

SPECIFICATION

SITE IMPROVEMENTS

SALMON COVE RIVER - PORT REXTON, NL

P/N: F6879-179009

PREPARED FOR


Fisheries and Oceans Canada

DATE

August 24, 2017

Revision 1

PROVINCE OF NEWFOUNDLAND

 PERMIT HOLDER
Class "A"
This Permit Allows
CROSBIE ENGINEERING LIMITED

To practice Professional Engineering
in Newfoundland and Labrador
Permit No. as issued by PEG-NL 00123
which is valid for the year 2017.


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AFN ENGINEERING INC.

To practice Professional Engineering
in Newfoundland and Labrador.
Permit No. as issued by APEGN E0292
which is valid for the year 2017



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A4	Field Cabin Plan and Elevations
A5	Fuel Storage Building Plan and Elevations
E1	Legend, Panel Schedules, and Trench Detail
E2	Floor Plans - Electrical Layouts and Electrical Details
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1.1 SCOPE

- .1 The work consists of the furnishing of all plant, labour, equipment and material for site improvements at Salmon Cove River, Port Rexton, NL, in strict accordance with specifications and accompanying drawings and subject to all terms and conditions of the Contract.

1.2 DESCRIPTION OF WORK

- .1 In general, work under this contract consists of refurbishment of the existing warehouse/garage, fuel storage building and field cabin and siteworks as outlined on the drawings.

Do not proceed with any portion of the work until the Departmental Representative has approved the Contractor's written work plan. Review the Hazardous Material Assessment Report, attached as an appendix to these specifications, and abide by all Regulatory requirements for the removal, disturbance, handling and disposal of hazardous building materials.

1.3 SITE OF WORK

- .1 Work will be carried out at Salmon Cove River, Port Rexton, NL.

1.4 DATUM

- .1 If requested by the Contractor, the Departmental Representative will establish a benchmark prior to the start of work activities.

1.5 FAMILIARIZATION WITH SITE

- .1 Before submitting a bid, it is recommended that bidders visit the site and its surroundings to review and verify the form, nature and extent of the work, materials needed for the completion of the work, the means of access to the site, any accommodations they may require, and in general shall obtain all necessary information as to risks, contingencies and

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other circumstances which may influence or affect their bid or costs to do the work. No allowance shall be made subsequently in this connection on account of error or negligence to properly observe and determine the conditions that will apply.

- .2 Contractors, bidders or those they invite to site are to review specification Section 01 35 29.06 - Health and Safety Requirements before visiting site. Take all appropriate safety measures for any visit to site, either before or after acceptance of bid.
- .3 Obtain prior permission from the Departmental Representative before carrying out such site inspection.

1.6 CODES AND STANDARDS

- .1 Perform work in accordance with the latest edition of the National Building Code of Canada, and any other code of provincial or local application including all amendments up to project bid closing date provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Materials and workmanship must meet or exceed requirements of specified standards, codes and referenced documents.

1.7 TERM ENGINEER

- .1 Unless specifically stated otherwise, the term Engineer where used in the Specifications and on the Drawings shall mean the Departmental Representative.

1.8 SETTING OUT WORK

- .1 Set grades and layout work in detail from control points and grades established by Departmental Representative.

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- .2 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated or as directed by Departmental Representative.
- .3 Provide devices needed to layout and construct work.
- .4 Supply such devices required to facilitate Departmental Representative's inspection of work.

1.9 COST BREAKDOWN

- .1 Before submitting first progress claim submit breakdown of Contract price in detail as directed by Departmental Representative and aggregating contract price.
- .2 Provide cost breakdown in same format as the numerical and subject title system used in this specification project manual and thereafter sub-divided into major work components as directed by Departmental Representative.
- .3 Upon approval by Departmental Representative, cost breakdown will be used as basis for progress payment.
- .4 This will be a lump sum project. Individual work items will not be measured separately for payment.

1.10 WORK SCHEDULE

- .1 Submit within 7 work days of notification of acceptance of bid, a construction schedule showing commencement and completion of all work within the time stated on the Bid and Acceptance Form and the date stated in the bid acceptance letter.
- .2 Provide sufficient details in schedule to

clearly illustrate entire implementation plan, depicting efficient coordination of tasks and resources, to achieve completion of work on time and permit effective monitoring of work progress in relation to established milestones.

- .3 As a minimum, work schedule to be prepared and submitted in the form of Bar (GANTT) Charts, indicating work activities, tasks and other project elements, their anticipated durations and planned dates for achieving key activities and major project milestones provided in sufficient details and supported by narratives to demonstrate a reasonable plan for completion of project within designated time. Generally Bar Charts derived from commercially available computerized project management system are preferred but not mandatory.
- .4 Submit schedule updates on a minimum bi-weekly basis and more often, when requested by Departmental Representative, due to frequent changing project conditions. Provide a narrative explanation of necessary changes and schedule revisions at each update.
- .5 The schedule, including all updates, shall be to Departmental Representative's approval. Take necessary measures to complete work within approved time. Do not change schedule without Departmental Representative's approval.
- .6 All work on the project will be completed within the time indicated on the Bid and Acceptance Form.

1.11 ABBREVIATIONS

- .1 Following abbreviations of standard specifications have been used in this

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specification and on the drawings:

CGSB - Canadian Government Specifications Board

CSA - Canadian Standards Association

NLGA - National Lumber Grades Authority

ASTM - American Society for Testing and Materials

- .2 Where these abbreviations and standards are used in this project, latest edition in effect on date of bid call will be considered applicable.

1.12 SITE
OPERATIONS

- .1 Arrange for sufficient space adjacent to project site for conduct of operations, storage of materials and so on. Exercise care so as not to obstruct or damage public or private property in area. All arrangements for space and access will be made by Contractor.

1.13 PROJECT
MEETINGS

- .1 Departmental Representative will arrange project meetings and assume responsibility for setting times and recording minutes.
- .2 Project meetings will take place on site of work unless so directed by the Departmental Representative.
- .3 Departmental Representative will assume responsibility for recording minutes of meetings and forwarding copies to all parties present at the meetings.
- .4 Have a responsible member of firm present at all project meetings.

1.14 PROTECTION

- .1 Store all materials and equipment to be incorporated into work to prevent damage by any means. Note that there will be no temporary storage space available in the existing building for the Contractor.

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- .2 Repair or replace all materials damaged in transit or storage to the satisfaction of Departmental Representative and at no cost to Canada.
- 1.15 EXISTING SERVICES
- .1 Where work involves breaking into or connecting to existing services, carry out work at times directed by governing authorities, with minimum of disturbance to site operations, and tenant operations.
- .2 Before commencing work, establish location and extent of service lines in area of work and notify Departmental Representative of findings.
- .3 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of services. Provide temporary services when directed by Departmental Representative to maintain critical facility systems.
- 1.16 DOCUMENTS REQUIRED
- .1 Maintain at job site, one copy each of the following:
- .1 Contract Drawings
 - .2 Specifications
 - .3 Addenda
 - .4 Contract and any resulting amendments signed by contracting authority.
 - .5 Test Reports
 - .6 Copy of Approved Work Schedule
 - .7 Site specific Health and Safety Plan and other safety related documents.
- 1.17 PERMITS
- .1 Obtain and pay for all permits, certificates and licenses as required by Municipal, Provincial, Federal and other Authorities.
- .2 Provide appropriate notifications of project to municipal and provincial

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inspection authorities.

.3 Obtain compliance certificates as prescribed by legislative and regulatory provisions of municipal, provincial and federal authorities as applicable to the performance of work.

.4 Submit to Departmental Representative, copy of application submissions and approval documents received for above referenced authorities.

.5 Comply with all requirements, recommendations and advice by all regulatory authorities unless otherwise agreed in writing by Departmental Representative. Make requests for such deviations to these requirements sufficiently in advance of related work.

1.18 CUTTING,
FITTING AND
PATCHING

.1 Execute cutting, including excavation, fitting and patching required to make work fit properly.

1.19 ACCEPTANCE

.1 Prior to the issuance of the Certificate of Substantial Performance, in company with Departmental Representative, make a check of all work. Correct all discrepancies before final inspection and acceptance.

1.20 WORKS
COORDINATION

.1 Responsible for coordinating the work of the various trades, where the work of such trades interfaces with each other.

.2 Convene meetings between trades whose work interfaces and ensure that they are fully aware of the areas and the extent of where interfacing is required. Provide each trade with the plans and specifications of the interfacing trade, as required, to

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assist them in planning and carrying out their respective work.

- .3 Canada will not be responsible for or held accountable for any extra costs incurred as a result of the failure to carry out coordination work. Disputes between the various trades as a result of their not being informed of the areas and extent of interface work shall be the sole responsibility of the General Contractor and shall be resolved at no extra cost to Canada.

1.21 CONTRACTOR'S
USE OF SITE

- .1 Responsible for arranging the storage of materials on or off site, and any materials stored at the site which interfere with any of the day to day activities at or near the site will be moved promptly at the Contractor's expense, upon request by Departmental Representative.
- .2 Exercise care so as not to obstruct or damage public or private property in the area.
- .3 At completion of work, restore area to its original condition. Damage to ground and property will be repaired by Contractor. Remove all construction materials, residue, excess, etc., and leave site in a condition acceptable to Departmental Representative.

1.22 WORK
COMMENCEMENT

- .1 Mobilization to project site is to commence immediately after acceptance of bid and submission of Site Specific Safety Plan and insurance and bonding documentation, unless otherwise agreed by Departmental Representative.
- .2 Project work on site is to commence as

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soon as possible, with a continuous reasonable work force, unless otherwise agreed by Departmental Representative.

- .3 Delivery challenges, coordination with site users, and the location of the work site may require the use of longer working days and additional work force to complete the project within the specified completion time.
- .4 Make every effort to ensure that sufficient material and equipment is delivered to site at the earliest possible date after acceptance of bid and replenished as required.

1.23 WORKS SERVICES
AND TRANSPORTATION
PERMIT

- .1 Given the close proximity of the work site to Route 230, a permit from the Department of Transportation and Works will be required prior to starting work. Abide by all terms and conditions of the permit. To obtain the permit, contact the Lethbridge Unit Office at (709)467-2288.

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PART 1 - GENERAL1.1 SECTION
INCLUDES

- .1 Inspecting and testing by inspecting firms or testing laboratories designated by Departmental Representative.

1.2 RELATED
REQUIREMENTS
SPECIFIED ELSEWHERE

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

1.3 APPOINTMENT
AND PAYMENT

- .1 Departmental Representative will appoint and pay for services of testing laboratory except for the following:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Tests specified to be carried out by Contractor under the supervision of Departmental Representative.
 - .4 Tests requested by Departmental Representative to confirm material specifications when the applicable manufacturer's documentation or test results are unavailable.
 - .5 Additional tests specified in the following paragraph.
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

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1.4 CONTRACTOR'S
RESPONSIBILITIES

- .1 Provide labour, equipment and facilities to:
 - .1 Provide access to Work to be inspected and tested.
 - .2 Facilitate inspections and tests.
 - .3 Make good Work disturbed by inspection and test.
 - .4 Provide storage on site for laboratory's exclusive use to store equipment, where required.
- .2 Notify Departmental Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

PART 2 - PRODUCTS2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL1.1 SECTION
INCLUDES

- .1 Product data.
- .2 Samples.
- .3 Certificates.

1.2 SUBMITTAL
GENERAL REQUIREMENTS

- .1 Submit to Departmental Representative for review submittals listed, including samples, certificates and other data, as specified in other sections of the Specifications. Note that any and all changes to the contract will have to be approved in writing by the Contracting Authority. Departmental Representative will provide a list of required samples/product data sheets to be provided, after contract award.
- .2 Submit with reasonable promptness and in orderly sequence so as to allow for Departmental Representative's review and not cause delay in Work. Failure to submit in ample time will not be considered sufficient reason for an extension of Contract time and no claim for extension by reason of such default will be allowed.
- .3 Do not proceed with work until relevant submissions are reviewed by Departmental Representative.
- .4 Present product data, samples and mock-ups in SI Metric units.
- .5 Where items or information is not produced in SI Metric units, provide soft converted values.
- .6 Review submittals prior to submission to Departmental Representative. Ensure during review that necessary requirements have been determined and verified, required field

measurements or data have been taken, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents.

.1 Submittals not stamped, signed, dated and identified as to specific project will be returned unexamined by Departmental Representative and considered rejected.

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

.8 Verify field measurements and affected adjacent work and coordinate.

.9 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

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

.11 Submittal format: paper originals, or alternatively clear and fully legible photocopies of originals. Facsimiles are not acceptable, except in special circumstances pre-approved by Departmental Representative. Poorly printed non-legible photocopies or facsimiles will not be accepted and be returned for resubmission.

.12 Make changes or revision to submissions which Departmental Representative may require, consistent with Contract Documents and resubmit as directed by Departmental Representative. When resubmitting, notify Departmental Representative in writing of any revisions other than those requested.

- .13 Keep one reviewed copy of each submittal document on site for duration of Work.

1.3 PRODUCT DATA

- .1 Product data includes 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 sufficient copies of product data which are required by the General Contractor and sub-contractors plus 2 copies which will be retained by Departmental Representative. Ensure sufficient numbers are submitted to enable one complete set to be included in each of the maintenance manuals specified, if applicable.
- .3 Allow 10 calendar days for Departmental Representative's review of each submission.
- .4 Adjustments or corrections made on product data by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, advise Departmental Representative in writing prior to proceeding with Work.
- .5 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections and comments are made, fabrication and installation may proceed upon receipt of shop drawings. If product data are rejected and noted to be Resubmitted, do not proceed with that portion of work until resubmission and review of corrected product data, through same submission procedures indicated above.
- .6 Accompany each submission with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and project number.
 - .3 Contractor's name and address.

