after completion of application of paint.
  - .3 Co-ordinate use of existing ventilation system with NCC Representative and ensure its operation during and after application of paint as required.
  - .4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements. Use of gas-fired appliances is not permitted.
  - .5 Do not perform painting work unless minimum lighting level of 323 Lux is provided on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:

- .1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, do not perform repainting work when:
  - .1 Ambient air and substrate temperatures are below 10 degrees C.
  - .2 Substrate temperature is over 32 degrees C unless paint is specifically formulated for application at high temperatures.
  - .3 Relative humidity within area to be repainted is above 85%.
- .2 Conduct moisture tests using properly calibrated electronic Moisture Meter, except use simple "cover patch test" on concrete floors to be repainted.
- .3 Do not perform repainting work when maximum moisture content of substrate exceeds:
  - .1 12% for concrete and masonry (clay and concrete brick/block).
  - .2 15% for wood.
  - .3 12% for plaster and gypsum board.
- .4 Test painted concrete, masonry and plaster surfaces for alkalinity as required.
- .3 Surface and Environmental Conditions:
  - .1 Apply paint finish 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 to adequately prepared surfaces and to surfaces within moisture limits noted herein.
  - .3 Apply paint when previous coat of paint is dry or adequately cured, unless otherwise pre-approved by specific coating manufacturer.
  - .4 Apply paint in occupied facilities in unoccupied rooms or areas. Schedule operations to approval of the NCC Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

## **1.10 MAINTENANCE**

- .1 Extra Materials:
  - .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
  - .2 Submit one (1) - one- litre can of each type and colour of stain and finish coating. Identify type and colour in relation to established colour schedule and finish system.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Paint materials listed in latest edition of MPI Approved Product List (APL) are acceptable for use on this project.
- .2 Where required by authorities having jurisdiction, paints and coatings to provide a fire resistant rating.
- .3 Paint materials for repaint systems to be products of single manufacturer.
- .4 Only qualified products with MPI "Environmentally Friendly" E2 rating are acceptable for use on this project.

- .5 Use only MPI listed L rated materials.
- .6 Paints, coatings, thinners, solvents, cleaners and other fluids used in repainting, to be as follows:
  - .1 Not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
  - .2 Be manufactured without compounds which contribute to ozone depletion in upper atmosphere.
  - .3 Be manufactured without compounds which contribute to smog in lower atmosphere.
  - .4 Be manufactured where matter generating 'Biochemical Oxygen Demand' (BOD) in undiluted production plant effluent discharged to natural watercourse or a sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.
  - .5 Be manufactured where total suspended solids (TSS) content in undiluted production plant effluent discharged to natural watercourse or sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.
  - .6 Paints and coatings must not be formulated or manufactured with formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

## 2.2 COLOURS

- .1 NCC Representative will provide Colour Schedule after Contract award.
- .2 Colour schedule will be based upon selection of one (1) base colours and one (1) accent colours. No more than eight colours will be selected for entire project and no more than three colours will be selected in each area.
- .3 Selection of colours will be from manufacturers' full range of colours.
- .4 Where specific products are available in restricted range of colours, selection will be based on limited range.
- .5 First coat in two-coat (Premium) repaint system to be tinted slightly lighter colour than top coat to show visible difference between coats.

## 2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed with NCC Representative's written permission.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Where thinner is used, addition not to exceed paint manufacturer's recommendations. Do not use kerosene or such organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer' instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to NCC Representative.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

## 2.4 GLOSS/SHEEN RATINGS

- .1 Paint gloss defined as sheen rating of applied paint, in accordance with following MPI gloss / sheen standard values:

<b>Gloss Level Category</b>	<b>Units @ 60 Degrees</b>	<b>Units @ 85 Degrees</b>
G1 – matte finish	0 to 5	maximum 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	minimum 35
G5 – semi-gloss finish	35 to 70	
G6 – gloss finish	70 to 85	
G7 – high gloss finish	> 85	

- .2 Gloss level ratings of repainted surfaces shall be as specified herein and as noted on Finish Schedule.

## 2.5 INTERIOR PAINTING SYSTEMS

- .1 RIN 6.3 - Dressed Lumber: (Including Doors, Door and Window Frames, and Mouldings).  
.1 RIN 6.3F - Semi-Transparent Stain/Lacquer G4 gloss level.
- .2 RIN 6.5 - Wood Floors and Stairs: (Including Hardwood Flooring).  
.1 RIN 6.5H - Polyurethane 2 Components, Pigmented G4 gloss level.
- .3 RIN 9.2 - Plaster and Gypsum Board: (gypsum wallboard, drywall, and "sheet rock type material").  
.1 RIN 9.2A - Latex G4 gloss level.

## 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 EXAMINATION

- .1 Interior surfaces requiring repainting: inspected by painting contractor who will notify NCC Representative in writing of defects or problems, prior to commencing repainting work, or after surface preparation if unseen substrate damage is discovered.
- .2 Where an assessed degree of surface degradation of DSD-1 to DSD-3 before preparation of surfaces for repainting is revealed to be DSD-4 after preparation, repair or replacement of such unforeseen defects discovered are to be corrected, as mutually agreed, before repainting is started.
- .3 Where "special" repainting or recoating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer to provide

as part of work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to NCC Representative.

### **3.3 PREPARATION**

- .1 Perform preparation and operations for interior painting in accordance with MPI Maintenance Repainting Manual requirements except where otherwise specified.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.
- .3 Clean and prepare interior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
  - .1 Remove dust, dirt, and surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
  - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using stiff bristle brush to remove dirt, oil and surface contaminants.
  - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
  - .4 Allow surfaces to drain completely and to dry thoroughly. Allow sufficient drying time and test surfaces using an electronic moisture meter before commencing work.
- .4 Use water-based cleaners in place of organic solvents where surfaces will be repainted using water based paints.
- .5 Many water-based paints cannot be removed with water once dried. Minimize use of kerosene or such organic solvents to clean up water-based paints.
- .6 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with MPI requirements. Remove such contaminants from surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.
- .7 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.
- .8 Do not apply paint until prepared surfaces have been accepted by NCC Representative.
- .9 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from distance up to 1000 mm.

### **3.4 EXISTING CONDITIONS**

- .1 Prior to commencing work, examine site conditions and existing interior substrates to be repainted. Report in writing to NCC Representative damages, defects, or unsatisfactory or unfavourable conditions or surfaces that will adversely affect this work.
- .2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test" and report findings to NCC Representative. Maximum moisture content not to exceed specified limits.

- .3 Do not commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to Painting Subcontractor and Inspection Agency.
- .4 Degree of surface deterioration (DSD) to be assessed using MPI Identifiers and Assessment criteria indicated in MPI Maintenance Repainting Manual. MPI DSD ratings and descriptions are as follows:

<b>Condition</b>	<b>Description</b>
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).

### 3.5 PROTECTION

- .1 Protect existing surfaces and adjacent fixtures and furnishings from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by NCC Representative.
- .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .3 Protect factory finished products and equipment.
- .4 Protect general public and building occupants in and about building.
- .5 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and surface mounted equipment, fittings and fastenings prior to undertaking re-painting operations. Store items and re-install after painting is completed.
- .6 Move and cover furniture and portable equipment as necessary to carry out repainting operations. Replace as painting operations progress.
- .7 As repainting operations progress, place "WET PAINT" signs in occupied areas to approval of NCC Representative.

