

DIVISION 00 PROCUREMENT AND CONTRACTING REQUIREMENTS

| | | |
|----------|---------------------------|---|
| 00 00 01 | PROJECT COVER PAGE _____ | 2 |
| 00 00 10 | SPECIFICATION INDEX _____ | 2 |

DIVISION 01 GENERAL REQUIREMENTS

| | | |
|----------|--|---|
| 01 00 10 | GENERAL REQUIREMENTS _____ | 2 |
| 01 33 00 | SUBMITTAL PROCEDURES _____ | 4 |
| 01 35 29 | HEALTH AND SAFETY REQUIREMENTS _____ | 4 |
| 01 35 43 | ENVIRONMENTAL PROCEDURES _____ | 4 |
| 01 41 00 | REGULATORY REQUIREMENTS _____ | 2 |
| 01 45 00 | QUALITY CONTROL _____ | 4 |
| 01 51 00 | TEMPORARY UTILITIES _____ | 2 |
| 01 56 00 | TEMPORARY BARRIERS AND ENCLOSURES _____ | 2 |
| 01 61 00 | COMMON PRODUCT REQUIREMENTS _____ | 4 |
| 01 73 00 | EXECUTION _____ | 2 |
| 01 73 29 | ALTERATIONS AND MAKING GOOD PROCEDURES _____ | 4 |
| 01 74 11 | CLEANING _____ | 2 |
| 01 74 21 | CONSTRUCTION/DEMOLITION WASTE MANAGEMENT _____ | 4 |
| 01 77 00 | CLOSEOUT PROCEDURES _____ | 2 |
| 01 78 00 | CLOSEOUT SUBMITTALS _____ | 6 |
| 01 79 00 | DEMONSTRATION AND TRAINING _____ | 2 |
| 01 91 13 | GENERAL COMMISSIONING (CX) REQUIREMENTS _____ | 8 |
| 01 91 31 | COMMISSIONING (CX) PLAN _____ | 8 |
| 01 91 33 | COMMISSIONING FORMS _____ | 2 |
| 01 91 41 | COMMISSIONING: TRAINING _____ | 4 |

DIVISION 02 EXISTING CONDITIONS

| | | |
|----------|---------------------------------|---|
| 02 41 13 | SELECTIVE SITE DEMOLITION _____ | 6 |
| 02 81 01 | HAZARDOUS MATERIALS _____ | 4 |

DIVISION 04 MASONRY

| | | |
|----------|---|---|
| 04 05 00 | COMMON WORK RESULTS FOR MASONRY _____ | 4 |
| 04 05 12 | MASONRY MORTAR AND GROUT _____ | 2 |
| 04 05 19 | MASONRY ANCHORAGE AND REINFORCING _____ | 4 |
| 04 05 23 | MASONRY ACCESSORIES _____ | 2 |
| 04 22 00 | CONCRETE UNIT MASONRY _____ | 6 |

DIVISION 05 METALS

| | | |
|----------|--------------------------|---|
| 05 50 00 | METAL FABRICATIONS _____ | 4 |
|----------|--------------------------|---|

DIVISION 06 WOODS, PLASTICS, AND COMPOSITES

| | | |
|-------------|------------------------------------|---|
| 06 10 00.01 | ROUGH CARPENTRY - SHORT FORM _____ | 4 |
|-------------|------------------------------------|---|

DIVISION 07 THERMAL AND MOISTURE PROTECTION

| | | |
|----------|---------------------------------|---|
| 07 16 16 | CRYSTALLINE WATERPROOFING _____ | 4 |
| 07 21 14 | BOARD INSULATION _____ | 4 |
| 07 21 16 | BLANKET INSULATION _____ | 2 |
| 07 26 00 | VAPOUR RETARDERS _____ | 2 |

| | | |
|-------------|---|----|
| 07 27 00.01 | AIR BARRIERS - DESCRIPTIVE | 6 |
| 07 55 00 | PROTECTED MEMBRANE ROOFING | 14 |
| 07 61 00 | LEAD-COATED SHEET COPPER ROOFING | 6 |
| 07 61 15 | SHEET COPPER ROOFING, FLASHING AND TRIM | 8 |
| 07 84 00 | FIRE STOPPING | 6 |
| 07 92 00 | JOINT SEALANTS | 6 |

DIVISION 09 FINISHES

| | | |
|----------|----------------------------|---|
| 09 21 16 | GYPSUM BOARD ASSEMBLIES | 6 |
| 09 21 99 | PARTITIONS FOR MINOR WORKS | 6 |
| 09 91 99 | PAINTING FOR MINOR WORKS | 6 |

DIVISION 14 CONVEYING EQUIPMENT

| | | |
|----------|---------------------|----|
| 14 20 06 | PASSENGER ELEVATORS | 14 |
|----------|---------------------|----|

DIVISION 21 FIRE SUPPRESSION

| | | |
|----------|----------------------------|---|
| 21 13 13 | WET PIPE SPRINKLER SYSTEMS | 1 |
|----------|----------------------------|---|

DIVISION 22 PLUMBING

| | | |
|----------|----------------|---|
| 22 10 10 | PLUMBING PUMPS | 2 |
|----------|----------------|---|

DIVISION 23 HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

| | | |
|-------------|--|---|
| 23 05 05 | INSTALLATION OF PIPEWORK | 2 |
| 03 05 29 | HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT | 3 |
| 23 05 48 | VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT | 3 |
| 23 21 13.02 | HYDRONIC SYSTEMS: STEEL | 2 |

DIVISION 26 ELECTRICAL

| | | |
|-------------|--|---|
| 26 05 00 | COMMON WORK RESULTS FOR ELECTRICAL | 7 |
| 26 05 20 | WIRE AND BOX CONNECTORS (0-1000 V) | 2 |
| 26 05 21 | WIRES AND CABLES (0-1000 V) | 3 |
| 26 05 31 | SPLITTERS, JUNCTION, PULL BOXES AND CABINETS | 2 |
| 26 05 32 | OUTLET BOXES, CONDUIT BOXES AND FITTINGS | 2 |
| 26 05 34 | CONDUITS, CONDUIT FASTENING AND CONDUIT FITTINGS | 4 |
| 26 27 26 | WIRING DEVICES | 4 |
| 26 28 16.02 | MOULDED CASE CIRCUIT BREAKERS | 3 |
| 26 28 23 | DISCONNECT SWITCHES – FUSED AND NON-FUSED | 2 |
| 26 50 00 | LIGHTING | 3 |
| 26 28 13.01 | FUSES – LOW VOLTAGE | 2 |
| 28 31 00 | FIRE DETECTION AND ALARM | 6 |

APPENDIX A DRAWING COMPANION

| | | |
|------|----------------------------|----|
| A 01 | DESIGNATE SUBSTANCE REPORT | 19 |
|------|----------------------------|----|

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

- .1 The work of this contract is described by drawings and specification sections as identified in Index Sections.
- .2 Work of this Contract comprises replacement of an existing elevator, located in the basement, first floor, second floor and roof at 1 Sussex Drive, Ottawa, Ontario; and further identified as Elevator Replacement. This contract consists of, but is not limited to the following:
 - .1 Removals and Demolition:
 - .1 Removal of the existing piston type elevator and related equipment.
 - .2 Removal of all electrical, mechanical, security and hydraulic equipment within the hoistway and machine room.
 - .3 Removal of elevator doors on each level including wall sections to accommodate the new rough openings for the new doors.
 - .4 Demolition of the roof section to accommodate a hoistway extension. Modifications to the parapet and adjacent sloped roof will be required.
 - .2 New Work:
 - .1 Installation of a new elevator system including all components, hoistway beam, pit ladder fire protection systems and pit water proofing epoxy.
 - .2 Control systems installed within the machine room. Reinstatement fire caulking, wall patching and new paint finishes within machine room.
 - .3 Within the hoistway, reinstatement damaged concrete block/wall, infill concrete blocks at the new doors and patch interior walls to match existing finishes.
 - .4 Extend the hoistway past the roof with new concrete block wall assembly and steel deck roof. Provide copper siding, roofing and flashing to match existing.
 - .5 Reinstatement existing parapets and roof assemblies to match existing. Relocate rooftop unit. Provide roof saddle on the existing sloped roof.
- .3 Work of this contract must begin within 10 days of award of contract. Note the following:
 - .1 Site survey to allow preparation of elevator shop drawing to be done during the first two weeks of March 2015.
 - .2 All site work during the summer season, between June 2015 and September 2015.
 - .3 New elevator system to be fully commissioned by September 15, 2015.

1.2 SITE EXAMINATION

- .1 The submission of a tender shall be deemed as proof that the tenderer and his sub-trades have complied with this requirement. Claims for additional compensation will not be entertained for any items of labour or material required to complete the work that could have been reasonably ascertained by the Site Examination.
- .2 The Contractor shall also make himself familiar with the security and site access routines for daily operations and procedures to follow during the implementation of the work of this contract in order to properly assess the work procedures and deliveries for work of this contract and ensure minimum disruption to the site's occupants.
- .3 The Contractor is responsible to verify all dimensions pertinent to work of this contract on site. Any discrepancies found during construction shall be borne by the contractor at no extra cost to this contract.
- .4 Assume responsibility for setting out the work, provide all instruments.

PART 2 CONTRACT ADMINISTRATION

2.1 CANADIAN LABOUR and MATERIAL

- .1 The Contractor shall use Canadian labour and materials in the design and performance of the Work to the full extent to which they are procurable, consistent with proper economy and the expeditious carrying out of the Work.
- .2 Subject to the above, the Contractor shall, in the performance of the work, employ labour from the locality where the work is being performed to the extent to which it is available.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 45 00 - Quality Control.

1.2 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 is 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's review.
- .10 Keep one reviewed copy of each submission on site.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 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.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 10 days for NCC Representative's review of each submission.
- .5 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.

- .6 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.
- .7 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 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.
- .9 After NCC Representative's review, distribute copies.
- .10 Submit electronic copy in (.pdf) format of shop drawings for each requirement requested in specification Sections and as NCC Representative may reasonably request.
- .11 Submit electronic copy in (.pdf) format or four (4) hard 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.
- .12 Submit electronic copy in (.pdf) format 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.
- .13 Submit electronic copy in (.pdf) format 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.
- .14 Submit electronic copy in (.pdf) format of manufacturer's 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.
- .15 Submit electronic copy in (.pdf) format of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by NCC Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit electronic copy in (.pdf) format and four (4) hard copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by NCC Representative.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by NCC Representative, no errors or omissions are discovered or if only minor corrections are made, electronic copy in (.pdf) format 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.
- .21 The review of shop drawings by NCC Representative is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that NCC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.4 **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.

1.5 **MOCK-UPS**

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

1.6 **PHOTOGRAPHIC DOCUMENTATION**

- .1 Submit electronic copy of colour digital photography in (.jpg) or (.tif) formats, standard resolution, as directed by NCC Representative.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: 2 locations.
 - .1 Viewpoints and their location as determined by NCC Representative.
- .4 Frequency of photographic documentation: as directed by NCC Representative.
 - .1 Upon completion of: framing and services before concealment, of Work, and as directed by NCC Representative.

1.7 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

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 41 00 - Regulatory Requirements.
- .3 Section 02 81 01 - Hazardous Materials.

1.2 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Ontario
 - .1 Occupational Health and Safety Act, R.S.O. 1990 Amended 2009.

1.3 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within seven (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.
- .3 Submit electronic copy in (.pdf) format or two (2) hard copies of Contractor's authorized representative's work site health and safety inspection reports to NCC Representative and authority having jurisdiction, weekly.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with and Section 02 81 01 - Hazardous Materials.
- .7 NCC Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within five (5) days after receipt of plan. Revise plan as appropriate and resubmit plan to NCC Representative within five (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.

1.4 FILING OF NOTICE

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

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

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

1.7 REGULATORY REQUIREMENTS

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

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 Ontario Health and Safety Act, R.S.O.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.11 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.

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

1.13 POSTING OF DOCUMENTS

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

1.14 CORRECTION OF NON-COMPLIANCE

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

1.15 POWDER ACTUATED DEVICES

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

1.16 WORK STOPPAGE

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

1.17 BUILDING SMOKING ENVIRONMENT

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

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 11 - Cleaning.
- .3 Section 01 74 21 - Construction/Demolition Waste Management.

1.2 REFERENCES

- .1 Definitions:
 - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
 - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.
- .2 Reference Standards:
 - .1 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832/R-92-005-92, Storm Water Management for Construction Activities, Chapter 3.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to commencing construction activities or delivery of materials to site, provide Environmental Protection Plan for review and approval by NCC Representative.
- .3 Ensure Environmental Protection Plan includes comprehensive overview of known or potential environmental issues to be addressed during construction.
- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Include in Environmental Protection Plan:
 - .1 Name(s) of person(s) responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from site.
 - .3 Name(s) and qualifications of person(s) responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.
 - .5 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Ensure plan includes measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
 - .6 Spill Control Plan including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
 - .7 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
 - .8 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.

- .9 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .10 Waste Water Management Plan identifying methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
- .11 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

1.4 FIRES

- .1 Fires and burning of rubbish on site is not permitted.
- .2 Where fires or burning permitted, prevent staining or smoke damage to structures, materials or vegetation which is to be preserved. Restore, clean and return to new condition stained or damaged work.
- .3 Provide supervision, attendance and fire protection measures as directed.

1.5 DRAINAGE

- .1 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.
- .2 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .3 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.6 POLLUTION CONTROL

- .1 Maintain temporary pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant to local authorities' emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area. Provide temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.7 NOTIFICATION

- .1 NCC Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform NCC Representative of proposed corrective action and take such action for approval by NCC Representative.
 - .1 Do not take action until after receipt of written approval by NCC Representative.
- .3 NCC Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management.
- .3 Burying rubbish and waste materials on site is not permitted.
- .4 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

END OF SECTION

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PART 1 GENERAL

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with National Building Code of Canada (NBC) including amendments up to tender closing date and other codes of provincial or local application and applicable standards provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify 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.

1.3 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions and municipal by-laws.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

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PART 1 GENERAL

1.1 INSPECTION

- .1 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.
- .2 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.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 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.

1.2 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by NCC Representative for purpose of inspecting and/or testing portions of Work.
- .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.

1.3 ACCESS TO WORK

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

1.4 PROCEDURES

- .1 Notify appropriate agency and 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.

1.5 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by NCC Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.

- .3 If in opinion of 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.

1.6 REPORTS

- .1 Submit electronic copy in (.pdf) format or three (3) hard 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.

1.7 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.

1.8 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 If requested, NCC Representative will assist in preparing schedule fixing dates for preparation.
- .6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.9 MILL TESTS

- .1 Submit mill test certificates as requested.

1.10 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Refer to Sections for definitive requirements.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

- .1 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 SUBMITTALS

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

1.4 DEWATERING

- .1 Provide temporary drainage and pumping facilities to keep site free from standing water.

1.5 WATER SUPPLY

- .1 Owner will provide continuous supply of potable water for construction use.
- .2 Owner will pay for utility charges at prevailing rates.

1.6 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .2 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
- .3 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .4 Permanent heating system of building, to be used when available. Be responsible for damage to heating system if use is permitted.
- .5 On completion of Work for which permanent heating system is used, replace filters.
- .6 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by NCC Representative.
- .7 Owner will pay utility charges when temporary heat source is existing building equipment.

- .8 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
- .9 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.7 TEMPORARY POWER AND LIGHT

- .1 Owner will pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 230 volts 30 amps.
- .2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.
- .3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.
- .4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .5 Connect to existing power supply in accordance with Canadian Electrical Code.
- .6 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of NCC Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

1.8 TEMPORARY COMMUNICATION FACILITIES

- .1 Provide and pay for temporary telephone, fax, data hook up of lines, and equipment necessary for own use.

1.9 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 74 21 - Construction/Demolition Waste Management.

1.2 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.

1.3 INSTALLATION AND REMOVAL

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

1.4 HOARDING

- .1 Erect temporary site enclosure using 38x89mm construction ggrade lumber framing at 600mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA 0121.
- .2 Apply plywood panels vertically.

1.5 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around open shafts, open edges of floors and roofs.
- .2 Provide as required by governing agencies.

1.6 WEATHER ENCLOSURES

- .1 Provide weather right closures to 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.

1.7 DUST TIGHT SCREENS

- .1 Provide negative pressure dust tight polyethylene screens with double curtained doorway 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.

1.8 ACCESS TO SITE

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

1.9 FIRE ROUTES

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

1.10 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 NCC Representative locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

1.11 WASTE MANAGEMENT AND DISPOSAL

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

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 73 00 - Execution.

1.2 REFERENCES

- .1 Within text of each specification section, reference may be made to reference standards. List of standards reference writing organizations is contained within each specification section.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, NCC Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be borne by NCC Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.3 QUALITY

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .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.

1.4 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify 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.

1.5 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 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 and lumber 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 satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.6 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 Owner. Unload, handle and store such products.

1.7 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.

1.8 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify 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.

1.9 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.

1.10 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.

1.11 REMEDIAL WORK

- .1 Refer to Section 01 73 00 - Execution Requirements.
- .2 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .3 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.12 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.

1.13 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 stainless steel fasteners and anchors for securing exterior work.
- .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.

1.14 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.

1.15 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.

1.16 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 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 07 84 00 - Firestopping.
- .3 Section 01 74 21 - Construction/Demolition Waste Management.

1.2 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of elements of project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of operational elements.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Owner or separate contractor.
- .3 Include in request:
 - .1 Identification of project.
 - .2 Location and description of affected Work.
 - .3 Statement on necessity for cutting or alteration.
 - .4 Description of proposed Work, and products to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on Work of Owner or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.3 MATERIALS

- .1 Required for original installation.
- .2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

1.4 PREPARATION

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.5 EXECUTION

- .1 Execute cutting, fitting, and patching to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.

- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00 - Firestopping, full thickness of the construction element.
- .12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

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.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management.
- .3 Section 07 84 00 - Firestopping.

1.2 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of elements of project.
 - .2 Integrity of weather exposed or moisture resistant elements.
 - .3 Efficiency, maintenance, or safety of operational elements.
 - .4 Visual qualities of sight exposed elements.
 - .5 Work of Owner or separate contractor.
- .3 Include in request:
 - .1 Identification of project.
 - .2 Location and description of affected Work.
 - .3 Statement on necessity for cutting or alteration.
 - .4 Description of proposed Work, and products to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on Work of Owner or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.3 GENERAL REQUIREMENTS

- .1 This Section provides guidelines to the existing building material refurbishment, as indicated on the Drawings, as specified herein and as required for a complete project, as well as requirements and limitations for cutting and patching the Work.
 - .1 Where indicated and required, patch and make good and/or reinstate finishes and assemblies with like materials to match existing finishes which are to remain, or new finishes to be provided.
 - .2 Complete work to extent required using appropriate transition points between existing or between existing and new assemblies to ensure neat consistent, finished appearance over entire surface.
 - .3 Where a smooth transition cannot be achieved in close proximity to the effected work, finish to appropriate transition points including:
 - .1 Intersection of ceiling or floor and wall plane
 - .2 Intersection of wall planes
 - .3 Intersection of other horizontal or vertical surfaces such as bulkheads
 - .4 Inside or outside corner at changes in surface plane.
- .2 Review construction documents and existing conditions at site assessment to ascertain extent of alterations required to meet the requirements described herein.

1.4 PREPARATION

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work.

- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.5 **ALTERATIONS, CUTTING AND PROTECTION**

- .1 Extent:
 - .1 Perform cutting and removal work so as not to cut or remove more than is necessary and so as not to damage adjacent work.
- .2 Shoring, Bracing and Capping:
 - .1 Provide shoring, needling and bracing as needed to keep the building structurally secure and free of deflection in all its parts and as needed for the installation of new work.
- .3 Responsibility and Assignment to Trades:
 - .1 The Contractor shall assign the work of moving, removal, cutting, patching and repair to trades under his supervision so as to cause the least damage to each type of work encountered, and so as to return the building as much as possible to the appearance of the new work.
 - .2 Assign patching of finish materials to tradesmen skilled in the work of the finish trade involved.
- .4 Protection:
 - .1 Protect remaining finishes, equipment and adjacent work from damage caused by cutting, moving, removal and patching operations. Protect surfaces which will remain a part of the finished work.

1.6 **PATCHING, EXTENDING AND MATCHING**

- .1 Skill:
 - .1 Patch and extend existing work using skilled tradesmen who are capable of matching the existing quality of workmanship. The quality of patched or extended work shall not be less than that specified in the applicable Sections of the Contract Specifications.
- .2 Patching:
 - .1 In areas where any portion of an existing finished surface is damaged, lifted, stained or otherwise found to be imperfect, patch or replace the imperfect portion of the surface with matching material.
 - .2 Do not incorporate salvaged or used material in new construction, except where small quantities of finish material which are difficult to match or duplicate are approved for patching or extending purposes by the NCC.
 - .3 Provide adequate support or substrate for patching of finishes.
 - .4 If the imperfect surface is a painted or coated one, repaint or recoat the patched portion in such a way that uniform colour and texture over the entire surface results.
 - .5 If the surrounding surface cannot be matched, repaint or recoat the entire surface to nearest natural break.
- .3 Quality:
 - .1 In the Sections of the Specifications to which these alteration procedures are applicable, products required for patching, matching, extending or replacing existing work have not necessarily been described. Obtain all required products in time to complete the Work on schedule. Provide products of quality equal to or better than the existing products.
- .4 Transitions:

- .1 Where new work abuts or finishes flush with existing work, make the transition as smooth and workmanlike as possible. Patched work shall match existing adjacent work in texture and appearance, so as to make the patch or transition invisible to the eye at a distance of one metre.
- .2 Where concrete, drywall, wood, metal or other finished surface is cut in such a way that a smooth transition with new work is not possible, terminate the existing surface in a neat fashion along a straight line at a natural line of division and provide trim appropriate to the finished surface.
- .5 Matching:
 - .1 Where not otherwise specified or indicated, restore existing work that is damaged during construction to a condition equal to its condition at the time of the start of the Work.
 - .2 At locations in existing areas where partitions are removed, patch the floors, walls and ceilings with finish materials to match adjacent finishes.

1.7 EXECUTION

- .1 Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.
- .2 Use material to match existing.
- .3 Cut rigid materials using a masonry saw or core drill. Pneumatic or impact tools not allowed without prior approval.
- .4 Restore work with new products in accordance with requirements of Contract Documents.
- .5 Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .6 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with fire rated materials and firestopping material, full thickness of the construction element in accordance with Section 07 84 00 - Firestopping, full thickness of the construction element.
- .7 Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
- .8 Reinstall work in accordance with the conditions of the surface prior to cutting and patching.
- .9 Reconnect any services damaged due to cutting as part of patching and repairing of the damage area.

1.8 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 Debris:
 - .1 Remove debris promptly from the site each day. Removed material, except that listed or marked by the NCC for retention, becomes the property of the Contractor. Load removed material directly on trucks for removal from the site. Dispose of removed material legally.
 - .2 Do not let piled material endanger structure.
- .3 Suppress dust. Prevent the occurrence of unsanitary conditions, dirt or debris.

PART 2 Products

2.1 NOT USED

- .1 Not Used.

PART 3 Execution

3.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

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

1.2 DAILY CLEANING

- .1 Contractor to perform daily and final cleaning. Ensuring a high level of cleanliness for the continuous use of facility's operations.

1.3 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 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers for collection of waste materials and debris.
- .5 Dispose of waste materials and debris off site.
- .6 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.4 FINAL CLEANING

- .1 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, shampoo 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.

1.5 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 of 75% 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 DEFINITIONS

- .1 Class III: non-hazardous waste - construction renovation and demolition waste.
- .2 Demolition Waste Audit (DWA): relates to actual waste generated from project.
- .3 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.
- .4 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .5 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .6 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.
- .7 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.
- .8 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .9 Separate Condition: refers to waste sorted into individual types.
- .10 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.
- .11 Waste Management Co-ordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .12 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials.

1.3 DOCUMENTS

- .1 Maintain at job site, one copy of following documents:
 - .1 Waste Reduction Workplan.

- .2 Material Source Separation Plan.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Prepare and submit following prior to project start-up:
 - .1 Submit two (2) copies of completed Waste Reduction Workplan (WRW).
- .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, or disposed of.
 - .3 For each material reused, sold or recycled from project, include quantities by number, type and size of items and the destination.
 - .4 For each material land filled or incinerated from project, include amount of material.

1.5 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.

1.6 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 material[s] in area[s] which minimize material damage.
- .7 Collect, handle, store on-site, and transport off-site, salvaged materials in separated condition. Transport to approved and authorized recycling facility.

1.7 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .4 Protect structural components not removed for demolition from movement or damage.
- .5 Support affected structures. If safety of building is endangered, cease operations and immediately notify NCC Representative.
- .6 Protect surface drainage, mechanical and electrical from damage and blockage.
- .7 Separate and store materials produced during dismantling of structures in designated areas. Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

1.8 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, or oil 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 quantity generated.
 - .4 Total quantity 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.

1.9 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, provide temporary security measures to work area approved by NCC Representative.

1.10 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 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 74 11 - Cleaning.
- .2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor and Sub Contractor shall 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's inspection.
 - .2 NCC Representative's 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 in English that 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, balanced and fully operational.
 - .4 Certificates required by Fire Commissioner: submitted.
 - .5 Operation of systems: demonstrated to Owner's personnel.
 - .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.
 - .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 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 45 00 - Quality Control.
- .3 Section 01 71 00 - Examination and Preparation.

1.2 O&M MANUAL

- .1 O&M Manuals are to be assembled in a 1" or greater 3 ring binder labelled on the front cover and on the binder edge with the:
 - .1 Building Name and address
 - .2 Project Name
 - .3 Project Number
 - .4 Project Completion Date
- .2 O&M manuals are to include a Title Page with: building name, address, date, general contractor information: name address & phone numbers, consultant: name address & phone numbers.
- .3 O&M Manuals are to be indexed and sectioned as follows
 - .1 Signed Letter of warranty: dated; identifying project by name; project number; location and warranty period. Any extended equipment warranty must also be identified.
 - .2 Contact information for all sub-contractors & suppliers.
 - .3 Reports:
 - .1 Copy of all TAB reports for HVAC systems.
 - .2 Pre-functional tests and/or start-up reports.
 - .3 Functional test reports.
 - .4 Completed performance verification forms.
 - .5 Cabling verifications.
 - .6 ESA certification - Certificate of Inspection & Requested.
 - .7 Inspection Outcome Summary Report.
 - .8 TSSA certification.
 - .9 Fire alarm certifications.
 - .10 NFPA 13 certifications.
 - .11 Seismic Reports.
 - .12 Other required certifications required by National Building Code.
 - .4 Sequence of operation: outline how the system is designed to operate.
 - .5 CMMS Data Sheets:
 - .1 All equipment which is to be deleted, removed, added or replaced from site is to have a CMMS inventory sheet completed and included in the O&M manual.
 - .6 Copy of approved shop drawings.
 - .7 Copy of the specific service and maintenance manual for new equipment.

1.3 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, at site for NCC Representative and Owner 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.

1.4 **AS-BUILT DRAWINGS**

- .1 NCC Representative will provide two sets of white prints for record drawing purposes.
- .2 Maintain project record drawings and record accurately all deviations from Contract documents as project progresses. Maintain on-going as-built records on site, ready for inspection during the course of the construction.
- .3 Update these drawings daily.
- .4 Record changes in red. Mark on one set of prints and at completion of project and prior to final inspection, neatly transfer notations to second set and submit both sets to NCC Representative.
- .5 Record the following information:
 - .1 Field changes of dimension and detail.
 - .2 Changes made by Addendum and Change Order.
 - .3 Final location of all devices and equipment.
 - .4 Location of conduit/cable runs, junction and pull boxes.
 - .5 Location of underground services.

1.5 **RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

- .1 Record information on set of black line opaque drawings, 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 for site records.

1.6 **FINAL SURVEY**

- .1 Submit final site survey certificate in accordance with Section 01 71 00 - Examination and Preparation, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

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.
- .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 (10) 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 4 month and 9 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 HVAC balancing and commissioned systems such as fire protection, alarm systems, sprinkler 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 9 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 RELATED SECTIONS

- .1 01 33 00 - Submittal Procedures.
- .2 01 45 00 – Quality Control.
- .3 01 91 13 - General Commissioning (Cx) Requirements

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection.
- .2 Owner: 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 Section 01 45 00 – Quality Control.
 - .4 Ensure testing, adjusting, and balancing has been performed [in accordance with Section 01 91 13 - 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 agreed upon times, at the designated 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for 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.

1.4 QUALITY ASSURANCE

- .1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:
 - .1 Instruct Owner'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 RELATED SECTIONS

- .1 01 33 00 - Submittal Procedures.
- .2 01 79 00 - Demonstration And Training
- .3 01 91 31 - Commissioning (Cx) Plan
- .4 01 91 33 - Commissioning Forms

1.2 SUMMARY

- .1 Section Includes:
 - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 Acronyms:
 - .1 AFD - Alternate Forms of Delivery, service provider.
 - .2 BMM - Building Management Manual.
 - .3 Cx - Commissioning.
 - .4 EMCS - Energy Monitoring and Control Systems.
 - .5 O&M - Operation and Maintenance.
 - .6 PI - Product Information.
 - .7 PV - Performance Verification.
 - .8 TAB - Testing, Adjusting and Balancing.

1.3 GENERAL

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
 - .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
 - .2 Ensure appropriate documentation is compiled into the BMM.
 - .3 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
 - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be operated interactively with each other as intended in accordance with Contract Documents and design criteria.
 - .2 Test with ATS as per Section 14 20 06 – Part 3.7.6.
 - .3 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.
- .4 AFD managed projects the term [Departmental Representative] in Cx specifications to be interpreted as AFD Service Provider.

1.4 COMMISSIONING OVERVIEW

- .1 Section 01 91 31 - Commissioning (Cx) Plan.
- .2 For Cx responsibilities refer to Section 01 91 31 - Commissioning (Cx) Plan.
- .3 Cx to be a line item of Contractor's cost breakdown.
- .4 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .5 Cx is conducted in concert with activities performed during every stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the new equipment is installed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .6 NCC Representative will issue Interim Acceptance Certificate when:
 - .1 Completed Cx documentation has been received, reviewed for suitability and approved by NCC Representative.
 - .2 Equipment, components and systems have been commissioned.
 - .3 O&M training has been completed.

1.5 **NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS**

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

1.6 **PRE-CX REVIEW**

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

1.7 CONFLICTS

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

1.8 SUBMITTALS

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

1.9 COMMISSIONING DOCUMENTATION

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.
- .2 NCC Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to NCC Representative.