- .4 Identification and quantity of each product data and sample.
- .5 Other pertinent data.
- .7 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and project 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 Cross references to particular details of contract drawings and specifications section number for which product data submission addresses.
 - .6 Details of appropriate portions of Work.
- .8 After Departmental Representative's review, distribute copies.
- .9 The review of samples and product data by the Departmental Representative or their delegated representative is for sole purpose of ascertaining conformance with general concept. This review shall not mean that the Departmental Representative approves the detail design inherent in the product data, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in product data or of responsibility for meeting all requirements of the construction and Contract Documents. 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 all sub-trades.

1.4 SCHEDULES,
PERMITS AND
CERTIFICATES

- .1 Upon acceptance of bid, submit to Departmental Representative copy of Work Schedule and various other schedules, permits, certification documents and project management plans as specified in other sections of the Specifications.
- .2 Submit copy of permits, notices, compliance Certificates received by Regulatory Agencies having jurisdiction and as applicable to the Work.
- .3 Submission of above documents to be in accordance with Submittal General Requirements procedures specified in this section.

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| <u>1.1 SECTION INCLUDES</u> | .1 | Fire Safety Requirements. |
| | .2 | Hot Work Permit. |
| <u>1.2 RELATED WORK</u> | .1 | Section 01 35 29 - Health and Safety Requirements. |
| <u>1.3 REFERENCES</u> | .1 | Fire Protection Standards issued by Fire Protection Services of Human Resources Development Canada as follows:
.1 National Fire Code - Standard for Construction Operations - latest edition (http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/commissioner/301/page00.shtml).
.2 National Fire Code - Standard for Welding and Cutting - latest edition (http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/commissioner/302/page00.shtml).
.3 FCC standards, may also be viewed at the Regional Labour Canada Office located at Baine Johnson Centre, 10 Fort William Place, St. John's, NL, A1C 1K4; Telephone 1-800-641-4049; fax 1-709-772-5985. |
| <u>1.4 DEFINITIONS</u> | .1 | Hot Work defined as:
.1 Welding work.
.2 Cutting of materials by use of torch or other open flame devices.
.3 Grinding with equipment which produces sparks. |
| <u>1.5 SUBMITTALS</u> | .1 | Submit copy of Hot Work Procedures and sample of Hot Work permit to Departmental Representative for review, within five (5) calendar days after notification of acceptance of bid. |
| | .2 | Submit in accordance with the Submittal General Requirements specified in Section 01 33 00. |

1.6 FIRE SAFETY
REQUIREMENTS

- .1 Implement and follow fire safety measures during Work. Comply with following:
 - .1 National Fire Code, latest edition.
 - .2 Fire Protection Standards FCC 301 and FCC 302 - latest edition.
 - .3 Federal and Provincial Occupational Health and Safety Acts and Regulations as specified in Section 01 35 29 - Health and Safety Requirements.
- .2 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

1.7 HOT WORK
AUTHORIZATION

- .1 Obtain Departmental Representative's written "Authorization to Proceed" before conducting any form of Hot work on site.
- .2 To obtain authorization submit to Departmental Representative:
 - .1 Contractor's typewritten Hot Work Procedures to be followed on site as specified below.
 - .2 Description of the type and frequency of Hot Work required.
 - .3 Sample Hot Work Permit to be used.
- .3 Upon review and confirmation that effective fire safety measures will be implemented during performance of hot work, Departmental Representative will provide authorization to proceed as follows:
 - .1 Issue one written "Authorization to Proceed" covering the entire project for duration of work or;
 - .2 Separate work, or segregate certain parts of work, into individual entities. Each entity requiring a separately written "Authorization to Proceed" from Departmental

Representative. Follow Departmental Representative's directives in this regard.

- .4 Requirement for individual authorization based on:
 - .1 Nature or phasing of work;
 - .2 Risk to Facility operations;
 - .3 Quantity of various trades needing to perform hot work on project or;
 - .4 Other situation deemed necessary by Departmental Representative to ensure fire safety on premises.
- .5 Do not perform any Hot Work until receipt of Departmental Representative's written "Authorization to Proceed" for that portion of work.

1.8 HOT WORK PROCEDURES

- .1 Develop and implement safety procedures and work practices to be followed during the performance of Hot Work.
- .2 Procedures to include:
 - .1 Requirement to perform hazard assessment of site and immediate hot work area for each hot work event in accordance with Hazard Assessment and Safety Plan requirements of Section 01 35 29.
 - .2 Use of a Hot Work Permit system for each hot work event.
 - .3 The step by step process of how to prepare and issue permit.
 - .4 Permit shall be issued by Contractor's site Superintendent, or other authorized person designated by Contractor, granting permission to worker or subcontractor to proceed with hot work.
 - .5 Provision of a designated person to carryout a Fire Safety Watch for a minimum of 60 minutes immediately upon completion of the hot work.
 - .6 Compliance with fire safety codes and standards specified herein and occupational health and safety regulations specified in

Section 01 35 29.

- .3 Generic procedures, if used, must be edited and supplemented with pertinent information tailored to reflect specific project conditions. Clearly label as being the Hot Work Procedures applicable to this contract.
- .4 Hot Work Procedures shall clearly establish worker instructions and allocate responsibilities of:
 - .1 Worker(s),
 - .2 Authorized person issuing the Hot Work Permit,
 - .3 Fire Safety Watcher,
 - .4 Subcontractors and Contractor.
- .5 Brief all workers and subcontractors on Hot Work Procedures and Permit system established for project. Stringently enforce compliance.
 - .1 Failure to comply with the established procedures may result in the issuance of a Non-Compliance Notification at Departmental Representative's discretion with possible disciplinary measures imposed as specified in Section 01 35 29.

1.9 HOT WORK
PERMIT

- .1 Hot Work Permit to include, as a minimum, the following data:
 - .1 Project name and project number.
 - .2 Building name, address and specific room or area where hot work will be performed.
 - .3 Date when permit issued.
 - .4 Description of hot work type to be performed.
 - .5 Special precautions required, including type of fire extinguisher needed.
 - .6 Name and signature of person authorized to issue the permit.
 - .7 Name of worker (clearly printed) to which the permit is being issued.
 - .8 Time Duration that permit is valid (not to exceed 8 hours). Indicate start time and date, and completion time and date.

.9 Worker signature with date and time upon hot work termination.

.10 Specified time period requiring safety watch.

.11 Name and signature of designated Fire Safety Watcher, complete with time and date when safety watch terminated, certifying that surrounding area was under continual surveillance and inspection during the full watch time period specified in Permit and commenced immediately upon completion of Hot Work.

.2 Permit to be typewritten form. Industry Standard forms shall only be used if all data specified above is included on form.

.3 Each Hot Work Permit to be completed in full and signed as follows:

.1 Authorized person issuing Permit before hot work commences.

.2 Worker upon completion of Hot Work.

.3 Fire Safety Watcher upon termination of safety watch.

.4 Returned to Contractor's Site Superintendent for safe keeping.

1.10 DOCUMENTS
ON SITE

.1 Keep Hot Work Permits and Hazard assessment documentation on site for duration of Work.

.2 Upon request, make available to Departmental Representative or to authorized safety representative for inspection.

<u>1.1 SECTION INCLUDES</u>	.1	Procedures to isolate and lockout electrical facility or other equipment from energy source.
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<u>1.2 RELATED WORK</u>	.1	Section 01 35 24 - Fire Safety Requirements.
	.2	Section 01 35 29 - Health and Safety Requirements.

<u>1.3 REFERENCES</u>	.1	C22.1-06 - Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
	.2	CAN/CSA C22.3 No. 1-10 - Overhead Systems.
	.3	COSH, Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.

<u>1.4 DEFINITIONS</u>	.1	Electrical Facility: means any system, equipment, device, apparatus, wiring, conductor, assembly or part thereof that is used for the generation, transformation, transmission, distribution, storage, control, measurement or utilization of electrical energy, and that has an amperage and voltage that is dangerous to persons.
	.2	Guarantee of Isolation: means a guarantee by a competent person in control or in charge that a particular facility or equipment is isolated.
	.3	De-energize: in the electrical sense, that a piece of equipment is isolated and grounded, e.g. if the equipment is not grounded, it cannot be considered de-energized (DEAD).
	.4	Guarded: means that an equipment or facility is covered, shielded, fenced, enclosed, inaccessible by location, or otherwise

protected in a manner that, to the extent that is reasonably practicable, will prevent or reduce danger to any person who might touch or go near such item.

- .5 Isolate: means that an electrical facility, mechanical equipment or machinery is separated or disconnected from every source of electrical, mechanical, hydraulic, pneumatic or other kind of energy that is capable of making it dangerous.
- .6 Live/alive: means that an electrical facility produces, contains, stores or is electrically connected to a source of alternating or direct current of an amperage and voltage that is dangerous or contains any hydraulic, pneumatic or other kind of energy that is capable of making the facility dangerous to persons.

1.5 COMPLIANCE REQUIREMENTS

- .1 Perform lockouts in compliance with:
 - .1 Canadian Electrical Code.
 - .2 Federal and Provincial Occupational Health and Safety Acts and Regulations as specified in Section 01 35 29.
 - .3 Regulations and code of practice as applicable to mechanical equipment or other machinery being de-energized.
 - .4 Procedures specified herein.
- .2 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

1.6 SUBMITTALS

- .1 Submit copy of proposed Lockout Procedures and sample form of lockout permit or lockout tags for review.

- .2 Submit documentation within 7 calendar days of acceptance of bid. Do not proceed with work until submittal has been reviewed by Departmental Representative.
- .3 Submit above documents in accordance with the submittal requirements specified in Section 01 33 00.
- .4 Resubmit Lockout Procedures with noted revisions as may result from Departmental Representative's review.

1.7 ISOLATION OF EXISTING SERVICES

- .1 Obtain Departmental Representative's written authorization prior to conducting work on an existing active, energized service or facility required as part of the work and before proceeding with lockout of such services or facility.
- .2 To obtain authorization, submit to Departmental Representative the following documentation:
 - .1 Written Request for Isolation of the service or facility and;
 - .2 Copy of Contractor's Lockout Procedures.
- .3 Make a Request for Isolation for each event, unless directed otherwise by Departmental Representative, and as follows:
 - .1 Fill-out standard forms in current use at the Facility when so directed by Departmental Representative or;
 - .2 Where no form exist at Facility, make request in writing identifying:
 - .1 Identification of system or equipment to be isolated, including it's location;
 - .2 Time duration, indicating Start time and date, and Completion time and date when isolation will be in effect;

- .3 Voltage of service feed to system or equipment being isolated;
- .4 Name of person making the request.
- .3 Document to be in typewritten format.
- .4 Do not proceed until receipt of written notification from Departmental Representative granting the Isolation Request and authorization to proceed with the isolation of designated equipment or facility. Departmental Representative may designate other individual at the Facility as the person authorized to grant the Isolation Request.
- .5 Conduct safe, orderly shut down of equipment or facilities, de-energize and isolate power and other sources of energy and lockout items in accordance with requirement of clause 1.8 below.
- .6 Plan and schedule shut down of existing services in consultation with the Departmental Representative and the Facility Manager. Minimize impact and downtime of facility operations.
- .7 Determine in advance, as much as possible, in cooperation with the Departmental Representative, the type and frequency of situations which will require a Request for Isolation. Follow Departmental Representative's directives in this regard.
- .8 Conduct hazard assessment as part of the planning process of isolating existing equipment and facilities. Hazard Assessments to conform with requirements of Health and Safety Section 01 35 29.

1.8 LOCKOUTS

- .1 Isolate and lockout electrical facilities, mechanical equipment and machinery from all potential energy sources prior to starting

work on such items.

- .2 Develop and implement lockout procedures to be followed on site as an integral part of the Work.
- .3 Use energy isolation lockout devices specifically designed and appropriate for type of facility or equipment being locked out.
- .4 Use industry standard lockout tags.
- .5 Provide appropriate safety grounding and guards as required.
- .6 Prepare Lockout Procedures in writing. Describe safe work practices, work functions and sequence of activities to be followed on site to safely isolate all potential energy sources and lockout/tagout facilities and equipment.
- .7 Include within procedures a system of worker request and issuance of individual lockout permit by a person, employed by Contractor, designated to be "in-charge" and being responsible for:
 - .1 Controlling issuance of permits or tags to workers.
 - .2 Determining permit duration.
 - .3 Maintaining record of permits and tags issued.
 - .4 Submitting a Request for Isolation to Departmental Representative when required in accordance with Clause 1.7 above.
 - .5 Designating a Safety Watcher, when one is required based on type of work.
 - .6 Ensuring equipment or facility has been properly isolated, providing a Guarantee of Isolation to worker(s) prior to proceeding with work.
 - .7 Collecting and safekeeping lockout

tags, returned by workers, as a record of the event.