### 3.6 APPLICATION

- .1 Apply paint by method that is best suited for substrate being repainted using brush, roller, air sprayer and/or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise. Methods of application as pre-approved by NCC Representative before commencing work.
- .2 Brush and Roller Application:
  - .1 Apply paint in uniform layer using brush and/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 and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple unless approved by NCC Representative.

- .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray Application:
  - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
  - .2 Keep paint ingredients properly mixed in containers during paint application by continuous mechanical agitation intermittent agitation frequently as necessary.
  - .3 Apply paint in uniform layer, with overlapping at edges of spray pattern.
  - .4 Back roll spray applications and brush out runs and sags immediately.
  - .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by NCC Representative.
- .5 Apply paint coats in continuous manner and allow surfaces to dry and properly cure between coats for minimum time period as recommended by manufacturer. Minimum dry film thickness of coats not less than that recommended by manufacturer. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Sand and dust between coats to remove visible defects.
- .7 Repaint surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .8 Repaint top, bottom, and vertical edges of doors to be repainted.
- .9 Repaint inside of cupboards and cabinets as specified for outside surfaces.
- .10 Repaint closets and alcoves to match existing, unless otherwise scheduled or noted.

### 3.7 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Unless otherwise noted, repainting to include exposed to view / previously painted mechanical and electrical equipment and components (panels, conduits, piping, hangers, and ductwork.).
- .2 Touch up scratches and marks and repaint such mechanical and electrical equipment and components with colour, and sheen finish to match existing unless otherwise noted or scheduled.
- .3 Do not paint over name plates or instruction labels.
- .4 Leave unfinished exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish.
- .5 Keep sprinkler heads free of paint.
- .6 Do not paint interior transformers and substation equipment.
- .7 Standard of Acceptance: when viewed using natural prevailing sunlight at peak period of day (mid-day) on surface viewed, surfaces to indicate following:
  - .1 Walls: no defects visible from distance of 1000 mm at 90 degrees to surface.
  - .2 Soffits: no defects visible from grade at 45 degrees to surface.
  - .3 Final coat to exhibit uniformity of colour and sheen across full surface area.

### **3.8 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning, supplemented as follows:
  - .1 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
  - .2 Keep work area free from unnecessary accumulation of tools, equipment, surplus materials and debris.
  - .3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
  - .4 Clean equipment and dispose of wash water used for water borne materials, solvents used for oil based materials as well as other cleaning and protective materials (e.g. rags, drop cloths, and masking papers), paints, thinners, paint removers/strippers in accordance with safety requirements of authorities having jurisdiction and as noted herein.
  - .5 Clean painting equipment in leak-proof containers that will permit particulate matter to settle out and be collected. Sediment remaining from cleaning operations to be recycled or disposed of in manner acceptable to authorities having jurisdiction.
  - .6 Recycle paint and coatings in excess of repainting requirements as specified.

### **3.9 RESTORATION**

- .1 Clean and re-install 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 affected exposed surfaces. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of NCC Representative. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by NCC Representative.

**END OF SECTION**

**Part 1            General**

**1.1            RELATED SECTIONS**

- .1    Section 09 91 23.01 - Interior Painting.
- .2    Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

**1.2            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .3    Shop drawings to show:
  - .1    Mounting arrangements.
  - .2    Operating and maintenance clearances.
- .4    Shop drawings and product data accompanied by:
  - .1    Detailed drawings of bases, supports, and anchor bolts.
  - .2    Acoustical sound power data, where applicable.
  - .3    Points of operation on performance curves.
  - .4    Manufacturer to certify current model production.
  - .5    Certification of compliance to applicable codes.
- .5    In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .6    Closeout Submittals:
  - .1    Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
  - .2    Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .3    Operation data to include:
    - .1    Control schematics for systems including environmental controls.
    - .2    Description of systems and their controls.
    - .3    Description of operation of systems at various loads together with reset schedules and seasonal variances.
    - .4    Operation instruction for systems and component.
    - .5    Description of actions to be taken in event of equipment failure.
    - .6    Valves schedule and flow diagram.
    - .7    Colour coding chart.
  - .4    Maintenance data to include:
    - .1    Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2    Data to include schedules of tasks, frequency, tools required and task time.
  - .5    Performance data to include:

- .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
- .2 Equipment performance verification test results.
- .3 Special performance data as specified.
- .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Approvals:
  - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
  - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .7 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
  - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
  - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .9 As-Built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

### **1.3 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

### **1.4 MAINTENANCE**

- .1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:

- .1 One set of packing for each pump.
- .2 One casing joint gasket for each size pump.
- .3 One glass for each gauge glass.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.
- .3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **Part 2 Products**

## **Part 3 Execution**

### **3.1 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 91 23.01 - Interior 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. Vacuum interior of ductwork and air handling units.

### **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 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.
- .4 Instruction duration time requirements as specified in appropriate sections.
- .5 Departmental Representative will record these demonstrations on video tape for future reference.

**3.5 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1    National Fire Prevention Association (NFPA)
  - .1        NFPA 13-2013, Standard for the Installation of Sprinkler Systems.
  - .2        NFPA 25-2011, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

**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 data sheets, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Shop Drawings:
  - .1        Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario of Canada.
  - .2        Indicate:
    - .1            Materials.
    - .2            Finishes.
    - .3            Method of anchorage
    - .4            Number of anchors.
    - .5            Supports.
    - .6            Reinforcement.
    - .7            Assembly details.
    - .8            Accessories.
- .4    Samples:
  - .1        Submit samples of following:
    - .1            Each type of sprinkler head.
- .5    Test reports:
  - .1        Submit certified test reports for wet pipe fire protection sprinkler systems from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .6    Certificates:
  - .1        Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7    Manufacturers' Instructions:
  - .1        Provide manufacturer's installation instructions.
- .8    Field Quality Control Submittals:

- .1 Manufacturer's Field Reports: manufacturer's field reports specified.

### **1.3 CLOSEOUT SUBMITTALS**

- .1 Provide operation, maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Manufacturer's Catalogue Data, including specific model, type, and size for:
  - .1 Pipe and fittings.
  - .2 Sprinkler heads.
  - .3 Mechanical couplings.
- .3 Field Test Reports:
  - .1 Preliminary tests on piping system.
- .4 Records:
  - .1 As-built drawings of each system.
    - .1 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes.
    - .2 Submit 760 mm by 1050 mm drawings on reproducible Mylar film with title block similar to full size contract drawings.
- .5 Operation and Maintenance Manuals:
  - .1 Provide detailed hydraulic calculations including summary sheet, and Contractors Material and Test Certificate for aboveground piping and other documentation for incorporation into manual in accordance with NFPA 13.

### **1.4 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: company or person specializing in wet sprinkler systems with documented experience.
- .2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.

### **1.5 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
  - .2 Provide spare sprinklers and tools in accordance with NFPA 13.

### **1.6 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:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

- .3 Storage and Protection:
  - .1 Store materials indoors in dry location.
  - .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **Part 2 Products**

### **2.1 DESIGN REQUIREMENTS**

- .1 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.
- .2 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.
- .3 Location of Sprinkler Heads:
  - .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13 for ordinary hazard occupancy.
  - .2 Uniformly space sprinklers on branch.

### **2.2 PIPE, FITTINGS AND VALVES**

- .1 Fittings and joints to NFPA 13:
  - .1 Ferrous: screwed, welded, flanged or roll grooved.
    - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
  - .2 Fittings: ULC approved for use in wet pipe sprinkler systems.
  - .3 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
  - .4 Sprinkler pipe and fittings: metal.