1.10 COMMISSIONING SCHEDULE

- .1 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
 - .1 Approval of Cx reports.
 - .2 Verification of reported results.
 - .3 Repairs, retesting, re-commissioning, re-verification.
 - .4 Training.

1.11 COMMISSIONING MEETINGS

- .1 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .2 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .3 At 60% construction completion stage. NCC Representative to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
 - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
 - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .4 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .5 Meeting will be chaired by NCC Representative, who will record and distribute minutes.

- .6 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.12 **STARTING AND TESTING**

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

1.13 **WITNESSING OF STARTING AND TESTING**

- .1 Provide 14 days' notice prior to commencement.
- .2 NCC Representative to witness of start-up and testing.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.14 **MANUFACTURER'S INVOLVEMENT**

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

1.15 **PROCEDURES**

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
 - .3 Operational testing: document equipment performance.
 - .4 System PV: include repetition of tests after correcting deficiencies.
 - .5 Post-substantial performance verification: to include fine-tuning.

- .3 Correct deficiencies and obtain approval from NCC Representative after distinct phases have been completed and before commencing next phase.
- .4 Document require tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by NCC Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - .1 Minor equipment/systems: implement corrective measures approved by NCC Representative.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by NCC Representative.
 - .3 If evaluation report concludes that major damage has occurred, NCC Representative shall reject equipment.
 - .1 Rejected equipment to be remove from site and replace with new.
 - .2 Subject new equipment/systems to specified start-up procedures.

1.16 START-UP DOCUMENTATION

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

1.17 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

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

1.18 TEST RESULTS

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

1.19 START OF COMMISSIONING

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

1.20 INSTRUMENTS / EQUIPMENT

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

1.21 COMMISSIONING PERFORMANCE VERIFICATION

- .1 Carry out Cx:
 - .1 Under actual operating conditions, over entire operating range, in all modes.
 - .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.

1.22 WITNESSING COMMISSIONING

- .1 NCC Representative to witness activities and verify results.

1.23 AUTHORITIES HAVING JURISDICTION

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

1.24 EXTRAPOLATION OF RESULTS

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

1.25 EXTENT OF VERIFICATION

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

1.26 REPEAT VERIFICATIONS

- .1 Assume costs incurred by NCC Representative for third and subsequent verifications where:
 - .1 Verification of reported results fail to receive NCC Representative's approval.
 - .2 Repetition of second verification again fails to receive approval.

- .3 NCC Representative deems Contractor's request for second verification was premature.

1.27 SUNDRY CHECKS AND ADJUSTMENTS

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

1.28 DEFICIENCIES, FAULTS, DEFECTS

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

1.29 COMPLETION OF COMMISSIONING

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

1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING

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

1.31 TRAINING

- .1 In accordance with Section 01 91 41 - Commissioning (Cx) - Training.

1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

1.33 INSTALLED INSTRUMENTATION

- .1 Use instruments installed under Contract for TAB and PV if:
 - .1 Accuracy complies with these specifications.
 - .2 Calibration certificates have been deposited with NCC Representative.

1.34 PERFORMANCE VERIFICATION TOLERANCES

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

1.35 OWNER'S PERFORMANCE TESTING

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

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 SUMMARY

- .1 Section Includes:
 - .1 Description of overall structure of Cx Plan and roles and responsibilities of Cx team.

1.2 RELATED SECTIONS

- .1 01 33 00 - Submittal Procedures.
- .2 01 91 13 - General Commissioning (Cx) Requirements.
- .3 01 79 00 - Demonstration And Training
- .4 01 91 13 - General Commissioning (Cx) Requirements
- .5 01 91 33 - Commissioning Forms
- .6 01 91 41 - Commissioning: Training
- .7 14 20 06 - Passenger Elevators
- .8 Division 23
- .9 Division 26

1.3 REFERENCES

- .1 National Fire Protection Association (NFPA)
 - .1 NFPA-13-13, Installation of Sprinkler Systems Handbook.
- .2 ASME A17.1-2013/CSA B44-13 - Safety code for elevators and escalators (Bi-national standard, with ASME A17.1)
- .3 Underwriters' Laboratories of Canada (ULC)

1.4 GENERAL

- .1 Provide a fully functional vertical transportation system:
 - .1 Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
 - .2 Facility user and O&M personnel have been fully trained in aspects of installed systems.
 - .3 Optimized life cycle costs.
 - .4 Complete documentation relating to installed equipment and systems.
- .2 Term "Cx" in this section means "Commissioning".
- .3 Use this Cx Plan as master planning document for Cx:
 - .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
 - .2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
 - .3 Sets out deliverables relating to O&M, process and administration of Cx.
 - .4 Describes process of verification of how built works meet design requirements.
 - .5 Produces a complete functional system prior to issuance of Certificate of Occupancy.
 - .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:

- .1 Overview of Cx.
- .2 General description of elements that make up Cx Plan.
- .3 Process and methodology for successful Cx.
- .4 Acronyms:
 - .1 Cx - Commissioning.
 - .2 BMM - Building Management Manual.
 - .3 EMCS - Energy Monitoring and Control Systems.
 - .4 MSDS - Material Safety Data Sheets.
 - .5 PI - Product Information.
 - .6 PV - Performance Verification.
 - .7 TAB - Testing, Adjusting and Balancing.
 - .8 WHMIS - Workplace Hazardous Materials Information System.
- .5 Commissioning terms used in this Section:
 - .1 Bumping: short term start-up to prove ability to start and prove correct rotation.
 - .2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.5 DEVELOPMENT OF 100% CX PLAN

- .1 Cx Plan to be 100% completed within 4 weeks of award of contract to take into account:
 - .1 Approved shop drawings and product data.
 - .2 Approved changes to contract.
 - .3 Contractor's project schedule.
 - .4 Cx schedule.
 - .5 Contractor's, sub-contractor's, suppliers' requirements.
 - .6 Project construction team's and Cx team's requirements.
- .2 Submit completed Cx Plan to NCC Representative and obtain written approval.

1.6 REFINEMENT OF CX PLAN

- .1 During construction phase, revise, refine and update Cx Plan to include:
 - .1 Changes resulting from Client program modifications.
 - .2 Approved design and construction changes.
- .2 Revise, refine and update every 2 weeks during construction phase. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to NCC Representative for review and obtain written approval.
- .4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.7 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 NCC Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Project Manager will select Cx Team consisting of following members:
 - .1 NCC Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.
 - .2 NCC Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:
 - .1 Review of Cx documentation from operational perspective.
 - .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
 - .3 Protection of health, safety and comfort of occupants and O&M personnel.

- .4 Monitoring of Cx activities, training, development of Cx documentation.
- .5 Work closely with members of Cx Team.
- .3 NCC Representative is responsible for:
 - .1 Organizing Cx.
 - .2 Monitoring operations Cx activities.
 - .3 Witnessing, certifying accuracy of reported results.
 - .4 Witnessing and certifying TAB and other tests.
 - .5 Developing BMM.
 - .6 Ensuring implementation of final Cx Plan.
 - .7 Performing verification of performance of installed systems and equipment.
 - .8 Implementation of Training Plan.
- .4 Construction Team: contractor, sub-contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including:
 - .1 Testing.
 - .2 TAB.
 - .3 Performance of Cx activities.
 - .4 Delivery of training and Cx documentation.
 - .5 Assigning one person as point of contact with Consultant and NCC Cx Manager for administrative and coordination purposes.
- .5 Contractor's Cx agent implements specified Cx activities including:
 - .1 Demonstrations.
 - .2 Training.
 - .3 Testing.
 - .4 Preparation, submission of test reports.
- .6 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:
 - .1 Receiving facility.
 - .2 Day-To-Day operation and maintenance of facility.

1.8 CX PARTICIPANTS

- .1 Employ the following Cx participants to verify performance of equipment and systems:
 - .1 Installation contractor/subcontractor:
 - .1 Equipment and systems except as noted.
 - .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
 - .1 To include performance verification.
 - .3 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.
 - .4 Specialist Cx agency:
 - .1 Possessing specialist qualifications and installations providing environments essential to client's program but are outside scope or expertise of Cx specialists on this project.
 - .5 Client: responsible for intrusion and access security systems.
 - .6 Ensure that Cx participant:
 - .1 Could complete work within scheduled time frame.
 - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O&M personnel, including:
 - .1 Redistribution of electrical services.
 - .2 Modifications of fire alarm systems.
 - .3 Modifications to voice communications systems.

- .7 Provide names of participants to NCC Representative and details of instruments and procedures to be followed for Cx 1 months prior to starting date of Cx for review and approval.

1.9 EXTENT OF CX

- .1 Cx Structural and Architectural Systems:
 - .1 Architectural and structural:
 - .1 Vertical transportation systems:
 - .1 Passenger elevators.
 - .2 Commission mechanical systems and associated equipment:
 - .1 Plumbing systems:
 - .1 Sump pumps: Elevator pit.
 - .2 HVAC and exhaust systems:
 - .1 HVAC systems fluid cooler.
 - .3 Fire and life safety systems:
 - .1 Special fire suppression systems identified herein:
 - .1 Wet pipe sprinkler systems.
 - .3 Commission electrical systems and equipment:
 - .1 Low voltage below 750 V:
 - .1 Low voltage equipment.
 - .2 Low voltage distribution systems.
 - .2 Lighting systems:
 - .1 Lighting equipment.
 - .3 Fire alarm systems, equipment:
 - .1 Fire detectors.

1.10 DELIVERABLES RELATING TO O&M PERSPECTIVES

- .1 General requirements:
- .2 Compile English and French documentation.
- .3 Documentation to be computer-compatible format ready for inputting for data management.
- .4 Provide deliverables:
 - .1 Warranties.
 - .2 Project record documentation.
 - .3 Inventory of spare parts, special tools and maintenance materials.
 - .4 Maintenance Management System (MMS) identification system used.
 - .5 WHMIS information.
 - .6 MSDS data sheets.
 - .7 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

1.11 DELIVERABLES RELATING TO THE CX PROCESS

- .1 General:
- .2 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .3 Definitions:
 - .1 Cx as used in this section includes:
 - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
 - .2 Factory inspections and performance verification tests.

- .4 Deliverables: provide:
 - .1 Startup, pre-Cx activities and documentation for systems, and equipment.
 - .2 Completed installation checklists (ICL).
 - .3 Completed product information (PI) report forms.
 - .4 Completed performance verification (PV) report forms.
 - .5 Results of Performance Verification Tests and Inspections.
 - .6 Description of Cx activities and documentation.
 - .7 Description of Cx of integrated systems and documentation.
 - .8 Tests performed by Owner/User.
 - .9 Training Plans.
 - .10 Cx Reports.
 - .11 Prescribed activities during warranty period.
- .5 NCC Representative to witness and certify tests and reports of results provided to NCC Representative.
- .6 NCC Representative to participate.

1.12 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Items listed in this Cx Plan include the following:
 - .1 Pre-Start-Up inspections: by NCC Representative prior to permission to start up and rectification of deficiencies to NCC Representative's satisfaction.
 - .2 NCC Representative to use approved check lists.
 - .3 NCC Representative will monitor all of these pre-start-up inspections.
 - .4 Include completed documentation with Cx report.
 - .5 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by NCC Representative and does not form part of Cx specifications.
 - .6 NCC Representative will monitor some of these inspections and tests.
 - .7 Include completed documentation in Cx report.
- .2 Pre-Cx activities - ARCHITECTURAL AND STRUCTURAL:
 - .1 Vertical transportation:
 - .1 Passenger elevator.
- .3 Pre-Cx activities - MECHANICAL:
 - .1 Plumbing systems:
 - .1 "Bump" each item of equipment in its "stand-alone" mode.
 - .2 Complete pre-start-up checks and complete relevant documentation.
 - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
 - .2 HVAC equipment and systems:
 - .1 "Bump" each item of equipment in its "stand-alone" mode.
 - .2 At this time, complete pre-start-up checks and complete relevant documentation.
 - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
- .4 Pre-Cx activities - LIFE SAFETY SYSTEMS
 - .1 Include equipment and systems identified above.
 - .1 Fire Alarm System.
 - .2 Reports of test results to be witnessed and certified by NCC Representative before verification.
- .5 Pre-Cx activities - ELECTRICAL:
 - .1 Low voltage distribution systems under 750 V:

- .1 Requires ESA inspection.
- .2 Fire alarm systems: test after other safety and security systems are completed. Testing to include a complete verification in accordance with ULC requirements. NCC Representative has witnessed and certified report; demonstrate devices and zones to NCC Representative.

1.13 START-UP

- .1 Start up components, equipment and systems.
- .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:
 - .1 Elevator.
- .3 NCC Representative to monitor all of these start-up activities.
 - .1 Rectify start-up deficiencies to satisfaction of NCC Representative.
- .4 Performance Verification (PV):
 - .1 Approved Cx Agent to perform.
 - .1 Repeat when necessary until results are acceptable to NCC Representative.
 - .2 Use procedures modified generic procedures to suit project requirements.
 - .3 NCC Representative to witness and certify reported results using approved PI and PV forms.
 - .4 NCC Representative to approve completed PV reports and provide to NCC Representative.
 - .5 NCC Representative reserves right to 30% of reported results at random.
 - .6 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

1.14 CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Perform Cx by specified Cx agency using procedures developed by NCC Representative and approved by NCC Representative.
- .2 NCC Representative to monitor Cx activities.
- .3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.
- .4 NCC Representative to witness, certify reported results of, Cx activities and forward to NCC Representative.
- .5 NCC Representative reserves right to verify a percentage of reported results at no cost to contract.

1.15 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

- .1 Cx to be performed by specified Cx specialist, using procedures developed by NCC Representative and approved by NCC Representative.
- .2 Tests to be witnessed by NCC Representative and documented on approved report forms.
- .3 Upon satisfactory completion, Cx specialist to prepare Cx Report, to be certified by NCC Representative and submitted to NCC Representative for review.
- .4 NCC Representative reserves right to verify percentage of reported results.
- .5 Integrated systems to include:
 - .1 Fire alarm systems: New fire detectors.
- .6 Identification:

- .1 In later stages of Cx, before hand-over and acceptance NCC Representative, Contractor and Cx Manager to co-operate to complete inventory data sheets and provide assistance to NCC in full implementation of MMS identification system of components, equipment, sub-systems, systems.

1.16 **INSTALLATION CHECK LISTS (ICL)**

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.17 **PRODUCT INFORMATION (PI) REPORT FORMS**

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.18 **PERFORMANCE VERIFICATION (PV) REPORT**

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.19 **DELIVERABLES RELATING TO ADMINISTRATION OF CX**

- .1 General:
 - .1 Because of risk assessment, complete Cx of occupancy, weather and seasonal-sensitive equipment and systems in these areas before building is occupied.

1.20 **CX SCHEDULES**

- .1 Prepare detailed Cx Schedule and submit to NCC Representative for review and approval same time as project Construction Schedule. Include:
 - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
 - .1 Design criteria, design intents.
 - .2 Pre-TAB review: 14 days after contract award, and before construction starts.
 - .3 Cx agents' credentials: 30 days before start of Cx.
 - .4 Cx procedures: 1 months after award of contract.
 - .5 Cx Report format: 2 months after contract award.
 - .6 Discussion of heating/cooling loads for Cx: 1 months before start-up.
 - .7 Submission of list of instrumentation with relevant certificates: 21days before start of Cx.
 - .8 Notification of intention to start TAB: 21days before start of TAB.
 - .9 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
 - .10 Notification of intention to start Cx: 14 days before start of Cx.
 - .11 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.
 - .12 Identification of deferred Cx.
 - .13 Implementation of training plans.
 - .14 Cx reports: immediately upon successful completion of Cx.
 - .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to NCC Representative.
 - .3 3 months in Cx schedule for verification of performance in all seasons and wear conditions.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
- .3 Consultant, Contractor, Contractor's Cx agent, and NCC Representative will monitor progress of Cx against this schedule.

1.21 CX REPORTS

- .1 Submit reports of tests, witnessed and certified by NCC Representative to NCC Representative who will verify reported results.
- .2 Include completed and certified PV reports in properly formatted Cx Reports.
- .3 Before reports are accepted, reported results to be subject to verification by NCC Representative.

1.22 ACTIVITIES DURING WARRANTY PERIOD

- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
 - .1 Fine tuning of HVAC systems.

1.23 TESTS TO BE PERFORMED BY OWNER/USER

- .1 NCC operates ATS to coordinate with elevator manufacturer during Cx.

1.24 TRAINING PLANS

- .1 Refer to Section 01 91 41 - Commissioning (Cx) - Training.

1.25 FINAL SETTINGS

- .1 Upon completion of Cx to satisfaction of NCC Representative lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

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 SUMMARY

- .1 Section Includes:
 - .1 Commissioning forms to be completed for equipment, system and integrated system.

1.2 RELATED SECTIONS

- .1 01 33 00 - Submittal Procedures.
- .2 01 45 00 – Quality Control.
- .3 01 91 13 - General Commissioning (Cx) Requirements
- .4 01 91 31 - Commissioning (Cx) Plan

1.3 INSTALLATION/START- UP CHECK LISTS

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

1.4 PRODUCT INFORMATION (PI) REPORT FORMS

- .1 Product Information (PI) forms compile gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.
- .2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain NCC Representative approval.

1.5 PERFORMANCE VERIFICATION (PV) FORMS

- .1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.

- .2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.
- .3 Prior to PV of integrated system, complete PV forms of related systems and obtain NCC Representative approval.

1.6 SAMPLES OF COMMISSIONING FORMS

- .1 Contractor will develop and provide to NCC Representative required project-specific Commissioning forms in electronic format complete with specification data.
- .2 NCC Representative will approve commissioning forms.

1.7 COMMISSIONING FORMS

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
 - .1 NCC Representative provides Contractor project-specific Commissioning forms with Specification data included.
 - .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
 - .3 Confirm operation as per design criteria and intent.
 - .4 Identify variances between design and operation and reasons for variances.
 - .5 Verify operation in specified normal and emergency modes and under specified load conditions.
 - .6 Record analytical and substantiating data.
 - .7 Verify reported results.
 - .8 Form to bear signatures of recording technician and reviewed and signed off by NCC Representative.
 - .9 Submit immediately after tests are performed.
 - .10 Reported results in true measured SI unit values.
 - .11 Provide NCC Representative with originals of completed forms.
 - .12 Maintain copy on site during start-up, testing and commissioning period.

1.8 LANGUAGE

- .1 Compile English documentation.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 01 33 00 - Submittal Procedures.
- .2 01 45 00 – Quality Control.
- .3 01 91 13 - General Commissioning (Cx) Requirements
- .4 01 91 31 - Commissioning (Cx) Plan

1.2 SUMMARY

- .1 Section Includes:
 - .1 This Section specifies roles and responsibilities of Commissioning Training.

1.3 TRAINEES

- .1 Trainees: personnel selected for operating and maintaining this facility. Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.
- .2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.4 INSTRUCTORS

- .1 NCC Representative will provide:
 - .1 Descriptions of systems.
 - .2 Instruction on design philosophy, design criteria, and design intent.
- .2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
 - .1 Start-Up, operation, shut-down of equipment, components and systems.
 - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
 - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
- .3 Contractor and equipment manufacturer to provide instruction on:
 - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.5 TRAINING OBJECTIVES

- .1 Training to be detailed and duration to ensure:
 - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
 - .2 Effective on-going inspection, measurements of system performance.
 - .3 Proper preventive maintenance, diagnosis and trouble-shooting.
 - .4 Ability to update documentation.
 - .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.6 TRAINING MATERIALS

- .1 Instructors to be responsible for content and quality.

- .2 Training materials to include:
 - .1 "As-Built" Contract Documents.
 - .2 Operating Manual.
 - .3 Maintenance Manual.
 - .4 Management Manual.
 - .5 TAB and PV Reports.
- .3 Project Manager, Commissioning Manager and Facility Manager will review training manuals.
- .4 Training materials to be in a format that permits future training procedures to same degree of detail.
- .5 Supplement training materials:
 - .1 Multimedia presentations.
 - .2 Manufacturer's training videos.
 - .3 Equipment models.

1.7 SCHEDULING

- .1 Include in Commissioning Schedule time for training.
- .2 Deliver training during regular working hours, training sessions to be 3 hours in length.
- .3 Training to be completed prior to acceptance of facility.

1.8 RESPONSIBILITIES

- .1 Be responsible for:
 - .1 Implementation of training activities,
 - .2 Coordination among instructors,
 - .3 Quality of training, training materials,
- .2 NCC Representative will evaluate training and materials.
- .3 Upon completion of training, provide written report, signed by Instructors, witnessed by NCC Representative.

1.9 TRAINING CONTENT

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
- .2 Content includes:
 - .1 Review of facility and occupancy profile.
 - .2 Functional requirements.
 - .3 System philosophy, limitations of systems and emergency procedures.
 - .4 Review of system layout, equipment, components and controls.
 - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
 - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
 - .7 Maintenance and servicing.
 - .8 Trouble-shooting diagnosis.
 - .9 Inter-Action among systems during integrated operation.
 - .10 Review of O&M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

1.10 VIDEO-BASED TRAINING

- .1 Manufacturer's videotapes to be used as training tool with NCC Representative's review and written approval prior to commencement of scheduled training.
- .2 Production methods to be professional quality.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 43 - Environmental Procedures.
- .3 Section 01 35 29.06 - Health and Safety Requirements.
- .4 Section 01 45 00 - Quality Control.
- .5 Section 01 74 21 - Construction/Demolition Waste Management.
- .6 Section 02 81 01 - Hazardous Materials.

1.2 REFERENCES

- .1 Canadian Council of Ministers of the Environment (CCME).
 - .1 PN1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.
- .2 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
 - .2 Canadian Environmental Protection Act, 1999 (CEPA), c. 33.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .4 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

1.3 MEASUREMENT PROCEEDURES

- .1 Measure removal of waste materials designated for alternate disposal from the site in tonnes.

1.4 DEFINITIONS

- .1 Demolition: rapid destruction of building following removal of hazardous materials.
- .2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.
- .3 Waste Audit (WA): detailed inventory of materials in building. Indicates quantities of reuse, recycling and landfill.
 - .1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.
 - .2 Indicates quantities of reuse, recycling and landfill.
- .4 Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .5 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
- .3 Shop drawings.
 - .1 Submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning, where required by authorities having jurisdiction.
 - .2 Submit drawings stamped and signed by qualified professional engineer registered or licensed in Province of Ontario, Canada.
- .4 Hazardous Materials: provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.
- .5 Waste Reduction Workplan: prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal and indicate:
 - .1 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.
 - .2 Schedule of selective demolition.
 - .3 Number and location of dumpsters.
 - .4 Anticipated frequency of tipping.
 - .5 Name and address of waste facilities.
- .6 Certificates: submit copies of certified receipts from authorized disposal sites and reuse and recycling facilities for material removed from site upon request of Departmental Representative.
 - .1 Written authorization from Departmental Representative is required to deviate from facilities listed in Waste Reduction Workplan.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEEA, TDGA, and applicable Provincial regulations.
- .2 Site Meetings.
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section:
 - .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.
 - .2 Arrange for site visit with Departmental Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.
 - .3 Hold project meetings every 2 week.
 - .4 Ensure key personnel attend.
 - .5 Reporting Requirements: WMC to complete.
 - .6 WMC must provide verbal report on status of waste diversion activity at each meeting.
 - .7 Departmental Representative will provide verbal notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.
- .3 Health and Safety.
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Perform Work in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Storage and Protection.
 - .1 Protect in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
 - .2 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to Departmental Representative.
 - .3 Remove and store materials to be salvaged, in manner to prevent damage.
 - .4 Store and protect in accordance with requirements for maximum preservation of material.
 - .5 Handle salvaged materials as new materials.

1.8 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.

1.9 SITE CONDITIONS

- .1 Site Environmental Requirements.
 - .1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.
 - .2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .3 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
 - .1 Ensure proper disposal procedures are maintained throughout the project.
 - .4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
 - .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.
 - .6 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .2 Existing Conditions.
 - .1 Remove contaminated or hazardous materials listed as hazardous as defined by authorities having jurisdiction from site, prior to start of demolition Work, and dispose of at designated disposal facilities in safe manner in accordance with TDGA and other applicable regulatory requirements and Section 02 81 01 - Hazardous Materials.

1.10 SCHEDULING

- .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
- .2 Notify Departmental Representative in writing when unforeseen delay(s) occur.

PART 2 PRODUCTS

2.1 EQUIPMENT

- .1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

PART 3 EXECUTION

3.1 PREPARATION

- .1 Inspect site with Departmental 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 and Cap Designated Mechanical Services.
 - .1 Natural Gas Supply Lines: as directed by Departmental Representative.
 - .2 Sewer and Water Lines: remove as directed by Departmental Representative and securely plug to form watertight seal.

3.2 REMOVAL OF HAZARDOUS WASTES

- .1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

3.3 REMOVAL OPERATIONS

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Disposal of Material.
 - .1 Dispose of materials not designated for salvage or reuse on site at authorized facilities approved in Waste Reduction Workplan.
 - .2 Trim disposal areas to approval of Departmental Representative.

3.4 STOCKPILING

- .1 Label stockpiles, indicating material type and quantity.
- .2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.
- .3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.
- .4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

3.5 REMOVAL FROM SITE

- .1 Remove stockpiled material as directed by Departmental Representative, when it interferes with operations of project.
- .2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.
- .3 Transport material designated for alternate disposal using approved facilities listed in Waste Reduction Workplan and in accordance with applicable regulations.
 - .1 Written authorization from Departmental Representative is required to deviate from facilities listed in Waste Reduction Workplan.
- .4 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.
 - .1 Disposal Facilities: approved and listed in Waste Reduction Workplan.

- .2 Written authorization from Departmental Representative is required to deviate from disposal facilities listed in Waste Reduction Workplan.

3.6 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.
- .2 .Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.7 CLEANING

- .1 Remove debris, trim surfaces and leave work site clean, upon completion of Work
- .2 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 29 - Health and Safety Requirements.
- .3 Section 01 35 43 - Environmental Procedures.
- .4 Section 01 61 00 - Common Product Requirements.
- .5 Section 01 74 11 - Cleaning.
- .6 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .7 Section 07 92 00 - Joint Sealant.
- .8 Section 09 91 99 – Painting for Minor Works.

1.2 REFERENCES

- .1 Definitions:
 - .1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
 - .2 Hazardous Material: product, substance, or organism used for its original purpose; and is either dangerous goods or material that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
 - .3 Hazardous Waste: hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .2 Reference Standards:
 - .1 Canadian Environmental Protection Act, 1999 (CEPA 1999)
 - .1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).
 - .2 Department of Justice Canada (Jus)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDG Act) 1992, (c. 34).
 - .2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001-286).
 - .3 Green Seal Environmental Standards (GS)
 - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
 - .2 GS-36-00, Commercial Adhesives.
 - .4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .5 National Research Council Canada Institute for Research in Construction (NRC-IRC)
 - .1 National Fire Code of Canada-2005.
- .3 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2007, Departmental Representativeur al Coatings.
 - .2 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

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 hazardous materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit WHMIS MSDS in accordance with Section 01 35 29 - Health and Safety Requirements and Section 01 35 43 - Environmental Procedures to Departmental Representative for each hazardous material required prior to bringing hazardous material on site.
- .3 Submit hazardous materials management plan to Departmental Representative that identifies hazardous materials, usage, location, personal protective equipment requirements, and disposal arrangements.

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 Transport hazardous materials and wastes in accordance with Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
 - .1 When exporting hazardous waste to another country, ensure compliance with Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulations.
- .4 Storage and Handling Requirements:
 - .1 Co-ordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labelling and storage of materials and wastes.
 - .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
 - .3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada requirements.
 - .4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.
 - .1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.
 - .2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.
 - .5 Transfer of flammable and combustible liquids is prohibited within buildings.
 - .6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.
 - .7 Solvents or cleaning agents must be non-flammable or have flash point above 38 degrees C.
 - .8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.
 - .9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.
 - .10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:
 - .1 Store hazardous materials and wastes in closed and sealed containers.
 - .2 Label containers of hazardous materials and wastes in accordance with WHMIS.
 - .3 Store hazardous materials and wastes in containers compatible with that material or waste.
 - .4 Segregate incompatible materials and wastes.

- .5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.
- .6 Store hazardous materials and wastes in secure storage area with controlled access.
- .7 Maintain clear egress from storage area.
- .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.
- .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
- .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
- .11 When hazardous waste is generated on site:
 - .1 Co-ordinate transportation and disposal with Departmental Representative.
 - .2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.
 - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
 - .4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material and it is licensed to accept this material.
 - .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
 - .6 Only trained personnel handle, offer for transport, or transport dangerous goods.
 - .7 Provide photocopy of shipping documents and waste manifests to Departmental Representative.
 - .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to Departmental Representative.
 - .9 Report discharge, emission, or escape of hazardous materials immediately to Departmental Representative and appropriate provincial authority. Take reasonable measures to control release.
- .12 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
- .13 Report spills or accidents immediately to Departmental Representative. Submit a written spill report to Departmental Representative within 24 hours of incident.
- .5 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Description:
 - .1 Bring on site only quantities hazardous material required to perform Work.
 - .2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.
 - .3 Sustainability Characteristics:
 - .1 Adhesives and Sealants in accordance with Section 07 92 00 - Joint Sealant.
 - .1 Adhesives and Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.

- .2 Primers, Paints and Coatings in accordance with manufacturer's recommendations for surface conditions and Section 09 91 99 – Painting for Minor Works.
 - .1 Primer: maximum VOC limit 250 g/L to SCAQMD Rule 1113.
 - .2 Paints: maximum VOC limit 50 g/L to SCAQMD Rule 1113.
 - .3 Coatings: maximum VOC limit 50 g/L to SCAQMD Rule 1113.

PART 3 EXECUTION

3.1 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 and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
 - .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
 - .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
 - .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
 - .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
 - .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
 - .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.
 - .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
 - .1 Hazardous wastes recycled in manner constituting disposal.
 - .2 Hazardous waste burned for energy recovery.
 - .3 Lead-acid battery recycling.
 - .4 Hazardous wastes with economically recoverable precious metals.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A165 Series-04(2009), Standards on Concrete Masonry Units.
 - .2 CSA A179-04(2009), Mortar and Grout for Unit Masonry.
 - .3 CSA-A371-04(2009), Masonry Construction for Buildings.