- .8 Clearly establish, describe and allocate, within procedures, the responsibilities of:
 - .1 Workers.
 - .2 Designated person controlling issuance of lockout tags/permits.
 - .3 Safety Watcher.
 - .4 Subcontractors and General Contractor.
- .9 Procedures shall meet the requirements of Codes and Regulations specified in clause 1.5 above.
- .10 Generic procedures, if used, must be edited, supplemented with pertinent information and tailored to reflect specific project conditions. Clearly label as being the procedures applicable to this contract.
 - .1 Incorporate site specific rules and procedures established by Facility Manager and in force at site. Obtain such procedures through Departmental Representative.
- .11 Procedures to be in typewritten format.
- .12 Submit copy of Lockout Procedures to Departmental Representative, in accordance with submittal requirements of clause 1.6 herein, prior to commencement of work.

1.9 CONFORMANCE

- .1 Ensure that lockout procedures, as established for project on site, are stringently followed. Enforce use and compliance by all workers.
- .2 Brief all persons working on electrical facilities, mechanical and other equipment fed by an energy source on requirements of this section.

- .3 Failure to perform lockouts in accordance with regulatory requirements or follow procedures specified herein may result in the issuance of a Non-Compliance Notification at Departmental Representative's discretion with possible disciplinary measures imposed as specified in Section 01 35 29.

1.10 DOCUMENTS ON SITE

- .1 Post Lockout Procedures on site in common location for viewing by workers.
- .2 Keep copies of Request for Isolation submitted to Departmental Representative and lockout permits or tags issued to workers during the course of work for full project duration.
- .3 Upon request, make such data available to Departmental Representative or to authorized safety representative for inspection.

1.1 RELATED WORK

- .1 Section 01 35 24 - Special Procedures on Fire Safety Requirements.

1.2 DEFINITIONS

- .1 COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.
- .2 Competent Person: means a person who is:
 - .1 Qualified by virtue of personal knowledge, training and experience to perform assigned work in a manner that will ensure the health and safety of persons in the workplace, and;
 - .2 Knowledgeable about the provisions of occupational health and safety statutes and regulations that apply to the Work and;
 - .3 Knowledgeable about potential or actual danger to health or safety associated with the Work.
- .3 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.
- .4 PPE: personal protective equipment.
- .5 Work Site: where used in this section shall mean areas, located at the premises where Work is undertaken, used by Contractor to perform all of the activities associated with the performance of the Work.

1.3 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00.
- .2 Submit to Departmental Representative, copies of the following documents including updates.
 - .1 Site specific Health and Safety Plan.
 - .2 Building permit, compliance

certification and other permits obtained.

.3 Reports or directives issued by Federal and Provincial Inspectors and other Authorities having jurisdiction.

.4 Accident or incident reports.

.5 WHMIS - MSDS data sheets.

.6 Name of Contractor's Representative designated to perform health and safety supervision in site.

.7 Certificate of clearance from Workplace Health Safety and Compensation Commission (Assessment Services Department) of Newfoundland and Labrador.

.3 Submit within five (5) work days of notification of Bid Acceptance. Provide one (1) copy.

.4 Departmental Representative will review Health and Safety Plan and provide comments.

.5 The Contractor will revise the Plan as appropriate and resubmit within five (5) work days after receipt of comments.

.6 Departmental Representative's review and comments made of the Plan shall not be construed as an endorsement, approval or implied warranty of any kind by Canada and does not reduce Contractor's overall responsibility for Occupational Health and Safety of the Work.

.7 Submit revisions and updates made to the Plan during the course of Work.

1.4 COMPLIANCE REQUIREMENTS

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

- .2 Comply with Canada Labour Code Part II, (entitled Occupational Health and Safety) and the Canada Occupational Health and Safety Regulations (COSH) as well as any other regulations made pursuant to the Act.
 - .1 The Canada Labour Code can be viewed at: [www.http://laws.justice.gc.ca/en/L-2/](http://laws.justice.gc.ca/en/L-2/)
 - .2 COSH can be viewed at: [www.http://laws.justice.gc.ca/eng/SOR-86-304/ne.html](http://laws.justice.gc.ca/eng/SOR-86-304/ne.html).
 - .3 A copy may be obtained at: Canadian Government Publishing Public Works & Government Services Canada Ottawa, Ontario, K1A 0S9 Tel: (819) 956-4800 (1-800-635-7943) Publication No. L31-85/2000 E or F).
- .3 Observe construction safety measures of:
 - .1 Part 8 of National Building Code.
 - .2 Municipal by-laws and ordinances.
- .4 In case of conflict or discrepancy between any specified requirements, the more stringent shall apply.
- .6 Maintain Workers Compensation Coverage in good standing for duration of Contract. Provide proof through submission of Certificate of Clearance from Workplace Health, Safety and Compensation Commission (Assessment Services Department) of Newfoundland and Labrador.
- .7 Obtain and maintain worker medical surveillance documentation where prescribed by legislation or regulation.

1.5 RESPONSIBILITY

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

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

1.6 SITE CONTROL AND ACCESS

- .1 Control the Work and entry points to Work Site. Approve and grant access only to workers and authorized persons. Immediately stop and remove non-authorized persons.
 - .1 Departmental Representative will provide names of those persons authorized by Departmental Representative to enter onto Work Site and will ensure that such authorized persons have the required knowledge and training on Health and Safety pertinent to their reason for being at the site, however, Contractor remains responsible for the health and safety of authorized persons while at the Work Site.
- .2 Isolate Work Site from other areas of the premises by use of appropriate means.
 - .1 Erect fences, hoarding, barricades and temporary lighting as required to effectively delineate the Work Site, stop non-authorized entry, and to protect pedestrians and vehicular traffic around and adjacent to the Work and create a safe environment.
 - .2 Post signage at entry points and other strategic locations indicating restricted access and conditions for access.
- .3 Provide safety orientation session to persons granted access to Work Site. Advise of hazards and safety rules to be observed while on site.

.4 Ensure persons granted site access wear appropriate PPE. Supply PPE to inspection authorities who require access to conduct tests or perform inspections.

.5 Secure Work Site against entry when inactive or unoccupied and to protect persons against harm. Provide security guard where adequate protection cannot be achieved by other means.

1.7 PROTECTION

.1 Give precedence to safety and health of persons and protection of environment over cost and schedule considerations for Work.

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

1.8 FILING OF NOTICE

.1 File Notice of Project with pertinent provincial health and safety authorities prior to beginning of Work.

1.9 PERMITS

.1 Post permits, licenses and compliance Certificates at Work Site.

.2 Where a particular permit or compliance certificate cannot be obtained, notify Departmental Representative in writing and obtain approval to proceed before carrying out applicable portion of work.

1.10 HAZARD ASSESSMENTS

.1 Perform site specific health and safety hazard assessment of the Work and its site.

.2 Carryout initial assessment prior to commencement of Work with further assessments as needed during progress of work, including when new trades and

subcontractors arrive on site.

- .3 Record results and address in Health and Safety Plan.
- .4 Keep documentation on site for entire duration of the Work.

1.11 PROJECT/SITE CONDITIONS

- .1 The following are known or potential project related safety hazards at site:
 - .1 Heavy lifting.
 - .2 Working at heights.
 - .3 Cutting tools and other construction power tools.
 - .4 Sharp objects (construction debris).
- .2 Above items shall not be construed as being complete and inclusive of potential health, and safety hazards encountered during work.
- .3 Include above items into hazard assessment process.

1.12 MEETINGS

- .1 Contractor to hold pre-construction health and safety meeting prior to commencement of Work. Ensure attendance of:
 - .1 Superintendent of Work.
 - .2 Contractor's designated Health & Safety Site Representative.
 - .3 Subcontractor's Health and Safety Site Representative.
 - .4 Health and Safety Site Coordinator.
- .2 Conduct regularly scheduled tool box and safety meetings during the Work in conformance with Occupational Health and Safety regulations.
- .3 Keep documents on site.

1.13 HEALTH AND
SAFETY PLAN

- .1 Prior to commencement of Work, develop written Health and Safety Plan specific to the work. Implement, maintain, and enforce Plan for entire duration of Work and until final demobilization from site.
- .2 Health and Safety Plan shall include the following components:
 - .1 List of health risks and safety hazards identified by hazard assessment.
 - .2 Control measures used to mitigate risks and hazards identified.
 - .3 On-site Contingency and Emergency Response Plan as specified below.
 - .4 On-site Communication Plan as specified below.
 - .5 Name of Contractor's designated Health & Safety Site Representative and information showing proof of his/her competence and reporting relationship in Contractor's company.
 - .6 Names, competence and reporting relationship of other supervisory personnel used in the Work for occupational health and safety purposes.
- .3 On-site Contingency and Emergency Response Plan shall include:
 - .1 Operational procedures, evacuation measures and communication process to be implemented in the event of an emergency.
 - .2 Evacuation Plan: site and floor plan layouts showing escape routes, marshaling areas. Details on alarm notification methods, fire drills, location of fire fighting equipment and other related data.
 - .3 Name, duties and responsibilities of persons designated as Emergency Warden(s) and deputies.
 - .4 Emergency Contacts: name and telephone number of officials from:

- .1 General Contractor and subcontractors.
 - .2 Pertinent Federal and Provincial Departments and Authorities having jurisdiction.
 - .3 Local emergency resource organizations.
- .4 On-site Communication Plan:
 - .1 Procedures for sharing of work related safety information to workers and subcontractors, including emergency and evacuation measures.
- .5 Address all activities of the Work including those of subcontractors.
- .6 Review Health and Safety Plan regularly during the Work. Update as conditions warrant to address emerging risks and hazards, such as whenever new trade or subcontractor arrive at Work Site.
- .7 Departmental Representative will respond in writing, where deficiencies or concerns are noted and may request re-submission of the Plan with correction of deficiencies or concerns.
- .8 Post copy of the Plan, and updates, prominently on Work Site.

1.14 SAFETY SUPERVISION

- .1 Employ Health & Safety Site Representative responsible for daily supervision of health and safety of the Work.
- .2 Health & Safety Site Representative may be the Superintendent of the Work or other person designated by Contractor and shall be assigned the responsibility and authority to:
 - .1 Implement, monitor and enforce daily compliance with health and safety requirements of the Work
 - .2 Monitor and enforce Contractor's site-specific Health and Safety Plan.

- .3 Conduct site safety orientation session to persons granted access to Work Site.
- .4 Ensure that persons allowed site access are knowledgeable and trained in health and safety pertinent to their activities at the site or are escorted by a competent person while on the Work Site.
- .5 Stop the Work as deemed necessary for reasons of health and safety.

.3 Health & Safety Site Representative must:

- .1 Be qualified and competent person in occupational health and safety.
- .2 Have site-related working experience specific to activities of the Work.
- .3 Be on Work Site at all times during execution of the Work.
- .4 All supervisory personnel assigned to the Work shall also be competent persons.
- .5 Inspections:
 - .1 Conduct regularly scheduled safety inspections of the Work on a minimum daily basis. Record deficiencies and remedial action taken.
 - .2 Conduct Formal Inspections on a minimum monthly basis. Use standardized safety inspection forms. Distribute to subcontractors.
 - .3 Follow-up and ensure corrective measures are taken.
- .6 Keep inspection reports and supervision related documentation on site.

1.15 TRAINING

- .1 Use only skilled workers on Work Site who are effectively trained in occupational health and safety procedures and practices pertinent to their assigned task.
- .2 Maintain employee records and evidence of

training received. Make data available to Departmental Representative upon request.

- .3 When unforeseen or peculiar safety-related hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.
- .4 All workers dealing with hazardous materials are required to provide evidence of training, in accordance with Provincial regulations.

1.16 MINIMUM SITE SAFETY RULES

- .1 Notwithstanding requirement to abide by federal and provincial health and safety regulations; ensure the following minimum safety rules are obeyed by persons granted access to Work Site:
 - .1 Wear appropriate PPE pertinent to the Work or assigned task; minimum being hard hat, safety footwear, safety glasses and safety vest.
 - .2 Immediately report unsafe condition at site, near-miss accident, injury and damage.
 - .3 Maintain site and storage areas in a tidy condition free of hazards causing injury.
 - .4 Obey warning signs and safety tags.
- .2 Brief persons of disciplinary protocols to be taken for non compliance. Post rules on site.

1.17 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct

non-compliance of health and safety issues identified.

- .3 Departmental Representative will stop Work if non-compliance of health and safety regulations is not corrected in a timely manner.

1.18 INCIDENT REPORTING

- .1 Investigate and report the following incidents to Departmental Representative:
 - .1 Incidents requiring notification to Provincial Department of Occupational Safety and Health, Workers Compensation Board or to other regulatory Agency.
 - .2 Medical aid injuries.
 - .3 Property damage in excess of \$10,000.00.
- .2 Submit report in writing.

1.19 HAZARDOUS PRODUCTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS).
- .2 Keep MSDS data sheets for all products delivered to site.
 - .1 Post on site.
 - .2 Submit copy to Departmental Representative.

1.20 SITE RECORDS

- .1 Maintain on Work Site copy of safety related documentation and reports stipulated to be produced in compliance with Acts and Regulations of authorities having jurisdiction and of those documents specified herein.
- .2 Upon request, make available to Departmental Representative or authorized Safety Officer for inspection.

1.21 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on Work Site in accordance with

Acts and Regulations of Province having jurisdiction.

- .2 Post other documents as specified herein, including:
 - .1 Site specific Health and Safety Plan.
 - .2 WHMIS data sheets.

1.1 DEFINITIONS

- .1 Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.