### **2.3 SPRINKLER HEADS**

- .1 General: to NFPA 13 and ULC listed for fire services.
- .2 Sprinkler Head Type:
  - .1 Type A: recessed pendent type.
- .3 Provide nominal 1.2 cm orifice sprinkler heads.
  - .1 Release element of each head to be of intermediate temperature rating or higher as suitable for specific application.
  - .2 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13.
  - .3 Provide recessed pendent sprinkler heads as indicated.

- .4 Ceiling plates: not more than 25 mm deep.
- .5 Ceiling cups: not permitted.

### **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, inspect and test to acceptance in accordance with NFPA 13 and NFPA 25.

#### **3.3 PIPE INSTALLATION**

- .1 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.
- .2 Inspect piping before placing into position.

#### **3.4 FIELD PAINTING**

- .1 Clean, pre-treat, prime, and paint new systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories.
- .2 Apply coatings to clean, dry surfaces, using clean brushes.
- .3 Clean surfaces to remove dust, dirt, rust, and loose mill scale.
- .4 Immediately after cleaning, provide metal surfaces with 1 coat of pre-treatment primer applied to minimum dry film thickness of 0.3 ml, and one coat of zinc chromate primer applied to minimum dry film thickness of 1.0 ml.
- .5 Shield sprinkler heads with protective covering while painting is in progress.
- .6 Upon completion of painting, remove protective covering from sprinkler heads.
- .7 Remove sprinkler heads which have been painted and replace with new sprinkler heads.

#### **3.5 FIELD QUALITY CONTROL**

- .1 Site Test, Inspection:
  - .1 Perform test to determine compliance with specified requirements in presence of Departmental Representative.
  - .2 Test, inspect, and approve piping before covering or concealing.
  - .3 Preliminary Tests:
    - .1 Hydrostatically test each system at 200 psig for a 2 hour period with no leakage or reduction in pressure.
    - .2 Flush piping with potable water in accordance with NFPA 13.
    - .3 Test alarms and other devices.

- .4 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.
- .4 Formal Tests and Inspections:
  - .1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.
  - .2 Submit written request for formal inspection at least 15 days prior to inspection date.
  - .3 Repeat required tests as directed.
  - .4 Correct defects and make additional tests until systems comply with contract requirements.
  - .5 Authority of Jurisdiction will witness formal tests and approve systems before they are accepted.
- .2 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 - ACTION AND INFORMATIONAL 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 Site Tests:
  - .1 Testing to be witnessed by authority having jurisdiction.
- .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: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**END OF SECTION**

**Part 1            General**

**1.1            RELATED REQUIREMENTS**

- .1            Section 09 91 23.01 - Interior Painting
- .2            Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

**1.2            ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .3            Shop drawings to show:
  - .1            Mounting arrangements.
  - .2            Operating and maintenance clearances.
- .4            Shop drawings and product data accompanied by:
  - .1            Manufacturer to certify current model production.
  - .2            Certification of compliance to applicable codes.
- .5            In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .6            Closeout Submittals:
  - .1            Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
  - .2            Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .3            Operation data to include:
    - .1            Operation instruction for systems and component.
    - .2            Description of actions to be taken in event of equipment failure.
  - .4            Maintenance data to include:
    - .1            Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2            Data to include schedules of tasks, frequency, tools required and task time.
  - .5            Performance data to include:
    - .1            Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
    - .2            Equipment performance verification test results.
    - .3            Special performance data as specified.
    - .4            Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
  - .6            Approvals:
    - .1            Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.

- .2 Make changes as required and re-submit as directed by Departmental Representative.
- .7 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
  - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
  - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

### **1.3 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

### **1.4 MAINTENANCE**

- .1 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

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

**Part 2 Products**

**2.1 N/A**

**Part 3 Execution**

**3.1 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 91 23.01 - Interior 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. Vacuum interior of ductwork and air handling units.

**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 DEMONSTRATION**

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
  - .1 Washroom trap guards.
- .3 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.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.
- .6 Departmental Representative will record these demonstrations on video tape for future reference.

**3.5 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1            CSA International
  - .1            CSA B79-08, Commercial and Residential Drains and Cleanouts.
- .2            Efficiency Valuation Organization (EVO)
  - .1            International Performance Measurement and Verification Protocol (IPMVP).
    - .1            IPMVP 2007 Version.

**1.2                ADMINISTRATIVE REQUIREMENTS**

- .1            Pre-installation Meetings:
  - .1            Convene pre-installation meeting 1 week prior to beginning work of this Section, with Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:
    - .1            Verify project requirements.
    - .2            Review installation and substrate conditions.
    - .3            Co-ordination with other building construction subtrades.
    - .4            Review manufacturer's written installation instructions and warranty requirements.

**1.3                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.
  - .2            Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3            Shop Drawings:
  - .1            Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
  - .2            Indicate on drawings to indicate materials, finishes, dimensions, accessories for following:
    - .1            trap guard and trap seal primer.
- .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.

**1.4                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.

## **1.5 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect plumbing materials from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **Part 2 Products**

### **2.1 TRAP SEAL PRIMERS**

- .1 Refer to drawings.

## **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 National Plumbing Code of Canada, provincial codes.
- .2 Install in accordance with manufacturer's instructions and as specified.

### **3.4 TRAP SEAL PRIMERS**

- .1 Install for floor drains and elsewhere, as indicated.

### **3.5 START-UP**

- .1 General:
  - .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: General Requirements, supplemented as specified herein.
- .2 Provide continuous supervision during start-up.

### **3.6 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 Floor drains:
  - .1 Verify operation of trap seal primer.
  - .2 Prime. Adjust flow rate to suit site conditions.
  - .3 Check operations of flushing features.
  - .4 Check security, accessibility, removability of strainer.
  - .5 Clean out baskets.

### **3.7 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.

### **3.8 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.9**

**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                RELATED REQUIREMENTS**

- .1        Section 09 91 23.01 - Interior Painting
- .2        Section 23 05 93 - Testing, Adjusting and Balancing for HVAC

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .3        Shop drawings to show:
  - .1        Mounting arrangements.
  - .2        Operating and maintenance clearances.
- .4        Shop drawings and product data accompanied by:
  - .1        Detailed drawings of bases, supports, and anchor bolts.
  - .2        Acoustical sound power data, where applicable.
  - .3        Points of operation on performance curves.
  - .4        Manufacturer to certify current model production.
  - .5        Certification of compliance to applicable codes.
- .5        In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .6        Closeout Submittals:
  - .1        Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
  - .2        Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .3        Operation data to include:
    - .1        Control schematics for systems including environmental controls.
    - .2        Description of systems and their controls.
    - .3        Description of operation of systems at various loads together with reset schedules and seasonal variances.
    - .4        Operation instruction for systems and component.
    - .5        Description of actions to be taken in event of equipment failure.
    - .6        Valves schedule and flow diagram.
    - .7        Colour coding chart.
  - .4        Maintenance data to include:
    - .1        Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2        Data to include schedules of tasks, frequency, tools required and task time.
  - .5        Performance data to include:

- .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
- .2 Equipment performance verification test results.
- .3 Special performance data as specified.
- .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Approvals:
  - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
  - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .7 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
  - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
  - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

### **1.3 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

#### **1.4 MAINTENANCE**

- .1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:
  - .1 One set of packing for each pump.
  - .2 One casing joint gasket for each size pump.
  - .3 One head gasket set for each heat exchanger.
  - .4 One glass for each gauge glass.
  - .5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.
- .3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

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

#### **Part 2 Products**

- 2.1 .1 Not applicable**

#### **Part 3 Execution**

##### **3.1 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 91 23.01 - Interior 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. Vacuum interior of ductwork and air handling units.