1.2 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 Samples.
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit samples:
 - .1 Each type and colour of masonry unit specified.
 - .2 Each type of masonry accessory specified.
 - .3 Each type of masonry reinforcement, tie and connector proposed for use.
- .3 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Provide shop drawings detailing temporary bracing required, designed to resist wind pressure and lateral forces during installation.
- .4 Manufacturer's Instructions.
 - .1 Submit manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

- .1 Mock-ups.
 - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
 - .2 Construct mock-up panel of exterior masonry wall construction 1200 x 1800 mm showing masonry colours and textures, use of reinforcement, ties, through-wall flashing, weep holes, jointing, coursing, mortar and workmanship.
 - .3 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
 - .2 For testing to determine compliance with performance requirements. Perform following tests.
 - .1 For clay units, in addition to requirements set out in referenced CSA and ASTM Standards include data indicating initial rate of absorption.
 - .4 Construct mock-up where directed.
 - .5 Allow 24 hours for inspection of mock-up by Consultant before proceeding with work.
 - .6 When accepted by Consultant, mock-up will demonstrate minimum standard for this work.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to job site in dry condition.
- .3 Storage and Protection.
 - .1 Keep materials dry until use except where wetting of bricks is specified.
 - .2 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

1.5 SITE CONDITIONS

- .1 Site Environmental Requirements.
 - .1 Cold weather requirements.
 - .1 Supplement Clause 5.15.2 of CSA-A371 with following requirements.
 - .1 Maintain temperature of mortar between 5 degrees C and 50 degrees C until batch is used or becomes stable.
 - .2 Maintain ambient temperature between 5 degrees C and 50 degrees C and protect site from wind-chill.
 - .2 Hot weather requirements.
 - .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
 - .2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.

Part 2 PRODUCTS

2.1 NOT USED.

- .1 Not Used.

Part 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

- .1 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.
- .2 Bracing approved by Consultant.

3.3 INSTALLATION

- .1 Do masonry work in accordance with CSA-A371 except where specified otherwise.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.4 CONSTRUCTION

- .1 Exposed masonry.
 - .1 Remove chipped, cracked, and otherwise damaged units, in accordance with CSA A-165, Clause 82.1, in exposed masonry and replace with undamaged units.
- .2 Jointing.
 - .1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints where concave joints are indicated.
 - .2 Allow joints to set just enough to remove excess water, then rake joints uniformly to 6 mm depth and compress with square tool to provide smooth, compressed, raked joints of uniform depth where raked joints are indicated.
 - .3 Strike flush joints concealed in walls and joints in walls to receive plaster, tile, insulation, or other applied material except paint or similar thin finish coating.
- .3 Cutting.
 - .1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.
 - .2 Make cuts straight, clean, and free from uneven edges.
- .4 Building-In.
 - .1 Build in items required to be built into masonry.
 - .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
 - .3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
- .5 Wetting of bricks.
 - .1 Except in cold weather, wet bricks having an initial rate of absorption exceeding 1 g/minute/1000 mm²: wet to uniform degree of saturation, 3 to 24 hours before laying, and do not lay until surface dry.
 - .2 Wet tops of walls built of bricks qualifying for wetting, when recommencing work on such walls.
- .6 Support of loads.
 - .1 Use concrete to Section 03 30 00 - Cast-in-Place Concrete, where concrete fill is used in lieu of solid units.
 - .2 Use grout to CSA A179 where grout is used in lieu of solid units.
 - .3 Install building paper below voids to be filled with concrete or grout; keep paper 25 mm back from faces of units.
- .7 Provision for movement.
 - .1 Leave 3 mm space below shelf angles.
 - .2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
 - .3 Built masonry to tie in with stabilizers, with provision for vertical movement.
- .8 Loose steel lintels.
 - .1 Install loose steel lintels. Centre over opening width.
- .9 Control joints.
 - .1 Construct continuous control joints as indicated.

- .10 Expansion joints.
 - .1 Build-in continuous expansion joints as indicated.
- .11 Interface with other work.
 - .1 Cut openings in existing work as indicated.
 - .2 Openings in walls: approved by Consultant.
 - .3 Make good existing work. Use materials to match existing.

3.5 SITE TOLERANCES

- .1 Tolerances in notes to Clause 5.3 of CSA-A371 apply.

3.6 CLEANING

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

3.7 PROTECTION

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

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A23.1/A23.2-09, 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 CAN/CSA A371-04, Masonry Construction for Buildings.
 - .4 CAN/CSA-A3000-08, Cementitious Materials Compendium; CAN/CSA-A3002-03, Masonry and Mortar Cement.

1.2 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 Samples.
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit two samples of mortar and coloured mortar.
- .3 Manufacturer's Instructions.
 - .1 Submit manufacturer's installation instructions.

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.
- .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 for recycling in accordance with Waste Management Plan.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Use same brands of materials and source of aggregate for entire project.
- .2 Mortar and grout: CSA A179.
- .3 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
- .4 Colour: ground coloured natural aggregates or metallic oxide pigments.
- .5 Mortar for exterior masonry above grade:
 - .1 Loadbearing: type S based on Proportion specifications.
 - .2 Non-Loadbearing: type N based on Proportion specifications.
- .6 Mortar for interior masonry.
 - .1 Loadbearing: type S based on Proportion specifications.
 - .2 Non-Loadbearing: type N based on Proportion specifications.
- .7 Following applies regardless of mortar types and uses specified above:

- .1 Mortar for grouted reinforced masonry: type S based on Proportion specifications.
- .2 Mortar for pointing: type S based on Proportion specifications.
- .8 White mortar: use white Portland cement, and lime to produce mortar type specified.
- .9 Coloured mortar: use colouring admixture not exceeding 10% of cement content by mass, or integrally coloured masonry cement, to produce coloured mortar to match approved sample.
- .10 Non-Staining mortar: use non-staining masonry cement for cementitious portion of specified mortar type.
- .11 Grout: to CSA A179, Table 3.
- .12 Parging mortar: type S to CSA A179.

2.2 MIXES

- .1 Pointing mortar: prehydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into ball. Allow to stand for not less than 1 hour not more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.
- .2 Colour: mix grout to semi-fluid consistency.
- .3 Coloured mortars: incorporate colour into mixes in accordance with manufacturer's instructions. Use clean mixer for coloured mortar.

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 CONSTRUCTION

- .1 Do masonry mortar and grout work in accordance with CSA A179 except where specified otherwise.
- .2 Apply parging in uniform coating not less than total 10 mm thick, where indicated.

3.3 CLEANING

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

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A23.1/A23.2-4044, 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 CAN/CSA A370-04, Connectors for Masonry.
 - .4 CAN/CSA A371-04, Masonry Construction for Buildings.
 - .5 CAN/CSA G30.18-M92(R2007), Billet-Steel Bars for Concrete Reinforcement.
 - .6 CSA-S304.1-04, Design of Masonry Structures.
 - .7 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.2 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 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Shop drawings consist of bar bending details, lists and placing drawings.
 - .3 On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

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.
- .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 for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Consultant.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Bar reinforcement: to CSA-A371 and CAN/CSA G30.18, Grade 400.
- .2 Wire reinforcement: to CSA-A371 and CSA G30.14, ladder type.
- .3 Connectors: to CSA-A370 and CSA-S304.
- .4 Corrosion protection: to CSA-S304, galvanized to CSA-S304 and CSA-A370.
- .5 Brick Ties: to CAN/CSA A370.

2.2 FABRICATION

- .1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Ontario.
- .2 Fabricate connectors in accordance with CSA-A370.
- .3 Obtain Consultant approval for locations of reinforcement splices other than shown on placing drawings.
- .4 Upon approval of Consultant, weld reinforcement in accordance with CSA W186.
- .5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

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 GENERAL

- .1 Supply and install masonry connectors and reinforcement in accordance with CSA-A370, CSA-A371, CAN/CSA-A23.1 and CSA-S304.1 unless indicated otherwise.
- .2 Prior to placing mortar and grout, obtain Consultant's approval of placement of reinforcement and connectors.
- .3 Supply and install additional reinforcement to masonry as indicated.

3.3 BONDING AND TYING

- .1 Bond walls of two or more wythes using metal connectors in accordance with CSA-S304, CSA-A371 and as indicated.
- .2 Tie masonry veneer to backing in accordance with NBC, CSA-S304.1, CSA-A371 and as indicated.

3.4 REINFORCED LINTELS AND BOND BEAMS

- .1 Reinforce masonry lintels and bond beams as indicated.
- .2 Place and grout reinforcement in accordance with CSA-S304.1, CSA-A371, and CSA-A179.

3.5 GROUTING

- .1 Grout masonry in accordance with CSA-S304.1, CSA-A371 and CSA-A179 and as indicated.

3.6 ANCHORS

- .1 Supply and install metal anchors as indicated.

3.7 LATERAL SUPPORT AND ANCHORAGE

- .1 Supply and install lateral support and anchorage in accordance with CSA-S304.1 and as indicated.

3.8 MOVEMENT JOINTS

- .1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

3.9 FIELD BENDING

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

3.10 FIELD TOUCH-UP

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcement steel and connectors with compatible finish to provide continuous coating.

3.11 CLEANING

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

END OF SECTION

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Part 1 GENERAL

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM D 2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA A371-04, Masonry Construction for Buildings.
 - .2 CAN/CSA-ISO 14021-00(R2204), Environmental Labels and Declarations - Self Declared Environmental Claims (Type II Environmental Labelling).

1.2 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 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

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.
- .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 for recycling in accordance with Waste Management Plan.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Control joint filler: purpose-made elastomer durometer hardness to ASTM D2240 of size and shape indicated.
- .2 Lap adhesive: recommended by masonry flashing manufacturer.
- .3 Weep hole vents: purpose-made polypropylene fibre filter, colour to match brick veneer.
- .4 Polyethylene flashings: In accordance with Section 07 27 00.01 – Air Barriers-Descriptive or Proprietary.
- .5 Flashings: In accordance with Section 07 61 15 – Sheet Copper Roofing, Flashing and Trim.

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 INSTALLATION

- .1 Install continuous control joint fillers in control joints at locations indicated on drawings.
- .2 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre.

3.3 CONSTRUCTION

- .1 Build in flashings in masonry in accordance with CSA-A371.
 - .1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses and as indicated.
 - .2 In cavity walls and veneered walls, carry flashings from front edge of masonry, under outer wythe, then up backing not less than 150 mm, and as follows:
 - .1 For masonry backing embed flashing 25 mm in joint.
 - .2 For concrete backing, insert flashing into reglets.
 - .3 For wood frame backing, staple flashing to walls behind sheathing paper.
 - .4 For gypsum board backing, bond to wall using manufacturer's recommended adhesive.
 - .3 Lap joints 150 mm and seal with adhesive.

3.4 CLEANING

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

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM E 336-07, Standard Test Method for Measurement of Airborne Sound Attenuation Between Rooms in Buildings.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A165 Series-2004, CSA Standards on Concrete Masonry Units covers: A165.1, A165.2, A165.3.
 - .2 CAN/CSA A371-04, Masonry Construction for Buildings.
 - .3 CSA S304.1-04, Design of Masonry Structures.
- .3 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101-07, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Product Data: provide product data, including manufacturer's printed data sheets and catalog pages illustrating products to be incorporated into project for specified products.
- .3 Samples:
 - .1 Provide unit samples in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .4 Manufacturer's Written Instructions: provide in accordance with Section 04 05 00 - Common Work Results for Masonry.

1.3 QUALITY ASSURANCE SUBMITTALS

- .1 Certificates: provide in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .2 Test and Evaluation Reports: provide certified test reports in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .3 Pre-Installation Meetings: conduct pre-installation meeting in accordance with Section 04 05 00 - Common Work Results for Masonry to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.
- .4 Mock-ups:
 - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control and requirements of Section 04 05 00 - Common Work Results for Masonry.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle concrete unit masonry in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .2 Packaging Waste Management:
 - .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Standard concrete block units to CAN/CSA-A165 Series (CAN/CSA-A165.1).
 - .1 Classification: H/10/A/M
 - .2 Dimensions - Nominal:
 - .1 190mm wide x 190 mm high x 390 mm long.
 - .3 Special shapes: provide bull-nosed units for exposed corners. Provide purpose-made shapes for lintels, beams and bond beams. Provide additional special shapes as indicated.
 - .4 Colour:
 - .1 Integrally coloured pre-finished architectural concrete block with one or more faces ground to expose variegated colours of natural aggregates; with factory-applied clear satin gloss acrylic finish.
 - .2 Unit faces filled with cementitious grout, polished with factory applied clear satin gloss acrylic finish.

2.2 REINFORCEMENT

- .1 Reinforcement in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

2.3 CONNECTORS

- .1 Connectors in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

2.4 FLASHING

- .1 Flashing: in accordance with Section 07 61 15 – Sheet Copper Roofing, Flashing and Trim.

2.5 MORTAR MIXES

- .1 Mortar and mortar mixes in accordance with Section 04 05 12 - Masonry Mortar and Grout.

2.6 GROUT MIXES

- .1 Grout and grout mixes in accordance with Section 04 05 12 - Masonry Mortar and Grout.

2.7 CLEANING COMPOUNDS

- .1 Use low VOC products.
- .2 Compatible with substrate and acceptable to masonry manufacturer for use on products.
- .3 Cleaning compounds compatible with concrete unit masonry and in accordance with manufacturer's written recommendations and instructions.

2.8 TOLERANCES

- .1 Tolerances for standard concrete unit masonry tolerances in accordance with CAN/CSA A165.1, supplemented as follows:
 - .1 Maximum variation between units within specific job lot not to exceed 2 mm.
 - .2 No parallel edge length, width or height dimension for individual unit to differ by more than 2 mm.
 - .3 Out of square tolerance not to exceed 2 mm.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verify surfaces and conditions are ready to accept work of this Section.
- .2 Commencing installation means acceptance of existing substrates.

3.2 PREPARATION

- .1 Protect adjacent finished materials from damage due to masonry work.

3.3 INSTALLATION

- .1 Concrete block units:
 - .1 Bond: running.
 - .2 Coursing height: 200mm for one block and one joint.
 - .3 Jointing: concave where exposed or where paint or other finish coating is specified.
- .2 Special Shapes:
 - .1 Install special units to form corners, returns, offsets, reveals and indents without cut ends being exposed and without losing bond or module.
 - .2 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.
 - .3 End bearing: not less than 200mm.
 - .4 Install special site cut shaped units.

3.4 REINFORCEMENT

- .1 Install reinforcing in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

3.5 CONNECTORS

- .1 Install connectors in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

3.6 FLASHING

- .1 Install flashings: in accordance with Section 07 61 15 – Sheet Copper Roofing, Flashing and Trim.

3.7 MORTAR PLACEMENT

- .1 Place mortar in accordance with Section 04 05 12 - Masonry Mortar and Grout.

3.8 GROUT PLACEMENT

- .1 Place grout in accordance with Section 04 05 12 - Masonry Mortar and Grout.

3.9 CONSTRUCTION

- .1 Cull out masonry units, in accordance with CAN/CSA A165 and reviewed range of colour samples, with chips, cracks, broken corners, excessive colour and texture variation.
- .2 Build in miscellaneous items such as bearing plates, steel angles, bolts, anchors, inserts, sleeves and conduits.
- .3 Construct masonry walls using running bond unless otherwise noted.
- .4 Build around frames previously set and braced. Fill behind hollow frames within masonry walls with mortar or grout and embed anchors.

- .5 Fit masonry closely against electrical and plumbing outlets so collars, plates and covers overlap and conceal cuts.
- .6 Install movement joints and keep free of mortar where indicated.
- .7 Hollow Units: spread mortar setting bed from outside edge of face shells. Gauge amount of mortar on top and end of unit to create full joints, equivalent to shell thickness. Avoid excess mortar.
- .8 Solid Units: apply mortar over entire vertical and horizontal surfaces. Avoid bridging of airspace between brick veneer and backup wall with mortar.
- .9 Ensure compacted head joints. Use full or face-shell joint as indicated.
- .10 Tamp units firmly into place.
- .11 Do not adjust masonry units after mortar has set. Where resetting of masonry is required, remove, clean and reset units in new mortar.
- .12 Tool exposed joints concave weathered/raked for interior work; strike concealed joints flush.
- .13 After mortar has achieved initial set up, tool joints.
- .14 Do not interrupt bond below or above openings.

3.10 REPAIR/RESTORATION

- .1 Upon completion of masonry, fill holes and cracks, remove loose mortar and repair defective work.

3.11 FIELD QUALITY CONTROL

- .1 Site Tests, Inspection: in accordance with Section 04 05 00 - Common Work Results for Masonry supplemented as follows:
 - .1 Concrete masonry units will be sampled and tested by independent testing agency appointed and paid by Owner in accordance with CSA S304.1.
 - .2 Noise reduction between two rooms will be tested by independent testing agency appointed and paid by Owner in accordance with ASTM E 336.
 - .3 Notify inspection agency minimum of 24 hours in advance of requirement for tests.
- .2 Manufacturer's Field Services: in accordance with Section 04 05 00 - Common Work Results for Masonry.

3.12 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning, supplemented as follows.
 - .1 Progress Cleaning:
 - .1 Standard Concrete Unit Masonry:
 - .1 Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block. Clean wall surface with suitable brush or burlap.
 - .2 Architectural Concrete Unit Masonry:
 - .1 Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block. Clean wall surface with suitable brush or burlap.
 - .3 Prefaced Concrete Unit Masonry:
 - .1 Clean masonry as work progresses using soft, clean cloths, within few minutes after laying. Upon completion, when mortar has set so that it will not be damaged by cleaning, clean with soft sponge or clean cloths, brush, and clean water. Polish with soft, clean cloths.

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

3.13 PROTECTION

- .1 Brace and protect concrete unit masonry in accordance with Section 04 05 00 - Common Work Results for Masonry.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 61 00 - Common Product Requirements.
- .3 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A 53/A 53M-02, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A 269-02, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A 307-02, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-92, Ready-Mixed, Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16.1-01, Limit States Design of Steel Structures.
 - .4 CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-1989(R2001), Welded Steel Construction (Metal Arc Welding) (Imperial Version).
- .4 The Environmental Choice Program
 - .1 CCD-047a-98, Paints, Surface Coatings.
 - .2 CCD-048-98, Surface Coatings - Recycled Water-borne.

1.3 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 WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:
 - .1 For finishes, coatings, primers and paints.
- .2 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.4 QUALITY ASSURANCE

- .1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

- .2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 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, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Storage and Protection:
 - .1 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.
 - .2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - 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, and 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 approved by NCC Representative.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 350W.
- .2 Steel pipe: to ASTM A 53/A 53M extra strong, galvanized finish.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A 307.
- .6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

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 flat 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/m² to CAN/CSA-G164.
- .2 Chromium plating: chrome on steel with plating sequence of 0.009 mm thickness of copper 0.010 mm thickness of nickel and 0.0025 mm thickness of chromium.
- .3 Shop coat primer: to CAN/CGSB-1.40.
- .4 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

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 SHOP PAINTING

- .1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .3 Clean surfaces to be field welded; do not paint.

2.6 ANGLE LINTELS

- .1 Steel angles: prime painted, sizes indicated for openings. Provide 150 mm minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated.
- .3 Finish: shop painted.

2.7 CHANNEL FRAMES

- .1 Fabricate frames from steel, sizes of channel and opening as indicated.
- .2 Weld channels together to form continuous frame for jambs and head of openings, sizes as indicated.
- .3 Finish: prime coat painted.

2.8 LOW PROFILE PIT ACCESS LADDERS

- .1 Stringers: PL 12x64mm, steel rails.
- .2 Steel Rungs: 25 mm diameter, welded to stringers at 305mm on centre.
- .3 Brackets: sizes and shapes to be coordinated with elevator manufacturer, complete with fixing anchors.
- .4 Metal bar grating platform: to ANSI/NAAMM MBG 531, steel, Type W-19-4, with checkered plate nosings.
- .5 Galvanize finish for interior.

PART 3 EXECUTION

3.1 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Architect 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 Provide components for building by other sections in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CAN/CSA-S16.1, or weld.
- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 CHANNEL FRAMES

- .1 Install steel channel frames to openings as indicated.

3.3 INSTALLATION OF LOW PROFILE ACCESS LADDERS

- .1 Install access ladders in locations as indicated.
- .2 Erect ladders clear of wall on bracket supports coordinated with elevator manufacturer.

3.4 CLEANING

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2010.

1.2 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.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - 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 and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused wood materials from landfill to recycling, reuse and composting facility approved by Departmental Representative.
- .5 Do not dispose of preservative treated wood through incineration.
- .6 Do not dispose of preservative treated wood with materials destined for recycling or reuse.
- .7 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Departmental Representative.
- .8 Dispose of unused wood preservative material at official hazardous material collections site approved by Departmental Representative.
- .9 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other locations where they will pose health or environmental hazard.

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 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.

- .2 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:
 - .1 S2S is acceptable for strapping.
 - .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 (DFP): to CSA O121, standard construction.

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, explosive actuated fastening devices, recommended for purpose by manufacturer.

2.4 FINISHES

- .1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work, interior highly humid areas, pressure preservative, fire retardant and treated lumber.
- .2 Stainless steel: use stainless steel 304 alloy for exposed fasteners and grommets or eyelets.

2.5 WOOD PRESERVATIVE

- .1 Pressure impregnation wood preservative (PT): All wood associated with the roof, all wood installed on the exterior of the building, including plywood and concealed blocking, and wood in all other locations likely to be subjected to damp and/or humid conditions. Except in locations where run-off could stain other surfaces.
- .2 Vacuum pressure impregnate wood for rot resistance, in accordance with CAN/CSA-O80:
 - .1 Pressure Treated wood Furring, blocking, nailing strips: to CAN/CSA-080.1-97
 - .2 Pressure Treated Plywood: to CAN/CSA-080.9-97
- .3 Impregnate at a rate of 8.8 lbs (above ground) and 14 lbs (ground contact) chemical per m³ wood.
- .4 Minimum penetration depth to be 3/8" with no less than 80% of sapwood treated.

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 where indicated as follows:
 - .1 Wood fascia backing, curbs, nailers, sleepers on roof deck.

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 fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.
- .6 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation for roof hopper.
- .7 Install sleepers as indicated.
- .8 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.

3.4 SCHEDULES

- .1 Provide electrical equipment backboards for mounting electrical equipment as indicated. Use 19 mm thick plywood on 19 x 38 mm furring around spacing, perimeter and at maximum 300 mm intermediate.

END OF SECTION

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PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-04(R2005), Concrete Materials and Methods of Concrete Construction Methods of Test for Concrete.
 - .2 CAN/CSA-A3000-03(R2005), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications, installation instructions, datasheet and general recommendations for waterproofing applications.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets.
 - .1 Indicate VOC's for crystalline waterproofing materials.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .4 Manufacturers' Field Reports: submit copies of manufacturers' field reports.

1.3 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Manufacturer Qualifications: Manufacture shall be ISO 9001 registered, and shall have no less than 10 years' experience in manufacturing the cementitious crystalline waterproofing materials for the required work. Manufacturers that cannot provide the performance test data specified herein will not be considered for the project.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Applicator: Waterproofing applicator shall be experienced in the installation of cementitious crystalline waterproofing materials as demonstrated by previous successful installations, and shall be approved by the manufacturer in writing.
- .5 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements..

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Divert unused crystalline waterproofing material from landfill to official hazardous material collections site approved by Departmental Representative.
- .2 Do not dispose of unused crystalline waterproofing materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

1.5 SITE CONDITIONS

- .1 Site Environmental Requirements:

- .1 Maintain air temperature and structural base temperature at waterproofing installation area above 5 degrees C for 72 hours before, during and 72 hours after installation.

1.6 WARRANTY

- .1 Manufacturer's Warranty: Manufacturer shall provide standard product warranty executed by authorized company official. Term of warranty shall be 12 months from Date of Substantial Completion.
- .2 Applicator's Warranty: Applicator shall warrant the waterproofing installation against defects caused by faulty workmanship or materials for a period of 12 months from Date of Substantial Completion. The warranty will cover the surfaces treated and will bind the applicator to repair, at his expense, any and all leaks through the treated surfaces which are not due to structural weaknesses or other causes beyond the applicator's control such as fire, earthquake, tornado and hurricane.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Cementitious Crystalline Waterproofing:
- .2 Non-shrink compound composed of 90% minimum finely graded ferrous metallic aggregate, free from non-ferrous particles, with water-reducing plasticizers and oxidizing catalyst free from ammonia.
- .3 Cement: to CAN/CSA-A3001.
- .4 Water: clean, potable free from slat and deleterious materials.
- .5 Curing Agent: manufacturer approved, compatible with crystalline waterproofing product.

2.2 MIXES

- .1 First brush coat: measure three parts cementitious dry powder to one part water by volume in mixing container and mix with a paddle on a slow speed electric drill (250RPM) or other type mixer which is acceptable for manufacturer. Mix waterproofing material in quantities that can be applied within 20 to 40 minutes from time of mixing. As mixture thickens, stir frequently, but do not add additional water. Do not mix bonding agents or admixtures with crystalline waterproofing materials.
- .2 Finish brush coat: mix three parts cementitious powder to one part water.
- .3 Pointing mix: Three parts dry powder to one part water by volume.
- .4 Curing Agent – Mix four parts water with one part curing concentrate.

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 SURFACE PREPARATION

- .1 Smooth surfaces or surfaces covered with excess form oil or other contaminants shall be washed, lightly sand-blasted, water-blasted or acid etched with muriatic acid as necessary to

provide a clean absorbent surface. Surfaces to be acid-etched shall be saturated with water prior to application of acid.

- .2 Filling surfaces irregularities:
 - .1 Cut out form tie holes, tie wires, construction joints, cracks to a depth of 25 mm.
 - .2 Rake out holes, honeycombs, open joints and porous areas.
 - .3 Make cuts square or under cut to a depth of 25 to 40 mm.
 - .4 Do not cut V-grooves or cone shaped recesses.
 - .5 Clean out areas thoroughly with wire brush and by vacuuming.
 - .6 Moisten thoroughly with water.
 - .7 Fill openings solidly with pointing mix.

3.3 INTERSECTIONS AND RECESSES

- .1 Apply pointing mix to form 25 mm cant strip at junctions of floor/wall and floor/column.
- .2 Pack continuous grooves with pointing mix and strike flush.
- .3 Waterproof recesses but do not reduce indicated opening sizes.

3.4 APPLICATION

- .1 Do waterproofing work in accordance with manufacturers printed application instructions, except where specified otherwise.
- .2 Continuously dampen surface to receive initial waterproof brush coat for minimum of 1 hour before application.
- .3 Curing between coats: spray each coat with fine fog spray to keep damp during oxidation period.
- .4 Brush Application:
 - .1 Apply with stiff bristle brush.
 - .2 Work coat into surface.
 - .3 Minimum interval between coats, 24 hours.
 - .4 Do not apply subsequent coat until previous coat has completely oxidized to uniform colour.
 - .5 Apply alternate coats in perpendicular direction to previous coat.
- .5 Return crystalline waterproofing on abutting surfaces.
 - .1 Floor applications 300 mm on faces of interior columns, walls and partitions.
 - .2 Wall application 600 mm on both faces of interior concrete walls and 1200 mm on both faces of interior masonry walls.
- .6 Waterproofing brush coats: minimum total surface coverage rate of crystalline compound 1 kg/m² for 2 coat or 3 coat applications.
- .7 Finish Brush coats:
 - .1 Apply to walls and floor surfaces perpendicular to previous brush coat.
 - .2 Do not apply until brush coats have completely oxidized.
 - .3 Do not allow setting or curing of bond coat before additional materials are placed.

3.5 CURING

- .1 Apply curing agent immediately after finish brush coat.
- .2 Cure by spraying frequently with water for 3 days minimum and protect cementitious crystalline waterproofing against rapid loss of moisture for additional 4 days by method recommended by manufacturer.
 - .1 Protect from direct sun rays.

- .2 Do not lay plastic sheeting directly on the waterproofing coating as air contact is required for proper curing. If poor circulation exists in treated areas, it may be necessary to provide fans or blown air to aid in curing of waterproofing treatment.

3.6 **FIELD QUALITY CONTROL**

- .1 Have manufacturer of products supplied under this Section review Work involved in handling, installation/application, protection and cleaning of its products, and submit written reports in acceptable format to verify compliance of Work with Contract.
- .2 Manufacturer's field services: 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 at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work on which Work of this Section depends is complete, but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.
 - .4 Obtain reports within three days of review and submit.

3.7 **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

Part 1 GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C208-95(2001), Specification for Cellulosic Fiber Insulating Board.
 - .2 ASTM C591-01, Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 - .3 ASTM C612-04, Standard Specification for Mineral Fibre Block and Board Thermal Insulation.
 - .4 ASTM C726-05, Standard Specification for Mineral Fiber Roof Insulation Board.
 - .5 ASTM C728-05, Standard Specification for Perlite Thermal Insulation Board.
 - .6 ASTM C1126-04, Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
 - .7 ASTM C1289-05a, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - .8 ASTM E96/E96M-05, Standard Test Methods for Water Vapour Transmission of Materials.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 71-GP-24M-77(R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
 - .2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .3 CAN/ULC-S704-03, Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.

1.2 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 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

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.
- .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 for recycling in accordance with Waste Management Plan.

Part 2 PRODUCTS

2.1 INSULATION

- .1 Wall Board Insulation: Extruded polystyrene insulation to CAN/ULC-S701.
 - .1 Type: 3.
 - .2 Size: 400 x 2400 mm.
 - .3 Thickness: As indicated on drawings.
 - .4 Edges: Butt Edge.
 - .5 Compressive Strength to ASTM D1621: 15 PSI minimum.
 - .6 Thermal Resistance to ASTM C518: 0.87 RSI / 25.4 mm minimum.
 - .7 Water Absorption to ASTM D2842: 0.3% maximum.
 - .8 Water Vapour Permeance to ASTM E96: 1.5 max per 25mm.
- .2 Roof Board Insulation: Extruded polystyrene insulation to CAN/ULC-S701.
 - .1 Type: 4.
 - .2 Size: 1200 x 2400 mm.
 - .3 Thickness: 152mm.
 - .4 Edges: Square Edge.
 - .5 Compressive Strength to ASTM D1621: 25 PSI minimum.
 - .6 Thermal Resistance to ASTM C518: 0.88 RSI / 25.4 mm minimum.
 - .7 Water Absorption to ASTM D2842: 0.1% maximum.
 - .8 Water Vapour Permeance to ASTM E96: 0.03 max per 25mm.

2.2 ADHESIVE

- .1 Adhesive for roof board insulation to CGSB 71-GP-24, in accordance with manufacturer's recommendations.

2.3 ACCESSORIES

- .1 Typical Insulation Clips: impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.
- .2 Canopy Clips: impale type, perforated 100 x 100 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.