1.2 DISPOSAL OF
WASTES AND
HAZARDOUS
MATERIALS

- .1 Do not bury rubbish and waste materials on site.
- .2 Do not dispose of hazardous waste or volatile materials, such as mineral spirits, paints, thinners, oil or fuel into waterways, storm or sanitary sewers or waste landfill sites.
- .3 Store, handle and dispose of hazardous materials and hazardous waste in accordance with applicable federal and provincial laws, regulations, codes and guidelines.
- .4 Dispose of construction waste materials and demolition debris, resulting from work, at approved landfill sites only. Carryout such disposal in strict accordance with provincial and municipal rules and regulations. Separate out and prevent improper disposal of items banned from landfills.
- .5 Establish methods and undertake construction practices which will minimize waste and optimize use of construction materials. Separate at source all construction waste materials, demolition debris and product packaging and delivery containers into various waste categories in order to maximize recycling abilities of various materials and avoid disposal of debris at landfill site(s) in a "mixed state". Where recycling firms, specializing in recycling of specific materials exist, transport such materials to the recycling facility and avoid disposal at landfill sites.

- .6 Communicate with landfill operator prior to commencement of work, to determine what specific construction, demolition and renovation waste materials have been banned from disposal at the landfill and at transfer stations.

1.3 POLLUTION CONTROL

- .1 Control emissions from equipment and plant to local authorities emission requirements.
- .3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .4 Have emergency spill response equipment and rapid clean-up kit, appropriate to work, at site. Locate adjacent to work and where hazardous materials are stored. Provide personal protective equipment as required for clean-up.
- .5 Report, to Federal and Provincial Department of the Environment, spills of petroleum and other hazardous materials as well as accidents having potential of polluting the environment. Also notify Departmental Representative and submit a written spill report to Departmental Representative within 24 hours of occurrence.

1.1 SECTION
INCLUDES

- .1 Inspection and testing, administrative and enforcement requirements.

1.2 INSPECTION

- .1 Facilitate Departmental Representative's access to Work. If part of Work is being fabricated at locations other than construction site, make preparations to allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection of Work designated for special tests, inspections or approvals by Departmental Representative or by inspection authorities having jurisdiction.
- .3 If Contractor covers or permits to be covered Work designated for special tests, inspections or approvals before such is made, uncover Work until particular inspections or tests have been fully and satisfactorily completed and until such time as Departmental Representative gives permission to proceed. Pay costs to uncover and make good such Work.
- .4 In accordance with the General Conditions, Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents.

1.3 INDEPENDENT
INSPECTION AGENCIES

- .1 Departmental Representative may engage and pay for service of Independent Inspection and Testing Agencies for purpose of inspecting and testing portions of Work except for the following which remain part of Contractor's responsibilities:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.

.3 Tests as specified within various sections designated to be carried out by Contractor under the supervision of Departmental Representative.

.4 Additional tests specified in Clause 1.3.2.

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

.3 Employment of inspection and testing agencies by Departmental Representative does not relax responsibility to perform Work in accordance with Contract Documents.

1.4 ACCESS TO WORK

.1 Furnish labour and facility to provide access to the work being inspected and tested.

.2 Co-operate to facilitate such inspections and tests.

.3 Make good work disturbed by inspections and tests.

1.5 PROCEDURES

.1 Notify Departmental Representative sufficiently in advance of when work is ready for tests, in order for Departmental Representative to make attendance arrangements with Testing Agency. When directed by Departmental Representative, notify such Agency directly.

.2 Submit representative samples of materials specified to be tested. Deliver in required quantities to Testing Agency. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.

- .3 Provide labour and facilities to obtain and handle samples on site. Provide sufficient space on site for Testing Agency's exclusive use to store equipment.

1.6 REJECTED WORK

- .1 Remove and replace defective Work, whether result of poor workmanship, use of defective or damaged products and whether incorporated in Work or not, which has been identified by Departmental Representative as failing to conform to Contract Documents.
- .2 Make good damages to existing or new work, including work of other Contracts, resulting from removal or replacement of defective work.

1.7 TESTING BY CONTRACTOR

- .1 Provide all necessary instruments, equipment and qualified personnel to perform tests designated as Contractor's responsibilities herein or elsewhere in the Contract Documents.

1.1 SANITARY
FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.2 WATER SUPPLY

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

1.3 CONSTRUCTION
SIGN AND NOTICES

- .1 Contractor or subcontractor advertisement signboards are not permitted on site.
- .2 Only notices of safety or instructions are permitted on site.
- .3 Maintenance and Disposal of Site Signs:
 - .1 Maintain approved signs and notices in good condition for duration of project and dispose of off site on completion of project or earlier if directed by Departmental Representative.

1.4 REMOVAL OF
TEMPORARY
FACILITIES

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

Site Improvements

Salmon Cove River - Port Rexton, NL

2017-08-22

PART 1 - GENERAL

- | | | |
|--|----|---|
| <u>1.1 SECTION INCLUDES</u> | .1 | Barriers. |
| | .2 | Traffic Controls. |
| <u>1.2 INSTALLATION AND REMOVAL</u> | .1 | Provide temporary controls in order to execute work expeditiously. |
| | .2 | Remove from site all such work after use. |
| <u>1.3 HOARDING</u> | .1 | Erect temporary site enclosure using new 1.2 m high snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 m centres. Provide one lockable truck gate. Maintain fence in good repair. |
| <u>1.4 GUARD RAILS AND BARRICADES</u> | .1 | Provide as required by governing authorities and to approval of Departmental Representative. |
| <u>1.5 ACCESS TO SITE</u> | .1 | Provide and maintain access to adjacent facilities. |
| <u>1.6 PUBLIC TRAFFIC FLOW</u> | .1 | Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform work and protect the public. |
| <u>1.7 FIRE ROUTES</u> | .1 | Maintain access to property including overhead clearances for use by emergency response vehicles. |
| <u>1.8 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY</u> | .1 | Protect surrounding private and public property from damage during performance of work. |
| | .2 | Be responsible for damage incurred. |

1.1 GENERAL

- .1 Use new material and equipment unless otherwise specified.
- .2 Within 7 days of written request by Departmental Representative, submit following information for any materials and products proposed for supply:
 - .1 name and address of manufacturer;
 - .2 trade name, model and catalogue number;
 - .3 performance, descriptive and test data;
 - .4 manufacturer's installation or application instructions;
 - .5 evidence of arrangements to procure.
 - .6 evidence of manufacturer delivery problems or unforeseen delays.
- .3 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.
- .4 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.
- .5 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.

1.2 PRODUCT QUALITY
AND REFERENCED
STANDARDS

- .1 Contractor shall be solely responsible for submitting relevant technical data and independent test reports to confirm whether a product or system proposed for use meets contract requirements and specified standards.
- .2 Final decision as to whether a product or system meets contract requirements rest solely with the Departmental Representative in accordance with the General Conditions.

1.3 ACCEPTABLE
MATERIALS AND
ALTERNATIVES

- .1 Acceptable Materials: When materials specified include trade names or trade marks or manufacturer's or supplier's name as part of the material description, select and only use one of the names listed for incorporation into the Work.
- .2 Alternative Materials: Submission of alternative materials to trade names or manufacturer's names specified must be done during the bidding period following procedures indicated in the Instructions to Bidders.
- .3 Substitutions: After acceptance of bid, substitution of a specified material will be dealt with as a change to the Work in accordance with the General Conditions of the Contract.

1.4 MANUFACTURERS
INSTRUCTIONS

- .1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods to be used. Do not rely on labels or enclosure provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental representative in writing of any conflict between these specifications and manufacturers instructions, so that Departmental Representative will designate which document is to be followed.

1.5 AVAILABILITY

- .1 Immediately notify Departmental Representative in writing of unforeseen or unanticipated material delivery problems by manufacturer. Provide support documentation as per Clause 1.1.2 above.

1.6 WORKMANSHIP

- .1 Ensure quality of work is of highest standard,

executed by workers experienced and skilled in respective duties for which they are employed.

- .2 Remove unsuitable or incompetent workers from site as stipulated in General Conditions.
- .3 Ensure cooperation of workers in laying out work. Maintain efficient and continuous supervision on site at all times.
- .4 Coordinate work between trades and subcontractors.
- .5 Coordinate placement of openings, sleeves and accessories.

1.7 FASTENINGS - GENERAL

- .1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use non-corrosive fasteners, anchors and spacers for securing exterior work and in humid areas.
- .2 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage. Wood or organic material plugs not acceptable.
- .3 Keep exposed fastenings to minimum, space evenly and lay out neatly.
- .4 Fastenings which cause spalling or cracking of material to which anchorage is made, are not acceptable.
- .5 Do not use explosive actuated fastening devices unless approved by Departmental Representative. See Section 01 35 29 on Health and Safety in this regard.

1.8 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.
- .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 and, use resilient washers with stainless steel.

1.9 STORAGE,
HANDLING AND
PROTECTION

- .1 Deliver, handle and store materials in manner to prevent deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled materials in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work. Provide additional cover where manufacturer's packaging is insufficient to provide adequate protection.
- .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 Immediately remove damaged or rejected materials from site.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.10 CONSTRUCTION EQUIPMENT AND PLANT

- .1 On request, prove to the satisfaction of Departmental Representative that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.
- .2 Maintain construction equipment and plant in good operating order. Prevent oil and other contaminant leaks. Should any contaminant leak onto ground or into the water, take immediate and appropriate measures to contain, cleanup and dispose in an environmentally responsible manner.

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- .1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
- .2 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .3 Prevent accumulation of wastes which create hazardous conditions.
- .4 Provide adequate ventilation during use of volatile or noxious substances.

1.2 CLEANING DURING CONSTRUCTION

- .1 Maintain project grounds and public properties in a tidy condition, free from accumulations of waste material and debris. Clean areas on a daily basis.
- .2 Provide on-site garbage containers for collection of waste materials and debris.
- .3 Remove waste materials and debris from site on a daily basis.

1.3 FINAL CLEANING

- .1 In preparation for acceptance of the Work perform final cleaning.

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1.1 RELATED
SECTIONS

- .1 01 74 11 - Cleaning.

1.2 WASTE AUDIT

- .1 At project start-up, conduct waste audit of:
 .1 Site conditions identifying salvageable
 and non-salvageable items and waste resulting
 from demolition and removal work.
 .2 Projected waste resulting from product
 packaging and from material leftover after
 installation work.
- .2 Develop written list. Record type,
 composition and quantity of various
 salvageable items and waste anticipated,
 reasons for waste generation and operational
 factors which contribute to waste.

1.3 WASTE REDUCTION

- .1 Based on waste audit, develop waste reduction
 program.
- .2 Structure program to prioritize actions, with
 waste reduction as first priority, followed
 by salvage and recycling effort, then
 disposal as solid waste.
- .3 Identify materials and equipment to be:
 .1 Protected and turned over to
 Departmental Representative when indicated.
 .2 Salvaged for resale by Contractor.
 .3 Sent to recycling facility.
 .4 Sent to waste processing/landfill site
 for their recycling effort.
 .5 Disposed of in approved landfill site.
- .4 Reduce construction waste during
 installation work. Undertake practices which
 will minimize waste and optimize full use of
 new materials on site, such as:
 .1 Use of a central cutting area to allow
 for easy access to off-cuts;
 .2 Use of off-cuts for blocking and

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bridging elsewhere.

.3 Use of effective and strategically placed facilities on site for storage and staging of left-over or partially cut materials to allow for easy incorporation into work whenever possible avoiding unnecessary waste.

- .5 Develop other strategies and innovative procedures to reduce waste such as minimizing the extent of packaging used for delivery of materials to site, etc.

1.4 MATERIAL SOURCE
SEPARATION PROCESS

- .1 Develop and implement material source separation process at commencement of work as part of mobilization and waste management at site.

- .2 Provide on-site facilities to collect, handle and store anticipated quantities of reusable, salvageable and recyclable materials.

.1 Use suitable containers for individual collection of items based on intended purpose.

.2 Locate to facilitate deposit but without hindering daily operations of existing building tenants.

.3 Clearly mark containers and stockpiles as to purpose and use.

- .3 Perform demolition and removal of existing structure components and equipment following a systematic deconstruction process.

.1 Separate materials and equipment at source, carefully dismantling, labelling and stockpiling alike items for the following purposes:

.1 Reinstallation into the work where indicated.

.2 Salvaging reusable items not needed in project which Contractor may

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sell to other parties. Sale of such items not permitted on site.

.3 Sending as many items as possible to locally available recycling facility.

.4 Segregating remaining waste and debris into various individual waste categories for disposal in a "non-mixed state" as recommended by waste processing/landfill sites.

.4 Isolate product packaging and delivery containers from general waste stream. Send to recycling facility or return to supplier/manufacturer.

.5 Send leftover material resulting from installation work for recycling whenever possible.

.6 Establish methods whereby hazardous and toxic waste materials, and their containers, encountered or used in the course work are properly isolated, stored on site and disposed in accordance with applicable laws and regulations from authorities having jurisdiction.

.7 Isolate and store existing materials and equipment identified for re-incorporation into the Work. Protect against damage.

1.5 WORKER TRAINING
AND SUPERVISION

.1 Provide adequate training to workforce, through meetings and demonstrations, to emphasize purpose and worker responsibilities in carrying out the Waste Management Plan.

.2 Waste Management Coordinator: designate full-time person on site, experienced in waste management and having knowledge of the

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purpose and content of Waste Management Plan to:

.1 Oversee and supervise waste management during work.

.2 Provide instructions and directions to all workers and subcontractors on waste reduction, source separation and disposal practices.

.3 Post a copy of Plan in a prominent location on site for review by workers.