##### **3.3 FIELD QUALITY CONTROL**

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.
  - .1 Furnace F-1 operation
  - .2 Heat Pump C-1 operation
  - .3 Ventilation Unit V-1 operation
- .2 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 DEMONSTRATION**

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
  - .1 Washroom thermostats.
- .3 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.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.
- .6 Departmental Representative will record these demonstrations on video tape for future reference.

**3.5 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

**Part 1 General**

**1.1 QUALIFICATIONS OF TAB PERSONNEL**

- .1 Submit names of personnel to perform TAB to Departmental Representative within 90 days of award of contract.
- .2 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, MN-1-2002.
  - .2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.
  - .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.
- .3 Recommendations and suggested practices contained in the TAB Standard: mandatory.
- .4 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- .5 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- .6 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- .7 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.

**1.2 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.

**1.3 EXCEPTIONS**

- .1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

**1.4 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.

**1.5 PRE-TAB REVIEW**

- .1 Review contract documents before project construction is started and confirm in writing to Departmental Representative 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.

**1.6 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.

**1.7 OPERATION OF SYSTEMS DURING TAB**

- .1 Operate systems for length of time required for TAB and as required by Departmental Representative for verification of TAB reports.

**1.8 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 in 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.

**1.9 APPLICATION TOLERANCES**

- .1 Do TAB to following tolerances of design values:
  - .1 HVAC systems: plus 5 %, minus 5 %.
  - .2 Hydronic systems: plus or minus 10 %.

**1.10 ACCURACY TOLERANCES**

- .1 Measured values accurate to within plus or minus 2 % of actual values.

**1.11 INSTRUMENTS**

- .1 Prior to TAB, submit to Departmental Representative list of instruments used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative.

**1.12 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit, prior to commencement of TAB:
- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

**1.13 PRELIMINARY TAB REPORT**

- .1 Submit for checking and approval of Departmental Representative, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
  - .1 Details of instruments used.
  - .2 Details of TAB procedures employed.
  - .3 Calculations procedures.
  - .4 Summaries.

**1.14 TAB REPORT**

- .1 Format in accordance with referenced standard.
- .2 TAB report to show results in SI units and to include:
  - .1 Project record drawings.
  - .2 System schematics.

- .3 Submit 6 copies of TAB Report to Departmental Representative for verification and approval, in both official languages 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 Number and location of verified results as directed by Departmental Representative.
- .4 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 Departmental Representative.

**1.18 AIR SYSTEMS**

- .1 Standard: TAB to most stringent of this section.
- .2 Do TAB of following systems, equipment, components, controls:
  - .1 Furnace F-1
  - .2 Heat Pump C-1
  - .3 Ventilator V-1
- .3 Qualifications: personnel performing TAB qualified to standards of AABC.
- .4 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC.
- .5 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
- .6 Locations of equipment measurements: to include as appropriate:
  - .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
  - .2 At controllers, controlled device.
- .7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

**Part 2            Products**

**2.1                NOT USED**

.1                Not used.

**Part 3            Execution**

**3.1                NOT USED**

.1                Not used.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

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

**1.2 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.
    - .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.
    - .2 Instructions: submit manufacturer's installation instructions.
      - .1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

**1.3 QUALITY ASSURANCE**

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

**1.4 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.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2 Products**

**2.1 THERMOSTAT T-1**

- .1 Line voltage wall mounted electric heating thermostat with:
  - .1 Full load rating: 16.7 A at 120 V.
  - .2 Temperature setting range: 3 degrees C to 30 degrees C.

- .3 Color: White
- .2 Finish: Molded Plastic

**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 control devices.
- .2 Install remote sensing device and capillary tube in metallic conduit. Conduit enclosing capillary tube must not touch heater or heating cable.

**3.3 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**

**Part 1 General**

**1.1 REFERENCES**

- .1 American National Standards Institute/National Fire Prevention Association (ANSI/NFPA)
  - .1 ANSI/NFPA 96-04, Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .2 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
  - .1 ASHRAE 52.1-1992, Gravimetric And Dust Spot for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter (ANSI Approved).
- .3 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-115.10-M90, Disposable Air Filters for the Removal of Particulate Matter from Ventilating Systems.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .5 Underwriters' Laboratories of Canada
  - .1 ULC -S111-95, Standard Method of Fire Tests for Air Filter Units.

**1.2 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.
    - .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 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
    - .1 Shop Drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .3 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.
- .4 Closeout Submittals
  - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

### **1.3 QUALITY ASSURANCE**

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

### **1.4 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.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **1.5 MAINTENANCE**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
  - .2 Furnish list of individual manufacturer's recommended spare parts for equipment such as frames and filters, addresses of suppliers, list of specialized tools necessary for adjusting, repairing or replacing for inclusion in operating manual.
  - .3 Spare filters: in addition to filters installed immediately prior to acceptance by Departmental Representative, supply 1 complete set of filters for each filter unit or filter bank in accordance with section 01 78 00 - Closeout Submittals.

## **Part 2 Products**

### **2.1 GENERAL**

- .1 Media: suitable for air at 100% RH and air temperatures between minus 40 and 50 degrees C.
- .2 Number of units, size and thickness of panels, overall dimensions of filter bank, configuration and capacities: to be verified by contractor on-site.

## **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 GENERAL**

- .1 Install in accordance with manufacturer's recommendations and with adequate space for access, maintenance and replacement.

**3.3 REPLACEMENT MEDIA**

- .1 Replace media with new upon acceptance.
- .2 Filter media new and clean, as indicated by pressure gauge, at time of acceptance.

**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**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
  - .2 CAN3-C235-83 (R2010) - Preferred Voltage Levels for AC Systems, 0 to 50 000 V.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
  - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

**1.3 DEFINITIONS**

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

**1.4 DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
  - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification labels for control items in English and French.
- .4 Use one label for both languages.

**1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings:
  - .1 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.
  - .2 Submit 1 soft copy to Departmental Representative.
  - .3 If changes are required, notify Departmental Representative of these changes before they are made.
- .3 Quality Control: in accordance with Section 01 45 00 - Quality Control.
  - .1 Provide CSA certified equipment and material.

- .2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for approval before delivery to site.
- .3 Submit test results of installed electrical systems and instrumentation.
- .4 Permits and fees: in accordance with General Conditions of contract.
- .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
- .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

## **1.6 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

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

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.
- .2 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **1.8 SYSTEM STARTUP**

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 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.

## **1.9 OPERATING INSTRUCTIONS**

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
  - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
  - .2 Start up, proper adjustment, operating, and shutdown procedures.
  - .3 Safety precautions.
  - .4 Procedures to be followed in event of equipment failure.
  - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Post instructions where directed.
- .4 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

**Part 2 Products**

**2.1 MATERIALS AND EQUIPMENT**

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

**2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS**

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

**2.3 WIRING TERMINATIONS**

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

**2.4 EQUIPMENT IDENTIFICATION**

- .1 Identify electrical equipment with labels as follows:
  - .1 Labels: embossed plastic labels with 6mm high letters unless specified otherwise.
  - .2 Wording on labels to be approved by Departmental Representative prior to manufacture.
  - .3 Allow for minimum of twenty-five (25) letters per label.
  - .4 Terminal cabinets and pull boxes: indicate system and voltage, supply panel and circuit numbers contained.