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 WORKMANSHIP

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from CAN/CGA-B149.1 and CAN/CGA-B149.2 type B and L vents.
- .5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .6 Offset both vertical and horizontal joints in multiple layer applications.
- .7 Do not enclose insulation until it has been inspected and approved by Consultant.

3.3 EXAMINATION

- .1 Examine substrates and immediately inform Consultant in writing of defects.
- .2 Prior to commencement of work ensure:
 - .1 Verify that the insulation boards and adjacent materials are compatible.
 - .2 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.4 RIGID INSULATION INSTALLATION

- .1 Apply full bed of adhesive in accordance with manufacturer's recommendations. Spread only enough adhesive to install four (4) boards at a time. Press boards in place to ensure complete bond with substrate. Apply adhesive fully around protrusions.
- .2 In addition to adhesive, install mineral fibre insulation boards with insulation clips and disk, 2 per 600 x 1200 mm board minimum, fit boards tight, cut off fastener spindle 3 mm beyond disk.
- .3 Leave insulation board joints unbonded over line of expansion and control joints. Bond a continuous 150 mm wide 0.15 mm modified bituminous membrane over expansion and control joints using compatible adhesive and primer before application of insulation.

3.5 CAVITY WALL INSTALLATION

- .1 Install polystyrene insulation boards over air/vapour barrier membrane to outer surface of inner wythe of wall cavity over impaling clips.
- .2 Place boards in a method to maximize contact with bedding. Stagger end joints. Butt edges and ends tight to adjacent boards and to protrusions.
- .3 Fit insulation boards neatly around wall ties.

3.6 ROOF INSTALLATION

- .1 Apply flat fill and sloped roof insulation boards in accordance with layout indicated on Shop Drawings.
- .2 Apply insulation boards parallel to roof perimeter long edges. Stagger end joints.
- .3 Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- .4 Lay second layer of insulation with joints staggered from first layer.
- .5 Cut boards to slope for a distance of 610 mm back from roof drains for positive drainage.
- .6 Apply no more insulation than can be covered with roofing membrane in same day.
- .7 Install single layer of overlay board, with joints staggered over insulation joints.

3.7 CLEANING

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C 553-02, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .2 ASTM C 665-01e1, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .3 ASTM C 1320-05, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S702-1997, Standard for Mineral Fibre Insulation.

1.2 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 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

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

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling 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 and corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.

Part 2 Products

2.1 INSULATION

- .1 Thermal Insulation: Mineral fibre to CAN/ULC-S702-97.
 - .1 Type: 1.
 - .2 Size: To suit stud spacing.

- .3 Thickness: As indicated on drawings.
- .4 Combustibility to CAN4-S114: Non-combustible.
- .5 Surface Burning Characteristics to CAN/ULC-S102:
 - .1 Flame Spread: 0
 - .2 Smoke Developed: 0
- .6 Density: 32 kg/m³.
- .7 Thermal Resistance:

| Thickness | RSI |
|-----------|------|
| 63.5 mm | 1.68 |
| 88.9 mm | 2.30 |
| 152.4 mm | 3.96 |

2.2 ACCESSORIES

- .1 Insulation clips:
 - .1 Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self-locking type.
- .2 Nails: galvanized steel, length to suit insulation plus 25 mm, to CSA B111.
- .3 Staples: 12 mm minimum leg.
- .4 Tape: as recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .2 Install insulation with factory applied vapour barrier facing warm side of building spaces and vapour permeable membrane facing cold side. Lap ends and side flanges of membrane over framing members. Retain in position with insulation clips installed as recommended by manufacturer. Tape seal butt ends. Do not tear or cut vapour barrier.
- .3 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .4 Do not compress insulation to fit into spaces.
- .5 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures.
- .6 Do not enclose insulation until it has been inspected and approved by NCC.

3.3 CLEANING

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

END OF SECTION

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Part 1 GENERAL

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
 - .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

1.2 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.
 - .1 Performance criteria.
 - .2 Limitations.
- .3 Quality assurance submittals:
 - .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 and comply with written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

1.3 QUALITY ASSURANCE

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

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 SHEET VAPOUR BARRIER

- .1 Polyethylene film: to CAN/CGSB-51.34, 0.15 mm thick.

2.2 ACCESSORIES

- .1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.
- .2 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer.
- .3 Staples: minimum 6 mm leg.

- .4 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

Part 3 EXECUTION

3.1 INSTALLATION

- .1 Ensure services are installed and inspected prior to installation of retarder.
- .2 Install sheet vapour retarder on warm side of exterior wall, ceiling and floor assemblies prior to installation of gypsum board to form continuous retarder.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

3.2 EXTERIOR SURFACE OPENINGS

- .1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

3.3 PERIMETER SEALS

- .1 Seal perimeter of sheet vapour barrier as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.
 - .3 Install staples through lapped sheets at sealant bead into wood substrate.
 - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.4 LAP JOINT SEALS

- .1 Seal lap joints of sheet vapour barrier as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
 - .4 Install staples through lapped sheets at sealant bead into wood substrate.
 - .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.5 ELECTRICAL BOXES

- .1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
 - .1 Wrap boxes with film sheet providing minimum 300 mm perimeter lap flange.
 - .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

3.6 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 Society for Testing and Materials International, (ASTM)
 - .1 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
 - .2 ASTM D570-98(2010)e1, Standard Test Method for Water Absorption of Plastics.
 - .3 ASTM D1004-09, Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
 - .4 ASTM D1876-08, Standard Test Method for Peel Resistance of Adhesives (T-Peel Test).
 - .5 ASTM D1938-08, Standard Test Method for Tear-Propagation Resistance (Trouser Tear) of Plastic Film and Thin Sheeting by a Single-Tear Method.
 - .6 ASTM D1970-09, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - .7 ASTM D3767-03(2008), Standard Practice for Rubber - Measurement of Dimensions.
 - .8 ASTM E96 / E96M-10, Standard Test Methods for Water Vapour Transmission of Materials.
 - .9 ASTM E154-08a, Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - .10 ASTM E2178-03, Standard Test Method for Air Permeance of Building Materials.
 - .11 ASTM E2357-05, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
- .2 National Air Barrier Association - Professional Contractor Quality Assurance Program.
- .3 Sealant and Waterproofers Institute - Sealant and Caulking Guide Specification.

1.2 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 Quality Assurance Submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Existing Substrate Condition: report deviations, as described in PART 3 - EXAMINATION in writing to NCC.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.
 - .4 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Applicator: company specializing in performing work of this section with minimum 5 years documented experience with installation of air/vapour barrier systems.
 - .1 Completed installation must be approved by the material manufacturer.
- .2 Mock-Up:
 - .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
 - .2 Construct typical exterior wall panel, 3 m long by 9 m wide, incorporating; insulation, building corner condition, junction with roof system; illustrating materials interface and seals.
 - .3 Locate where directed by NCC.
 - .4 Mock-up may remain as part of finished work.
 - .5 Allow 48 hours for inspection of mock-up by NCC before proceeding with air/vapour barrier Work.
- .3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .3 Avoid spillage: immediately notify NCC if spillage occurs and start clean up procedures.
- .4 Clean spills and leave area as it was prior to spill.

1.5 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 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

1.6 AMBIENT CONDITIONS

- .1 Install solvent curing sealants and vapour release adhesive materials in open spaces with ventilation.
- .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
- .3 Maintain temperature and humidity recommended by materials manufactures before, during and after installation.

1.7 WARRANTY

- .1 Provide three year warranty under provisions of Section 01 78 00 - Closeout Submittals.
- .2 Warranty: include coverage of installed sealant and sheet materials which:
 - .1 Fail to achieve air tight and watertight seal.
 - .2 Exhibit loss of adhesion or cohesion.
 - .3 Do not cure.

PART 2 PRODUCTS

2.1 GENERAL

- .1 For each type of material required for the work of this section, provide primary materials that are the products of one manufacturer.

2.2 SHEET MATERIALS

- .1 SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film:
 - .1 Air leakage: <0.0001 CFM/ft² @ 1.6 lbs/ft² to ASTM E 2178 and ASTM E 283 and have no increased air leakage when subjected to a sustained wind load of 10.5 lbs/ft² for 1 hour and gust wind load pressure of 62.8 lbs/ft² for 10 seconds when tested at 1.6 lbs/ft² to ASTM E331.
 - .2 Tested to ASTM E 2357 for the air barrier assembly.
 - .3 Vapor permeance: 0.05 perms to ASTM E96.
 - .4 Membrane Thickness: 0.0394" (40 mils).
 - .5 Low temperature flexibility: -22 degrees F to CGSB 37-GP-56M.
 - .6 Elongation: 200% to ASTM D412-modified.
 - .7 Meets CAN/CGSB-51-33 Type I Water Vapor Permeance requirements.

2.3 SEALANTS

- .1 Sealants: Two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/l max. VOC Content.
- .2 Primer: Water-based primer which imparts an aggressive, high tack finish on the treated substrate
 - .1 Flash Point: No flash to boiling point.
 - .2 Solvent Type: Water.
 - .3 VOC Content: Not to exceed 10 g/l.
 - .4 Application Temperature: -4°C and above.
 - .5 Freezing point (as packaged): -7°C.
- .3 Substrate Cleaner: non-corrosive type recommended by sealant manufacturer compatible with adjacent materials.

2.4 ACCESSORIES

- .1 Seam Tape: As recommended by the weather barrier manufacturer.
- .2 Fasteners:
 - .1 42mm rust resistant screw with 50mm diameter plastic cap or manufacturer approved 31.75mm or 50mm metal gasketed washer.
 - .2 Masonry tap-con fasteners with Caps: 50mm diameter plastic cap fasteners.

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 GENERAL

- .1 Perform Work in accordance with Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification requirements for materials and installation.
- .2 Perform Work in accordance with National Air Barrier Association - Professional Contractor Quality Assurance Program and requirements for materials and installation.
- .3 Perform Work in accordance with Canadian Urethane Foam Contractor's Association - Professional Contractor Quality Assurance Program and requirements for materials and installation.

3.3 EXAMINATION

- .1 Verify that surfaces and conditions are ready to accept work of this section.
- .2 Ensure surfaces are clean, dry, sound, smooth, continuous and comply with air barrier manufacturer's requirements.
- .3 Report unsatisfactory conditions to NCC in writing.
- .4 Do not start work until deficiencies have been corrected.
 - .1 Beginning of Work implies acceptance of conditions.

3.4 PREPARATION

- .1 Remove loose or foreign matter, which might impair adhesion of materials.
- .2 Ensure substrates are clean of oil or excess dust; masonry joints struck flush, and open joints filled; and concrete surfaces free of large voids, spalled areas or sharp protrusions.
- .3 Ensure substrates are free of surface moisture prior to application of self-adhesive membrane and primer.
- .4 Ensure metal closures are free of sharp edges and burrs.
- .5 Prime substrate surfaces to receive adhesive and sealants in accordance with manufacturer's instructions.

3.5 INSTALLATION

- .1 Refer to manufacturer's literature for recommendations on installation.
- .2 Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
- .3 Application of Self-Adhered Air Barrier Membrane
 - .1 Install air & vapour barrier to dry surfaces at air and surface temperatures of -4°C and above in accordance with manufacturer's recommendations, at locations indicated on Construction Documents.
 - .2 Prime substrate to receive air barrier membrane as required per manufacturers written instructions.
 - .3 Precut pieces of air & vapour barrier into easily handled lengths.
 - .4 Remove silicone-coated release paper and position membrane carefully before placing length horizontally against the surface.
 - .5 Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
 - .6 When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
 - .7 Overlap horizontally adjacent pieces 50 mm and roll seams.
 - .8 Subsequent sheets of membrane applied above shall be positioned immediately below masonry reinforcement or ties. Bottom edge shall be slit to fit around reinforcing

- wires or ties, and membrane shall overlap the membrane sheet below by 50 mm. Roll firmly into place.
- .9 Seal around masonry reinforcing or ties and all penetrations with termination mastic.
 - .10 Continue the membrane into all openings in the wall, such as doors, windows, etc., and terminate at points that will prevent visibility from interior.
 - .11 Coordinate the installation of air & vapour barrier with roof installer to ensure continuity of membrane with rooftop air & vapour membrane.
 - .12 At end of each working day seal top edge of air & vapour barrier to substrate with termination mastic.
 - .13 Do not allow the rubberized asphalt surface of the air & vapour barrier membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.
 - .14 Do not expose air & vapour barrier membrane to sunlight for more than thirty days prior to enclosure.
 - .15 Inspect installation prior to enclosing and repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 150 mm in all directions from the perimeter of the affected area.
- .4 Application of Transition Membrane.
- .1 Prime substrate to receive transition membrane as required per manufacturers written instructions.
 - .2 Apply transition membrane with a minimum overlap of 75 mm onto each surface at all beams, columns and joints as indicated in detail drawings.
 - .3 Tie in to window and door frames, spandrel panels, roof and floor intersections and changes in substrate.
 - .4 Use pre-cut, easily handled lengths for each location.
 - .5 Remove silicone-coated release paper and position membrane flashing carefully before placing it against the surface.
 - .6 When properly positioned, place against surface by pressing firmly into place by hand roller.
 - .7 Overlap adjacent pieces 50 mm and roll all seams with a hand roller.
 - .8 Seal top edge of flashing with termination mastic.
 - .9 When transition flashing is pre-installed prior to application of Fluid Applied Membrane, apply transition flashing as above. Spray or trowel a continuous uniform film of Fluid Membrane at min. 1.5 mm (60 mils) dry film thickness using multiple, overlapping passes, with a minimum overlap of 75 mm onto transition flashing. For sill condition, spray or trowel Fluid Membrane onto pre-installed sill flashing and onto horizontal section of sill.
- .5 Application of Flexible Membrane Wall Flashing.
- .1 Prime substrate to receive wall flashing as required per manufacturers written instructions.
 - .2 Precut pieces of flashing to easily handled lengths for each location.
 - .3 Remove silicone-coated release paper and position flashing carefully before placing it against the surface.
 - .4 When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
 - .5 Overlap adjacent pieces 50 mm and roll all seams with a hand roller.
 - .6 Trim bottom edge 13 mm back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
 - .7 At heads, sills and all flashing terminations, turn up ends a minimum of 50 mm and make careful folds to form an end dam, with the seams sealed.
 - .8 Seal top edge of flashing with termination mastic.

- .9 Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with poly-sulfide sealants, creosote, uncured coal tar products or EPDM.

3.6 **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.

3.7 **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.

3.8 **PROTECTION OF WORK**

- .1 Protect finished work in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Do not permit adjacent work to damage work of this section.
- .3 Ensure finished work is protected from climatic conditions.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM D2178-97a, Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
 - .2 CGSB 37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing.
 - .3 CAN/CGSB-37.29-M89, Rubber-Asphalt Sealing Compound.
 - .4 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 Canadian Standards Association (CSA International).
 - .1 CSA-A231.2-95(R2000), Precast Concrete Pavers.
 - .2 CSA O121-M1978(R1998), Douglas Fir Plywood.
 - .3 CSA O151-M1978(R1998), Canadian Softwood Plywood.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .5 Underwriters' Laboratories of Canada (ULC).
 - .1 CAN/ULC-S701-01, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 SUBMITTALS

- .1 Submit proof of manufacturer's CCMC Listing and listing number in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence and cleaning procedures.

1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Submit product data sheets for bitumen, roofing felts, insulation and adhesives. Include:
 - .1 Product characteristics.
 - .2 Performance criteria.
 - .3 Limitations.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate flashing, control joints, and tapered insulation details.
- .3 Provide layout for tapered insulation.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle, store and protect materials of this section in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Provide and maintain dry, off-ground weatherproof storage.
- .3 Store materials on supports to prevent deformation.
- .4 Remove only in quantities required for same day use.
- .5 Store materials in accordance with manufacturers written instructions.
- .6 Store solvent-based liquids away from excessive heat and open flame.
- .7 Store adhesives and sealants at temperature above 5 degrees Celsius.
- .8 Store insulation protected from sunlight, weather and deleterious materials.
- .9 Store Products on roof deck in a manner to prevent overloading the structure and properly secured to prevent movement due to wind or other forces.
- .10 Identification for delivery: indicate on containers or wrappings of and materials:
 - .1 Manufacturer's name and brand.
 - .2 Compliance with applicable standard.
 - .3 Mass where applicable.
- .11 Deliver materials in original containers, sealed, with labels intact. Ensure that shelf life of materials has not expired.
- .12 Deliver fasteners in boxes or kegs and keep in protective storage until used. Do not oil or grease fasteners.
- .13 Supply electronic copy of purchase orders to NCC Representative. Include following data:
 - .1 Purchase order number.
 - .2 Supplier's name and address.
 - .3 Purchaser's name and address.
 - .4 Contract number and job number.
 - .5 Material and governing specification including type, grade, colour, class and quantity.
 - .6 Shipping instructions.
 - .7 Destination.
- .14 Remove damaged and/or rejected materials from site.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .5 Fold up metal banding, flatten and place in designated area for recycling.
- .6 Plan and coordinate insulation work to minimize generation waste.
- .7 Collect and separate plastic and/or paper packaging for recycling.

- .8 Give preference to suppliers who take back mineral fibre insulation waste for reuse or recycling.
- .9 Use the least toxic sealants and adhesives necessary to comply with requirements of this section.
- .10 Close and seal, tightly, all partly used sealant and adhesive containers and store protected in well ventilated, fire-safe area at moderate temperature.
- .11 Place used hazardous sealant tubes and adhesive containers in areas designated for hazardous materials.
- .12 Collect, package and store partly used or unused containers of asphalt, sealing compounds, primers and roofing felts for recycling, and return to recycler in accordance with Waste Management Plan.

1.7 PROJECT/SITE ENVIRONMENTAL REQUIREMENTS

- .1 Temperature, relative humidity, moisture content.
 - .1 Apply built-up bituminous membranes only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
 - .2 Do not install built-up bituminous membranes when air and substrate temperature remains below 5 degrees C in accordance with manufacturer's recommendations or when wind chill gives equivalent cooling effect.
 - .3 Install built-up bituminous membranes on dry substrate, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into system.
- .2 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.

1.8 WARRANTY

- .1 For Work of Roofing and Waterproofing within this section, 12 months warranty period prescribed in subsection GC32.1 of General Conditions "C" is extended to 60 months.
- .2 Contractor hereby warrants that Cold Applied Rubberized Asphalt [Roofing and Waterproofing will stay in place and remain leak proof in accordance with General Conditions (GC) - CCDC GC12.3, but for 60 months.

Part 2 Products

2.1 COMPATIBILITY

- .1 Compatibility between components of system and adjacent materials is essential. Provide written declaration to NCC Representative stating that materials and components, as assembled in system, meet this requirement.

2.2 DECK SHEATHING

- .1 Glass-mat gypsum board to Section 09 21 16 – Gypsum Board Assemblies.

2.3 PRIMER

- .1 Asphalt cutback primer: to CGSB 37-GP-9Ma, non-fibrated, asbestos free, water-based, low-VOC.

2.4 MEMBRANE

- .1 Ethylene propylene diene monomer/Styrene Butadiene Rubber (EPDM/SBR sheet membrane): to CGSB 37-GP-52M
 - .1 Type 1, Class A, 1.2 mm thick, reinforced membrane for use in adhered and ballasted system;

2.5 SEPARATION SHEET

- .1 Separation/Slip Sheet: Thermally bound, water-repellent membrane of 100% polypropylene 0.55 mm thick.

2.6 INSULATION

- .1 Roof deck rigid insulation to Section 07 21 14 – Board Insulation.

2.7 FILTER FABRIC

- .1 UV resistant, black woven polyolefin fabric for installation between insulation and stone ballast in protected membrane system. Fabric to meet recommendation of insulation manufacturer.

2.8 ADHESIVES

- .1 For Deck Sheathing:
 - .1 Solvent free single component bituminous modified polyurethane as recommended by the membrane manufacturer.
- .2 For Separation Sheet:
 - .1 Single component bitumen modified polyurethane as recommended by the membrane manufacturer.
- .3 For Membrane:
 - .1 Asphalt cutback primer to CGSB 37-GP-9 or as recommended by the membrane manufacturer.
- .4 For Insulation:
 - .1 As recommended by the insulation manufacturer.
- .5 For Aggregate Ballast:
 - .1 Asbestos-free, cold-process asphalt adhesive.

2.9 SEALERS

- .1 Sealant: Asbestos-free sealant, compatible with systems materials, recommended by system manufacturer.

2.10 BALLAST

- .1 Stone: 19 to 32 mm size, well graded crushed stone, opaque, non-porous, washed, free from fines, splinters, ice and snow.
- .2 Paving slabs: to CSA A231.1, of sizes indicated, air entrained precast concrete paving slabs having non-slip finish with 51 mm plain margin around perimeter.

2.11 ACCESSORIES

- .1 Provide the following accessory products as required and as recommended by the membrane manufacturer:
 - .1 Clamping rings; Adjustable, non corrosive metal rings.

- .2 Stack Flashings: Prefabricated aluminum sleeves; sizes to suit applications.
- .3 Roof Drain; Cast iron covers to suit existing applications,
- .4 Metal Flashing: as specified in Section 07 62 00 – Sheet Metal Flashings and Trim.
- .5 Joint Tape: pressure sensitive heat resistant fiberglass reinforced.
- .6 Latex Filler: latex modified cement.
- .7 Flexible Flashing Membrane: similar to roof membrane as specified above.
Flashing Adhesive: Single-component bitumen modified polyurethane.
- .8 Stripping Membrane: Vinyl-coated fibreglass mesh; Burmesh.
- .9 Stripping Adhesive: Single-component bitumen modified polyurethane, vertical grade.
- .10 Pitch Pan: premanufactured type; 0.953 mm thick galvanized steel sheet, minimum 200 mm high.
- .11 Termination Bar: 3 mm thick aluminum bar, 25 mm wide profile, pre-drilled for mechanical attachment.
- .12 Sheathing Fasteners: No.10 flat head, self tapping, Type S, cadmium plated screws to ASTM C 1002.
- .13 Exposed Fasteners: 25 mm square or round head, ring shanked galvanized or non-ferrous type, length as required to suit application.
- .14 Prefabricated Control or Expansion Joint Flashing: sheet butyl reinforced with closed cell urethane foam backing, seamed into metal flashing flanges, including sheet butyl counter flashing each side.

Part 3 Execution

3.1 WORKMANSHIP

- .1 Do work in accordance with applicable, standard in Canadian Roofing Contractors Association (CRCA) Roofing Specifications Manual.

3.2 SUBSTRATE EXAMINATION

- .1 Examine substrates and immediately inform NCC in writing of defects.
- .2 Prior to beginning of Work ensure:
 - .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, contamination and swept clean of dust and debris.
 - .2 Curbs have been built.
 - .3 Drains have been installed at proper elevations relative to finished surfaces.
 - .4 Sleeves, vents, pipes and other items passing through substrates receiving work of this Section are properly and rigidly installed.
 - .5 Plywood and lumber nailer plates have been installed to walls and parapets as indicated.

3.3 PREPARATION - PROTECTION

- .1 Cover walls, walks, sloped roofs and adjacent work where materials hoisted or used.
- .2 Use warning signs and barriers. Maintain in good order until completion of Work.
- .3 Clean off drips and smears of bituminous material immediately.
- .4 Dispose of rain water away from face of building until drains or hoppers installed and connected.
- .5 Protect from traffic and damage. Comply with precautions deemed necessary by NCC.

- .6 Place plywood runways over work to enable movement of material and other traffic.
- .7 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.
- .8 Seal and ballast exposed edges.
- .9 If metal connectors used, treat connectors and decking with rust proofing or galvanization.
- .10 Free substrates from curing compounds, dust and loose particles, grease, paint, frost, form oil and other material detrimental to bond of membrane materials.
- .11 Heat membrane in double shell indirect fired melter using high flash point oil as heat transfer medium. Equip melter with positive mechanically operated agitator, and thermometers. Under no circumstances is membrane material to be heated in direct heating kettle.
- .12 Reinforce substrate cracks less than 3 mm wide with layer of hot rubberized asphalt 300 mm wide centred on crack and 150 mm wide fabric reinforcing sheet embedded into it.
- .13 Reinforce substrate cracks larger than 3 mm with layer of hot rubberized asphalt 300 mm wide centred over crack and 225 mm wide strip of standard thickness elastomeric reinforcing sheet embedded into it.
- .14 At expansion joints, loop heavy duty elastomeric reinforcing sheet down into joint, embedded into 3 mm thick layer to membrane. ensure that depth of loop is minimum 1.5 mm. Extend reinforcing sheet minimum 150 mm on each side of joint. Cap end joints min. of 150 mm and seal with 3 mm coat of membrane. Fill loop with membrane. Secure top of reinforcing sheet with continuous fixing bar at vertical wall locations.
- .15 At mechanical vent and pipe flashings, provide standard elastomeric reinforcing sheet around vent pipes and protrusions through membrane. Set and seal with membrane and clamping ring. Install prefabricated metal sleeves for substrate perforations.
- .16 At pitch pockets place pan on top of membrane. Set standard elastomeric reinforcing sheet into membrane over top at flange. Fill pitch pocket with membrane or plastic cement in order to shed water.
- .17 At drain flashings, extend membrane and standard elastomeric reinforcing into upper surface of drain base and ensure watertight seal between membrane and drain. Apply clamping ring exerting sufficient pressure to affect seal between clamping ring and membrane. Temporarily block drains during application of ballast, or other materials which might block drains. Remove blocking when work is not in progress and upon completion.

3.4 PREPARATION OF STEEL DECK

- .1 Install preformed sound absorbing glass fibre insulation strips in acoustical deck flutes in accordance with deck manufacturer's instructions.
- .2 Using mechanical fasteners, treat decking with rust proofing or galvanization.

3.5 DECK COVERING

- .1 Lay Glass Mat Gypsum Board with tightly butted joints. Longitudinal joints must be at right angles to flute direction. Joints occurring along widths of board to be continuously supported on top flange of metal deck.
- .2 Mechanically fasten deck covering to steel deck with self-tapping, non-corroding screws spaced 400 mm on centre each way and to only top flanges of steel deck.
- .3 Reinforce joints with minimum 75 mm joint tape, centered on joints.
- .4 Filler boards shall be minimum 450 mm each direction.

3.6 MEMBRANE

- .1 Ensure that water does not flow under completed sections of the membrane system by completing flashings, terminations, and daily seals by the end of each work day.
- .2 Membrane, adhered application.
 - .1 Allow membrane to relax for 1/2 hour.
 - .2 Layout sheets to ensure least number of seams.
 - .3 Shingle lap edges in manner designed to shed water away from lap.
 - .4 Starting at the area's lowest level, unroll two sheets in adjacent parallel lines and position the uppermost sheet to overlap the adjacent sheet 100 mm.
 - .5 Apply membrane adhesive to entire substrate and also on top of the adjacent sheet 100-125 mm.
 - .6 Immediately roll out the top sheet into membrane adhesive. Roll or broom membrane to ensure it is properly embedded, without wrinkles, blisters or fishmouths.
 - .7 Apply stripping adhesive and stripping membrane over lap such that adhesive extends 75-100 mm either side of leading edge. Install succeeding sheets in similar manner. Apply stripping adhesive at a minimum rate of 3.3 L/m².
 - .8 Apply adhesives at a minimum rate of 1.2 L/m².

3.7 ELASTOMERIC FLASHINGS

- .1 Provide membrane flashings in accordance with manufacturer's written installation guidelines.
- .2 Install flashings to ensure the roof is watertight at the end of each Working Day.
- .3 Extend flashing membrane minimum 150 mm over roof membrane.
- .4 Extend flashing membranes minimum 200 mm up vertical surfaces.
- .5 Secure flashings at 200 mm OC. Secure vertical flashings through termination bar.
- .6 Overcoat lap edges with end lap stripping adhesive and membrane.
- .7 Tie-in leading edge of elastomeric sheet flashing with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
- .8 Canted Eave:
 - .1 Extend reinforced elastomeric sheeting over outside face of cant and extend a minimum 25 mm below the blocking. Mechanically fasten with 38 mm common roofing nails, 200 mm on centre.
 - .2 Extend reinforced elastomeric sheeting down over cant strip and embed in flashing adhesive from top of cant to at least 150 mm beyond toe of cant onto roof.
 - .3 Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends 100 mm; and adhere with flashing adhesive.
 - .4 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .5 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
- .9 Canted eave with fascia:
 - .1 Extend reinforced elastomeric sheeting over outside face of cant and fascia and secure to underside of fascia. Mechanically fasten with 38 mm common roofing nails, 200 mm on centre.
 - .2 Extend reinforced elastomeric sheeting down over cant strip and embed in flashing adhesive onto roof surface a minimum of 150 mm.
 - .3 Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends 100 mm; and adhere with flashing adhesive.
 - .4 Overcoat lap edges with end lap stripping adhesive and membrane.

- .5 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
- .10 Low Parapet Wall Flashing:
 - .1 Seal exposed joint between the wall and roof deck for airtight seal.
 - .2 Adhere elastomeric sheeting completely to flashing surface, cant, and roofing with flashing adhesive.
 - .3 Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends 100 mm and adhere with flashing adhesive.
 - .4 Extend elastomeric sheeting up and over parapet at least 38 mm and face nail with 38 mm common roofing nails, 200 mm o.c.
 - .5 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .6 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
- .11 Gravel stop:
 - .1 Prior to setting and nailing horizontal flanges of edge flashings, trowel 1.5 mm uniformly thick layer of cold flashing adhesive to roofing surface receiving metal flange.
 - .2 Install metal gravel stop with formed drip edge incorporating lock type joints (S lock or equal) to allow expansion and contraction. Set flange in cold flashing adhesive.
 - .3 Nail interior portion of flange to wood blocking 75 mm o.c., staggered.
 - .4 Prime metal flange with asphalt primer.
 - .5 Adhere elastomeric sheeting completely to flashing surface with flashing adhesive. Ensure complete bond and continuity without wrinkles or voids lap sheeting ends 100 mm and adhere with flashing adhesive. Elastomeric sheeting width: sufficient to cover gravel stop completely and extend onto adjacent roof and minimum of 150 mm.
 - .6 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .7 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
 - .8 Caulk over edge of flashing membrane at metal upturn with specified material.
- .12 At Edge/Gutters:
 - .1 Fabricate and install new one-piece edge/gutter with downspouts. Slope gutter to downspouts.
 - .2 Prior to setting and nailing horizontal flanges of gutter, trowel 1.5 mm uniformly thick layer of cold flashing adhesive to roofing surface receiving metal flange.
 - .3 Nail flange to wood blocking 75 mm o.c., staggered.
 - .4 Prime metal flange with asphalt primer.
 - .5 Adhere elastomeric sheeting completely to flashing surface with flashing adhesive. Ensure complete bond and continuity without wrinkles or voids lap sheeting ends 100 mm and adhere with flashing adhesive. Elastomeric sheeting width: sufficient to cover gravel stop completely and extend onto adjacent roof and minimum of 150 mm.
 - .6 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .7 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
 - .8 Caulk over edge of flashing membrane at metal upturn with specified material.
- .13 Wall Flashing:
 - .1 The exposed joint between the wall and deck shall be sealed securely to provide and complete air seal.