1.6 CERTIFICATION
OF MATERIAL
DIVERSION

.1 Submit to Departmental Representative, copies of certified weigh bills from authorized waste processing sites and sale receipts from recycling/reuse facilities confirming receipt of building materials and quantity of waste diverted from landfill.

.2 Submit data at pre-determined project milestones as determined by Departmental Representative.

.3 Compare actual quantities diverted from landfill with projections made during waste audit.

1.7 DISPOSAL
REQUIREMENTS

.1 Burying or burning of rubbish and waste materials is prohibited.

.2 Disposal of waste, volatile materials, mineral spirits, oil, paint, paint thinner or unused preservative material into waterways, storm, or sanitary sewers is prohibited.

.3 Do not dispose of preservative treated wood through incineration.

.4 Do not dispose of preservative treated wood

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with other materials destined for recycling or reuse.

- .5 Dispose of treated wood, end pieces, wood scraps and sawdust at a sanitary landfill.
- .6 Dispose of waste only at approved waste processing facility or landfill sites approved by authority having jurisdiction.
- .7 Contact the authority having jurisdiction prior to commencement of work, to determine what, if any, demolition and construction waste materials have been banned from disposal in landfills and at transfer stations. Take appropriate action to isolate such banned materials at site of work and dispose in strict accordance with provincial and municipal regulations.
- .8 Transport waste intended for landfill in separated condition, following rules and recommendations of Landfill Operator in support of their effort to divert, recycle and reduce amount of solid waste placed in landfill.
- .9 Collect, bundle and transport salvaged materials to be recycled in separated categories and condition as directed by recycling facility. Ship materials only to approved recycling facilities.
- .10 Sale of salvaged items by Contractor to other parties not permitted on site.

1.1 PROJECT RECORD
DOCUMENTS

- .1 Departmental Representative will provide two white print sets of contract drawings and two copies of Specifications.
- .2 Maintain at site one set of the contract drawings and specifications to record actual "As-Built" site conditions.
- .3 At project completion, submit full manual of products used in new work (complete with manufacturer's data sheets, warranty data, user manuals, etc.).

PART 1 **GENERAL****1.1** **SECTIONS INCLUDES**

- .1 Methods and procedures for demolishing, salvaging, recycling and removing sitework items designated to be removed in whole or in part, and for backfilling resulting trenches and excavations.

1.2 **RELATED SECTIONS**

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

1.3 **SUBMITTALS**

- .1 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 licensed in Province of Newfoundland and Labrador, Canada.
- .2 Hazardous Materials: provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.
- .3 Submit plan indicating:
 - .1 Descriptions of and anticipated quantities of materials to be salvaged, reused, recycled and landfilled.
 - .2 Schedule of selective demolition.
- .4 Submit copies of certified weigh bills, bills of lading from authorized disposal sites and reuse and recycling

facilities for material removed from site upon request from Owner's Representative.

1.4 QUALITY ASSURANCE

- .1 Convene pre-installation meeting one week prior to beginning work of this section to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with building subtrades.
- .2 Arrange for site visit with Owner's Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, replace or make repairs to approval of Owner's Representative and at no cost to Owner.
- .2 Remove and store materials to be salvaged in a manner to prevent damage.
- .3 Store and protect in accordance with requirements for maximum preservation of material.

1.6 SITE CONDITIONS

- .1 In all circumstances ensure that demolition work does not adversely affect adjacent water courses groundwater and wildlife, or contribute to excess air and noise pollution.
- .2 Do not dispose of waste or volatile materials such as mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout project.
- .3 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.

- .4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.
- .5 Protect trees, plants and foliage on site and adjacent properties where indicated.

1.7 EXISTING CONDITIONS

- .1 Prior to start of any demolition work, remove contaminated or hazardous materials as defined by authorities having jurisdiction from site and dispose of at designated disposal facilities.

1.8 SCHEDULING

- .1 Notify Owner's Representative in writing when unforeseen delays occur.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 PREPARATION

- .1 Inspect site with Owner's 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.

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. Do not disturb items designated to remain in place.
- .2 Interim removal of stockpiled material may be required by Owner's Representative if it is deemed to interfere with operations of Owner's Representative, Owner or other contractors.

3.4 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to match conditions 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.

3.5 CLEAN UP

- .1 Upon completion of work, remove debris, trim surfaces and leave work site clean.
- .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

PART 1 **GENERAL****1.1** **RELATED SECTIONS**

- .1 Section 03 30 00 - Cast-In-Place Concrete.
- .2 Section 03 35 00 - Concrete Finishing

1.2 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.3 **Submittals**

- .1 Submittals to Section 01 33 00.
- .2 Submit manufacturer's product data and installation instructions for approval.

PART 2 **PRODUCTS****2.1** **MATERIALS**

- .1 Expansion Joint: 13 mm (1/2") fibre expansion joint, by WR Meadows, or approved equal.
- .2 Welded Wire Mesh: rectangular wire mesh, hot dipped galvanized, 50 mm x 25 mm (2" x 1") mesh, Ø1.3 mm (16 gauge), by McNichols, or approved equal.
- .3 Mechanical fasteners: single pre-galvanized mesh clip, 1.5 mm thick for single wire, 2 x 5 mm fastening holes. Galvanized fasteners acceptable for use in concrete, minimum 38 mm embedment.

PART 3 **EXECUTION****3.1** **PREPARATION**

- .1 Remove all loose, broken and or chipped concrete from existing floor slab, including along perimeter foundation wall curb, at overhead doors, along foundation wall between original building and extension, along all other joints in slab, areas of spalling, etc.
- .2 Chip away and remove any other concrete fragments not fully broken but may be partially broken and failure/separation is imminent.
- .3 Where required, as indicated on drawings, saw-cut channel along perimeter wall and chip away concrete to form 37 mm deep x 50 mm wide keyway.
- .4 Prepare entire floor surface via pressure washing, minimum 10,000 psi, or other approved method, to remove 3 mm to 12 mm of existing surface, including all flaking paint, delaminated/spalling concrete, grease, oils, laitance, dirt and efflorescence.

3.2 **INSTALLATION**

- .1 Verify lines, levels and centres before proceeding with work and ensure dimensions agree with drawings.
- .2 Based on slab level survey as indicated on drawings, in consultation with Departmental Representative, establish finished grade for top of concrete floor topping system, which shall be top elevation for expansion joint around perimeter.
- .3 Install expansion joint level at top and scribe to follow existing concrete floor slab on bottom. Use adhesive or other to hold in place until new concrete topping is placed and cured to Section 03 30 00.
- .4 Install galvanized welded wire mesh, 300 mm either side of joint, using mechanical fasteners over all existing slab joints and holes. Infill holes and voids below mesh with grout prior to installing mesh.

Stagger mechanical fasteners at a maximum of 300 mm on centre.

- .5 Place concrete topping system, leveling course and heavy duty overlay, to Section 03 30 00.

END OF SECTION

PART 1 **GENERAL****1.1** **SECTION INCLUDES**

- .1 This section specifies the requirements for the concrete topping, including both the concrete leveling course and heavy-duty mortar topping.

1.2 **RELATED SECTIONS**

- .1 01 29 83 - Payment Procedures for Testing Laboratory Services.
- .2 Section 01 33 00 - Submittal Procedures.
- .3 Section 01 45 00 - Quality Control.
- .4 Section 03 10 00 - Concrete Forming and Accessories.
- .5 Section 03 35 00 - Concrete Finishing.

1.3 **REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
- .2 Canadian Standards Association (CSA)
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN3-A266.4, Guidelines for the Use of Admixtures in concrete.
 - .3 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .4 CSA-A3001, Cementitious Materials for Use in Concrete.

1.4 ACRONYMS AND TYPES

- .1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).
 - .1 Type GU or GUb - General use cement.

1.5 SUBMITTALS

- .1 Submit product data, including manufacturer's installation instructions, health and safety, MSDS, technical data, limitations, warranty, etc., for approval to Section 01 33 00.
- .2 At least 4 weeks prior to commencing work, inform Owner's Representative of proposed source of aggregates and provide access for sampling.
- .3 Submit testing results and reports for review by Owner's Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .4 Certificates:
 - .1 Minimum 4 weeks prior to starting concrete work submit to Owner's Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
 - .1 Portland cement.
 - .2 Blended hydraulic cement.
 - .3 Supplementary cementing materials.
 - .4 Grout.
 - .5 Admixtures.
 - .6 Aggregates.
 - .7 Water.
 - .8 Joint filler.
 - .2 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA-A23.1/A23.2.
 - .3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1/A23.2.

1.6 SOURCE QUALITY CONTROL

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

1.7 QUALITY ASSURANCE

- .1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures in accordance with Section 01 45 00 - Quality Control for Owner's Representative approval for following items:
 - .1 Hot weather concrete.
 - .2 Cold weather concrete.
 - .3 Curing.
 - .4 Finishes.
 - .5 Joints.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
 - .1 Modifications to maximum time limit must be agreed to Owner's Representative and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by Owner's Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .3 Waste Management and Disposal:
 - .1 Divert unused concrete materials from landfill to local facility approved by Owner's Representative.
 - .2 Provide an appropriate area on the job site where concrete trucks can be safely washed.
 - .3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official

hazardous material collections site as approved by the Owner's Representative.

- .4 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
- .5 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial and National regulations.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS - LEVELING COURSE

- .1 Bonding Agent: Weld-Crete by Larson Products Corp., or approved equal.
- .2 Portland cement: to CAN/CSA-A3001, Type GU.
- .3 Water: to CAN/CSA-A23.1.
- .4 Aggregates: to CSA-A23.1.
- .5 Coarse aggregates: normal density to CSA-A23.1/A23.2.
- .6 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixtures: to ASTM C494, Owner's Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .7 Proportion normal density concrete in accordance with CSA-A23.1/A23.2, Alternative 1 to give following quality and yield for all concrete.
 - .1 Minimum compressive strength at 28 days, to NBCC, Part 9: 32 MPa with 5 to 8 % air entrainment for concrete floor slab leveling course.

- .2 Class of exposure: C-2
- .3 Minimum cement content: 300 kg/m³ of concrete.
- .4 Nominal size of coarse aggregate: 10 mm.
- .5 Slump at time and point of discharge: 75 to 100 mm.

2.2 MORTAR TOPPING

- .1 Bonding Agent: Cem-Kote Barrier Cote 100, Gemite Products Inc., or approved equal, compatible with mortar topping.
- .2 Mortar Topping:
 - .1 Heavy duty, waterproof topping, Portland cement based, fibre-reinforced micro-silica modified material, shrinkage compensating mortar.
 - .2 Gem-Crete HDO Premix, Heavy Duty Overlay, by Gemite Products Inc., or approved equal.

PART 3 EXECUTION

3.1 PREPARATION

- .1 Obtain Owner's Representative approval before placing concrete. Provide seven (7) working days' notice prior to placing of concrete.
- .2 Install concrete forming and accessories to Section 03 10 00 - Concrete Forming and Accessories.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Owner's Representative approval of proposed method for

protection of concrete during placing and curing in adverse weather or temperatures.

3.2 CONSTRUCTION

- .1 Protect previous Work from staining.
- .2 Clean and remove stains prior to application for concrete finishes.
- .3 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .4 Do not place load upon new concrete until authorized by Owner's Representative.
- .5 Do cast-in-place concrete work in accordance with CSA-A23.1/A23.2.
- .6 Finishing.
 - .1 Finish concrete in accordance with CSA-A23.1/A23.2.
 - .2 Use procedures acceptable to Owner's Representative or those noted in CSA-A23.1/A23.2, to remove excess bleed water. Ensure surface is not damaged.
 - .3 Wet cure using polyethylene sheets placed over sufficiently hardened concrete to prevent damage. Overlap adjacent edges 150 mm and tightly seal with sand on wood planks. Weigh sheets down to maintain close contact with concrete during the entire curing period.
 - .4 Where burlap is used for moist curing, place two pre-wetted layers on concrete surface and keep continuously wet during curing period.
 - .5 Finish concrete floor to meet requirements of CSA-A23.1/A23.2.
 - .6 Concrete floor to have finish hardness equal or greater than Mohs hardness in accordance with CSA-A23.1/A23.2.
 - .7 Provide raked finish for interior floor slabs.
- .7 Joint fillers.

- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Owner's Representative.
- .2 When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .3 Locate and form, isolation, construction and expansion joints as indicated. Install joint filler.
- .4 Use 12 mm thick joint filler, unless otherwise indicated, to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

3.3 SITE TOLERANCE

- .1 Concrete slab tolerances in accordance with CSA-A23.1/A23.2, F-number Method, $F_F = 25$, $F_L = 20$.

3.4 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Owner's Representative in accordance with CSA-A23.1/A23.2, and Section 01 45 00 - Quality Control.
- .2 Owner's Representative will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services. Costs of retesting due to deficient work will be paid for by contractor, by credit change order.
- .3 Owner's Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .4 Non-destructive Methods for Testing Concrete shall be in accordance with CSA-A23.1/A23.2.
- .5 Provide Certificate of Field Quality Inspection and Testing to Owner's Representative for inclusion in Commissioning Manual.

- .6 Inspection or testing by Owner's Representative will not augment or replace Contractor quality control nor relieve the Contractor of his contractual responsibility.

END OF SECTION

PART 1 **GENERAL****1.1** **RELATED SECTIONS**

- .1 Section 03 10 00 - Concrete Forming and Accessories.
- .2 Section 01 51 00 - Temporary Utilities.
- .3 Section 01 61 00 - Common Product Requirements.
- .4 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .5 Section 03 30 00 - Cast-in-Place Concrete.