**2.5 WIRING IDENTIFICATION**

- .1 Maintain phase sequence and colour coding throughout.
- .2 Colour coding: to CSA C22.1.

**2.6 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 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
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
Fire Alarm	Red	

Emergency Voice	Prime	Auxiliary
Other Security Systems	Red	Blue
	Red	Yellow

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

**3.2 NAMEPLATES AND LABELS**

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

**3.3 CONDUIT AND CABLE INSTALLATION**

- .1 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

**3.4 LOCATION OF OUTLETS**

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .3 Locate light switches on latch side of doors.

**3.5 MOUNTING HEIGHTS**

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
  - .1 Local switches: 1400 mm.
  - .2 Accessible door operator paddles: 1100 mm.

**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 Load Balance:
  - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

- .2 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
  - .1 Power distribution system including phasing, voltage, grounding and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and its control.
  - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
  - .5 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.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

### **3.8 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.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1            CSA International
  - .1            CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.
  - .2            CAN/CSA-C22.2 No.65-03(R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2            National Electrical Manufacturers Association (NEMA)

**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 wire and box connectors 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 wire and box connectors 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 off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2            Store and protect wire and box connectors from nicks, scratches, and blemishes.
  - .3            Replace defective or damaged materials with new.

**Part 2            Products**

**2.1                MATERIALS**

- .1            Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2            Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3            Clamps or connectors for TECK cable as required to: CAN/CSA-C22.2 No.18.

**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 wire and box connectors 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 Remove insulation carefully from ends of conductors and:
  - .1 Install mechanical pressure type connectors and tighten screws. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
  - .2 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.

**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 26 05 00- Common Work Results for Electrical
- .2        Section 26 05 20 – Wire and Box Connectors (0-1000 V)
- .3        Section 26 05 34- Conduits, Conduit Fastenings and Conduit Fittings

**1.2                PRODUCT DATA**

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

**Part 2            Products**

**2.1                BUILDING WIRES**

- .1        Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2        Copper conductors: size as indicated, with 600 V rated insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE and RWU90 XLPE, for exterior or wet locations, Jacketted.
- .3        Neutral supported cable: 1 phase insulated conductors of Copper and one neutral conductor of Copper steel reinforced, size as indicated. Type: NS90 Insulation: Type NS-1 rated 300 V.

**2.2                ARMoured CABLES**

- .1        Conductors: insulated, copper, size as indicated.
- .2        Type: AC90.
- .3        Armour: interlocking type fabricated from galvanized aluminum strip.
- .4        Connectors: anti short connectors.

**2.3                CONTROL CABLES**

- .1        Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated:
  - .1        Insulation: polyethylene.
  - .2        Shielding: metallized tapes over each pair.
  - .3        Overall covering: polyethylene jackets.

**Part 3            Execution**

**3.1                FIELD QUALITY CONTROL**

- .1        Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2        Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

### **3.2 GENERAL CABLE INSTALLATION**

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

### **3.3 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

### **3.4 INSTALLATION OF ARMOURED CABLES**

- .1 Group cables wherever possible on channels.

### **3.5 INSTALLATION OF CONTROL CABLES**

- .1 Ground control cable shield.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1            Canadian Standards Association (CSA International)
  - .1            CSA C22.2 No.41-07, Grounding and Bonding Equipment.

**1.2                PRODUCT DATA**

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

**1.3                WASTE MANAGEMENT AND DISPOSAL**

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

**Part 2            Products**

**2.1                CONNECTORS AND TERMINATIONS**

- .1            Copper long barrel compression connectors to CSA, as required sized for conductors.

**Part 3            Execution**

**3.1                INSTALLATION**

- .1            Install terminations, and splices in accordance with manufacturer's instructions.
- .2            Bond and ground as required to CSA C22.2No.41.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 – Common Work Results for Electrical.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1-12, Canadian Electrical Code, Part 1, 22nd Edition.

**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, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4 DELIVERY, STORAGE AND HANDLING**

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

**Part 2 Products**

**2.1 JUNCTION AND PULL BOXES**

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on turned edge covers.

**Part 3 Execution**

**3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION**

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

**3.2 IDENTIFICATION**

- .1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating supply panel, cct# and voltage phase as indicated.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
  - .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
  - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
  - .1 Test reports: submit certified test reports.
  - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .3 Instructions: submit manufacturer's installation instructions.

**1.3                WASTE MANAGEMENT AND DISPOSAL**

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

**Part 2            Products**

**2.1                CABLES AND REELS**

- .1 Provide cables on reels or coils.
  - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.

**2.2                CONDUITS**

- .1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .2 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

**2.3                CONDUIT FASTENINGS**

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
  - .1 Two hole steel straps for conduits larger than 50 mm.

- .2 Channel type supports for two or more conduits at 500 mm on centre.
- .3 Threaded rods, 6 mm diameter, to support suspended channels.

## **2.4 CONDUIT FITTINGS**

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
  - .1 Set-screws are not acceptable.

## **2.5 FISH CORD**

- .1 Polypropylene.

## **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 conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .3 Surface mount conduits except in attic space above Room 101 (Display Area).
- .4 Use electrical metallic tubing (EMT).
- .5 Use flexible metal conduit for connection to recessed incandescent fixtures without prewired outlet box and connection to surface or recessed fluorescent fixtures.
- .6 Minimum conduit size for lighting and power circuits: 21 mm.
- .7 Bend conduit cold:
  - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .8 Mechanically bend steel conduit over 21 mm diameter.
- .9 Install fish cord in empty conduits.
- .10 Dry conduits out before installing wire.

### **3.3 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Group conduits wherever possible on surface channels.
- .4 Do not pass conduits through structural members except as indicated.

- .5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

**3.4 CONCEALED CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.

**3.5 CLEANING**

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

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1            CSA International
  - .1            CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.

**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 devices 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.
- .2            Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3            Storage and Handling Requirements:
  - .1            Store materials off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2            Store and protect devices from nicks, scratches, and blemishes.
  - .3            Protect metal accessories and trim from being bent or damaged.
  - .4            Replace defective or damaged materials with new.

**Part 2            Products**

**2.1                PHOTOELECTRIC LIGHTING CONTROL**

- .1            Photoelectric Lighting Controls: to CSA C22.1.
  - .1            Wall mounting.
  - .2            Capable of switching 1000 W of lighting at 120 V.
  - .3            Voltage variation: plus or minus 10%.
  - .4            Temperature range: minus 40 degrees C to plus 40 degrees C.
  - .5            Switching on lights at 200 lx.
  - .6            Switching off lights at 250 lx.
  - .7            Rated for 5000 operations.
  - .8            Options:
    - .1            Sensitivity adjustment.
  - .9            Switching time delay of 30 s.
  - .10          Wall mounting bracket.

- .11 Colour coded leads: size 10 AWG, 460 mm long.

## **2.2 CONTACTOR**

- .1 Contactor: to CSA C22.1.
  - .1 Pole mounting.
  - .2 Capable of switching multiple lamp circuits with total lighting load of 6000 W.
  - .3 Waterproof enclosure.
  - .4 Manual override.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for lighting control device 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 photoelectric controls in accordance with manufacturer's written instructions and to CSA C22.1.

### **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.

### **3.4 PROTECTION**

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

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 - Common Work Results for Electrical.

**1.2 REFERENCES**

- .1 CSA International
  - .1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
  - .2 CAN/CSA C22.2 No.42.1-00(R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
  - .3 CSA C22.2 No. 55-08, Special Use Switches.
  - .4 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-National Standard, with UL 20).