- .2 Adhere elastomeric sheeting completely to flashing surface, cant and roofing with flashing adhesive.
 - .3 Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends 100 mm and adhere with flashing adhesive.
 - .4 Elastomeric sheeting width: sufficient to extend at least 150 mm beyond toe of cant onto roof surface and 200 mm above the roof surface.
 - .5 Secure the top of the elastomeric sheeting to the vertical plane with a flashing termination bar. Mechanically fasten 300 mm O.C. Overcoat bar with end lap stripping adhesive and membrane.
 - .6 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .7 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
 - .8 Flashing detail shall conform to drawing entitled, Base Flashing for wall flashing (with thru-wall counterflashing).
- .14 Building Expansion Joint(s):
- .1 Fill joint with loose insulation.
 - .2 Install 13 mm plywood to the top of the blocking, securing on one side only.
 - .3 Apply foam rubber or 25 mm minimum thickness fibreglass insulation to the top of the plywood.
 - .4 Install elastomeric sheeting centred over expansion joint.
 - .5 Adhere sheeting completely to horizontal and vertical blocking surfaces with flashing adhesive. Press sheeting into adhesive. Ensure complete bond and continuity without wrinkles or voids.
 - .6 Sheeting width: Sufficient to extend onto adjacent roofing 150 mm, minimum.
 - .7 Lap sheeting ends 100 mm; and adhere with flashing adhesive.
 - .8 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .9 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
- .15 Expansion Joint at Wall:
- .1 Extend vapour retarder from deck level up wall sufficiently and secure to wall.
 - .2 Fill joint with loose insulation.
 - .3 Install interior carpentry and compressible insulation as per flashing detail entitled - Expansion Joint At Wall.
 - .4 Adhere elastomeric sheeting completely to flashing surface, cant and roofing with flashing adhesive.
 - .5 Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends 100 mm; and adhesive.
 - .6 Elastomeric sheeting width: sufficient to extend at least 150 mm beyond toe of cant onto roof surface and 200 mm above the roof surface.
 - .7 Secure the top of the elastomeric sheeting to the vertical plane with a flashing termination bar. Mechanically fasten 300 mm o.c. Overcoat bar with end lap stripping adhesive and membrane.
 - .8 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .9 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
- .16 Area divider:
- .1 Install elastomeric sheeting centered over area divider extending onto roof membrane a minimum of 150 mm beyond toe of cant on either side.
 - .2 Adhere sheeting completely with flashing adhesive. Press sheeting into adhesive. Ensure complete bond and continuity without wrinkles or voids.

- .3 Lap sheeting ends 100 mm; and adhere with flashing adhesive.
- .4 Overcoat lap edges with end lap stripping adhesive and membrane.
- .5 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
- .17 Curb Flashings:
 - .1 Adhere sheeting completely to horizontal and vertical blocking surfaces with flashing adhesive. Press sheeting into adhesive. Ensure complete bond and continuity without wrinkles or voids.
 - .2 Sheeting width: Sufficient to extend from top of curb down onto adjacent roofing 150 mm, minimum. Mechanically fasten sheeting on top face of curb.
 - .3 Lap sheeting ends 100 mm; and adhere with flashing adhesive.
 - .4 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .5 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate continuous courses of stripping ply adhesive.
 - .6 If membrane does not completely cover sleeper, secure top edge with a flashing termination bar. Mechanically fasten 300 mm o.c. Overcoat bar with end lap stripping adhesive and membrane.
- .18 Projection Flashing:
 - .1 Apply elastomeric flashing adhesive to the prepared area and place aluminum base over the pipe and set into the flashing adhesive.
 - .2 Select the proper step of the rubber cap and cut off above the index ring. Remember, when in doubt, cut the smaller size.
 - .3 Slip the rubber cap down over the pipe and onto the collar of the aluminum base. Press around edge to ensure cap is properly sealed. This will centre the unit.
 - .4 Place clamp around pipe and rubber cap and tighten screw.
 - .5 Prime flange.
 - .6 Install elastomeric sheeting with stripping ply adhesive and membrane.
 - .7 Cover flange completely. Extend flashing at least 100mm onto adjacent roofing. Remove wrinkles and voids. Lap flashing ply ends 100mm.
 - .8 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
- .19 Plumbing Vents:
 - .1 Fabricate and install plumbing vent flashing from lead. Flange: 100 mm wide minimum; extend completely around periphery of vent flashing. Set flange into flashing adhesive. Neatly dress flange with wood block.
 - .2 Prime lead flange with asphalt primer.
 - .3 Pipe outside diameter greater than 50 mm: Bend lead inside pipe 25 mm minimum with pliers or rubber/plastic mallet; replace cracked lead.
 - .4 Pipe outside diameter 50 mm or less: Cut lead at vent top; fabricate and install integral lead cap.
- .20 Projection Flashing:
 - .1 Install cartwheel and collar flashing around projection using elastomeric sheeting and Flashing Adhesive. Method as outlined on the drawing entitled: Projection Flashing-Cart wheel and Collar.
 - .2 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
- .21 Copings:
 - .1 The copings are tested for adhesion to the wall by gently lifting on each tile. If a few are loose they may be reset in a bed of flashing adhesive. If many are loose, it is best to have them all reset in mortar.

- .2 All loose mortar is removed from the bell and all dust blown from the area.
 - .3 Flashing adhesive is packed into the bell joint and extended up onto the bell about 75 mm and down onto the shank of the adjoining tile a similar distance.
 - .4 150 mm wide reinforcement membrane is cut to the proper length and dry troweled into the flashing adhesive tight and wrinkle-free.
 - .5 The reinforcing membrane is then overcoated with flashing adhesive.
- .22 Pitch pans:
- .1 Apply 3 mm uniform layer of flashing adhesive to surface receiving metal flange.
 - .2 Install premanufactured pitch pan into adhesive. Prime flange prior to installation.
 - .3 Pitch pans shall be a 24 gauge galvanized steel, a minimum 100 mm high. There shall be at least 50 mm clearance between the projection and side wall.
 - .4 Adhere elastomeric sheeting completely to flashing surface with flashing adhesive. Cover flange completely. Extend flashing at least 100mm onto adjacent roofing. Ensure complete bond and continuity without wrinkles and voids. Lap sheeting ends 100mm.
 - .5 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .6 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
 - .7 Fill pitch pan 25 mm from top with pitch pan base filler.
 - .8 Fill remainder with pitch pan topping mastic. The mastic shall be crowned in order to ensure water run-off.
- .23 At Equipment Stands (Pipe):
- .1 Fabricate and install sleeve flashing. Height: 200 mm. Flange width: 100 mm. Flange to extend completely around flashing periphery. Solder all joints. Double solder vertical joints.
 - .2 Nail flange to wood blocking 75 mm o.c., staggered.
 - .3 Prime flange with asphalt primer.
 - .4 Install elastomeric sheeting to stand and to roofing with a continuous 1.5 mm thick application of flashing adhesive.
 - .5 Sandwich top edge of sheeting between two (2) layers flashing tape.
 - .6 Secure top of sheeting with stainless steel drawband. Caulk top of drawband and sheeting/pipe interface. Provide watershed. Tool neatly.
 - .7 Fabricate umbrella and install drawband; cover sleeve flashing 75 mm minimum. Install immediately above sleeve flashing. Tighten drawband.
 - .8 Wipe clean top of umbrella and projection with metal cleaner. Prime surface with metal primer.
 - .9 Caulk projection/sheet metal interface. Provide watershed. Tool neatly.
 - .10 Flashing detail shall conform to drawing entitled, Mechanical Equipment Stand.
 - .11 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .12 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
- .24 At piping through roof box(es):
- .1 Install wood blocking.
 - .2 Fabricate and install two piece pipe box. The bottom portion shall be fabricated with 100 mm flange. The top section shall be notched to fit over piping. Openings shall be a minimum 200 mm above the roof surface.
 - .3 Set flange in mastic, nail flange to wood blocking 75 mm o.c. Prime flange.
 - .4 Fill box interior with batt insulation.
 - .5 Fasten top and closure detail to bottom.

- .6 Wipe clean metal surfaces of box and piping with metal cleaner. Prime metal with metal primer. Caulk joint between box and piping. Tool neatly.
- .7 Install elastomeric sheeting with flashing adhesive and membrane.
- .8 Flashing detail shall conform to drawing entitled, Piping Through Roof Deck.
- .9 Overcoat lap edges with end lap stripping adhesive and membrane.
- .10 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
- .25 Drains:
 - .1 Install new drain assembly per manufacturer's instructions, plug/seal drain to prevent water entry until service connection is completed.
 - .1 Elastomeric sheeting:
 - .1 Provide 600 x 600 mm elastomeric sheeting reinforcement to drain.
 - .2 Centre sheeting over drain.
 - .3 Adhere sheeting with continuous application of flashing adhesive.
 - .4 Remove wrinkles/entrapped air.
 - .5 Apply mastic to exposed edge of membrane inside the drain opening.
 - .2 Reclamp flashing collar to drain in bed of flashing adhesive.
 - .3 Cut/remove excess sheeting within drain.
 - .4 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .5 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
- .26 Drains: Insert
 - .1 Cut 225 mm diameter opening thru new membrane and insulation coinciding with a existing drain opening.
 - .2 Install drain insert into existing drain pipe according to the manufacturers recommendations.
 - .3 Adhere drain flange to membrane with flashing adhesive.
 - .4 Elastomeric sheeting:
 - .1 Provide 900 x 900 mm elastomeric sheeting reinforcement to drain.
 - .1 Centre sheeting over drain.
 - .2 Adhere sheeting with continuous application of elastomeric flashing adhesive.
 - .3 Remove wrinkles/entrapped air.
 - .4 Cut/remove excess sheeting within drain.
 - .5 Seal leading edge of sheet with reinforcing membrane embedded between alternate continuous courses of flashing adhesive.
 - .5 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .6 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.

3.8 SEPARATION SHEET

- .1 Place separation sheet in asphalt while still hot enough to assure good bond but not so hot as to damage sheet.
- .2 Begin application at low end, lapping sheets 50 mm.
- .3 Carry sheet up vertical faces over rubberized asphalt while still warm.

3.9 INSULATION APPLICATION

- .1 Apply insulation loose laid immediately after application of separation sheet.
 - .1 Butt insulation boards tightly, in parallel rows with staggered end joints.
 - .2 Cut and fit around peripheries and items passing through insulation.
- .2 Do not install more insulation than can be covered in the same day.

3.10 FILTER FABRIC APPLICATION

- .1 Apply continuous layer of filter fabric unbonded over installed insulation lapping joints 300 mm minimum.
- .2 Lay filter fabric in manner ensuring no laps occur within 1800 mm of roofing perimeter.
- .3 Cut fabric around drains, vents and other penetrations and extend up protrusions and place under metal flashings.
- .4 Extend filter fabric up vertical surfaces and secure under metal counterflashing.

3.11 BALLAST AND PROTECTIVE COVERING

- .1 Apply stone ballast, as soon as possible after placement of fabric, at minimum rate of 75 kg/m².
- .2 Spread stone ballast to an even thickness over entire area. Extend ballast over base of metal flashings by 100 mm.
- .3 Spread additional stone ballast around perimeter for width of 1200 mm to increase ballast weight to 100 kg/m².
- .4 Install paving slabs accurately aligned and levelled. Shim up as required to obtain smooth surface transition from slab to slab. Allow space between slabs to permit drainage of surface water. Cut pavers to fit irregularly shaped areas and around protrusions.

3.12 WALKWAYS

- .1 Install walkway temporary planks and concrete paving slabs in accordance with manufacturer's instructions and as indicated.

3.13 FIELD QUALITY CONTROL

- .1 Contractor Inspection: Prior to application aggregate surfacing, inspect completed membrane and flashing for punctures, tears, and discontinuously sealed seams.
- .2 Apply additional layer of membrane over punctures and tears, extending minimum 50 mm beyond damaged area in all directions, and seal seams.
- .3 Manufacturer's Field Service: arrange for manufacturer's technical representative to regularly inspect the roofing application (minimum twice per week) and confirm that the roofing system installation is in strict accordance with manufacturer's recommendations.

3.14 FLOOD TESTING

- .1 Do not conceal waterproofing until inspection and testing are completed to satisfaction of NCC.
- .2 Temporarily plug drains and dam horizontal surface areas to be tested and flood with water to minimum depth of 80 mm.
- .3 Maintain flooded depth for 24 hours.
- .4 If leaks occur repair and retest.
- .5 Remove water at end of test.

3.15 PROTECTION OF COMPLETED WORK

- .1 Adequately protect Products and work from damage by weather, traffic and other causes.
- .2 At the end of each Working Day, seal exposed edges of roofing membrane to be watertight.
- .3 Protect adjacent Work from damage. Repair damage.

3.16 CLEANING

- .1 Clean work in accordance with Section 01 74 11- Cleaning.
- .2 Clean to NCC's approval, soiled surfaces, spatters, and damage caused by work of this Section.
- .3 Clean adjacent roof surfaces, levels and ground level areas of debris and excess Products.
- .4 Check drains to ensure cleanliness and proper function, and remove debris, equipment and excess material from site.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM B32-89 Specification for Solder Metal.
 - .2 ASTM B101-92 Standard Specifications for Lead-Coated Copper Sheet and Strip for Building Construction.
 - .3 ASTM B248-91b Specifications for General Requirements for Wrought Copper and Copper Alloy Plate, Sheet, Strip and Rolled Bar (Metric).
- .2 Canadian Copper & Brass Development Association Publications.

1.2 SUBMITTALS

- .1 Product data: submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit WHMIS MSDS - Material Safety Data Sheets 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.
 - .2 Indicate dimensions, profiles, attachment methods, schedule of wall elevations, trim and closure pieces, soffits, fascia, metal furring, and related work.
- .3 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit duplicate 300 x 300 mm samples of siding material, of colour and profile specified.

1.3 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.
- .4 The work of this Section shall be executed by a specialist sheet metal firm established for over five (5) years and able to demonstrate a proven record of installation using traditional materials and installation techniques, all satisfactory to the departmental representative.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Divert used metal cut-offs from landfill by disposal removed for disposal at the nearest metal recycling facility.

- .3 Divert reusable materials for reuse at nearest used building materials facility.
- .4 Divert unused caulking, sealants, and adhesive materials from landfill through disposal at hazardous material depot.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Lead-Coated Copper sheet: to ASTM B101, H00 or H01 temper designation, Class B coating weight, 2% yield strength, free from pinholes or other dewetted areas, uniform in quality and temper, clean, smooth, commercially flat and straight, and free from defects, weight:
 - .1 Roof sheets: 7.08 kg/m² minimum coated weight (0.69 mm minimum base copper thickness).
 - .2 Caps, flashings, trim, closures: 8.30 kg/m² minimum weight (0.82 mm minimum base copper thickness).
- .2 Isolation coating: alkali resistant bituminous paint.
- .3 Underlay: Self-adhering sheet membrane waterproofing as specified.
- .4 Slip sheet: reinforced sisal paper or a heavy felt kraft paper .
- .5 Solder for copperwork: 67% pig-lead and 33% block-tin conforming to ASTM B32.
- .6 Flux: rosin, cut muriatic acid, or commercial preparation suitable for materials to be soldered .
- .7 Sealants: Refer to Section 07 92 00.
- .8 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Weight: 10.73 kg/ m² (1.1 mm base copper thickness).
- .9 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.
- .10 Washers: of same material as sheet metal, 1 mm thick with neoprene packings.

2.2 FABRICATION

- .1 Fabricate sheet copper work in shop by brake forming, bench shearing, cutting, drilling and shaping, wherever possible.
- .2 Form individual pieces in 2400 mm maximum lengths. Make allowances for expansion at joints.
- .3 Hem exposed edges on underside 12 mm, miter and seal.
- .4 Form bends with straight sharp lines, angles and arrises. Form sheets -into true planes free from twists, buckles, dents and other visual distortions.
- .5 Provide accessories required for installation. Fabricate accessories of same material as Work with which they will be incorporated.
- .6 Hem all exposed metal edges at least 20 mm.
- .7 Apply minimum 0.2 mm dry film thickness coat of plastic cement to both faces of dissimilar metals in contact.
- .8 Protect sheet metals against oxidization by back painting with isolation coating where indicated.

2.3 LEAD-COVERED COPPER FLASHING

- .1 Form flashings, copings and fascias to profiles indicated of 8.30 kg/m² lead-coated copper sheet.

2.4 FORMING

- .1 Form new metalwork on a bending-brake. Shape, trim and handseam on the bench as far as possible, with the proper sheet metal working tools.
- .2 Form rolls on wooden roll molds to create a smooth profile matching the specified profiles exactly. Broken curves are not acceptable.
- .3 Form the angles of bends and folds of interlocking metal with full regard to expansion and contraction to avoid buckling or fullness in the metal after it is in service.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine areas and conditions under which work is to be performed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work.
- .2 Do not proceed with the work until unsatisfactory conditions have been corrected to the satisfaction of the installer.
- .3 Ensure that the self-adhesive membrane waterproofing system specified has been properly installed and has been reviewed and accepted by the Engineer.
- .4 Commencement of the installation will be construed as acceptance of the site conditions and, thereafter, the Contractor shall be fully responsible for satisfactory work as specified herein.

3.2 PROTECTION

- .1 Be responsible for the cost of repair and restitution of damage to the building caused by the Work of this Section.
- .2 Ensure that protection boarding has been installed against all windows where work is taking place, before work of this trade commences.
- .3 Maintain the roof leak proof as the work progresses.

3.3 SURFACE PREPARATION

- .1 Make surfaces to which finishes are to be applied smooth, clean, dry and free from any other defects that might adversely affect the installation.
- .2 Cover Knot holes or voids up to 20 mm in diameter with sheet copper nailed to deck.
- .3 Punch down exposed nail heads 3 mm minimum.
- .4 Apply a slip sheet over the membrane waterproofing to prevent bonding between the sheet metal and the membrane. Secure with minimum anchorage and lap joints 50 mm minimum in the direction of the water flow.

- .5 Ensure that reglets cut into masonry by masonry Trade are a full 38 mm deep and full joint height at locations indicated on the drawings before proceeding. Cut reglets before installation of adjacent finish materials.

3.4 SHEET COPPER INSTALLATION

- .1 Install flashings and sheet-metalwork dead-level, true to line and square. Fit work to existing building exactly.
- .2 Install sheet metalwork to prevent entry of water under service and weather conditions.
- .3 Form seams in direction of water-flow and make watertight.
- .4 Fasten work with weathertight fasteners, evenly spaced and neatly located.
- .5 Install all sheet metalwork with concealed fasteners. Obtain acceptance from Consultant before proceeding when unable to provide concealed fasteners.
- .6 Hem all exposed edges 20 mm unless otherwise detailed.
- .7 Flash roof penetrations with material matching roof panels, and make watertight.

3.5 DISSIMILAR METALS

- .1 Do not place copper or lead-coated copper in direct contact with any other type of metal other than accepted lead-plugs or washers.
- .2 Make concealed fasteners and clips of the same metal as the flashings.
- .3 Place a sheet of 2.27 kg sheet lead between copper and iron or steel to minimize galvanic action where contact is inevitable. Use stainless steel fasteners at these connections.
- .4 Painting of surfaces to provide protection is not acceptable.

3.6 CLEATS

- .1 Fasten sheet metal to substrate with suitably sized cleats.
- .2 Use fasteners and cleats of the same metal as the fastenings.
- .3 Fabricate cleats 50 mm x 75 mm, spaced 300 mm O.C. unless otherwise specified.
- .4 Secure one end of cleat with two fasteners and fold back over fastener heads. Lock free end of cleat into seam or into folded edge of copper sheet.
- .5 Fasteners:
 - .1 Use No. 12 x 25 mm screws with lead shields in masonry.
 - .2 Use 32 mm copper nails in wood.

3.7 SOLDERING

- .1 Tin all edges of plain copper sheets to be soldered for a width of 40 mm both sides with solder.
- .2 Gently close clinch-locked joints and seams with a block of wood and mallet, then flux and fill with molten solder. Use sufficient heat to induce the solder to flow by capillary and create a waterproof joint.
- .3 Perform soldering slowly with well heated coppers, so as to heat thoroughly the seam and sweat the solder through its full width.

- .4 When soldering lead-coated copper, brush a liberal amount of flux into the seam.
- .5 Wipe clean all exposed joints, wash immediately after the joints are soldered to remove all traces of solder and flux. Wash all copperwork with soapy hot water upon completion.

3.8 SEAMS

- .1 Finish flat-lock seams 20 mm wide.
- .2 Finish soldered lap-seams 30 mm wide, and rivet 40 to 50 mm o.c. with 3 mm rivets.
- .3 Finish non-soldered lap-seams 30 mm wide, and rivet 40 to 50 mm o.c. with 3 mm rivets.
- .4 Install seams in the direction of flow.

3.9 JOINING

- .1 Flat-lock and seam-solder the following locations:
 - .1 Horizontal or sloped joints at a gradient of less than 1:5.
 - .2 Sloped or vertical joints within 150 mm of the above locations.
 - .3 Gutters, from the roof deck down through the gutter and up to the metal cornice mold.
- .2 Make vertical joints and sloped joints as a gradient of more than 1:5 watertight by forming with slip-lock seams. Use soldered lock seams for internal corners. Use locked standing seams for external corners.
- .3 Lap and rivet formed metal cornices.
- .4 Provide Irish locks at 1200 mm centres along fascias.
- .5 Refer to details for connection details. Do not change connection design without acceptance from the Consultant.

3.10 STARTER STRIPS

- .1 Provide starter strips where metal extends over edges and where necessary to secure sheet metal work at eaves, gables, rakes, cornices and elsewhere.
- .2 Form starter strips of metal in continuous butted lengths to allow metal work to be hooked over not less than 20 mm.
- .3 Secure to building with fasteners set 200 mm O.C.
 - .1 Use medium duty anchors at masonry.
 - .2 Use nails at woodwork.
- .4 Keep fasteners back 50 mm from masonry edges.

3.11 FLAT SEAM ROOFING

- .1 Use 7.08 kg/m² lead-coated copper, 0.69 mm base copper thickness, 450 x 600 mm rectangular sheets to make flat seam roofing. Notch corners and turn up pretinned edges 20 mm.
- .2 Lay sheets with the long dimension parallel to the eaves.
- .3 Lock cleats into seams and flatten smooth in the direction of the flow.

3.12 CLEANING

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

END OF SECTION

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PART 1 GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 606-04, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
 - .2 ASTM A 653/A 653M-07, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM A 792/A 792M-06a, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .4 ASTM B 32-04, Standard Specification for Solder Metal.
 - .5 ASTM B 370-03, Standard Specification for Copper Sheet and Strip for Building Construction.
 - .6 ASTM D 523-89(1999), Standard Test Method for Specular Gloss.
 - .7 ASTM D 822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
 - .8 ASTM B32-89 Specification for Solder Metal.
 - .9 ASTM B101-92 Standard Specifications for Lead-Coated Copper Sheet and Strip for Building Construction.
 - .10 ASTM B248-91b Specifications for General Requirements for Wrought Copper and Copper Alloy Plate, Sheet, Strip and Rolled Bar (Metric).
- .2 Canadian Copper & Brass Development Association Publications.
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual 1997.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
- .5 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.

1.2 SAMPLES

- .1 Submit shop drawings in accordance with Section 01 33 00 Submittal Procedures.
- .2 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, colour and finish.

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.
- .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 for recycling in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Ensure emptied containers are sealed and stored safely for disposal away from children.

- .6 Divert unused metal materials from landfill to metal recycling facility as approved by Architect.
- .7 Unused paint and sealant material must be disposed of at an official hazardous material collections site as approved by Architect.
- .8 Unused paint and sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .9 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 COPPER SHEET

- .1 Copper sheet: to ASTM B 370 temper designation H00 or H01, 2% yield strength
- .2 Roof sheets: 4.88 kg/m² minimum mass (0.55 mm minimum thickness).
- .3 Caps, flashings, trim, closures: 6.10 kg/m² minimum mass (0.69 mm minimum thickness).
- .4 Cladding: 6.10 kg/m² minimum mass (0.69 mm minimum thickness).

2.2 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CAN/CGSB 37.5.
- .3 Underlay for metal flashing: dry sheathing to CAN/CGSB 51.32.
- .4 Sealants: In accordance with Section 07 92 00 – Joint Sealants.
- .5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness 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 application.
- .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.
- .9 Touch up paint: as recommended by prefinished material manufacturer.

2.3 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details.
- .2 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.
- .3 Hem exposed edges on underside 12 mm. Mitre and seal corners with sealant.
- .4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.4 METAL FLASHINGS

- .1 Form flashings, copings and fascias to profiles indicated of 0.69 mm thick copper.

2.5 PANS

- .1 Form pans to receive roofing plastic from 12.20 kg/m² (1.35 mm thick) sheet copper, with minimum 75 mm upstand above finished roof and 100 mm continuous flanges with no open corners. Solder joints. Make pans minimum 50 mm wider than member passing through roof membrane.

2.6 REGLETS AND CAP FLASHINGS

- .1 Form recessed reglets and cap flashing of 0.69 mm thick copper to be built in concrete and masonry work for base flashings as detailed and in accordance with CRCA FL series details. Provide slotted fixing holes and steel/plastic washer fasteners. Cover face and ends with plastic tape.

2.7 SCUPPERS

- .1 Form scuppers from 0.69 mm thick prefinished scupper.
- .2 Sizes and profiles as indicated.
- .3 Provide necessary fastenings.

2.8 FORMING

- .1 Form new metalwork on a bending-brake. Shape, trim and hand seam on the bench as far as possible, with the proper sheet metal working tools.
- .2 Form rolls on wooden molds to create an exactly smooth profile matching the specified profiles exactly. Broken curves are not acceptable.
- .3 Form the angles of bends and folds interlocking metal with full regard to expansion and contraction to avoid buckling or fullness in the metal after it is in service.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install sheet metal work in accordance with Construction as detailed.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.
- .4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using standing seams 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 and 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 and cap flashing with sealant.
- .10 Install pans, where shown around items projecting through roof membrane.

3.2 SURFACE PREPERATION

- .1 Make surfaces to which finishes are to be applied smooth, clean, dry and free from any other defects that might adversely affect the installation.
- .2 Cover knot holes or voids up to 20 mm in diameter with sheet copper nailed to deck.
- .3 Punch down exposed nail heads 3 mm minimum.
- .4 Isolate all metalwork from masonry or from roofing felt with a continuous layer of dry sheathing paper. Lay sheets of underlayment over the felt or masonry as the metalwork proceeds to provide a bond-breaker.
- .5 Ensure that reglets cut into masonry by masonry Trade are a full 38 mm deep and full joint height at locations indicated on the drawings before proceeding. Cut reglets before installation of adjacent finish materials.

3.3 SHEET COPPER INSTALLATION

- .1 Install flashings and sheet-metalwork dead-level, true to line and square. Fit work to existing building exactly.
- .2 Install sheet metalwork to prevent entry of water under service and weather conditions. Form seams in direction of water-flow and make watertight.
- .3 Fasten work with weather tight fasteners, evenly spaced and neatly located.
- .4 Install all sheet metalwork with concealed fasteners. Obtain acceptance from Consultant before proceeding when unable to provide concealed fasteners.
- .5 Hem all exposed edges 20.0 mm unless otherwise detailed.
- .6 Flash roof penetrations with material matching roof panels, and make watertight.

3.4 DISSIMILAR METALS

- .1 Do not place copper or lead-coated copper in direct contact with any other type of metal other than accepted lead-plugs or washers.
- .2 Make concealed fasteners and clips of the same metal as the flashings.
- .3 Place a sheet of 2.27 kg sheet lead between copper and iron or steel to minimize galvanic action where contact is inevitable. Use stainless steel fasteners at these connections.
- .4 Painting of surfaces to provide protection is not acceptable.

3.5 CLEATS

- .1 Fasten sheet metal to substrate with suitably sized cleats.
- .2 Use fasteners and cleats of the same metal as the fastenings.
- .3 Fabricate cleats 50 mm x 75 mm, spaced 300 mm O.C. unless otherwise specified.
- .4 Secure one end of cleat with two fasteners and fold back over fastener heads. Lock free end of cleat into seam or into folded edge of copper sheet.

3.6 FASTENERS

- .1 Use No. 12 x 25 mm screws with lead shields in masonry.
- .2 Use 32 mm copper nails in wood.

3.7 SOLDERING

- .1 Tin all edges of plain copper sheets to be soldered for a width of 40 mm both sides with solder.
- .2 Gently close clinch-locked joints and seams with a block of wood and mallet, then flux and fill with molten solder. Use sufficient heat to induce the solder to flow by capillary and create a waterproof joint.
- .3 Perform soldering slowly with well heated coppers, so as to heat thoroughly the seam and sweat the solder through its full width.
- .4 When soldering lead-coated copper, brush a liberal amount of flux into the seam.
- .5 Wipe clean all exposed joints, wash immediately after the joints are soldered to remove all traces of solder and flux. Wash all copperwork with soapy hot water upon completion.

3.8 SEAMS

- .1 Finish flat-lock seams 20 mm wide.
- .2 Finish soldered lap-seams 30 mm wide, and rivet 40 to 50 mm o.c. with 3 mm rivets.
- .3 Finish non-soldered lap-seams 30 mm wide, and rivet 40 to 50 mm o.c. with 3 mm rivets.
- .4 Install seams in the direction of flow.

3.9 JOINING

- .1 Flat-lock and seam-solder the following locations:
 - .2 Horizontal or sloped joints at a gradient of less than 1:5.
 - .3 Sloped or vertical joints within 150 mm of the above locations.
 - .4 Gutters, from the roof deck down through the gutter and up to the metal cornice mold.
 - .5 Make vertical joints and sloped joints as a gradient of more than 1:5 watertight by forming with slip-lock seams. Use soldered lock seams for internal corners. Use locked standing seams for external corners.
 - .6 Lap and rivet formed metal cornices.
 - .7 Provide Irish locks at 1200 mm centres along fascias.
 - .8 Refer to details for connection details. Do not change connection design without acceptance from the Consultant.