1.2 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.3 **PERFORMANCE REQUIREMENTS**

- .1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

1.4 **PRODUCT DATA**

- .1 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content.
- .2 Include application instructions for concrete floor treatment.

1.5 **ENVIRONMENTAL REQUIREMENTS**

- .1 Temporary lighting:
 - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.

.2 Electrical power:

- .1 Provide sufficient electrical power to operate equipment normally used during construction.

.3 Work area:

- .1 Make the work area water tight to protect against rain and detrimental weather conditions.

.4 Temperature:

- .1 Maintain ambient temperature of not less than 10°C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.

.5 Moisture:

- .1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.

.6 Safety:

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

.7 Ventilation:

- .1 Ventilate area of work as directed by Owner's Representative by use of approved portable supply and exhaust fans.
- .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
- .3 Provide continuous ventilation during and after product application.

PART 2 **PRODUCTS**

2.1 **CHEMICAL HARDENERS**

- .1 Water: potable.

2.2 **SEALING COMPOUNDS**

- .1 Surface sealer: to CAN/CGSB-25.20, Type 2 - water based.

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- .2 Surface sealers may not be manufactured or formulated with aromatic solvents formaldehyde halogenated solvents mercury lead cadmium hexavalent chromium and their compounds.

2.3 WET CURE

- .1 Clear polyethylene film to ASTM C171, minimum thickness 0.15 mm (6 mil).

2.4 MIXES

- .1 Mixing, ratios and application in accordance with manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verify that slab surfaces are ready to receive work and elevations are as indicated on drawings.

3.2 PREPARATION OF EXISTING SLAB

- .1 Prepare slab to Section 03 10 00.
- .2 Use protective clothing, eye protection, respiratory equipment during stripping of chlorinated rubber or existing surface coatings.

3.3 APPLICATION

- .1 After floor treatment is dry, seal expansion joints at junction with vertical surfaces with caulking/sealant.
- .2 Clean sealant from adjacent surfaces.

3.4 PROTECTION

- .1 Protect finished installation in accordance with manufacturer's instructions.

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 and Disposal.

1.2 **REFERENCES**

- .1 American Wood-Preservers' Association (AWPA)
 - .1 AWPA M2, Standard Inspection of Treated Wood Products.
 - .2 AWPA M4, Standard for the Care of Preservative-Treated Wood Products.
- .2 Canadian Standards Association (CSA)
 - .1 CSA O80 Series, Wood Preservation.

1.3 **CERTIFICATES**

- .1 For products treated with preservative or fire-retardant by pressure impregnation, submit following information certified by authorized signing officer of treatment plant:
 - .1 Information listed in AWPA M2 and revisions specified in CSA O80 Series, Supplementary Requirement to AWPA M2 applicable to specified treatment.
 - .2 Moisture content after drying following treatment with water-borne preservative, fire-retardant.
 - .3 Acceptable types of paint, stain, and clear finishes that may be used over treated materials to be finished after treatment.

1.4 **WASTE MANAGEMENT AND DISPOSAL**

- .1 Do not dispose of preservative treated wood through incineration.
- .2 Do not dispose of preservative treated wood with other materials destined for recycling or reuse.

- .3 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Owner's Representative.
- .4 Dispose of unused wood preservative material at official hazardous material collections site approved by Owner's Representative.
- .5 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other location where they will pose health or environmental hazard.

PART 2 **PRODUCTS**

2.1 **MATERIALS**

- .1 Preservative: to CAN/CSA-080 Series, stained finish.

PART 3 **EXECUTION**

3.1 **APPLICATION: PRESERVATIVE**

- .1 Treat lumber to CAN/CSA-080 Series.
- .2 Following water-borne preservative treatment, dry material to maximum moisture content of 19%.

3.2 **APPLICATION: FIELD TREATMENT**

- .1 Comply with AWPA M4 and revisions specified in CAN/CSA-080 Series, Supplementary Requirements to AWPA Standard M2.
- .2 Treat all field cuts with two (2) coats of clear copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.
- .3 Remove chemical deposits on treated wood to receive applied finish.

END OF SECTION

PART 1 **GENERAL****1.1** **RELATED SECTIONS**

- .1 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Section 06 05 73 - Wood Treatment.

1.2 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CSA B111, Wire Nails, Spikes and Staples.
 - .2 CSA 0112.9, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).
 - .3 CSA 0121, Douglas Fir Plywood.
 - .4 CAN/CSA-0141, Softwood Lumber.
 - .5 CSA 0151, Canadian Softwood Plywood.
 - .6 CAN/CSA-0325.0, Construction Sheathing.
- .2 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber.

1.3 **QUALITY ASSURANCE**

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

1.4 **SUBMITTALS**

- .1 Submit proof of compatibility between Alkaline Copper Quaternary (ACQ) pressure treated lumber and fasteners to be utilized.

PART 2 PRODUCTS**2.1 FRAMING AND LUMBER MATERIALS**

- .1 Lumber: unless specified otherwise, softwood, No. 1 or No. 2 grade, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Framing and board lumber: in accordance with NBC.
- .3 Furring, blocking, nailing strips, grounds, rough bucks, fascia backing and sleepers:
 - .1 Board sizes: "Standard" or better grade.
 - .2 Dimension sizes: "Standard" light framing or better grade.
 - .3 Post and timbers sizes: "Standard" or better grade.
- .4 Pressure treated material to be Alkaline Copper Quaternary (ACQ).

2.2 PANEL MATERIALS

- .1 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.0.
- .2 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .3 Canadian softwood plywood (CSP): to CSA O151, standard construction.

2.3 ACCESSORIES

- .1 Exterior wall sheathing paper/air barrier: to CAN/CGSB-51.32 single ply, spunbonded olefin type coated impregnated as indicated.
- .2 General purpose adhesive: to CSA O112.9.
- .3 Nails, spikes and staples: to CSA B111.

2.4 FASTENER FINISHES

- .1 Galvanizing: to ASTM A123/A123M, ASTM A653, use galvanized fasteners for exterior work, interior highly humid areas and fire-retardant treated lumber.

2.5 WOOD PRESERVATIVE

- .1 Surface-applied wood preservative: clear or copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

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 all material as indicated as follows:
 - .1 Wood fascia, backing, curbs, nailers.

3.2 INSTALLATION

- .1 Comply with requirements of NBC latest edition, Part 9 supplemented by following paragraphs.
- .2 Install members true to line, levels and elevations, square and plumb.
- .3 Construct continuous members from pieces of longest practical length.
- .4 Install spanning members with "crown-edge" up.
- .5 Select exposed framing for appearance. Install lumber and panel materials so that grade-marks and other

defacing marks are concealed or are removed by sanding where materials are left exposed.

- .6 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding electrical equipment mounting boards, and other work as required.
- .7 Install furring to support siding applied vertically where there is no blocking and where sheathing is not suitable for direct nailing.
 - .1 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .8 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .9 Install, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.

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 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

END OF SECTION

PART 1 **GENERAL****1.1** **RELATED WORK**

- .1 Section 01 45 00 - Quality Control.
- .2 Section 01 51 00 - Temporary Utilities.
- .3 Section 01 61 00 - Common Product Requirements.
- .4 Section 07 92 00- Joint Sealants.

1.2 **REFERENCES**

- .1 Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification.

1.3 **SUBMITTALS**

- .1 Submittals to Section 01 61 00.
- .2 Submit manufacturer's product data sheets.
- .3 Submit manufacturer's installation instructions.

1.4 **QUALITY ASSURANCE**

- .1 Perform work in accordance with Sealant and Waterproofer's Institute - Sealant and Caulking Guide Assurance program and 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 Manufacturer's Representative:
 - .1 Inspect substrate prior to commencement of work, twice during application of membrane and at commissioning to ascertain that air/vapour barrier system is installed according to membrane manufacturer's most current published specifications and details.

- .2 Provide technical assistance to applicator and assist where required in correct installation of membrane.
- .3 Provide certificate of quality compliance upon satisfactory completion of installation.
- .4 Maintain one copy of documents on site.

1.5 QUALIFICATIONS

- .1 Applicator: Company specializing in performing work of this section with minimum 5 years documented experience with installation of air/vapour barrier system. Complete installation must be approved by the material manufacturer.
- .2 Applicator: Company who is currently licensed by certifying organization must maintain their license throughout the duration of the project.

1.6 MOCK-UPS

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct typical panel, 10m² minimum, illustrating materials interface and seals.
- .3 Locate where directed.
- .4 Mock-up may remain as part of the Work.
- .5 Allow five (5) working days for inspection of mock-up by Owner's Representative before proceeding with air/vapour work.

1.7 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. Deliver membrane materials in factory wrapped packaging indicating name of manufacturer and product.

- .3 Avoid spillage. Immediately notify Owner's Representative if spillage occurs and start clean up procedures.
- .4 Clean spills and leave area as it was prior to spill.
- .5 Store roll materials on end in original packaging.
- .6 Store primers at temperature of 5° C and above to facilitate handling. Keep solvent away from open flame and excessive heat.

1.8 PROJECT ENVIRONMENTAL REQUIREMENTS

- .1 Do not install solvent curing sealants or vapour release adhesive materials in enclosed spaces without ventilation
- .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
- .3 Maintain temperature and humidity recommended by materials manufacturer before, during and after installation.

1.9 WARRANTY

- .1 Provide a written warranty for work of this section from manufacturer for failure due to defective materials for ten (10) years from the date of Substantial Completion.
- .2 Include coverage of installed sealant and sheet materials which fail to achieve watertight seal, exhibit loss of adhesive or cohesion or do not cure.

PART 2 PRODUCTS

2.1 SHEET MATERIALS THERMAL BARRIER AND AIR/VAPOUR BARRIER

- .1 Roof Underlay: Grace Ice and Water Shield, or approved Equal

2.2 SEALANTS

- .1 Sealants in accordance with Section 07 92 00 - Joint Sealants.
- .2 Primer: as recommended by membrane manufacturer.

PART 3 EXECUTION**3.1 EXAMINATION**

- .1 Verify that surfaces and conditions are ready to accept the work of this section.
- .2 Ensure all surfaces are clean, dry, sound, smooth, continuous and comply with membrane manufacturer's requirements.
- .3 Report any unsatisfactory conditions to the Owner's Representative in writing.
- .4 Do not start work until deficiencies have been corrected.

3.2 PREPARATION

- .1 Remove loose or foreign matter which might impair adhesion of materials.
- .2 Ensure all substrates are clean of oil or excess dust; all concrete surfaces free of large voids, spilled areas or sharp protrusions.
- .3 Ensure all substrates are free of surface moisture prior to application of 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.

3.3 INSTALLATION

- .1 Install materials in accordance with manufacturer's instructions.
- .2 Over the properly prepared substrate surface apply primer with a roller and allow drying to a tacky surface. Prime only area to be covered in a working day. Reprime area not covered with membrane within 24 hours.
- .3 After primer has dried, using a hand roller firmly press the entire membrane onto the primed surface in strict accordance with membrane manufacturer's written instructions.
- .4 Ensure complete coverage of and adhesion of all substrates to receive membrane, including wall penetrations. Co-operate with other trades to ensure continuity of the membrane.
- .5 Overlap membrane 50 mm and carefully smooth out with a roller to ensure full continuous bond throughout overlaps without fissures or fish-mouthing.
- .6 It is important that a complete water seal be achieved. Be responsible for the completeness of the membrane wherever it is not specifically detailed. Consult with Owner's Representative if there is any doubt as to the integrity of the membrane, whether detailed or not.
- .7 In order to ensure a complete seal, seal membrane to all penetrations in an approved manner.
- .8 Apply a trowelled bead of mastic to all terminations of the membrane at the end of a day's work.
- .9 Do not enclose membrane until it has been inspected and approved by Owner's Representative. Inform Owner's Representative four (4) working days prior to required inspection.

3.4 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.

3.5 INSPECTION

- .1 Carefully inspect for continuity of waterproofing prior to placement of drainage board.
- .2 Repair all deficient membrane areas.
- .3 Misaligned or inadequately lapped seams, punctures or other damage must be repaired with a patch of membrane extending 50 mm in all directions from edge of damaged areas.
- .4 Cover membrane immediately after Owner's Representative's inspection to protect from damage by other trades.

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 and Disposal.

1.2 **REFERENCES**

- .1 American Society for Testing and Materials, (ASTM).
 - .1 ASTM C553, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .2 ASTM C665, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .3 ASTM C1320, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
 - .4 ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.
- .2 Underwriters Laboratories of Canada (ULC).
 - .1 CAN/ULC-S702, Standard for Mineral Fibre Insulation.

1.3 **SUBMITTALS**

- .1 Submittals to Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

PART 2 **PRODUCTS****2.1** **INSULATION**

- .1 Thermal batt and blanket mineral fibre:

- .1 Unfaced glass fiber thermal insulation to ASTM C665 Type:I, thickness and RSI value as indicated on 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 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces as noted on drawings.
- .2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .3 Do not compress insulation to fit into spaces.
- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls and CSA B149.1 and CSA B149.2 Type B and L vents.
- .5 Do not enclose insulation until it has been inspected and approved by Owner's Representative.