**1.3 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 wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

**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 off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect wiring devices from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 SWITCHES**

- .1 20 A, 120 V, single pole, switches to: CSA C22.2 No.55, 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 Decora style.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps.
- .4 Switches of one manufacturer throughout project.

## **2.2 COVER PLATES**

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .3 Stainless steel 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

## **2.3 SOURCE QUALITY CONTROL**

- .1 Cover plates from one manufacturer throughout project.

## **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 wiring devices 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 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 for Electrical.
- .2 Cover plates:
  - .1 Install suitable common cover plates where wiring devices are grouped.
  - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

**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.

**3.4 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1            CSA International
  - .1            CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

**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.
- .2            Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**Part 2            Products**

**2.1                BREAKERS GENERAL**

- .1            Moulded-case circuit breakers: to CSA C22.2 No. 5
- .2            Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
- .3            Common-trip breakers: with single handle for multi-pole applications.
- .4            Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
  - .1            Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .5            Circuit breakers to have interrupting capacity rating to match existing breakers or 10 kA, whichever is higher.

**Part 3            Execution**

**3.1                INSTALLATION**

- .1            Install circuit breakers as indicated.

**3.2                CLEANING**

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

**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 C62.41-2001, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .2 ASTM International Inc.
  - .1 ASTM F1137-11e1, Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .3 Canadian Standards Association (CSA International)
- .4 ICES-005-07, Radio Frequency Lighting Devices.
- .5 Underwriters' Laboratories of Canada (ULC)

**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 datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.
  - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials 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.

**Part 2 Products**

**2.1 LAMPS**

- .1 LED lamps to be as specified in light schedule, 50,000 hour min. lamp life, nominal lumen output as indicated.
- .2 Type as indicated in luminaire schedule.

**2.2 BALLASTS**

- .1 LED driver: CSA Certified.

- .1 Rating: 120 V input unless otherwise specified.
- .2 High efficiency, energy management type driver.
- .3 Dimming or non-dimming as indicated.

**2.3 FINISHES**

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

**2.4 OPTICAL CONTROL DEVICES**

- .1 As indicated in luminaire schedule.

**2.5 LUMINAIRES**

- .1 As indicated in luminaire schedule.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Locate and install luminaires as indicated.

**3.2 WIRING**

- .1 Connect luminaires to lighting circuits:
  - .1 Install flexible or rigid conduit for luminaires as indicated.

**3.3 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.

**3.4 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            Division 1
- .2            Section 32 92 19.13 Topsoil Placement and Grading
- .3            Section 32 92 23 Sodding

**1.2                REFERENCES**

- .1            American Society for Testing and Materials (ASTM)
  - .1            ASTM D 698-91(1998), Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m<sup>3</sup>).

**1.3                EXISTING CONDITIONS**

- .1            Known underground and surface utility lines and buried objects are as indicated on site plan.

**1.4                PROTECTION**

- .1            Protect and/or transplant existing fencing, trees, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain as directed by NCC Representative. If damaged, restore to original or better condition unless directed otherwise.
- .2            Maintain access roads to prevent accumulation of construction related debris on roads.

**Part 2            Products**

**2.1                MATERIALS**

- .1            Excavated or graded material existing on site may be suitable to use as fill for grading work if approved by NCC Representative.

**Part 3            Execution**

**3.1                STRIPPING OF TOPSOIL**

- .1            Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by NCC Representative.
- .2            Commence topsoil stripping of areas as indicated after area has been cleared of weeds and grasses and removed from site.
- .3            Strip topsoil to depths as indicated. Rototill weeds and grasses and retain as topsoil on site. Avoid mixing topsoil with subsoil.

- .4 Stockpile in locations as indicated. Stockpile height not to exceed 2 m.
- .5 Dispose of unused topsoil to location as indicated.

### **3.2 GRADING**

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 Rough grade to following depths below finish grades:
  - .1 150mm for flowerbeds.
  - .2 300mm for shrub beds.
  - .3 330mm for asphalt paving.
  - .4 330 mm for paving units.
- .3 Slope rough grade away from building as indicated.
- .4 Grade ditches to depth required for maximum run-off as indicated.
- .5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .6 Compact filled and disturbed areas to corrected maximum dry density maximum dry density to ASTM D 698, as follows:
  - .1 85% under landscaped areas.
  - .2 95 % under paved and walk areas.
- .7 Do not disturb soil within branch spread of trees or shrubs to remain.

### **3.3 SURPLUS MATERIAL**

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

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes: Materials and installation for fertilizing and preserving root systems of plants affected by changing grades or excavation.

**1.2 RELATED SECTIONS**

- .1 Division 1
- .2 Section 31 22 13 Rough Grading
- .3 Section 32 92 19.13 Topsoil Placement and Grading

**1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CSA G30.5-M1983(R1998), Welded Steel Wire Fabric for Concrete Reinforcement.
- .2 Department of Justice Canada (Jus).
- .3 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .4 Fertilizers Act (R.S. 1985, c. F-10).
- .5 Fertilizers Regulations (C.R.C., c. 666).
- .6 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .7 Health Canada - Pest Management Regulatory Agency (PMRA).
  - .1 National Standard for Pesticide Education, Training and Certification in Canada (1995).
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).

**1.4 DEFINITIONS**

- .1 Mycorrhiza : association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

**1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit monthly written reports on maintenance during warranty period, to NCC Representative identifying:
  - .1 Maintenance work carried out.
  - .2 Development and condition of plant material.

- .3 Preventative or corrective measures required which are outside Contractor's responsibility.
- .3 Submit WHMIS MSDS.

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

- .1 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Regional and Municipal regulations.
  - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
  - .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
  - .4 Separate for reuse and recycling and place in designated containers Steel, Metal and Plastic waste.
  - .5 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by NCC Representative.
  - .6 Divert unused wood materials from landfill by alternative disposal.
  - .7 Divert unused stone and aggregate materials from landfill to local quarry or facility.
  - .8 Divert unused plastic materials from landfill to local recycling.
  - .9 Place materials defined as hazardous or toxic in designated containers.
  - .10 Dispose of unused fertilizer material at official hazardous material collections site.
  - .11 Handle and dispose of hazardous materials in accordance with CEPA , TDGA , Regional and Municipal regulations.
  - .12 Do not dispose of unused fertilizer material into sewer system, into streams, lakes, onto ground or in any other location where they will pose health or environmental hazard.
  - .13 Ensure emptied containers are sealed and stored safely.
  - .14 Fold up metal banding, flatten and place in designated area for recycling.

## **1.7 SCHEDULING**

- .1 Obtain approval from NCC Representative of schedule indicating beginning of Work.

## **1.8 MAINTENANCE DURING WARRANTY PERIOD**

- .1 From time of acceptance by NCC Representative to end of warranty period, perform following maintenance operations.
- .2 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
- .3 Apply pesticides in accordance with National Standard for Pesticide Education, Training and Certification in Canada, Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from NCC Representative prior to application.