3.10 STARTER STRIPS

- .1 Provide starter strips where metal extends over edges and where necessary to secure sheet metal work at eaves, gables, rakes, cornices and elsewhere.
- .2 Form starter strips of metal in continuous butted lengths to allow metal work to be hooked over not less than 20 mm.
- .3 Secure to building with fasteners set 200 mm O.C.
- .4 Use medium duty anchors at masonry.
- .5 Use nails at woodwork.
- .6 Keep fasteners back 50 mm from masonry edges.

3.11 BATTEN SEAM ROOFING

- .1 Install dry sheathing paper over 6.8 kg felt as the work progresses.

- .2 Batten installation:
 - .1 Install tapered wood battens over dry sheathing paper.
 - .2 Centre battens on each roof area to give not less than a one-half pan at each end and at eave.
- .3 Pans:
 - .1 Construct batten seam roofing of sheets of metal maximum 4800 mm long.
 - .2 Turn up side of sheets to top of batten plus 12 mm. Turn additional 12 mm at right angles to batten.
 - .3 Construct pans a maximum of 500 mm wide.
- .4 Cross Seams:
 - .1 Form cross seams with a 20 mm fold under on the lower end and a 50 mm fold over on the upper end.
 - .2 Slit folds in cross seams as each corner, 25 mm in from batten to form a tab.
 - .3 Hook 20 mm fold on lower end of pan into 50 mm fold on upper end of underlying pan.
- .5 General:
 - .1 Apply sheet metal roofing beginning at eaves with half-length sheets, staggering transverse seams.
 - .2 Space cleats 300 mm o.c., and nail to vertical face of battens.
 - .3 Hook pans over starter strip and fit into place.
- .6 Batten Caps:
 - .1 Place cover strips over batten, locking edges with flanges of pan malleted down against sides of battens.
 - .2 Cover batten ends with a vertical cap folded and locked into extensions of batten covers and vertical legs of pans.
- .7 Hips:
 - .1 Construct hips of copper covered battens similar to roof battens.
 - .2 At intersection of roof slope with ridge or hip battens, turn up edges of roof pans against hip battens and terminate in a 12 mm horizontal flange at top of battens.
 - .3 Install cover strips over top of ridge battens, constructed as specified for roof battens.
- .8 Valleys:
 - .1 Form valleys of 6.10 kg/m² metal not exceeding 3000 mm in length.
 - .2 Lap cross joints 150 mm in direction of flow.
 - .3 At valley line, flat lock valley and roof
 - .4 sheets into frost-lock set 150 mm from cleat seam.

3.12 RIDGE FLASHINGS

- .1 Provide roll ridge flashing as detailed in 2400 mm loose slip-locked sections:
 - .1 Provide solid birch dowelling to fill void.
 - .2 Provide blocked end caps as required.
- .2 Secure to continuous starter strip securely fixed to wood ridge blocking.

3.13 REGLETS

- .1 Direct Masonry Trade to prepare reglets.
 - .1 Reglets are to be cut 38 mm deep and the width of the joint.
- .2 Form metal to fit into reglet as follows:
 - .1 With a 5 mm upstand at the back edge.
 - .2 To fit 25 mm into reglets.

- .3 Secure with light duty fasteners at 300 mm centres. Recess head of fastener 10 mm from arriess of reglet to permit covering of head with sealant.
- .4 Apply sealant as directed in Section 07 92 00 – Joint Sealants:
 - .1 Recess face of sealant 5 mm into reglet and tool to a flat recessed joint.
 - .2 Dust face of wet sealant with dry sand.

3.14 STEPPED CAP FLASHING

- .1 Design:
 - .1 Make stepped flashings in individual panels to suit masonry joint layout.
 - .2 Panels are not to exceed 1200 mm in length.
 - .3 Overlap base flashing minimum 100 mm.
 - .4 Set leading edge of panels at angle.
- .2 Installation:
 - .1 Lap panels 100 mm and fix with cleats above base flashing.
 - .2 Turn panels into prepared reglet as specified.

3.15 REPAIRS TO EXISTING

- .1 Make repairs to existing sheet copper roofing, flashing and trim as indicated on the drawings and as required.
- .2 New work to be an exact match to existing. Make good and/or replace, as appropriate, all damaged or defective existing work.

3.16 CLEANING

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

END OF SECTION

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PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 45 00 - Quality Control.
- .3 Section 01 61 00 - Common Product Requirements.
- .4 Section 01 74 11 - Cleaning.
- .5 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .6 Section 02 81 01 - Hazardous Materials.

1.2 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-1995, Fire Tests of Fire stop Systems.

1.3 DEFINITIONS

- .1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- .2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- .3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.
- .4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1 and 9.10.9.6.1): penetrating items that are cast in place in buildings of non-combustible construction or have "0" annular space in buildings of combustible construction.
 - .1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.4 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 Shop Drawings:
 - .1 Submit shop drawings to show [location,] proposed material, reinforcement, anchorage, fastenings and method of installation.
 - .2 Construction details should accurately reflect actual job conditions.

- .4 Samples:
 - .1 Submit duplicate [300 x 300] mm samples showing actual fire stop material proposed for project.
- .5 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
 - .4 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.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company specializing in fire stopping installations with 5 years documented experience approved by manufacturer.
- .2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section with contractor's representative 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.
- .3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.
- .2 Storage and Protection:
 - .1 Store materials 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.
- .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 MATERIALS

- .1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN- ULC-S115 and not to exceed opening sizes for which they are intended and conforming to specified special requirements described in PART 3.
- .2 Service penetration assemblies: systems tested to CAN-ULC-S115.
- .3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.
- .4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .10 Sealants for vertical joints: non-sagging.

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 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
 - .1 Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.
- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.

- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
- .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to neat finish.
- .5 Remove excess compound promptly as work progresses and upon completion.

3.4 SEQUENCES OF OPERATION

- .1 Proceed with installation only when submittals have been reviewed by Architect.
- .2 Install floor fire stopping before interior partition erections.
- .3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.
- .4 Mechanical pipe insulation: certified fire stop system component.
 - .1 Ensure pipe insulation installation precedes fire stopping.

3.5 FIELD QUALITY CONTROL

- .1 Inspections: notify Architect when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
- .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.

3.6 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 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.7 SCHEDULE

- .1 Fire stop and smoke seal at:
 - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
 - .2 Edge of floor slabs at curtain wall and precast concrete panels.
 - .3 Top of fire-resistance rated masonry and gypsum board partitions.
 - .4 Intersection of fire-resistance rated masonry and gypsum board partitions.
 - .5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
 - .6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
 - .7 Openings and sleeves installed for future use through fire separations.
 - .8 Around mechanical and electrical assemblies penetrating fire separations.

- .9 Rigid ducts: greater than 129 cm²: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 45 00 - Quality Control.
- .3 Section 01 61 00 - Common Product Requirements.
- .4 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C 919-02, Standard Practice for Use of Sealants in Acoustical Applications.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
 - .2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .3 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
 - .4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
 - .5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .4 General Services Administration (GSA) - Federal Specifications (FS)
 - .1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .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 samples in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Submit duplicate samples of each type of material and colour.
- .5 Cured samples of exposed sealants for each color where required to match adjacent material.
- .6 Submit manufacturer's instructions in accordance with Section 01 33 00 - Submittal Procedures.

- .1 Instructions to include installation instructions for each product used.

1.4 **QUALITY ASSURANCE/MOCK-UP**

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct mock-up to show location, size, shape and depth of joint(s) complete with back-up material, primer, caulking and sealant.
- .3 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
- .4 Locate where directed by Architect.
- .5 Allow 24 hours for inspection of mock-up by Architect before proceeding with sealant 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.

1.5 **DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

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 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 for recycling in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .7 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Architect.
- .8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.
- .9 Fold up metal banding, flatten, and place in designated area for recycling.

1.7 **PROJECT CONDITIONS**

- .1 Environmental Limitations:
 - .1 Do not proceed with installation of joint sealants under following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C.
 - .2 When joint substrates are wet.
- .2 Joint-Width Conditions:

- .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
 - .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 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 Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .3 Ventilate area of work as directed by Architect 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 Polyurethane Hybrid sealant to CAN/CGSB-19.13: Type A, Fast Curing, Low-Modulus, Silane End-Capped.
 - .1 Rheological Properties to ASTM C 639: Non-sag (NS), 0" of sag in channel.
 - .2 Extrusion Rate to ASTM C 1183, minimum: 93.1 ml.
 - .3 Hardness Properties to ASTM C 661: 25.
 - .4 Weight Loss to ASTM C 1246: Pass.
 - .5 Skin Time: 1 hour.
 - .6 Tack Free Time to ASTM C 679: 3-4 hours.
 - .7 Stain & Color Change to ASTM C 510: No visible color change/No stain.
 - .8 Adhesion-in-Peel to ASTM C 794: Aluminum 20-25 pli, Concrete 18-22 pli. No Adhesion Loss.
 - .9 Effects of Accelerated Aging to ASTM C 793: Pass.
 - .10 Movement Capability: $\pm 35\%$.
 - .11 Colour: To match adjacent surfaces.
 - .12 Recommended Product: Dymonic FC by Tremco Inc.

2.3 SEALANT SELECTION

- .1 Sealant Type A:
 - .1 Control and expansion joints in cast-in-place concrete.
 - .2 Joints between architectural precast concrete units.

- .3 Control and expansion joints in unit masonry.
- .4 Perimeter joints between EIFS and frames of doors, windows, storefronts, louvers and similar openings.
- .5 Butt joints between metal panels.
- .6 Joints between different materials listed above.
- .7 Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers and similar openings.
- .8 Control and expansion joints in soffits and overhead surfaces.
- .9 Other exterior joints in vertical surfaces and non-traffic horizontal surfaces for which no other sealant is specified.
- .10 Concealed lap and hook joints in sheet metal flashing and trim.
- .11 Control and expansion joints on exposed interior surfaces of exterior walls.
- .12 Perimeter joints on exposed interior surfaces of exterior openings.
- .13 Joints on precast beams and planks.
- .14 Perimeter joints between interior wall surfaces and frames of interior doors, windows, storefronts, louvers, elevator entrances and similar openings.
- .15 Other interior joints in vertical surfaces and non-traffic horizontal surfaces subject to movement for which no other sealant is specified.
- .16 Bedding joints under metal thresholds and saddles.
- .17 Bedding joints between sheet metal flashing and other materials

2.4 **JOINT CLEANER**

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
- .2 Primer: as recommended by manufacturer.

PART 3 EXECUTION

3.1 **PROTECTION**

- .1 Protect installed Work of other trades from staining or contamination.

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 Cleanup.
 - .1 Clean adjacent surfaces immediately and leave Work neat and clean.
 - .2 Remove excess and droppings, using recommended cleaners as work progresses.
 - .3 Remove masking tape after initial set of sealant.

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C 475-02(2007), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .2 ASTM C 514-04(2009e1), Standard Specification for Nails for the Application of Gypsum Board.
 - .3 ASTM C 557-03(2009)e1, Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - .4 ASTM C 840-08, Standard Specification for Application and Finishing of Gypsum Board.
 - .5 ASTM C 954-07, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - .6 ASTM C 1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .7 ASTM C 1047-09, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .8 ASTM C 1280-99, Standard Specification for Application of Gypsum Sheathing.
 - .9 ASTM C 1177/C 1177M-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .10 ASTM C 1178/C 1178M-08, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
 - .11 ASTM C 1396/C 1396M-09a, Standard Specification for Gypsum Wallboard.
- .2 Association of the Wall and Ceilings Industries International (AWCI)
 - .1 AWCI Levels of Gypsum Board Finish-97.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in original packages, containers or bundles bearing manufacturers brand name and identification.
- .2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.
- .3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

1.3 SITE ENVIRONMENTAL REQUIREMENTS

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

1.4 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 and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused gypsum from landfill to gypsum recycling facility for disposal approved by Consultant.
- .5 Divert unused metal materials from landfill to metal recycling facility approved by Consultant.
- .6 Divert unused wood materials from landfill to recycling or composting facility approved by Consultant.
- .7 Divert unused paint and caulking material from landfill to official hazardous material collections site approved by Consultant.
- .8 Do not dispose of unused paint and caulking materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

Part 2 Products

2.1 MATERIALS

- .1 Fiberglass-Mat Faced Gypsum Sheathing Type X (**GB-01**): to ASTM C1177/C1177M, water resistant, mold resistant, thickness as indicated, 1200 mm wide x maximum practical length, ends square cut, edges squared.
- .2 Standard board (**GB-02**): to ASTM C36/C36M regular, thickness as indicated, 1200 mm wide x maximum practical length, ends square cut, edges squared.
- .3 Resilient clips: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
- .4 Steel drill screws: to ASTM C1002.
- .5 Stud adhesive: to CAN/CGSB-71.25.

- .6 Shadow mould: 35 mm high, snap-on trim, of extruded PVC plastic, white colour.
- .7 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 12 mm wide, with self sticking permanent adhesive on one face, lengths as required.
- .8 Joint compound: to ASTM C475, asbestos-free.

Part 3 Execution

3.1 COORDINATION

- .1 Examine the mechanical and electrical drawings and coordinate with appropriate other trades to establish openings, additional support, furring out and other special provisions required for mechanical and electrical fixtures and fittings and access hatches built into the work of this Section.
- .2 Examine the architectural drawings and coordinate with appropriate other trades to establish openings, additional support and other special provisions required for items built into or partially supported by the work of this Section.

3.2 ERECTION

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Do application of gypsum sheathing in accordance with ASTM C1280.
- .3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.
- .4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.
- .6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers and grilles.
- .7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .10 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.
- .11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

- .13 Erect drywall resilient furring transversely across studs, joists and between the layers of gypsum board, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.
- .14 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

3.3 APPLICATION

- .1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.
- .2 Apply single and double layer gypsum board to metal furring or framing using screw fasteners for first layer and second layer. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
 - .2 Double-Layer Application:
 - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
 - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
 - .3 Apply base layers at right angles to supports unless otherwise indicated.
 - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.
- .3 Exterior Soffits and Ceilings: Install exterior gypsum board perpendicular to supports; stagger end joints over supports. Install with 6 mm gap where boards abut other work.
- .4 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, and any additional penetrations in partitions where perimeter sealed with acoustic sealant.
- .5 Apply board using stud adhesive on furring or framing.
- .6 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
- .7 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .8 Install gypsum board with face side out.
- .9 Do not install damaged or damp boards.
- .10 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.4 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Install shadow mould at gypsum board/ceiling juncture as indicated. Minimize joints; use corner pieces and splicers.
- .6 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.
- .7 Provide continuous polyethylene dust barrier behind and across control joints.
- .8 Locate control joints where indicated, at changes in substrate construction, at approximate 10 m spacing on long corridor runs and at approximate 15 m spacing on ceilings.
- .9 Install control joints straight and true.
- .10 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.
- .11 Install expansion joint straight and true.
- .12 Splice corners and intersections together and secure to each member with 3 screws.
- .13 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .14 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .15 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 Level 2 (Behind wall tile finishes): Embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable.
 - .2 Level 4: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.

- .16 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .17 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .18 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .19 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .20 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.
- .21 Mix joint compound slightly thinner than for joint taping.
- .22 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.
- .23 Allow skim coat to dry completely.
- .24 Remove ridges by light sanding or wiping with damp cloth.
- .25 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C 1396/C 1396M-09a, Standard Specification for Gypsum Wallboard.
 - .2 ASTM C 475/C 475M-02(2007), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .3 ASTM C 514-04(2009)e1, Standard Specification for Nails for the Application of Gypsum Board.
 - .4 ASTM C 645-09a, Standard Specification for Nonstructural Steel Framing Members.
 - .5 ASTM C 754-09a, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - .6 ASTM C 840-08, Standard Specification for Application and Finishing of Gypsum Board.
 - .7 ASTM C 954-10, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.122 in. (2.84 mm) in Thickness.
 - .8 ASTM C 1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .9 ASTM C 1047-10, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .10 ASTM C 1178/C 1178M-08, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
- .2 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .3 Underwriters' Laboratories of Canada (ULC)
 - .1 AN/ULC-S102-07, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum, framing, sealants and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit 300 x 300 mm size samples.
- .4 Test and Evaluation Reports: submit test reports in accordance with Section 01 45 00 - Quality Control, from approved independent testing laboratory, certifying partition system complies with sound transmission rating, fire-resistance rating as specified.

1.3 DELIVERY, STORAGE AND HANDLING

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

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store materials inside, level, under cover. Protect from weather, damage from construction operations and other causes, in accordance with manufacturer's printed instructions.
 - .3 Handle materials to prevent damage to edges or surfaces. Protect metal accessories and trim from being bent or damaged.
 - .4 Store and protect partition materials from nicks, scratches, and blemishes.
 - .5 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return as specified in Construction Waste Management Plan Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Performance / Design Criteria:
 - .1 Partition assembly to be non-combustible construction and fire resistance rated.
 - .2 Minimum sound transmission class rating of installed panel partition to be STC 30, tested to ASTM E 90.
- .2 Non-structural Metal Framing:
 - .1 Non-load bearing channel stud framing: to ASTM C 645, stud size as indicated, roll formed from 0.53 mm thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460 mm centres.
 - .2 Floor and ceiling tracks: to ASTM C 645, in widths to suit stud sizes, 32 mm flange height.
 - .3 Metal channel stiffener: 19 x 1.4 mm thick cold rolled steel, coated with rust inhibitive coating.
- .3 Gypsum Board:
 - .1 Refer to Section 09 21 16 – Gypsum Board Assemblies.
- .4 Metal furring runners, hangers, tie wires, inserts, and anchors.
- .5 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .6 Steel drill screws: to ASTM C 1002.
- .7 Casing beads, corner beads, control joints and edge trim: to ASTM C 1047, aluminum coated phosphatized, 0.5 mm base thickness, perforated flanges, one piece length per location.

2.2 ACCESSORIES

- .1 Acoustical insulation: type recommended by manufacturer to achieve STC rating specified.
- .2 Sealants: in accordance with Section 07 92 00 - Joint Sealants to ASTM C 475.
 - .1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.
- .3 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 12 mm wide, with self sticking permanent adhesive on one face, lengths as required.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions prior to partition installation.
 - .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 ERECTION OF FRAMING

- .1 Install steel framing members to receive screw-attached gypsum board in accordance with ASTM C 754 except where specified otherwise.
- .2 Align partition tracks at floor and ceiling and secure at 600 mm on centre maximum.
- .3 Place studs vertically at 400 mm on centre and maximum of 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .4 Erect metal studding to tolerance of 1:1000.
- .5 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .6 Include two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .7 Install heavy gauge single jamb studs at openings.
- .8 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .9 Include 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.
- .10 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .11 Extend partitions to ceiling height except where indicated.
- .12 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use double track slip joint.
- .13 Install continuous insulating strips to isolate studs from uninsulated surfaces.
- .14 Install insulating strip under studs and tracks around perimeter of sound control partitions.

3.3 ERECTION OF GYPSUM BOARD AND ACCESSORIES

- .1 Do application and finishing of gypsum board in accordance with ASTM C 840 except where specified otherwise.
- .2 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C 840 except where specified otherwise.

- .3 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .4 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.
- .5 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .6 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .7 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .8 Install wall furring for gypsum board wall finishes in accordance with ASTM C 840, except where specified otherwise.
- .9 Install acoustical insulation and sealant in sound rated partitions to correspond with tested assembly.
- .10 Install gypsum boards in direction that will minimize number of end-butt joints. Stagger end joints 250 mm minimum.

3.4 APPLICATION

- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work is approved.
- .2 Apply single layer gypsum board to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
- .3 Arrange vinyl-faced gypsum board symmetrical about openings and wall areas, with butt joints.

3.5 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .6 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .7 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .8 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .9 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

3.6 CLEANING

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

3.7 PROTECTION

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

END OF SECTION

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PART 1 GENERAL

- .1 Green Seal Environmental Standards (GS)
 - .1 GS-11-2008, 2nd Edition, Paints and 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 - [current edition].
 - .2 Maintenance Repainting Manual - current edition.
- .4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.

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 [paint and coating 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 and 01 35 43 - Environmental Procedures.
- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 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.
- .4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Provide and maintain dry, temperature controlled, secure storage.
 - .2 Store painting materials and supplies away from heat generating devices.
 - .3 Store materials and equipment in well ventilated area within temperature as recommended by manufacturer.
- .4 Fire Safety Requirements:
 - .1 Supply 9 kg Type ABC fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

- .5 Develop Construction Waste Management Plan related to Work of this Section.
- .6 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan and Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.4 **SITE CONDITIONS**

- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
 - .2 Co-ordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
 - .3 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Apply paint finishes when ambient air and substrate temperatures at location of installation can be satisfactorily maintained during application and drying process, within MPI and paint manufacturer's prescribed limits.
 - .2 Test concrete, masonry and plaster surfaces for alkalinity as required.
 - .3 Apply paint to adequately prepared surfaces, when moisture content is below paint manufacturer's prescribed limits.
- .3 Additional application requirements:
 - .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 in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

PART 2 PRODUCTS

2.1 **MATERIALS**

- .1 Supply paint materials for paint systems from single manufacturer.
- .2 Conform to latest MPI requirements for painting work including preparation and priming.
- .3 Materials in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual "Approved Product" listing.
 - .1 Use MPI listed materials having E3 rating where indoor air quality requirements exist.
 - .2 Primer: VOC limit 100 g/L maximum to GS-11 SCAQMD Rule 1113.
 - .3 Paint: VOC limit 100 g/L maximum to GS-11 SCAQMD Rule 1113.
- .4 Provide three coats, second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.
- .5 Colours:
 - .1 Submit proposed Colour Schedule to Departmental Representative for review.
 - .2 Colours to match existing.
- .6 Mixing and tinting:
 - .1 Perform colour tinting operations prior to delivery of paint to site, in accordance with manufacturer's written recommendations. Obtain written approval from Departmental Representative for tinting of painting materials.
 - .2 Use and add thinner in accordance with paint manufacturer's recommendations.
 - .1 Do not use kerosene or similar organic solvents to thin water-based paints.

- .3 Thin paint for spraying in accordance with paint manufacturer's written recommendations.
- .4 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.

.7 Gloss/sheen ratings:

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

| Gloss Level - Category | Gloss @ 60 degrees | Sheen @ 85 degrees |
|------------------------------|--------------------|--------------------|
| Gloss Level 1 – Matte finish | Max. 5 | Max.10 |
| Gloss Level 2 – Velvet | Max. 10 | 10 to 35 |
| Gloss Level 3 – Eggshell | 10 to 25 | 10 to 35 |
| Gloss Level 4 – Satin | 20 to 35 | Min. 35 |
| Gloss level 5 – Semi-gloss | 35 to 70 | |
| Gloss Level 6 – Gloss | 70 to 85 | |
| Gloss Level 7 – High-gloss | More than 85 | |

- .2 Gloss level ratings of painted surfaces as indicated.

.8 Interior painting:

- .1 Concrete vertical surfaces: including horizontal soffits:
 - .1 INT 3.1C - High performance architectural latex G3 finish.
- .2 Concrete horizontal surfaces: floors and stairs:
 - .1 INT 3.2C - Epoxy G5 finish.
- .3 Concrete masonry units: smooth and split face block and brick:
 - .1 INT 4.2D - High performance architectural latex G3 finish.
- .4 Structural steel and metal fabrications: columns, beams, joists:
 - .1 INT 5.1W - Alkyd G1 finish (over quick dry shop primer).
- .5 Galvanized Metal: high contact/high traffic areas (doors, frames, railings and handrails, etc.).
 - .1 INT 5.3C - Alkyd Semi-gloss finish (over cementitious primer).
- .6 Dressed lumber: including doors, door and window frames, casings, mouldings:
 - .1 INT 6.3H - Clear lacquer G5 finish.
- .7 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
 - .1 INT 9.2B - High performance architectural latex G2 and G3 finish.
 - .1 Ceilings: G2 finish.
 - .2 Walls: G3 finish.

PART 3 EXECUTION

3.1 GENERAL

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.
- .2 Perform preparation and operations for interior painting in accordance with MPI - Architectural Painting Specifications Manual and MPI - Maintenance Repainting Manual except where specified otherwise.

3.2 EXAMINATION

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with 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". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

3.3 PREPARATION

- .1 Protection of in-place conditions:
 - .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 surfaces as directed by Departmental Representative.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
- .2 Surface Preparation:
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
 - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.
 - .4 Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual specific requirements and coating manufacturer's recommendations.
 - .5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.
 - .6 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
 - .7 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
 - .8 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements.
 - .9 Touch up of shop primers with primer as specified.

3.4 APPLICATION

- .1 Paint only after prepared surfaces have been accepted by Departmental Representative.
- .2 Use method of application approved by Departmental Representative.
 - .1 Conform to manufacturer's application recommendations.
- .3 Apply coats of paint in continuous film of uniform thickness.
 - .1 Repaint thin spots or bare areas before next coat of paint is applied.
- .4 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .5 Sand and dust between coats to remove visible defects.
- .6 Finish 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.

- .7 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .8 Finish closets and alcoves as specified for adjoining rooms.
- .9 Finish top, bottom, edges and cut-outs of doors after fitting as specified for door surfaces.
- .10 Mechanical/Electrical Equipment:
 - .1 Paint conduits, piping, hangers, ductwork and other mechanical and electrical equipment exposed in finished areas, to match adjacent surfaces, except as indicated.
 - .2 Do not paint over nameplates.
 - .3 Keep sprinkler heads free of paint.
 - .4 Paint fire protection piping red.
 - .5 Paint disconnects switches for fire alarm system and exit light systems in red enamel.
 - .6 Paint natural gas piping yellow.
 - .7 Paint both sides and edges of backboards for telephone and electrical equipment before installation.
 - .1 Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

3.5 **CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .4 Place paint, stains and primer defined as hazardous or toxic waste, including tubes and containers, in containers or areas designated for hazardous waste.

END OF SECTION

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PART 1 GENERAL

1.1 SUMMAR

- .1 Related Sections:
 - .1 Section 01 33 00 - Submittal Procedures.
 - .2 Section 01 35 29.06 - Health and Safety Requirements.
 - .3 Section 01 45 00 - Quality Control.
 - .4 Section 01 61 00 - Common Product Requirements.
 - .5 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .6 Section 01 78 00 - Closeout Submittals.
 - .7 Section 02 81 01 - Hazardous Materials.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI).
 - .1 ANSI/NEMA MG 1-2003, Motors and Generators.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA-B44-00, Safety Code for Elevators.
 - .2 CAN/CSA-B651-95(R2001), Barrier-Free Design.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .4 National Building Code (NBC).
 - .1 National Building Code of Canada 2010.

1.3 DESCRIPTION OF WORK INCLUDED

- .1 This Section covers the design, engineering, fabrication, manufacture, installation and inspection of one (1) Machine Roomless Traction Passenger Elevator. Design elevator for Seismic Risk Zone 2 or greater, and for the possibility of a future third floor front extension.
- .2 Where a device or component is mentioned in the singular number, such references shall be understood to mean that this Section shall provide as many of said devices or components as is necessary for the completion of the elevators covered under this Section.

1.4 SYSTEM DESCRIPTION

- .1 Equipment Description: Gearless machine-roomless elevator.
- .2 Equipment Control: Microprocessor-based controller.
- .3 Drive: Regenerative.
- .4 Quantity of Elevators: One (1).
- .5 Stops: Three (3)
 - .1 Future Stop: Design for addition of a future fourth stop.
- .6 Openings: In line – Three (3) Front Openings.
- .7 Travel (maximum): 12 m (150 fpm).
- .8 Rated Capacity: 953 kg.
- .9 Rated Speed: 0.74 m/s.
- .10 Platform Size: 1755 mm W x 1425 mm D
- .11 Clear Inside Dimensions: 1735 mm W x 1325 mm D

- .12 Cab Height: 2362 mm.
- .13 Clear Cab Height: 2362 mm with 8 mm floor recess and 4 LED ceiling.
- .14 Entrance Type and Width: Single-Slide 915 mm.
- .15 Entrance Height: 2134 mm.
- .16 Main Power Supply: 600 Volts 3PH+ or - 5% of normal, three-Phase, with a separate equipment grounding conductor.
- .17 Car Lighting Power Supply: 120 Volts, Single-phase, 15 Amp, 60 Hz.
- .18 Machine Location: Inside the hoistway at the top of the hoistway.
- .19 Signal Fixtures: Manufacturer's standard with metal button targets (exc. CA).
- .20 Performance:
 - .1 Car Speed: $\pm 3-5$ % of contract speed under any loading condition or direction of travel.
 - .2 Car Capacity: Safely lower, stop and hold up to 120% of rated load. (code required).
 - .3 Ride Quality:
 - .4 Vertical Vibration (maximum): 25 milli-g
 - .5 Horizontal Vibration (maximum): 25 milli-g
 - .6 Vertical Jerk (maximum): 1.4 to 0.3 m/ sec³
 - .7 Acceleration/Deceleration (maximum): 0.8 m/ sec²
 - .8 In Car Noise: 55 – 60 dB(A)
- .21 Operation:
 - .1 Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
 - .2 Operating Features – Standard
 - .1 Full Collective Operation
 - .2 Anti-nuisance.
 - .3 Fan and Light Protection.
 - .4 Load Weighing Bypass.
 - .5 Independent Service.
 - .6 Full Collective Operation.
 - .7 Special Emergency Service Phase I and II – Emergency Recall and In-Car Emergency Operation.
 - .8 Top of Car Inspection.
 - .9 Zoned Car Parking.
 - .10 Relative System Response Dispatching.
- .22 Door Control Features:
 - .1 Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
 - .2 Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.
 - .3 Door protection shall consist of a two dimensional, multi-beam array projecting across the car door opening.
 - .4 Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.
- .23 Provide equipment according to seismic zone.
- .24 Design and construct elevator in accordance with CSA-B44, local codes and regulations.

1.5 FIREFIGHTERS EMERGENCY OPERATION

- .1 Provide AUTOMATIC "Firefighters= Emergency Operation" in accordance with Clause 2.27.3 of the CSA-B44 Elevator Safety Code and the National Building Code of Canada.
- .2 When required, an additional key-operated "FIRE RECALL" switch with two positions marked "OFF" and "ON" in that order, shall be permitted at "Building Fire Control Station" only.