3.3 CLEANING

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

END OF SECTION

PART 1 **GENERAL****1.1** **RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .3 Section 01 45 00 - Quality Control.
- .4 Section 01 51 00 - Temporary Utilities.
- .5 Section 07 26 00 - Vapour Barrier

1.2 **REFERENCES**

- .1 Canadian Urethane Foam Contractors' Association Inc. (CUFCA)
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101, Fire Endurance Tests of Building Construction and Materials.
 - .2 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.
 - .3 CAN/ULC-S705.1, Standard for Thermal Insulation Spray Applied Rigid Foam, Medium Density, Material Specification.
 - .4 CAN/ULC-S705.2, Standard for Thermal Insulation Spray Applied Rigid Foam, Medium Density, Installer's Responsibilities-Specification.

1.3 **TEST REPORTS**

- .1 Submit test reports, verifying qualities of foam sealant meet or exceed requirements of this specification.
- .2 Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.

1.4 **QUALITY ASSURANCE**

- .1 Applicators to conform to CUFCA Quality Assurance Program.

1.5 SAFETY REQUIREMENTS

- .1 Protect workers as recommended by CAN/ULC-S705.2 and manufacturer's recommendations:
 - .1 Workers must wear gloves, respirators, dust masks, eye protection, protective clothing when applying foam sealant.
 - .2 Workers must not eat, drink or smoke while applying foam sealant.

1.6 PROTECTION

- .1 Ventilate area in accordance with Section 01 51 00 - Temporary Utilities.
- .2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24 hours after application to maintain non-toxic, unpolluted, safe working conditions.
- .3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.
- .4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.
- .5 Dispose of waste foam sealant daily.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Apply foam sealant only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

PART 2 PRODUCTS**2.1 MATERIALS**

- .1 Low expanding, one-component, polyurethane foam sealant, curing to a semi-rigid, closed cell urethane foam providing a RSI of 0.9 per 25.4 mm. To meet the following physical properties:
 - .1 Density: 25.7 kg/m³
 - .2 Compressive Strength Parallel @ 10%: 69-96 psi

- .3 Tensile Strength: 103 psi
- .4 Water Vapour Transmission: 5.97 perms
- .5 Flame Spread: 20
- .6 Smoke Development: 70

PART 3 **EXECUTION**

3.1 **APPLICATION**

- .1 Apply foam sealant to clean surfaces in accordance manufacturer's printed instructions. Surfaces to be free of dust, dirt, oil and other foreign materials.
- .2 Cover surfaces not intended to be foamed.
- .3 Apply foam sealant to perimeter of all openings, such as doors and windows and other exterior wall penetrations, and to thickness as recommended by manufacturer and so as to completely fill cavity. Trim excess cured foam from finished area.
- .4 Cover exposed urethane foam sealants to protect from adverse affects from ultraviolet light (sunlight).

END OF SECTION

PART 1 GENERAL**1.1 SECTION INCLUDES**

- .1 Materials and installation methods providing primary air/vapour barrier materials and assemblies.
- .2 Air/vapour barrier materials to provide continuous seal between components of building envelope and building penetrations.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 45 00 - Quality Control.
- .3 Section 01 51 00 - Temporary Utilities.
- .4 Section 01 61 00 - Common Product Requirements.
- .5 Section 07 92 00 - Joint Sealants.

1.3 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.13M, Sealing Compound, One Component, Elastomeric Chemical Curing.
 - .2 CAN/CGSB-19.18M, Sealing Compound, One Component, Silicone Base Solvent Curing.
 - .3 CAN/CGSB-19.24M, Multi-Component, Chemical Curing Sealing Compound.
 - .4 CGSB 19-GP-14M, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
- .2 National Building Code of Canada (NBCC)
 - .1 NBCC, Part 5 - Environmental Separation
- .3 Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification.

1.4 SUBMITTALS

- .1 Submittals to Section 01 33 00.

- .2 Submit manufacturer's product data sheets.
- .3 Submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

- .1 Perform Work in accordance with Sealant and Waterproofing 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.

1.6 MOCK-UP

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct typical panel, 10 m² minimum, incorporating wall openings, insulation, building corner condition, illustrating materials interface and seals.
- .3 Locate where directed.
- .4 Mock-up may remain as part of the Work.
- .5 Allow five (5) working days for inspection of mock-up by Owner's Representative before proceeding with air/vapour barrier Work.

1.7 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. Deliver membrane materials in factory wrapped packaging indicating name of manufacturer and product.

1.8 PROJECT ENVIRONMENTAL REQUIREMENTS

- .1 Maintain temperature and humidity recommended by materials manufacturers before, during and after installation.

1.9 WARRANTY

- .1 Provide a written warranty for work of this section from Manufacturer for failure due to defective materials for ten (10) years respectively from the date of Substantial Completion.
- .2 Include coverage of installed sealant and sheet materials which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion or do not cure.

PART 2 PRODUCTS**2.1 AIR BARRIER APPLIED TO EXTERIOR WALL SHEATHING**

- .1 For application to Warehouse and Field Office.
- .2 Spunbonded olefin type coated impregnated sheathing paper to CAN/CGSB-51.32 single ply, as indicated.
- .3 Tyvek by Dupont, or approved equal.

2.2 AIR BARRIER APPLIED TO EXTERIOR CONCRETE WALL

- .1 For application to Fuel Storage Building.
- .2 Self-adhered, water resistive air barrier consisting of SBS rubberized asphalt compound integrally laminated to thermoplastic film surface, as indicated.
- .3 Blueskin SA by Henry, or approved equal.
- .4 Primer: Blueskin Adhesive, Blueskin LVC Adhesive or Aquatic, and as recommended by manufacturer, by Henry, or approved equal.
- .5 Grout: Sika 212, or approved equal.

2.3 SEALANTS

- .1 Sealants to Section 07 92 00 - Joint Sealants, or as recommended by manufacturer.

PART 3 EXECUTION**3.1 EXAMINATION**

- .1 Ensure all surfaces are clean, dry, sound, smooth, continuous and comply with air barrier manufacturer's requirements.
- .2 Report any unsatisfactory conditions to the Owner's Representative in writing.
- .3 Do not start work until deficiencies have been corrected.

3.2 PREPARATION

- .1 Remove existing lead based-paint from Fuel Storage Building concrete walls. Concrete surface to be smooth and without large voids, spalled areas or sharp protrusions. Repair voids and spalled areas with grout. Remove sharp edges/protrusions.
- .2 Inspect wall sheathing on Field Office and Warehouse and verify sheathing is not deteriorated and advise Departmental Representative of unsuitable conditions.
- .3 Verify that surfaces and conditions are ready to accept the Work of this section.
- .4 Ensure all substrates are free of surface moisture prior to application of membrane and primer.

3.3 INSTALLATION (SHEET MEMBRANE)

- .1 Install materials in accordance with manufacturer's instructions.
- .2 Ensure complete coverage of all substrates to receive membrane, including wall penetrations. Co-operate with other trades to ensure continuity of membrane.
- .3 Overlap membrane 50mm and carefully smooth out with a roller to ensure full continuous bond throughout overlaps without fissures or fish-mouthing.
- .4 It is important that a complete air seal be achieved. Be responsible for the completeness of membrane wherever it is not specifically detailed. Consult with Owner's Representative if there is any doubt as

to the integrity of membrane, whether detailed or not.

- .5 In order to ensure a complete seal, seal membrane to all penetrations in an approved manner.
- .6 Do not enclose membrane until it has been inspected and approved by Owner's Representative. Inform Owner's Representative five (5) working days prior to required inspection.

3.4 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.

3.5 INSPECTION

- .1 Carefully inspect for continuity of air barrier prior to placement of subsequent materials/products.
- .2 Repair all deficient membrane areas.
- .3 Misaligned or inadequately lapped seams, punctures or other damage must be repaired with a patch of air barrier membrane extending 50mm in all directions from edge of damaged areas.
- .4 Cover membrane immediately after Owner's Representative's inspection to protect from damage by other trades.

END OF SECTION

PART 1 GENERAL**1.1 SECTION INCLUDES**

- .1 Materials, removal and installation of fiberglass-reinforced asphalt shingles and roof underlay.

1.2 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 07 13 26 - Roof Underlay.
- .5 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .6 Section 01 78 00 - Closeout Submittals.
- .7 Section 07 62 00 - Sheet Metal Flashing and Trim.

1.3 REFERENCES

- .1 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-37.4, Fibrated, Cutback Asphalt, Lap Cement for Asphalt Roofing.
 - .2 CAN/CGSB-37.5, Cutback Asphalt Plastic Cement.
- .2 Canadian Roofing Contractors' Association (CRCA).
 - .1 CRCA Roofing Specification Manual.
- .3 Canadian Standards Association (CSA).
 - .1 CAN/CSA-A123.1/A123.5, Asphalt Shingles Made from Organic Felt and Surfaced With Mineral Granules/Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules.
 - .2 CAN3-A123.51, Asphalt Shingle Application on Roof Slopes 1:3 and Steeper.
 - .3 CAN3-A123.52, Asphalt Shingle Application on Roof Slopes 1:6 to Less Than 1:3.
 - .4 CSA B111, Wire Nails, Spikes and Staples.

1.4 SUBMITTALS

- .1 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures.
- .2 Submit product data sheets for asphalt shingles. Include:
 - .1 Product characteristics.
 - .2 Performance criteria.
 - .3 Installation instructions.
 - .4 Limitations.
 - .5 Colour and finish.
- .3 Submit duplicate samples of full size specified shingles, if requested.

1.5 DELIVERY, STORAGE AND HANDLING

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

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Place materials defined as hazardous or toxic in designated containers.
- .2 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .3 Use the least toxic sealants, and adhesives necessary to comply with requirements of this section.
- .4 Close and seal tightly. Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .5 Place used hazardous sealant tubes and adhesive containers in areas designated for hazardous materials.

1.7 WARRANTY

- .1 Provide a written guarantee, signed and issued in the name of the owner, stating the fiberglass-reinforced asphalt shingles shall remain free from defects in materials and workmanship for a period of twenty-five (25) years from the date of Substantial Completion.

PART 2 PRODUCTS**2.1 MATERIALS**

- .1 Fiberglass-reinforced asphalt shingles: to CSA A123.1/A123.5.
 - .1 Type: self-seal, standard, pattern rectangular
 - .2 Mass: minimum 33 kg/3m²
 - .3 Colour: as selected by Owner's Representative
- .2 Roofing underlayment: to Section 07 13 26.
- .3 Cement: Plastic cement: to CAN/CGSB-37.5.
- .4 Nails: to CSA B111, of galvanized steel, sufficient length to penetrate 19 mm into deck.

PART 3 EXECUTION**3.1 REMOVAL OF EXISTING ROOFING**

- .1 Remove existing roofing, flashings and underlay, and expose sheathing or shingle lath of roof.
- .2 Withdraw existing shingle and flashing nails, set those which break off. Leave surfaces free from dirt and loose material.
- .3 Owner's Representative to inspect roof sheathing. Take up, cut out, portion of sheathing boards affected by fungal or insect attack as directed on site by Owner's Representative.
- .4 Replace cut out portions of sheathing or lath with sheathing of equal sectional dimensions, and specified grade. Seat each end of board on rafter/truss, with 25mm bearing, and secure to rafter/truss.

3.2 APPLICATION

- .1 Do fiberglass-reinforced asphalt shingle work in accordance with CAN3-A123.51/CAN3-A123.52, NBC/CRCA Specification, except where specified otherwise.
- .2 Install layer of self-adhesive roof underlayment over the entire roof area.
- .3 Install drip edge along eaves, overhanging 12 mm, with minimum 50 mm flange extending onto roof decking. Nail to deck at 400 mm oc.
- .4 Install bottom step flashing (soaker base flashing) interleaved between shingles at vertical junctions.
- .5 Install fiberglass-reinforced asphalt shingles on roof slopes 1:3 and steeper in accordance with CAN3-A123.51 supplemented as follows:
- .6 Install fiberglass-reinforced asphalt shingles on roof slopes 1:6 to less than 1:3 in accordance with CAN3-A123.52 supplemented as follows.

3.3 PROTECTION

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

END OF SECTION

PART 1 GENERAL**1.1 RELATED SECTIONS**

- .1 Section 01 61 00 - Common Product Requirements
- .2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .3 Section 06 10 00 - Rough Carpentry.
- .4 Section 07 62 00 - Sheet Metal Flashing and Trim.
- .5 Section 07 92 00 - Joint Sealants.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A135.6, Hardboard Siding Standard.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3, Hardboard.
 - .2 CAN/CGSB-11.5, Hardboard, Pre-coated, Factory Finished, for Exterior Cladding.
 - .3 CAN/CGSB-11.6, Installation of Exterior Hardboard Cladding.
- .3 Canadian Standards Association (CSA)
 - .1 CSA B111, Wire Nails, Spikes and Staples.
- .4 National Lumber Grading Authority (NLGA)
 - .1 NLGA Standard Grading Rules for Canadian Lumber.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
 - .2 Submit copies of WHMIS MSDS - Material Safety Data Sheets. Indicate VOC's for caulking materials during application and curing.
- .2 Submit duplicate 300 x 300 mm size profile specified.

- .3 Submit manufacturer's installation instructions.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver siding suitable packaged to avoid damage to finished surface.
- .3 Store in an unheated structure or under cover until application. Siding may be temporarily stored outside if at least 4 inches off the ground and on a flat, well drained surface protected from moisture with a shed pack or waterproof cover.

1.5 QUALITY ASSURANCE

- .1 Provide Certificate of Quality Compliance from siding manufacturer upon completion of fabrication.
- .2 Provide Certificate of Quality Compliance upon satisfactory completion of installation.