- .4 Apply fertilizer in early spring at rate of 0.025 kg of nitrogen/m<sup>2</sup> at manufacturer's suggested rate.
- .5 Remove dead, broken or hazardous branches from plant material.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Fill:
  - .1 Type (A): clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.
  - .2 Type (B): excavated pervious soil, free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc). Excavated material shall be approved by NCC Representative before use as fill.
- .2 Coarse washed stones: 35-75 mm diameter clean round hard stone.
- .3 Peatmoss:
  - .1 Derived from partially decomposed species of Sphagnum Mosses.
  - .2 Elastic and homogeneous.
  - .3 Free of wood and deleterious material which could prohibit growth.
  - .4 Shredded minimum particle size: 5 mm.
- .4 Fertilizer:
  - .1 To Canada Fertilizer Act and Fertilizers Regulations.
  - .2 Complete, commercial, slow release with 35 % of nitrogen content in water-insoluble form.
  - .3 Adding mycorrhiza during planting operation might improve better root system and provide stress relief in plant growth. It is important that new root growth be in contact with mycorrhiza. Use as recommended by the manufacturer.
- .5 Anti-desiccant: commercial, wax-like emulsion.
- .6 Filter Cloth:
  - .1 Type 1: 100 % non-woven needle punched polyester, 2.75 mm thick, 240 g/m<sup>2</sup> mass.
  - .2 Type 2: biodegradable burlap.
- .7 Wood posts: 38 x 89 x 2400 mm length, untreated wood.
- .8 Welded wire fabric (WWF): 100 x 100mm, to CSA G30.5.

## **Part 3 Execution**

### **3.1 IDENTIFICATION AND PROTECTION**

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Identify plants and limits of root systems to be preserved as approved by NCC Representative.

- .3 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by NCC Representative.
- .4 Ensure no pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by NCC Representative.

**3.2 LOWERING GRADE AROUND EXISTING TREE**

- .1 Begin Work in accordance with schedule approved by NCC Representative.
- .2 Cut slope not less than 500 mm from tree trunk to new grade level.
- .3 Excavate to depths as indicated. Protect from damage root zone which is to remain.
- .4 When severing roots at excavation level, cut roots with sharp tools.
- .5 Cultivate excavated surface manually to 15 mm depth.
- .6 Prepare homogeneous soil mixture consisting by volume of:
  - .1 60 % excavated soil cleaned of roots, plant matter, stones, debris.
  - .2 25 % coarse, clean sterile sand.
  - .3 15 % organic matter.
  - .4 Grade 2:12:8 fertilizer at rate of 1.5 kg/m<sup>3</sup>.
- .7 Place soil mixture over area of excavation to finished grade level. Compact to 85% Standard Proctor Density.
- .8 Water entire root zone to optimum soil moisture level.
- .9 Install surface cover of sodding in accordance with Section 32 92 23 - Sodding.

**3.3 ANTI-DESICCANT**

- .1 Apply anti-desiccant to foliage where applicable and as directed by NCC Representative.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1        DIVISION 1
- .2        Section 32 12 16.01 Asphalt Paving
- .3        Section 32 14 10 Unit paving on Sand Bed

**1.2                REFERENCES**

- .1        ASTM International
  - .1        ASTM C 117-04, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  - .2        ASTM C 131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3        ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4        ASTM D 422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.
  - .5        ASTM D 698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .6        ASTM D 1557-09, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft<sup>3</sup>) (2,700kN-m/m<sup>3</sup>).
  - .7        ASTM D 1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .8        ASTM D 4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2        Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2        CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3        U.S. Environmental Protection Agency (EPA) / Office of Water
  - .1        EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Construction Waste Management:
  - .1        Submit project Waste Management Plan highlighting recycling and salvage requirements.
  - .2        Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

**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 Storage and Handling Requirements:
- .3 Store materials in accordance with manufacturer's recommendations erosion and sedimentation control plan.
- .4 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Granular sub-base material: in accordance with the following requirements:
- .2 Crushed, pit run or screened stone, gravel or sand.
- .3 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2.
- .4 Table

<b>Sieve Designation</b>	<b>% Passing</b>
100 mm	
75 mm	100
50	100
37.5 mm	
25 mm	55-100
19 mm	
12.5	38-70
9.5	
4.75 mm	22-55
2.00 mm	13-42
0.425 mm	5-28
0.180	
0.075 mm	2-10

- .5 Other properties as follows:
  - .1 Liquid Limit: to ASTM D 4318, Maximum 25.
  - .2 Plasticity Index: to ASTM D 4318, Maximum 6.
  - .3 Los Angeles degradation: to ASTM C 131.
  - .4 Maximum loss by mass: 40 50 %.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for granular sub-base installation in accordance with manufacturer's written instructions.

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

### **3.2 PREPARATION**

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### **3.3 PLACING**

- .1 Place granular sub-base after subgrade is inspected and approved by NCC Representative.
- .2 Construct granular sub-base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
- .7 NCC Representative may authorize thicker lifts if specified compaction can be achieved.
- .8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .9 Remove and replace portion of layer in which material has become segregated during spreading.

### **3.4 COMPACTION**

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from NCC Representative before use.
- .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compact to density of not less than 98% corrected maximum dry density.
- .5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .6 Apply water as necessary during compaction to obtain specified density.

- .7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by NCC Representative.
- .8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

### **3.5 CLEANING**

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

### **3.6 SITE TOLERANCES**

- .1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

### **3.7 PROTECTION**

- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by NCC Representative.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1      Division 1
- .2      Section 31 22 13 Rough Grading
- .3      Section 32 11 16.01 Granular Sub-Base

**1.2                REFERENCES**

- .1      American Society for Testing and Materials International, (ASTM)
  - .1      ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - .2      Canadian General Standards Board (CGSB)
  - .3      CAN/CGSB-1.5-M91(March 1999), Low Flash Petroleum Spirits Thinner (Reaffirmation of December 1991).
  - .4      CAN/CGSB-1.74-2001, Alkyd Traffic Paint.
- .2      Government of Québec, Minister of Transport
  - .1      Cahier des charges et devis généraux (CCDG)-97.

**1.3                SAMPLES**

- .1      Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Submit to NCC Representative, samples of material for sieve analysis at least two (2) weeks before beginning Work.

**1.4                WASTE MANAGEMENT AND DISPOSAL**

- .1      Separate and recycle waste materials in accordance with local regulations.
- .2      Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3      Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling.
- .4      Place materials defined as hazardous or toxic in designated containers.
- .5      Divert unused aggregate materials from landfill to facility for reuse.
- .6      Dispose of unused paint and paint thinner materials at official hazardous material collections site.
- .7      Fold up metal banding, flatten and place in designated area for recycling.
- .8      Do not dispose of unused paint and paint thinner material into sewer system, into streams, lakes, onto ground or in other location where it will pose health environmental hazard.
- .9      Divert unused asphalt from landfill to facility capable of recycling materials.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Aggregates: to CCDG.
  - .1 Crushed Granular MG 20 MG 20b MG 56.
  - .2 Natural Gravel 80-0.
  - .3 Gravel and sand.
- .2 Prime coat: RC-30 to CCDG.
- .3 Tack coat: SS-1 to CCDG.
- .4 Asphalt concrete: to CCDG.

**Part 3 Execution**

**3.1 FOUNDATIONS**

- .1 Foundations for paved paths to comprise:
  - .1 300 mm compacted thickness of granular base A 20-0.
- .2 Construction of granular foundations: CCDG.
- .3 Compaction: compact each lift of granular material to 100% maximum density to ASTM D 698. Maximum lift thickness: 150 mm.

**3.2 PAVEMENT THICKNESS**

- .1 Pavements for paved paths:
  - .1 Wear course: 50 mm HL3MB5.