1.6 FIREFIGHTERS' OPERATION PANEL

- .1 The "FIRE OPERATION" switch, the "CALL CANCEL" button, the "STOP" switch, the door open button(s), the door close button(s), the additional visual signal and the operating instructions shall be grouped together at the top of a main car operating panel behind a locked cover.
- .2 The firefighters' operation panel cover shall be opened by the same key that operates the "FIRE OPERATION" switch. The cover shall be permitted to open automatically when the car is on Phase I Emergency Recall Operation and at the recall level.
- .3 When the key is in the "FIRE OPERATION" switch, the cover shall not be capable of being closed. When closed, the cover shall be self-locking.
- .4 All buttons and switches shall be readily accessible, located not more than 1800 mm above the floor. The front of the cover shall contain the words "FIREFIGHTERS= OPERATION" in red letters at least 10 mm high.

1.7 FIREFIGHTERS' OPERATION INSTRUCTIONS

- .1 Instructions for the operation of the elevators on Phase I Emergency Recall shall be permanently incorporated with, or adjacent to the "FIRE RECALL" switch at the designated level. The wording of the instructions shall comply with wording only as shown in figure 2.27.7.1 of the B44 Code.
- .2 Instructions for the operation of the elevators on Phase II Emergency In-Car Operation shall be permanently incorporated on the rear of the fire panel door in each car. The wording of the instructions shall comply with wording only shown in figure 2.27.7.2 of the B44 Code.
- .3 The instructions shall be in letters not less than 3mm in height and shall be permanently installed and protected against removal or defacement.

1.8 FIREFIGHTERS' EMERGENCY OPERATION KEY – FEO-K1

- .1 Provide a standard TSSA approved firefighters= operation key (FEO-K1).
- .2 The key shall be of a tubular type, 7-pin, style 137 construction and have a bitting code of 6143521.
- .3 The same FEO-K1 key shall operate the elevator emergency power selector switch when provided, the fire recall switch and fire operation panel door.
- .4 The key switches shall comply with Clause 2.27.8 and be of the Group 3 Security.

1.9 AUTOMATIC EMERGENCY POWER OPERATION

- .1 Provide Automatic Emergency Power Operation in accordance with Clause 2.27.2 of the CSAB44 Safety Code For Elevators.
- .2 Sufficient stand-by power will be provided to operate the elevator at rated speed and capacity.
 - .1 Provide at the Main Lobby an emergency power indicator light and engraving, as described elsewhere in the specifications.
 - .2 A signal, provided by others, will indicate to the elevator control system, that the system is now operating on the emergency power supply.

- .3 Transfer from emergency power to normal power will be adjustable. Design elevator control system to compensate for any power variance which may occur during transfer and testing. Automatically re-instate normal operation following stabilization of power supply.
- .4 During testing conditions, on pre transfer to and from emergency power, arrange that the car and hoistway doors remain open at the landing for at least 20 seconds prior to transfer or until the emergency or normal power is restored.

1.10 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit manufacturer's printed product literature, specifications and data sheet.
 - .1 Submit WHMIS MSDS in accordance with Section 02 81 01 - Hazardous Materials.
- .3 Shop Drawings:
 - .1 Submit shop drawings to indicate project layout, including details and the following information:
 - .1 Size and location of machine and controller.
 - .2 Size and location of car, hoisting beam, guide rails, buffers stands and other components in hoistway.
 - .3 Rail bracket spacing and maximum loads on guide rails.
 - .4 Reactions at points of support.
 - .5 Weights of principal components.
 - .6 Top and bottom clearance and over travel of car.
 - .7 Location of circuit breaker, switchboard panel or disconnect switch, light switch and feeder extension points in machine room.
 - .8 Location in hoistway for connection of travelling cables for car light and telephone.
 - .9 Location and size of access doors.
 - .10 Loads on hoisting beams.
 - .11 Expected heat generation of equipment in machine room.
 - .12 Seismic design data.
 - .13 Shop drawings submitted stamp by qualified professional engineer registered in Province of Ontario.
 - .14 Include on general arrangement drawings:
 - .1 Type, size, location of hoistway entrances showing details of fastening to hoistway structure.
 - .2 Provide detailed calculations for seismic design.
 - .3 Provide wiring diagrams.
- .4 Samples:
 - .1 Submit two samples, complete with colour schemes, 150x 150 mm in size, illustrating: floor material, car interior, car ceiling, car door, hoistway entrance door and frame finishes.
- .5 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Instructions: submit manufacturer's installation instructions.
- .8 Manufacturers Field Services: submit copies of manufacturers field reports.

1.11 CONTROL AND DRIVE EQUIPMENT REQUIREMENTS

- .1 The Elevator Contractor is to provide all information, and special tools to the NCC representative that is required for the safe and efficient maintenance of the elevator equipment, including any solid state equipment, software or devices supplied under these specifications. The supplier is not to refuse any information, or the supply of parts, at fair market value, that is required by the Owner's Maintenance Contractor.
- .2 The Contractor is to permanently attach any service or diagnostic tool access code numbers to the controller at the completion of the project.
- .3 Any special tools required for the operation, testing, adjusting or setting parameters for the controller, drive, or car door operator, must be left on-site in the machine room and will become the property of the Owner for future servicing and maintenance. All special tools are considered part of the elevator package.

1.12 CLOSEOUT SUBMITTALS

- .1 Submit the following in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Project Record Documents:
 - .1 Record actual locations of equipment, names of equipment manufacturers and suppliers, concealed conduit and boxes, concealed devices, disconnects.
- .3 Operation and Maintenance Data:
 - .1 Include description of elevator system's method of operation and control including group supervisory control system, motor control system, door operation, signals, firefighter's service, emergency power operation, and special or non-standard features provided.
 - .2 Provide parts catalogues with complete list of equipment replacement parts with equipment description and identifying numbers.
 - .3 Legible schematic wiring diagrams covering electrical equipment installed, including changes made in final work, with symbols listed corresponding to identity or markings on both machine room and hoistway apparatus.
 - .4 Instruct NCC Representative in maintenance of special finishes.

1.13 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer Qualifications: company or person experienced in performing work of this section specializing in installation of work similar to that required for this project, with minimum five years documented experience and approved by elevator systems manufacturer.
- .2 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations.
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building sub trades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

1.14 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle components in accordance with Section 01 61 00 - Common Product Requirements and in accordance with manufacturer's written instructions.
- .2 Packing, Shipping, Handling and Unloading:

- .1 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .3 Storage and Protection:
 - .1 Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
- .4 Waste Management and Disposal:
 - .1 Separate waste materials for recycling 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 and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).
 - .4 Separate for recycling and place in designated containers Steel, Metal and Plastic waste in accordance with Waste Management Plan (WMP).
 - .5 Divert unused metal materials from landfill to metal recycling facility as approved by NCC Representative.

1.15 WARRANTY

- .1 Warrant that the materials, the performance and workmanship are first class in every respect and make good any defects not due to ordinary wear and tear or improper use, which may develop within one (1) year from the date of the Final Certificate of Completion of the project.
- .2 Warrant that the equipment performs to the standard set out herein.
- .3 Neither the final payment nor any provision of the Contract documents relieves the Contractor of the responsibility for negligence or faulty materials or workmanship within the extent and period provided by law.
- .4 Upon written notice remedy any defects and pay all expenses for any damage to other work resulting from the defects.

1.16 MAINTENANCE SERVICE

- .1 Provide complete service and maintenance of elevator system components during 12 month warranty period. Perform all Tests and Examinations as required by Section 8.6 of the B44 Safety Code For Elevators and the B44.2.07 - Maintenance requirements and intervals for elevators, dumbwaiters, escalators and moving walks.
- .2 Furnish complete service and maintenance of elevator system components during elevator contract warranty period.
- .3 Systematically; monthly examine, clean, adjust, and lubricate equipment as per planned maintenance tasks and frequencies.
- .4 Perform work at a minimum frequency of one visit per unit per month; do not remove elevator from service during peak traffic periods.
- .5 Maintenance to include systematic examination, adjustment and lubrication of elevator equipment; repair or replace parts whenever required. Use genuine parts produced by the manufacturer of specific equipment. Replace wire rope as necessary to maintain required factor of safety.
- .6 Perform work without removing cars during peak traffic periods.
- .7 Provide call back service 24 hours per day, seven (7) days per week, at no extra charge.
- .8 Maintain locally, near place of work, an adequate stock of parts for replacement or emergency purposes and have qualified installation personnel available to ensure fulfillment of this maintenance service without unreasonable loss of time.

- .9 Perform maintenance work using competent personnel, under supervision and in direct employ of elevator manufacturer.
- .10 Provide a metal part cabinet and waste can in the machine room.
- .11 Do not assign or transfer maintenance service to any agent or subcontractor without prior written consent of NCC Representative.
- .12 Maintain locally, near the place of work, an adequate stock of parts for replacement or emergency purposes and have qualified installation personnel available to ensure fulfillment of this maintenance service without unreasonable loss of time.

1.17 USE OF ELEVATORS FOR PERSONS WITH PHYSICAL DISABILITIES

- .1 Fully comply with the requirements of Appendix E of the B44 Safety Code For Elevators and all other governing codes and regulations.

1.18 PRELIMINARY DETAILS

- .1 The contractor shall submit, within 15 working days after award of the contract, all information and details required for the work to be performed by others in conjunction with the installation of the equipment.

1.19 FINISHES

- .1 Unless otherwise specified, paint machinery equipment with oil resistant paint.
- .2 Remove rust on all elevator structural parts and paint same with rust resistant paint.
- .3 Thoroughly clean and prepare, doors, frames, and other components that require a baked enamel finish as follows:
 - .1 Apply sufficient number of mineral filler coats, each baked and sanded perfectly smooth, to provide flat even surface.
 - .2 Apply heavy coat of baked enamel primer sanded and rubbed smooth.

PART 2 PRODUCTS

2.1 CONTROLLER COMPONENTS

- .1 Controller: A microcomputer based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car operational control.
 - .1 All high voltage (110V or above) contact points inside the controller shall be protected from accidental contact when the controller doors are open.
 - .2 Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
 - .3 Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC)
 - .4 Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity. Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.
- .2 Drive: A Variable Voltage Variable Frequency AC drive system shall be provided. The drive shall be set up for regeneration of AC power back to the building grid.
- .3 Controller Location: Controller shall be located inside the wall next to the top landing entrance frame. Emergency access shall be provided through an access panel in the entrance frame secured by a key lock.

2.2 MACHINE AND GOVERNOR

- .1 Machine: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.
- .2 Governor: The governor shall be a tension or friction type car-mounted governor.
- .3 Buffers, Car and Counterweight: Polyurethane type buffers shall be used.
- .4 Hoistway Operating Devices:
 - .1 Emergency stop switch in the pit
 - .2 Terminal stopping switches.
 - .3 Emergency stop switch on the machine.
- .5 Positioning System: Consists of an encoder, reader box, and door zone vanes.
- .6 Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.
- .7 Coated-Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords and a flat profile on the running surface and the backside of the belt. All driving sheaves and deflector sheaves should have a crowned profile to ensure center tracking of the belts. A continuous 24/7 monitoring system using resistance based technology has to be installed to continuously monitor the integrity of the coated steel belts and provide advanced notice of belt wear.
- .8 Governor Rope: Governor rope shall be steel and shall consist of at least eight strands wound about a sisal core center.

2.3 HOISTWAY ENTRANCES

- .1 Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel.
- .2 Sills shall be extruded aluminum, or bronze finish, or nickel silver finish.
- .3 Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.
- .4 Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour
- .5 Entrance Finish:
 - .1 Basement: Paint to match existing.
 - .2 Ground Floor: Paint to match existing.
 - .3 Second Floor: Paint to match existing.
 - .4 Future Third Floor: Provide unfinished.
- .6 Color to be selected from the manufacturer's color chart.
- .7 Entrance marking plates: Entrance jambs shall be marked with 102x102mm plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.
- .8 Sight Guards: sight guards will be furnished with all doors painted to match with painted doors, painted black for stainless steel satin doors.

2.4 EQUIPMENT: CAR COMPONENTS

- .1 Car frame and Safety: A car frame fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosures. The car safety shall be integral to the car frame.
- .2 Cab Options: Steel Shell Cab with raised laminate hang on panels.
 - .1 Steel Shell Cab with raised stainless steel hang on panels.
 - .2 Plastic Laminate Panels: Windsor Mahogany.

- .3 Brushed Stainless Steel finished base plate located at top and bottom
- .4 Car Front Finish: Satin Stainless Steel.
- .3 Car Door Finish: Satin Stainless Steel.
- .4 Ceiling Type:
 - .1 Drop Ceiling: Dropped flat steel ceiling Real White with 6 LED lights.
- .5 Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car in the event of building power failure.
- .6 Fan: A one-speed 120 VAC fan will be mounted to the ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.
- .7 Handrail: Handrails shall be provided on the side and rear walls of the car enclosure. Handrails shall be 9.5 mm x 51 mm flat tubular handrail with a Brushed Steel.
- .8 Lower Protection Rail: rails shall be provided on the side and rear walls of the car enclosure. Handrails shall be 9.5 mm x 51 mm flat tubular handrail with a Brushed Steel.
- .9 Threshold: Extruded Aluminum Finish.
- .10 Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.
- .11 Guides: The car shall have roller guides at top and bottom and the counterweight shall have slide type guides at the top and the bottom.
- .12 Platform: The car platform shall be constructed of metal. Load weighing device shall be mounted on the belts at the top of the hoistway.
- .13 Certificate frame: Provide a Certificate frame with a satin stainless steel finish.
- .14 The LED ceiling lights and the fan should automatically shut off when the system is not in use and be powered back up after a passenger calls the elevator and pushes a hall button.

2.5 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- .1 Car Operating Panel: A car operating panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a satin stainless steel finish. A car operating panel shall be furnished. It shall contain a bank of round stainless steel, mechanical LED illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served. All buttons to have raised numerals and Braille markings with:
 - .1 3 mm satin stainless steel projecting button with blue illuminating halo.
- .2 The car operating panel shall be equipped with the following features:
 - .1 Raised markings and Braille to the left hand side of each push-button.
 - .2 Car Position Indicator at the top of and integral to the car operating panel.
 - .3 Door open and door close buttons.
 - .4 Inspection key-switch.
 - .5 Elevator Data Plate marked with elevator capacity and car number.
 - .6 Help Button: The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
 - .7 Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
- .3 Car Position Indicator: A digital, LED car position indicator shall be integral to the car operating panel.

- .4 Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Integral Hall fixtures shall feature round stainless steel, mechanical buttons marked to correspond to the landings. Hall fixtures to be located in the wall. Buttons shall be in vertically mounted fixture. Fixture shall be satin stainless steel. Buttons shall be:
 - .1 3 mm satin stainless steel projecting button with blue or white illuminating halo or gold satin button with white illuminating halo.
- .5 Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.

2.6 BILINGUAL MARKINGS

- .1 Engrave identification and instructions at least 0.25 mm deep on operating panels and on all signal equipment in both English and French except where design is such that inference is obvious and readily understood.
- .2 All position indicators are to display Bilingual Characters similar to the Bilingual floor markings in the car operating panel.

2.7 EMERGENCY COMMUNICATIONS SYSTEM IN THE CAR

- .1 Comply with clause 2.27.1.1.1 of the B44 Code.
- .2 Provide a hands free, vandal resistant, emergency communications device containing an internal adjustable volume control speaker and microphone, mounted in the car station to enable two-way voice communication between the car and a location in the building that is readily accessible to authorized and emergency personnel.
- .3 The device shall be activated by pressing the HELP button located in the car station and shall automatically ring a telephone number of the NCC Representative's choice. Once activated in the elevator the line shall remain open until disconnected by the receiver.
- .4 Provide an LED and engraving to visually indicate that the call has been answered. Provide beside the Help button, an International Telephone Symbol as per E19.7.2.2.of the B44 Code and the operating instructions.
- .5 The line dialer network shall operate on any central office line along with conventional phones and shall have an internal battery for memory back-up for a minimum of two months in the event that power fails or the dialer is removed from the telephone line.
- .6 The device shall contain a ring sensor which shall allow the initiation of a call to the elevator. The number of rings shall be adjustable. The two-way communication shall not be transmitted to an automatic answering system.
- .7 The two-way communications, once established, shall be disconnected only when authorized personnel outside the car terminate the call.
- .8 The two-way communications means shall provide on demand to authorized personnel, information that identifies the building location and elevator number and that assistance is required.
- .9 Provide all wiring necessary for the complete installation of the system from the device in the elevator to an externally located terminal in the elevator machine room. Connect to the telephone line.
- .10 The two-way communications means shall not use a handset in the car. Comply with clause 2.27.1.1.3 of the B44 Code.
- .11 If the emergency communication means is connected to the building power supply, it shall automatically transfer to a source of standby or emergency power as required by the applicable building code, after the normal power fails. The power source shall be capable of

providing for illumination of the visual indication within the car, and the means of emergency communications for at least 4 hours; and the audible signaling device for at least 1 hour.

2.8 KEYS

- .1 Provide six (6) sets of keys for each control device and for Special Emergency Service switches.
- .2 Organize keys on suitable key rings with permanently engraved tags, clearly identifying use. Tags to be approved by NCC Representative.
- .3 All keys shall be grouped as per clause 8.1.1 of the B44 Code.
- .4 Provide NCC Representative with a copy of a Transmittal signed by the NCC Representative indicating that all tagged keys have been received by the authorized representative.
- .5 Provide a copy of the Transmittal in the maintenance manuals.

2.9 FUTURE THIRD FLOOR EXTENSION

- .1 In preparation for the addition of a future third floor. Provide the following additional equipment for the future extension of the elevator hoistway: door with trims, push buttons and elevator position indicator. Additional materials shall be packed securely for long term storage.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 WORKMANSHIP

- .1 Install all equipment in a first class workmanship manner. Upon completion do all necessary repairs, cleaning, and painting as required to turn the equipment over in "New Condition".

3.3 INSTALLATION

- .1 Install hoistway, machine room, and other elevator materials and components in accordance with CSA-B44, local codes, regulations and manufacturer's written instructions.

3.4 ARRANGEMENT OF EQUIPMENT

- .1 Arrange equipment in machine room so that the machines and controllers, and other equipment can be removed for repairs or replacement without dismantling or removing other equipment components.
- .2 Arrange equipment for clear passage.
- .3 Arrange equipment according to plans and drawings.
- .4 Accommodate equipment in provided space according to above mentioned requirements.

3.5 WELDING

- .1 All welds shall be identified with the welder's identification stamp.
- .2 Field welding and cutting is not permitted.

3.6 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.
 - .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, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.
 - .4 Obtain reports, within 3 days of review, and submit, immediately, to NCC Representative.

3.7 SITE TESTS

- .1 Perform and meet tests required by CSA-B44.
- .2 Supply instruments and execute specific tests.
- .3 Furnish test and approval certificates issued by jurisdictional authorities.
- .4 Test elevator system by carrying full load and no load
- .5 At agreed time during twelve month warranty period, and with building normally occupied using normal building traffic, conduct tests to verify performance. Furnish event recording of hall call registrations, time initiated, and response time throughout entire normal working day.
- .6 Test the elevator system under full load during a simulated transfer of building power from both normal to emergency and emergency to normal by initiating a transfer of the facilities Automatic Transfer Switch (ATS) while the elevator is in motion. The elevator must either ride through the transfer without fail or automatically reset to allow full operation of the elevator system after the ATS transfer in either direction within a 30 second time period. The test must be performed without connection of a pre-transfer signal from the ATS, or other signal sources, to the elevator control circuit.

3.8 PIT EQUIPMENT ARRANGEMENT

- .1 Arrange the pit equipment for convenient access and maintenance.

3.9 ERECTION OF HOISTWAY DOORS AND FRAMES

- .1 Set hoistway doors and frames in perfect alignment with car door and in true plumb with car guide rails.
- .2 Erect hoistway doors and frames in accordance with labelling requirements.
- .3 Securely fasten frames to structural supports.
- .4 Hoistway doors shall be hung so that with the closing mechanism released they shall start to close regardless of their position on the track, when a 2.7 kg horizontal force is applied at mid height of the door and parallel to the motion.

3.10 SURFACE PROTECTION

- .1 Provide protective coverings for finished surfaces.

3.11 LIMIT SWITCHES

- .1 .1 Subsequent to the performance of safety tests and checks by the Inspecting Authorities, fasten final limit switches and brackets by through bolting or dowelling.

3.12 BRAKE

- .1 Adjust brake to hold car cab plus 125% of the rated load.
- .2 After final adjustment of the brake and subsequent to the performance of safety tests and checks by the Inspecting Authorities, drill the brake spring nuts and rod and insert a cotter pin or seal to avoid incorrect or different adjustments in the future.
- .3 Arrange the brake to stop the elevator with full load in the car from full speed in the down direction within the normal stopping distance of the car.

3.13 CAR BALANCE

- .1 Check the static balance of the car.
- .2 Adjust the equipment and all guide rollers so that at any point the pressure upon the rollers does not exceed 11 kg with closed doors and empty car cab.

3.14 COUNTERWEIGHT BALANCE

- .1 Check the static balance of the counterweight.
- .2 Adjust the equipment and all guide rollers so that at any point the pressure upon the rollers does not exceed 11 kg.
- .3 Check and adjust as required to ensure that the counterweight is equal to the complete elevator cab plus between 40 to 42.5% of the contract load.

3.15 SPEED VARIATION

- .1 Adjust for speed variation as follows:
 - .1 When lifting rated load, do not permit car speed to vary from rated speed by more than 2%.
 - .2 When operating under varying normal conditions, i.e. rated load to no load, do not permit operating conditions to exceed 2%.

3.16 OPERATING TIME

- .1 Adjust the equipment so that the elapsed time to travel one typical floor does not exceed 12.5 to 13.5 seconds in both directions.
- .2 .2 Measure this time as follows:
 - .1 The time starts when the fully opened doors begin to close and continues until the car is stopped level with the next floor and the car and hall doors are open to three-quarters of their fully open position.
 - .2 Floor level is considered to be within 6.35 mm of level.
 - .3 The time is measured with full load in the car and in both directions of travel.
 - .4 The power door operation for the hall and car doors conforms to the elevator safety code requirements.
 - .5 Adjust the equipment so that for other conditions of loading, the time does not vary more than five percent (5%).
 - .6 Adjust the equipment so that the operating time, as set out above, is compatible with dependable, consistent operation without undue wear or excessive maintenance and can be readily maintained over the life of the elevator installation.
 - .7 Adjust the equipment so that with the control adjusted to give the required time, the elevator operates under smooth acceleration and retardation and provides a comfortable and agreeable ride to the passengers.

3.17 DOOR ADJUSTMENT

- .1 Arrange levelling and door opening controls in such a manner that the doors start to open during the levelling zone and the doors are open to three quarters of fully open when the car is stopped level with the floor.
- .2 The time required to open the doors measured from start of open to fully open position shall not exceed 2.0 seconds.
- .3 The time required to close the doors measured from start of close to fully closed position shall not exceed 3.0 seconds.

3.18 RIDE PERFORMANCE

- .1 Acceleration/Deceleration
 - .1 Adjust the equipment to allow the car to start, accelerate, decelerate and stop smoothly.
 - .2 Adjust deceleration to the negative of the acceleration with final ramp being equal to the initial.

3.19 CLEANING

- .1 Remove protective coverings from finished surfaces and components.
- .2 Clean surfaces and components ready for inspection.

3.20 ADJUSTMENTS

- .1 Adjust door opening and closing times to suit handicapped users in accordance with NCC Representative.
- .2 Adjust control system to cause elevators to answer hall calls during working day within performance criteria specified.
- .3 Adjust for smooth acceleration and deceleration of car as so not to cause passenger discomfort.
- .4 Adjust automatic floor levelling feature at each floor.

END OF SECTION

Appendix 'A01'
DESIGNATED SUBSTANCE REPORT



April 17, 2014
(re-issue : December 9, 2014)

Via e-mail:
leslie.scott-maclennan@ncc-ccn.ca

Ms. Leslie Scott-Maclennan
National Capital Commission
40 Elgin Street
Ottawa, ON K1P 1C7

Re: OTT-00218432-F0 **Limited Designated Substance Survey
Sussex Street, Elevator Renovation**

Dear Ms. Scott:

1.0 INTRODUCTION

Exp Services Incorporated (exp) was requested by the National Capital Commission (NCC) to conduct a limited Designated Substance Survey (DSS) at Sussex Street in Ottawa, ON in anticipation of the proposed renovation / upgrade of the Elevator.

Exp understands that upgrades to the elevator system will consist of:

- extending the vertical height of the elevator shaft through the existing roof;
- replacing the existing elevator doors.

As such, this limited materials sampling event was conducted to satisfy section 30 of the Occupational Health and Safety Act (OHSA) to identify materials listed in O.Reg. 490/09 that may be disturbed while conducting any potential renovations to this portion of the site building.

2.0 SAMPLING EVENT

On April 11, 2014, Mr. Shawn Doherty, P.Eng., conducted the on-site sampling event following a site walk-through with Mr. Faouzi Trabelsi of the NCC. Based on the walk-through, **exp** understands the work program to potentially impact the following:

- extending the elevator will require the removal of the existing roof system. The adjacent pitched roof system (to the south) may be slightly impacted;
- replacing the elevator doors were considered to potentially disturb the walls immediately adjacent to the elevator (i.e. potentially 1 to 3 cm width around the elevator door);
- removal / replacement of conduits / mechanical lines within the elevator room may require the drilling of a limited number of holes in the elevator room walls.

Samples were collected of all potentially asbestos containing building materials associated with the walls and ceilings within these potentially impacted areas. Due to the limited amount of paint to be disturbed, if any, combined with the nature of the building (i.e. living areas), paint samples were not collected based on the required 2 cm by 2 cm area required for analytical results would account for visible damage of the surface. A visual survey of all other building materials associated with the walls and ceilings in the hallways was also conducted to take note of any potential designated substances. The findings of the field survey are outlined in the following sections of this letter report.

3.0 OBSERVATIONS AND RESULTS

The figures and photos of sampling locations is included in Attachment 1. The building summary table which summarizes the construction materials of the hallways, select residential units and descriptions of suspected asbestos and lead paint samples along with the results is included in Attachment 2. The laboratory certificates of analysis are included in Attachment 3.

3.1 Asbestos

The sampling program was conducted in accordance with O.Reg. 278/05 and the number of samples collected is considered to be representative of the building materials. As per O.Reg. 278/05, a building material is considered asbestos-containing, and therefore subject to the protocols of the regulation, if the material contains 0.5% or more of asbestos from one or more of the samples collected for the specific building material.

All asbestos samples were submitted to Crisp Analytical (Crisp) in Baton Rouge, Louisiana. This laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) by the National Institute of Standards and Technology for analysis of bulk materials for asbestos.

Analyses were performed in accordance with the method outlined in the *Regulation Respecting Asbestos on Construction Projects and in Buildings and Repair Operations (O.Reg. 278/05)*, made under the *Occupational Health and Safety Act*, IRSST Method 224-1 and the EPA/600/R-93-116 Method for the Determination of Asbestos in Bulk Building Materials.

The following building materials and associated samples were observed within the hallways, and specific units that **exp** was instructed to assess.

- Pipe elbows: Asbestos pipe elbows were documented within the elevator mechanical room. They were not sampled as they were already marked as asbestos. They were observed to be in good condition.

Recommendation: If the elbows are to be disturbed as part of the work program, they are to be removed using Type 2 glove bag operations in accordance with Section 15 through 17 of O.Reg. 278/05.

- Plaster (AS1a –d): White textured / finishing plaster on a greyish coarser plaster was observed on the 2nd, 1st and basement floor. Without causing any damage within the 1st and 2nd floors, plaster samples were collect by removing the electrical outlet. Best efforts were made to collect the base greyish coat/layer from the 1st and 2nd floor sample locations but the amount of greyish plaster collected was minimal. Conversely, greyish plaster samples, in addition to the surficial white textured coat, were easily collected from the basement elevator room. A total of four samples were collected from the white on grey plaster.

Based on the analytical results, the greyish base plaster can be considered non-asbestos based on the results of the two samples collected from the basement (AS-1c,d) and the suspected debris combined within samples AS-1a,b (1st and 2nd floor).

However, one of the four white texture plaster samples was determined to contain asbestos at a concentration of 3% chrysotile. As per the regulation, a material is deemed asbestos containing if a sample of a homogeneous material contains above 0.5% asbestos. However, a 3rd white textured plaster layer was observed within the basement elevator room (west wall, which is indicative of patchwork). Therefore, the white textured plaster, on the west wall within the elevator room, should be considered asbestos containing based on suspected patches of additional plaster above the original plaster (i.e. third plaster layer). It is noted that some of the plaster was noted to be damaged.

Recommendations: It is recommended that any disturbance of the white textured on grey plaster within the basement elevator room be conducted as a Type 2 operation as per Section 15 through 17 of O.Reg. 278/05, if less than 1 m² of the white texture material is to be disturbed.

Alternatively, a Type 3 removal operation as per Section 18 would be required if more than 1 m² is to be disturbed.

It is recommended that the damaged plaster within the elevator room (i.e. near the floor) be repaired / removed using Type 2 operations (depending on the size of the repair) to minimize health risks.

- **Plaster (AS-2):** A softer whitish / grayish plaster material was present on the north wall of the elevator room (adjacent to the elevator). Although the grey plaster appeared soft, it had a similar chemical composition to other grey plaster analysed based on laboratory classification. The plaster was not finished with a white textured coat but simply a coat of paint. One sample was collected from this wall.

Based on the analytical results, the plaster was deemed to contain asbestos and can be considered homogeneous with other grey plaster within the elevator shaft area.

Recommendations: There are no special asbestos removal procedures required for the removal of grey plaster.

- **Stipple Ceiling (AS-3):** Stippled ceiling plaster was observed on bulkheads and the hallway ceiling within the basement corridor. Given that the removal of the elevator was not anticipated to disturb the stippled ceiling in the area, only a single sample was collected from the bulkhead. As such, the results are only intended to classify the presence / absence of asbestos within the stipple at the bulkhead in front of the elevator.

Based on the analytical results, asbestos was not detected within the stippled plaster material.

Recommendations: There are no special asbestos removal procedures required for the removal of the stipple plaster.

- **Grey Caulking:** Grey caulking material was observed around the roof trim (i.e. where the flashing joins the roof). Similar caulking was observed on various portions of the roofing system that is accessible from the 2nd floor. Three samples of the caulking were collected at various locations of the roof system. The caulking was noted to be hard.

Based on the analytical results, one of the three samples was shown to contain asbestos below 0.5% chrysotile whereas the remaining two samples did not display any detectable asbestos. As such, the grey caulking is considered non-asbestos.

Recommendations: There are no special asbestos removal procedures required for the removal of the grey caulking.

- **Roof system:** Two roof cuts were conducted within the roof system to be removed for the elevator improvements. Given that the removal was to occur over a limited space (i.e. less than 5 m²), the two roof cuts were deemed sufficient. Based on the visual observations, the roof was determined to consist of gravel, followed by black tar then a blue foam insulation. Two samples of the roof cuts were submitted for analysis.

Based on the analytical results, the black tar and/or blue foam insulation did not display any detectable asbestos concentrations.

Recommendation: There are no special asbestos removal procedures required for the removal of the roof system.

3.2 Lead

Based on the nature of the proposed work program, a lead-paint sampling program was not deemed to be required. Notable disturbances of painted surfaces is not anticipated (i.e. with the exception of drilling through a wall, minimal damage to a wall through the removal of elevator doors). As such, there are no concerns regarding the generation of lead dust.

3.3 Silica

A visual inspection of materials that would contain silica was conducted within the areas associated with the elevator improvements. Exposure to airborne silica is regulated under Ontario Regulation 845/90 (amended to O. Reg. 606/05) regarding silica under the OHSA.

Materials that likely contain silica within the work these areas include:

- White textured on grey coarse plaster that form the walls in which the elevator doors are fastened;
- Plaster walls within the elevator room;
- Ceramic tiles applied to the walls within the basement hallway.

Isolated damage of plaster and associated debris was identified sporadically (i.e. in preparation of the renovation program). However, the area did not appear to be excessively dusty.

Recommendation: Airborne silica can be generated through such processes as blasting, grinding, crushing, and sandblasting silica-containing material. Precautions must be taken to prevent silica-containing particles from becoming airborne during the application of such processes. Such precautions include wetting of silica-containing area(s) to be disturbed and daily wet sweeping or HEPA vacuuming of silica dust. Additionally, appropriate respiratory protection and ventilation must be utilized during disturbance of silica-containing structures. It is recommended that the Ministry of Labour's Guideline "Silica on Construction Projects", April, 2011 be referred to when dealing with silica containing materials. As such, mechanisms to minimize the spread of silica dust is required.

3.4 Mercury

Based on a review of the proposed work area, mercury was limited to a limited number of fluorescent lights within the basement hallway and elevator room

No mercury-containing thermostats were observed in the work area.

Recommendations: Exposure to mercury is regulated under Ontario Regulation 844/90 (amended to O.Reg. 110/04) and Ontario Regulation 347. All mercury containing material and equipment should be removed and re-used/recycled or disposed prior to renovation in accordance with applicable regulations, if they are to be disturbed as part of the renovation program.

3.5 PCBS

Based on a review of the work area, a limited number of fluorescent light fixtures were observed. However, exp does not anticipate that the fluorescent light fixtures would be impacted during the elevator work program.

No transformers were observed during the survey.

Recommendation: The handling and removal of any PCB-containing equipment, including storage, should be conducted as specified in Federal Regulations SOR/2008-273 and Ontario Regulation 362.

If the fluorescent light ballasts are to be removed from service, they should be assessed for PCB content by comparing the coding on the surface of each ballast with the Environment Canada publication EPS 2/CC/2 entitled "Identification of Lamp Ballasts Containing PCBs", revised August 1991. Ballasts that are found to be PCB-containing should be disposed of in accordance with Ontario Regulations 362 and 347.

3.6 Ozone Depleting Substances

Based on a review of the work area, an air-conditioner / chiller is located on the roof system which would contain a potential ozone depleting refrigerant.

Recommendation: All sources of ODS should be removed from the building and reused/recycled or disposed prior to the dismantling of the refrigeration system when disturbed as part of on-going building maintenance. In accordance with O.Reg. 189/94, any removal and disposal of refrigeration equipment

should only be undertaken by individuals who hold ozone depleting prevention cards. Disposal of any refrigeration equipment and/or refrigerant containers is regulated under O.Reg. 189/94 (amended to O.Reg. 238/01).

3.7 Other Designated Substances

Based on a review of the work area, no other designated substances were observed.

3.8 Mould

Based on a review of the work area, no mould was identified.

Recommendation: Should mould be identified, it is recommended that the Environmental Abatement Council of Ontario's Mould Abatement Guideline be followed.

4.0 CLOSURE

The services performed and outlined herein were based in part upon visual observations of the site and attendant structures. Our opinion cannot be extended to portions of the site that were unavailable for direct observation by objects or coverings at the time of our observations.

Any of our observations relating to designated substances at the site are described in this report. Where testing was performed, it was executed in accordance with our contract for these services. It should be noted that other compounds or materials not tested for might be present in the building.

The objective of this report was to survey the environmental conditions at the site within the context of our contract with respect to the existing regulations within the applicable jurisdiction. Compliance of past and current owners with applicable local, provincial and federal government laws and regulations was not included in our contract for services.

The conclusions of this report are based, in part, on the information provided by others and any testing and analyses described in the report. The possibility remains that unexpected environmental conditions may be encountered at the site locations not explored. Should such an even occur, exp should be notified in order that we may determine if modifications to our conclusions are necessary.

This report has been prepared in accordance with generally accepted environmental study and/or engineering practices. No other warranties, expressed or implied, are made as to the professional service provided under the terms of our contract and included in this report.

We trust this report is satisfactory for your purposes. If you have any questions regarding our submission, please do not hesitate to contact this office.

Yours truly,

exp Services Inc.



Shawn Doherty, P.Eng.
Environmental Engineer
Earth and Environment



for Darragh Kilroy, B.Eng.
Environmental Scientist
Earth and Environment

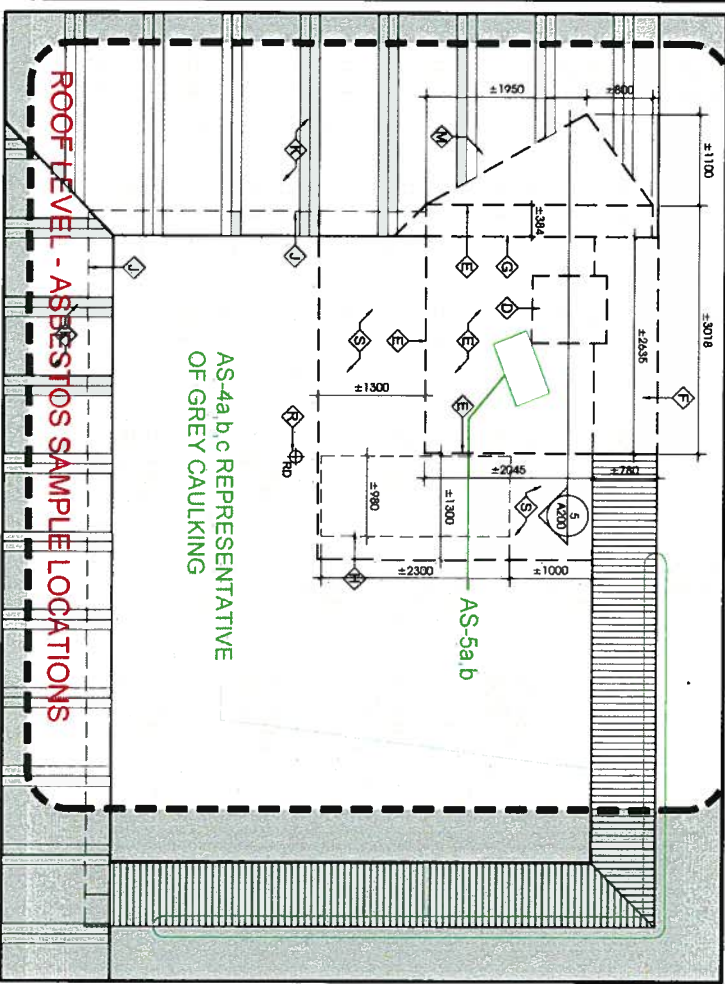
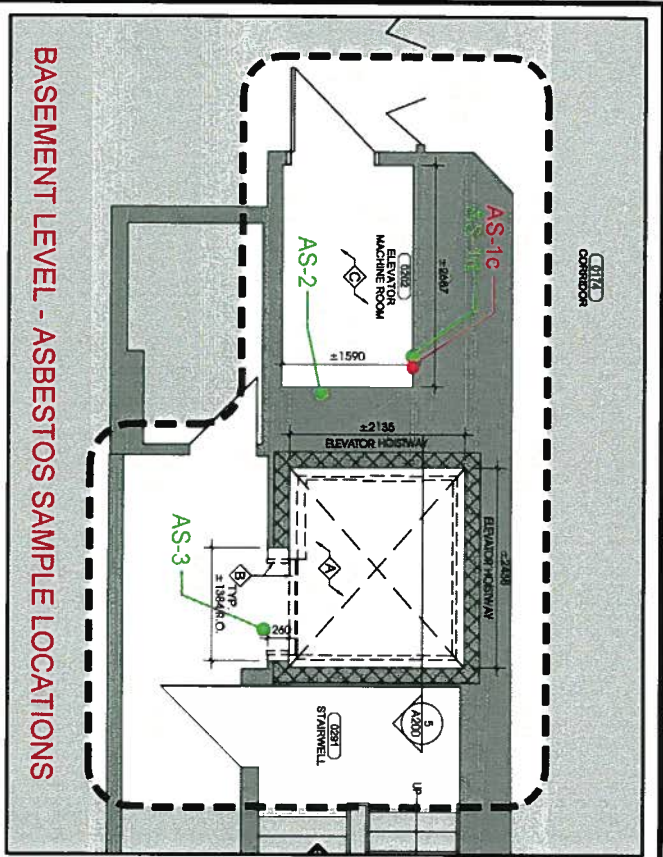
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- Attachments: 1: Figure / Site Photographs
2: Summary Tables
3: Laboratory Certificate of Analysis



**Attachment 1:
Figures / Photos**

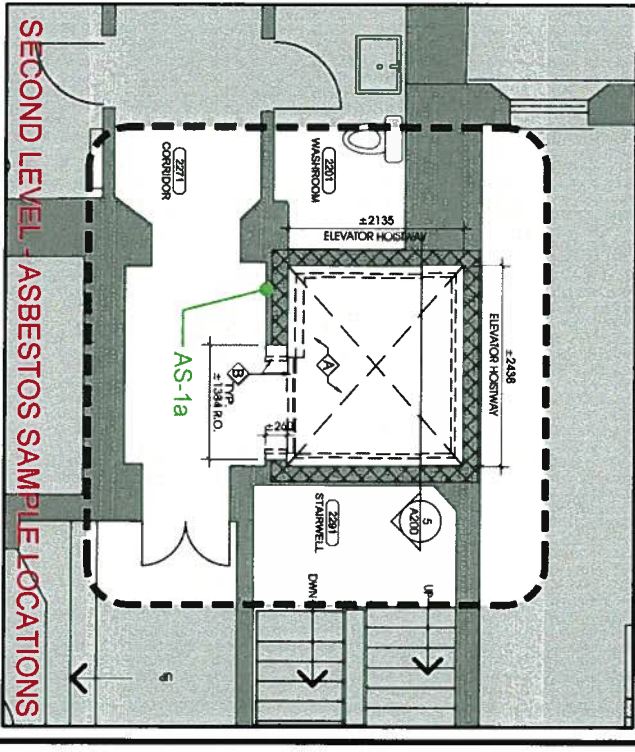
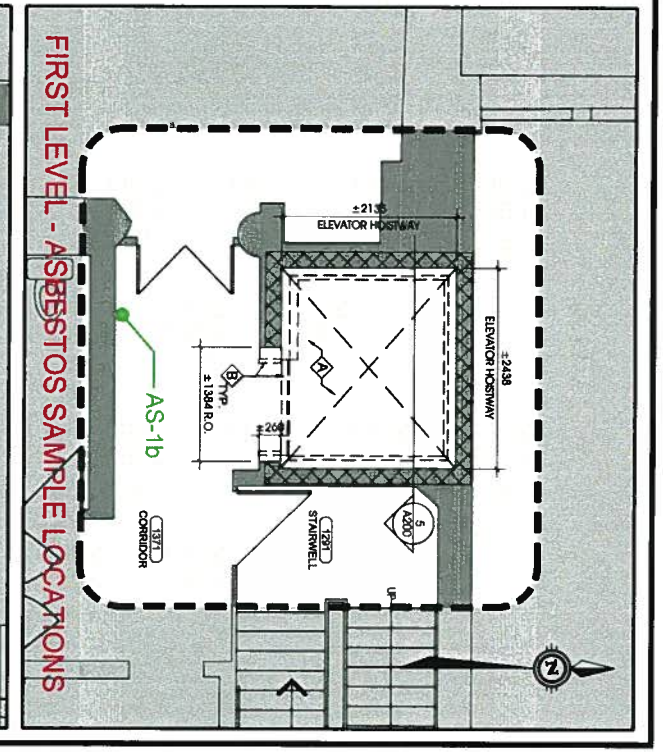




NOTES:
 1. ORIGINAL DRAWINGS FROM NATIONAL CAPITAL COMMISSION PROJECT DC 110-21-10, PRINCESS ANNE ELEVATOR REPLACEMENT, A-200, EXISTING/DEMOLITION FLOOR PLANS & ROOF PLAN

LEGEND

- SA-1 SAMPLE NAME & LOCATION
- SA-2 POSITIVE ACM CONTENT
- SA-1 POSITIVE ACM CONTENT
- SA-2 NEGATIVE ACM CONTENT

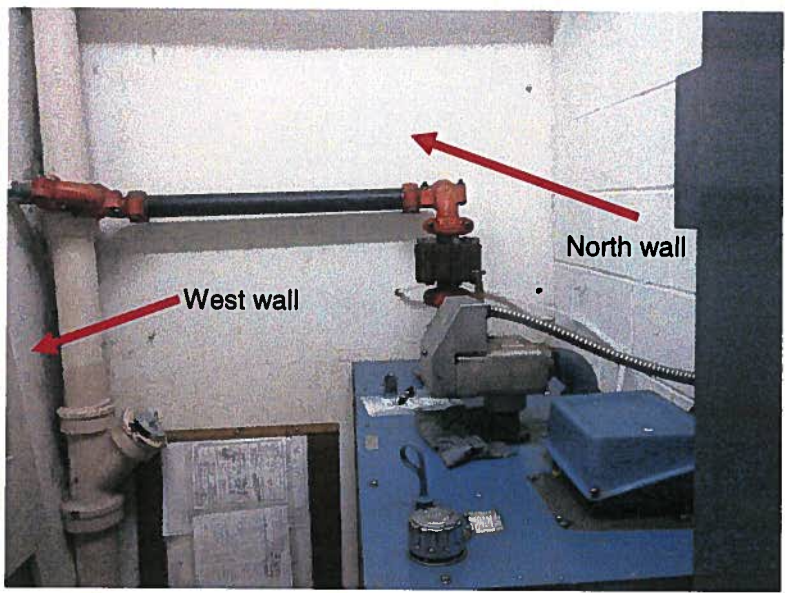


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| | | |
|--------------------|-------------------------------------|-----------------------------|
| Scale: 1:75 | Client: NATIONAL CAPITAL COMMISSION | Project No: OTT-00218432-F0 |
| Date: 17/04/2014 | Title: ASBESTOS SAMPLES | FIG 1 |
| Drawn by: J.REVELL | | |



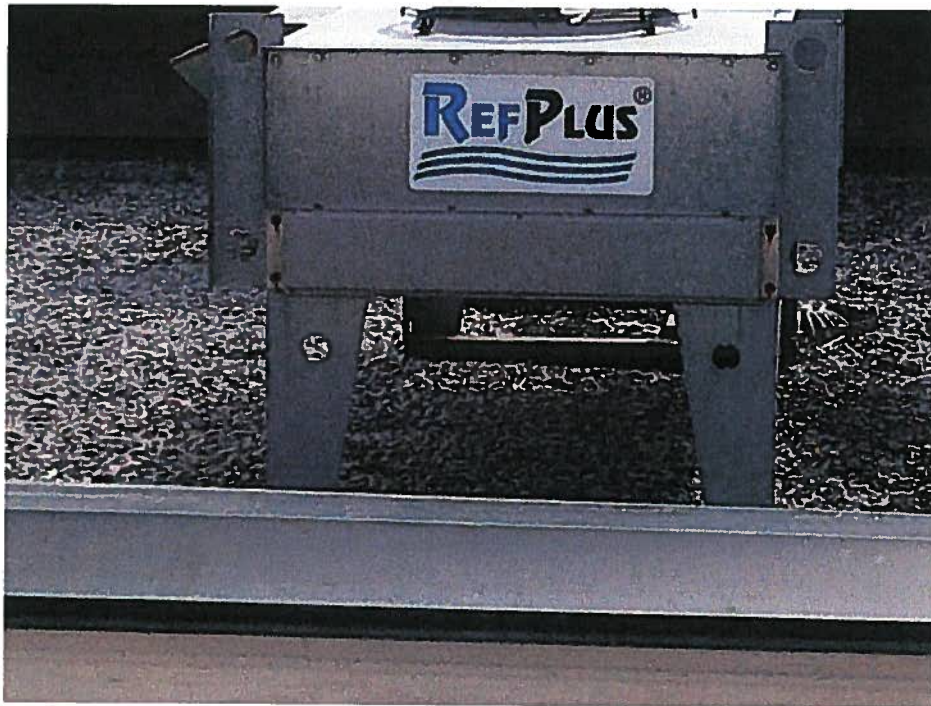
Photograph No. 1

Plaster walls (North wall – non asbestos), West Wall (asbestos white plaster)



Photograph No. 2

Asbestos pipe elbow in elevator room (A marked in Red). White on grey plaster on west wall.



Photograph No. 3
Air-conditioning system on roof.

**Attachment 2:
Building Summary Table**

Building Summary Table
Elevator DSS
OT-00218432-F0

| Building Section | Room Number | General Building Construction | | | | Potential Asbestos-Containing Materials | | | | | Potential Lead Paint | | | | Mercury | | PCB | | ODS | Other |
|------------------|-------------------|---|---|--|---|---|-------------------|--|---|------------------------------|--------------------------------|---------------|--------------------|-----------|-------------------|------------|-----------|---------------------------------|------|-------|
| | | Walls | Floor | Ceiling | Piping / Ductwork | Asbestos Sample Description | Friability (F/NF) | Sample Number | Laboratory Result | Condition | Paint Colour | Sample Number | Lead Result (µg/g) | Condition | Fluorescent Light | Thermostat | Ballasts | Transformers | | |
| Main Floor | Hallway | ceramic tile on potential white texture on grey plaster | rubber / battleship flooring | stippled ceiling bulkhead near elevator entrance | not applicable | stippled plaster potential plaster behind ceramic tile | F | AS-3 | ND | | Paint associated with stippled | none | | good | 2 tubes in area | none | 1 ballast | none | none | none |
| | | north wall / facing elevator - soft white/grey plaster | poured concrete floor | concrete ceiling - potential plaster thin coat | asbestos elbow pipe insulation | mud elbows - identified as asbestos on site | F | none collected | confirmed asbestos | good | | | | | | | | | | |
| | Elevator Room 202 | west wall / facing corridor 174 - white textured plaster on grey coarse plaster | | | | soft white / grey plaster - north wall | F | AS-2 | ND | | | | | | | | | | | |
| | | | | | white textured plaster on grey coarse plaster | F | AS-1c, 1d | AS-1c - 3% C in white plaster, grey = ND AS-1d = ND in all layers | damaged plaster on base near loor | white primer paint / plaster | none | | good | 2 tubes | none | 1 ballast | none | none | none | |
| Floor 1 | Corridor 1371 | brown painted white textured on grey coarse plaster | carpet | white textured plaster potentially on grey plaster | not applicable | white textured plaster on grey coarse plaster | F | AS-1b | white texture with some potential grey debris - ND | | brown / taupe | none | good | none | none | none | none | none | none | |
| Floor 2 | Corridor 2271 | cream painted white textured coat on grey coarse plaster | carpet | white textured plaster potentially on grey plaster | not applicable | white textured plaster on grey coarse plaster | F | AS-1a | white textured with some potential grey debris - ND | | cream | none | good | none | none | none | none | none | none | |
| Roof | | some greyish caulking along roof siding | gravel material with black tar and blue foam insulation | not applicable | not applicable | blue foam insulation and black tar roof | NF | AS-5a, b | ND | | none | | | none | none | none | none | Ref Plus chiller system on roof | none | |

ND = non detectable
C = chrysotile asbestos
F = Friable
NF = Non-Friable

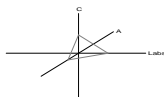
exp Services Inc.

*National Capital Commission
Limited Designated Substance Survey
Elevator Improvements
OTT-00218432-F0*

Attachment 3: Laboratory Certificates of Analysis

CA Labs
Dedicated to
Quality

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Phone 972-242-2754
Fax 972-242-2798



CA Labs, L.L.C.
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Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Materials Characterization - Bulk Asbestos Analysis

Laboratory Analysis Report - Polarized Light

exp Services, Inc.

100-2650 Queensview Dr.
Ottawa, ON K2B 8H6

Customer Project: OTT-ov218432
Reference #: CBR14041048

Date: 4/15/2014

Analysis and Method

Summary of polarizing light microscopy (PLM / Stereomicroscopy bulk asbestos analysis) using the methods described in 40CFR Part 763 Appendix E to Subpart E (Interim and EPA 600 / R-93 / 116 (Improved)). The sample is first viewed with the aid of stereomicroscopy. Numerous liquid slide preparations are created for analysis under the polarized microscope where identifications and quantifications are performed. Calibrated liquid refractive oils are used as liquid mounting medium. These oils are used for identification (dispersion staining). A calibrated visual estimation is reported, should any asbestiform mineral be present. Other techniques such as acid washing are used in conjunction with refractive oils for detection of smaller quantities of asbestos. All asbestos percentages are based on calibrated visual estimation traceable to NIST standards for regulated asbestos. Traceability to measurement and calibration is achieved by using known amounts and types of asbestos from standards where analyst and laboratory accuracy are measured. As little as 0.001% asbestos can be detected in favorable samples, while detection in unfavorable samples may approach the detection limit of 0.50% (well above the laboratory definition of trace).

Discussion

Vermiculite containing samples may have trace amounts of actinolite-tremolite, where not found by PLM should be analyzed using TEM methods and / or water separation techniques. Suspected actinolite/vermiculite presence will be indicated through the sample comment section of this report.

Fibrous talc containing samples may even contain a related asbestos fiber known as anthophyllite. Under certain conditions the same fiber may actually contain both talc and anthophyllite (a phenomenon called intergrowth). Again, TEM detection methods are recommended. CA Labs PLM report comments will denote suspected amounts of asbestiform anthophyllite with talc, where further analysis is recommended.

Some samples (floor tiles, surfacings, etc.) may contain fibers too small to be detectable by PLM analysis and should be analyzed by TEM bulk protocols.

A "trace asbestos" will be reported if the analyst observes far less than 1% asbestos. CA Labs defines "trace asbestos" as a few fibers detected by the analyst in several preparations and will indicate as such under these circumstances.

Quantification of <1% will actually be reported as <=1% (allowable variance close to 1% is high). Such results are ideal for point counting, and the technique is mandatory for friable samples (NESHAP, Nov. 1990 and clarification letter 8 May 1991) under 1% percent asbestos and the "trace asbestos". **In order to make all initial PLM reports issued from CA Labs NESHAP compliant, all <1% asbestos results (except floor tiles) will be point counted at no additional charge.**

Qualifications

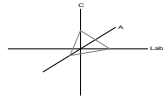
CA Labs is accredited by the National Voluntary Accreditation Program (NVLAP) for selected test methods for airborne fiber analysis (TEM), and for bulk asbestos fiber analysis (PLM). All analysts have a college degree in a natural science (geology, biology, or environmental science) or are recognized by a state professional board in one these disciplines. Extensive in-house training programs are used to augment education background of the analyst. The group leader of polarized light has received supplemental McCrone Research training for asbestos identification. This report is not covered by the scope of AIHA accreditation. Analysis performed at CA Labs, LLC 12232 Industriplex, Suite 32 Baton Rouge, LA 70809.

Baton Rouge NVLAP Lab Code 200772-0 TEM/PLM
LDEQ

TDH 30-0370

CA Labs
Dedicated to
Quality

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Phone 225-751-5632
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Overview of Project Sample Material Containing Asbestos

| Customer Project: | | OTT-ov218432 | | CA Labs Project #: | | CBR14041048 | |
|-------------------|---------|--------------|-----------------------------------|--|--|-------------|--|
| Sample # | Layer # | Analysts | Physical Description of Subsample | Asbestos type / calibrated visual estimate percent | List of Affected Building Material Types | | |
| AS-1c | 2 | | White Finishing Plaster | 3% Chrysotile | White Finishing Plaster Gray Sealant | | |
| AS-4a | 1 | | Gray Sealant | <0.5 Chrysotile | | | |

Baton Rouge NVLAP Lab Code 200772-0 TEM/PLM
LDEQ

TDH 30-0370

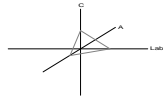
Glossary of abbreviations (non-asbestos fibers and non-fibrous minerals):

| | | | |
|------------------|--------------|--------------------|--------------------------|
| ca - carbonate | pe - perlite | fg - fiberglass | pa - palygorskite (clay) |
| gypsum - gypsum | qu - quartz | mw - mineral wool | |
| bi - binder | | wo - wollastinite | |
| or - organic | | ta - talc | |
| ma - matrix | | sy - synthetic | |
| mi - mica | | ce - cellulose | |
| ve - vermiculite | | br - brucite | |
| ot - other | | ka - kaolin (clay) | |

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CA Labs
Dedicated to
Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798



CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Polarized Light Asbestiform Materials Characterization

Customer Info: Attn:
exp Services, Inc.
100-2650 Queensview Dr.
Ottawa, ON K2B 8H6

Customer Project:
OTT-ov218432

CA Labs Project #:
CBR14041048

Phone # 613-688-1899
Fax # 613-225-7337

Turnaround Time: 48 hr

Date: 4/15/2014

Samples Received: 4/14/2014

Date Of Sampling:

Purchase Order #:

| Sample # | Com ment | Layer # | Analysts Physical Description of Subsample | Homo- geneo us (Y/N) | Asbestos type / calibrated visual estimate percent | Non-asbestos fiber type / percent | Non-fibrous type / percent |
|----------|-------------|------------|---|-------------------------------|--|--------------------------------------|-------------------------------|
| AS-1a | | 1 | Tan Surfaced White Finishing Plaster | N | None Detected | | 100% qu, bi, ca |
| AS-1b | | 1 | Tan Surfaced White Finishing Plaster | N | None Detected | | 100% qu, pe, bi, ca |
| AS-1c | | 1 | White Surfaced Tan Plaster | N | None Detected | | 100% qu, mi, bi, ca |
| | | 2 | White Finishing Plaster | Y | 3% Chrysotile | | 97% qu, ca |
| | | 3 | Gray Plaster | Y | None Detected | | 100% qu, ca |
| AS-1d | | 1 | White Surfaced Tan Plaster | N | None Detected | | 100% qu, mi, bi, ca |
| | | 2 | White Finishing Plaster | Y | None Detected | | 100% qu, ca |

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Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116)
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

| | | | |
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Approved Signatories:


Stanley Massett III
Analyst

Senior Analyst
Alicia Stretz

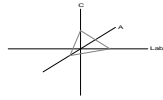

Laboratory Director
Chris Williams

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze

6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

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Date Of Sampling:

Purchase Order #:

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|----------|-------------|------------|---|-------------------------------|--|--------------------------------------|-------------------------------|
| | | 3 | Gray Plaster | Y | None Detected | | 100% qu, ca |
| AS-2 | | 1 | Gray Debris | N | None Detected | | 100% qu, ma, ca |
| AS-3 | | 1 | White Textured Surfacing | Y | None Detected | | 100% qu, pe, bi, ca |
| AS-4a | 10 | 1 | Gray Sealant | Y | <0.5 Chrysotile | 2% wo | 98% qu, bi, ca |
| AS-4b | 10 | 1 | Gray Sealant | Y | None Detected | 2% wo | 98% qu, bi, ca |
| AS-4c | 10 | 1 | Gray Sealant | Y | None Detected | 2% wo | 98% qu, bi, ca |
| AS-5a | | 1 | Black Tar | Y | None Detected | 3% ce | 97% qu, bi |

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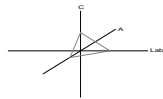
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10. TEM analysis suggested

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Phone # 613-688-1899
Fax # 613-225-7337

Turnaround Time: 48 hr

Date: 4/15/2014

Samples Received: 4/14/2014

Date Of Sampling:

Purchase Order #:

| Sample # | Com ment | Layer # | Analysts Physical Description of Subsample | Homo- geneo us (Y/N) | Asbestos type / calibrated visual estimate percent | Non-asbestos fiber type / percent | Non-fibrous type / percent |
|----------|-------------|------------|---|-------------------------------|--|--------------------------------------|-------------------------------|
| | | 2 | Blue Foam Insulation | Y | None Detected | | 100% qu, ot |
| AS-5b | | 1 | Black Tar | Y | None Detected | 3% ce | 97% qu, bi |
| | | 2 | Blue Foam Insulation | Y | None Detected | | 100% qu, ot |

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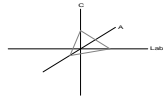
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Polarized Light Asbestiform Materials Point Count
Laboratory Analysis Report - Point Count

Analysis and Method

Point counting was performed on a polarized light microscope with a calibrated reticle according to the revised NESHAP method of November 20, 1990 (Federal Register, V.55, N.224, 11/20/90). Original asbestos content of bulk materials was determined using procedures outlined in the interim method (40 CFR part 763, Appendix E to subpart E) and AHERA method (EPA-600/R-93/116). Samples were prepared using HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion staining / becke line method.

Qualifications

CA Labs is accredited by the National Voluntary Accreditation Program (NVLAP) for selected test methods for airborne fiber analysis (TEM), and for bulk asbestos fiber analysis (PLM). All analysts have a college degree in a natural science (geology, biology, or environmental science) or are recognized by a state professional board in one of these disciplines. Extensive in-house training programs are used to augment education background of the analyst. The group leader of polarized light has received supplemental McCrone Research training for asbestos identification. This report is not covered by the scope of NVLAP or AIHA accreditation. Analysis performed at CA Labs, LLC 12232 Industriplex, Suite 32 Baton Rouge, LA 70809.

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Phone # 613-688-1899
Fax # 613-225-7337

Turnaround Time: 48 hr

Date: 4/15/2014
Samples Received: 4/14/2014
Date Of Sampling:
Purchase Order #:

| Sample # | Layer # | Analysts Physical Description of Subsample | Homo-geneous (Y/N) | Point Counted % / Asbestos Type |
|----------|---------|--|--------------------|---------------------------------|
| AS-4a | 1 | Gray Sealant | Y | Trace Chrysotile |

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