**3.3 PAVEMENT CONSTRUCTION**

- .1 Surface preparation: CCDG.
- .2 Application of prime coat: CCDG.
- .3 Construction of asphalt concrete: CCDG.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 01 10 10 - General Instructions

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM C 117-95, Standard Test Method for Material Finer Than 75- $\mu$  m (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C 136-01, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600kN-m/m<sup>3</sup>)).
  - .4 ASTM D 1557-00, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700kN-m/m<sup>3</sup>)).
  - .5 ASTM E 11-01, Standard Specification for Wire-Cloth Sieves for Testing Purposes.
- .2 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International).
  - .1 CSA A23.1/A23.2-00, Concrete Materials and Methods of Construction/Methods of Test for Concrete.
  - .2 CSA A179-94(R1999), Mortar and Grout for Unit Masonry.
  - .3 CSA-A231.1-99, Precast Concrete Paving Slabs.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit following product test data:
  - .1 Sieve analysis for gradation of bedding and joint material.
  - .2 Unit paver test data.
- .2 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Indicate layout, pattern and relationship of paving joints to fixtures and project formed details.
- .3 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance local regulations.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling.
- .4 Divert unused concrete materials from landfill to local facility.
- .5 Divert unused aggregate materials from landfill to facility.
- .6 Divert unused geotextiles from landfill to plastic recycling facility.
- .7 Fold up metal banding, flatten and place in designated area for recycling.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Unit pavers: uniform in material, colour, size and from one manufacturer.
- .2 Flagstone (natural stone): existing stones to be removed and reinstalled.
- .3 Crushed stone or gravel base: consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .4 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2

<u>Sieve Designation</u>	<u>% Passing</u>
19 mm	100
12.5 mm	70-100
4.75 mm	40- 70
2.00 mm	23- 50
0.425 mm	7- 25
0.075 mm	3- 8

- .5 Manufactured sand for bedding: hard, durable, crushed stone particles, conforming to gradation of concrete sand as specified in CAN/CSA A23.1. Sand: free from clay lumps, cementation, organic material, frozen material and other deleterious materials. Do not use limestone screenings or stone dust.
- .6 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2. 0% to pass 0.075 mm sieve.

<u>Sieve Designation</u>	<u>% Passing</u>
10 mm	100
5 mm	95-100
2.5 mm	80-100
1.25 mm	50- 90
0.630 mm	25- 60
0.315 mm	10- 35
0.160 mm	2- 10

- .7 Joint sand: to CSA A179, hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.

**Part 3 Execution**

**3.1 PROTECTION**

- .1 Prevent damage to buildings, landscaping, curbs, sidewalks, trees, fences, roads and adjacent property. Make good any damage.

**3.2 SUBGRADE**

- .1 Ensure that subgrade preparation conforms to levels and compaction required to allow for installation of granular base.

**3.3 GRANULAR BASE**

- .1 Base minimum thickness: as indicated.
- .2 Spread and compact crushed stone or gravel base in uniform layers not exceeding 100 mm compacted thickness.
- .3 Compact base to a density of not less than 98 % Standard Density in accordance with ASTM D698 D1557.
- .4 Shape and roll alternately to obtain smooth, even and uniformly compacted granular base and ensure conformity of grades with finish surface.
- .5 Apply water as necessary during compaction to obtain specified density. If granular base is excessively moist, remove it and install more granular material to rid it of sponginess.
- .6 In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.
- .7 Ensure top of granular base does not exceed plus or minus 10mm over 3 m straightedge.

**3.4 EDGING**

- .1 Install edging true to grade, in location, layout and pattern as indicated.

**3.5 BEDDING SAND**

- .1 Place and spread bedding sand to thickness as indicated.
- .2 Maximum thickness after compaction: 25mm.
- .3 Use material other than bedding sand to compensate for depressions that exceed specified tolerances in surface of base.
- .4 Do not use joint sand for bedding sand.

**3.6 SURFACE COURSE**

- .1 Ensure bedding sand and granular base are not saturated prior to placement of unit pavers.
- .2 Install unit paving true to grade on the bedding sand, in location, layout and pattern as indicated.
- .3 Where required, cut units accurately without damaging edges.

- .4 Flagstone.
  - .1 Install units with butt mm joints.
  - .2 Fill joint spaces to full depth by sweeping in sand.
  - .3 Sweep surface course clean.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            Division 1

**1.2                REFERENCES**

- .1            Agriculture and Agri-Food Canada
  - .1            The Canadian System of Soil Classification, Third Edition, 1998.
- .2            Canadian Council of Ministers of the Environment
  - .1            PN1340-2005, Guidelines for Compost Quality.
- .3            U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1            EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**1.3                DEFINITIONS**

- .1            Compost:
  - .1            Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
  - .2            Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss on Ignition (LOI) test.
  - .3            Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below (25) (50)), and contain no toxic or growth inhibiting contaminants.
  - .4            Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

**1.4                WASTE MANAGEMENT AND DISPOSAL**

- .1            Separate waste materials for reuse and recycling in accordance with local regulations.
- .2            Divert unused soil amendments from landfill to official hazardous material collections site.
- .3            Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

**Part 2            Products**

**2.1                TOPSOIL**

- .1            Topsoil for planting beds: mixture of particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.
- .2            Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10 % organic matter by weight.

- .3 Contain no toxic elements or growth inhibiting materials.
- .4 Finished surface free from:
  - .1 Debris and stones over 50 mm diameter.
  - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
- .5 Consistence: friable when moist.

## 2.2 SOIL AMENDMENTS

- .1 Fertilizer:
  - .1 Fertility: major soil nutrients present in following amounts:
  - .2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
  - .3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
  - .4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
  - .5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
  - .6 Ph value: 6.5 to 8.0.
- .2 Peatmoss:
  - .1 Derived from partially decomposed species of Sphagnum Mosses.
  - .2 Elastic and homogeneous, brown in colour.
  - .3 Free of wood and deleterious material which could prohibit growth.
  - .4 Shredded particle minimum size: 5 mm.
  - .5 Sand: washed coarse silica sand, medium to course textured.
- .3 Organic matter: compost Category A, in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .4 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.
- .5 Limestone:
  - .1 Ground agricultural limestone.
  - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .6 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

## Part 3 Execution

### 3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

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

### **3.2 STRIPPING OF TOPSOIL**

- .1 Begin topsoil stripping of areas as indicated after area has been cleared of weeds and grasses and removed from site.
- .2 Strip topsoil to depths as indicated.
- .3 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.
- .4 Stockpile in locations as indicated.
- .5 Stockpile height not to exceed 2 m.
- .6 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill.
- .7 Protect stockpiles from contamination and compaction.

### **3.3 PREPARATION OF EXISTING GRADE**

- .1 Verify that grades are correct.
- .2 If discrepancies occur, notify NCC Representative and do not commence work until instructed by NCC Representative.
- .3 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .4 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
- .5 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
- .6 Remove debris which protrudes more than 75 mm above surface.
- .7 Dispose of removed material off site.
- .8 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
- .9 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

### **3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL**

- .1 Place topsoil after NCC Representative DCC Representative Consultant has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 For sodded areas keep topsoil 15 mm below finished grade.
  - .1 Spread topsoil as indicated to following minimum depths after settlement.
  - .2 300 mm for flower beds.
  - .3 500 mm for shrub beds.
- .4 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

### **3.5 FINISH GRADING**

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
- .2 Prepare loose friable bed by means of cultivation and subsequent raking.

- .3 Consolidate topsoil to required bulk density using equipment approved by NCC Representative.
- .4 Leave surfaces smooth, uniform and firm against deep footprinting.

**3.6 ACCEPTANCE**

- .1 NCC Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

**3.7 SURPLUS MATERIAL**

- .1 Dispose of materials except topsoil not required off site.

**3.8 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**