1.6 WARRANTY

- .1 Warranty Period: 15 years against cracking, peeling, blistering, chalking, loss of coating adhesion, yellowing with age, and no damage caused by rinse cleaning surface dirt. Warranty to commence at date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Clapboard Siding: Cape Cod prefinished wood siding, or approved equal; color as selected by Owner; sizes and profile of siding and trims as indicated on drawings; Western Lodgepole Pine, No. 1 select or better grade, factory finished, saw texture, free of large knots, knot holes, or loose knots; maximum moisture content of 15 percent.
- .2 Moldings and trim: Cape Cod prefinished wood siding, or approved equal; color as selected by

Owner; sizes as indicated on drawings; Western Lodgepole Pine, No. 1 select or better grade, factory finished same as siding.

- .3 Strapping: Softwood Lumber, pressure treated, as indicated on drawings.
- .4 Nails: stainless steel, length as recommended by siding manufacturer, double nailed, color matched to siding
- .5 Sealant: Thermoplastic type, color to exactly match siding.
- .6 Concealed Flashings: 0.4 mm thick galvanized steel to Section 07 62 00.

2.2 FINISH

- .1 Pre-finish color: Thermoplastic acrylic latex emulsion, factory coated under controlled environment conditions by a modified vacuum coat method, one prime coat and one finish coat, applied to all board surfaces, minimum 0.15 mm dry film thickness.
 - .1 Standard color or custom color from manufacturer's range of colors.
 - .2 Touch-Up Paint: Thermoplastic acrylic latex emulsion, same type and color as siding.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verify that substrate surfaces and wall openings are ready to receive work.

3.2 PREPARATION

- .1 Install flashing continuous over window and other openings. Secure in position tight to wall sheathing.
- .2 Install one layer of air barrier horizontally on sheathed walls, weather lap edges and ends minimum 150 mm. Stagger vertical laps. Tape all edges.

- .3 Install pressure-treated strapping at 406 mm o.c. Treat all field cuts.
- .4 Install starter strips behind first row of siding.
- .5 Apply sealant around window, door and other opening frames.

3.3 **INSTALLATION**

- .1 Install siding and accessories to manufacturer's instructions and NBCC.
- .2 Install screen at bottom of base trim.
- .3 Install siding for natural watershed.
- .4 Install siding in straight aligned lengths, set level with plumb ends and corners.
- .5 Paint all field cuts to manufacturer's instructions.
- .6 Achieve siding joints no less than 800 mm apart in adjoining boards and distribute evenly over wall surface.
- .7 Miter external and internal corners. Install corner boards, closures, frieze boards, skirt boards and trim.
- .8 Fasten siding securely to wood batten substrate.
- .9 Face nail 25 mm from bottom of siding board directly into wood strapping, drive nail head just flush with siding surface; do not indent or penetrate painted coating.
- .10 Caulk all seams, joints between siding and corner/trim boards per manufacturer's instructions with color-matching caulking. Clean off excess caulking.

3.4 INCIDENTAL SITE FINISHING

- .1 Carefully set exposed nails flush with siding coating.
- .2 Touch-up blemished siding materials to match siding color.

3.5 CLEANING

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

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 and Disposal.
- .3 Section 06 10 00 - Rough Carpentry.
- .4 Section 07 92 00 - Joint Sealants.

1.2 REFERENCES

- .1 The Aluminum Association Inc. (AA)
 - .1 Aluminum Sheet Metal Work in Building Construction.
 - .2 AA DAF45, Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A792/A792M, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .3 ASTM D523, Standard Test Method for Specular Gloss.
 - .4 ASTM D822, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .3 Canadian General Standards Board (CGBS)
 - .1 CAN/CGSB-37.5, Cutback Asphalt Plastic Cement.
- .4 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA B111, Wire Nails, Spikes and Staples.

1.3 SAMPLES

- .1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, colour and finish.

PART 2 PRODUCTS**2.1 SHEET METAL MATERIALS**

- .1 Aluminum-zinc alloy coated steel sheet: to ASTM A792/A792M, commercial quality, grade 33 with AZ150 coating, regular spangle surface, 0.60 mm base metal thickness. Pre-painted to CGSB -GP-71.

2.2 PREFINISHED STEEL SHEET

- .1 Prefinished sheet with factory applied polyvinylidene fluoride.
 - .1 Class F1S
 - .2 Colour as selected by Owner's Representative from manufacturer's standard range.
 - .3 Specular gloss: 30 units +/- 5 in accordance with ASTM D523.
 - .4 Coating thickness: not less than 22 micrometres.
 - .5 Resistance to accelerated weathering for caulk rating of 8, colour fade 5 units or less and erosion rate less than 20 % to ASTM D822 as follows:
 - .1 Outdoor exposure period 2500 hours.
 - .2 Humidity resistance exposure period 5000 hours.

2.3 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CAN/CGSB 37.5.
- .3 Underlay for metal flashing: to Section 07 13 26.
- .4 Sealants: to Section 07 92 00.
- .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 metal flashing application.
- .7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .8 Touch-up paint: as recommended by prefinished material manufacturer.

2.4 FABRICATION

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

2.5 METAL FLASHINGS

- .1 Form flashings, copings and fascia to profiles indicated of 0.60 mm thick prefinished steel.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install sheet metal work in accordance with CRCA FL series details and 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 S-lock forming tight fit over hook strips, as detailed.
- .5 Lock end joints and caulk with sealant.

END OF SECTION

PART 1 **GENERAL****1.1** **RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 07 92 00 - Joint Sealants.

1.2 **DESIGN REQUIREMENTS**

- .1 Quantity of vents as indicated on drawings based on NBCC requirements for minimum Net Free Area (NFA).

1.3 **SUBMITTALS**

- .1 Indicate size and description of components, materials, attachment devices, description of frame and finish, and construction details.
- .2 Submit manufacturer's printed product literature, specifications, installation instructions and data sheet.

1.4 **CLOSEOUT SUBMITTALS**

- .1 Provide maintenance data for vents complete with details, spare parts lists, maintenance requirements and practices for incorporation into manual specified in 01 78 00 - Closeout Submittals.

PART 2 **PRODUCTS****2.1** **VENTS**

- .1 Roof Vent: quantity and location as indicated on drawings, CSA Approved, lifetime limited warranty, 60 in² NFA, black, High Impact Resin Square-Top Roof Louver Vent, Model RT65 by Master Flow, or approved equal.
- .2 Soffit Vent: quantity and location as indicated on drawings, screened aluminum, 65 in² NFA, white, Model EAC16X8 by Master Flow, or approved equal.

PART 3 **EXECUTION****3.1** **INSTALLATION**

- .1 Erect components plumb, level and in proper alignment.
- .2 Ensure continuity of building envelope.
- .3 Adjust and seal assembly with provision for expansion and contraction of components.
- .4 Install per Manufacturer's instructions.
- .5 Remove existing roof and soffit materials, plywood/board/shingles, to provide air flow through vents.
- .6 For Warehouse, ensure air flow is unrestricted through soffit into attic. Remove/relocate existing insulation batts. Do not install new batts such that air flow will be restricted.

3.2 **CLEANING**

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

END OF SECTION

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 C834, Standard Specification for Latex Sealants.
 - .2 ASTM C882, Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
 - .3 ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications.
 - .4 ASTM C920, Standard Specification for Elastomeric Joint Sealants.
 - .5 ASTM C1330, Standard Specification for Cylindrical Sealant Backing for use with Cold Liquid Applied Sealants.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.21, Sealing and Bedding Compound Acoustical.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act (TDGA).

1.3 SUBMITTALS

- .1 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.
 - .4 Installation instructions, surface preparation and product limitations.
- .2 Manufacturers' instructions to include installation instructions for each product used.

1.4 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 joints complete with back-up material, primer, caulking and sealant. Mock-up may be part of finished work.
- .3 Allow four(4) working days for inspection of mock-up by Owner's Representative before proceeding with sealant work.
- .4 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
- .5 When accepted, mock-up will demonstrate minimum standard of quality required for this 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.

- .3 Condition products to approximately 16 to 20 degrees C for use in accordance with manufacturer's recommendations.
- .4 Handle all products with appropriate precautions and care as stated on the Material Safety Data Sheet.

1.6 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°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.

PART 2 PRODUCTS

2.1 SEALANT MATERIALS

- .1 Sealants and Caulking compounds must:
 - .1 Meet or exceed all applicable governmental and industrial safety and performance standards; and
 - .2 Be manufactured and transported in such a manner that all steps of the process, including the disposal of waste products arising therefrom, will meet the requirements of all applicable governmental acts, by laws and regulations including, for facilities located in Canada, the Fisheries Act and the Canadian Environmental Protection Act (CEPA).

- .2 Sealant and caulking compounds must not be formulated or manufactured with: aromatic solvents, fibrous talc or asbestos, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium, barium or their compounds, except barium sulphate.
- .3 Sealant and caulking compounds must not contain a total of volatile organic compound (VOC's) in excess of 100 grams per litre as calculated from records of the amounts of constituents used to make the product.
- .4 Sealant and caulking compounds must be accompanied by detailed instructions for proper application so as to minimize health concerns and maximize performance, and information describing proper disposal methods.
- .5 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .6 When low toxicity caulks are not possible, confine usage to areas which off-gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off-gas time.
- .7 Where sealants are qualified with primers use only these primers.
- .8 Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Board for Joint Sealants. Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Single component, low odor, moisture cure, medium modulus, low VOC sealant for use in sealing air/vapour barrier penetrations, to ASTM C920, Type S, Grade NS, Class 35.
 - .1 ASTM C719: $\pm 35\%$.
 - .2 Ultimate Elongation: 450 - 550%.
 - .3 Modulus, 100%: 275 - 345 kPa.
 - .4 Shore A Hardness: 25 ± 5 .
 - .5 Tensile Strength: 1034 - 1378 kPa.

- .6 Maximum VOC: 5 g/L.
- .2 Single component, medium modulus, high-performance, neutral-cure silicone sealant for general purpose exterior use, to ASTM C920, Type S, Grade NS, Class 35, Use NT, M, A and O.
 - .1 ASTM C719: $\pm 25\%$.
 - .2 Ultimate Elongation: 550%.
 - .3 Modulus, 50% extension: 380 kPa.
 - .4 Shore A Hardness: 25 ± 5 .
 - .5 Tensile Strength: 1240 kPa.
 - .6 Maximum VOC: 35 g/L.
 - .7 Colour to be selected from manufacturer's standard range.
- .3 Single component, low modulus, neutral-cure silicone sealant for general purpose masonry use, to ASTM C920, Type S, Grade NS, Class 50, Use T, NT, M, G, A and O.
 - .1 ASTM C719: $\pm 50\%$.
 - .2 Ultimate Elongation: 1600%.
 - .3 Modulus, 50% extension: 193 kPa.
 - .4 Shore A Hardness: 15.
 - .5 Tensile Strength: 690 kPa.
 - .6 Maximum VOC: 22 g/L.
 - .7 Colour to be selected from manufacturer's standard range.
- .4 Two-component, high modulus, neutral-cure flexible silicone rubber sealant for use with aluminum window and curtain wall fabrication, assembly and glazing installation, to ASTM C1184 and ASTM C920, Type M, Grade NS, Class 12 $\frac{1}{2}$, Use NT.
 - .1 ASTM C719: $\pm 25\%$.
 - .2 Ultimate Elongation: 120%.
 - .3 Shore A Hardness: 30 - 40.
 - .4 Tensile Strength: 2000 kPa.
 - .5 Maximum VOC: < 18 g/L.
- .5 Single component, medium modulus, neutral-cure silicone sealant for general roofing applications, to ASTM C920, Type S, Grade NS, Class 50, Use NT, G, A and O.
 - .1 ASTM C719: $\pm 50\%$.

- .2 Shore A Hardness: 35.
- .3 Tensile Strength: 415 kPa.
- .4 Maximum VOC: 28 g/L.
- .5 Colour to be selected from manufacturer's standard range.
- .6 Single component, chemical cure, silicone rubber sealant, for use with plumbing fixtures, showers, sinks, tubs, and junction of counter tops and adjacent wall finishes, to ASTM C920, Type S, Grade NS, Class 25, Use NT.
 - .1 Shore A Hardness: 25.
 - .2 Tensile Strength: 2100 kPa.
 - .3 Maximum VOC: 36 g/L.
 - .4 Colour to be selected from manufacturer's standard range.
- .7 Single component, high-performance, elastomeric polyurethane sealant, paintable, for general purpose interior use, to ASTM C920, Type S, Grade NS, Class 35, Use NT, M, A, T, O and I.
 - .1 ASTM C719: 35%.
 - .2 Ultimate Elongation: 800%.
 - .3 Shore A Hardness: 25 - 30.
 - .4 Tensile Strength: 2400 kPa.
 - .5 Maximum VOC: 35 g/L.
 - .6 Colour to be selected from manufacturer's standard range.
- .8 Single component, non-skinning, non-hardening, synthetic rubber sealant for use in acoustical applications, to CAN/CGSB 19.21.
 - .1 Shrinkage: maximum 20%.
 - .2 Maximum VOC: 53 g/L.
 - .3 Sag: Maximum 4.0 mm.
- .9 Two-component, non-sag, tamper resistant, elastomeric polyurethane sealant, for use in interior joints, penetrations, doors, windows, perimeters of fixtures, where a flexible security sealant is required due to idle tampering or vandalism, to ASTM C920, type M, Grade NS, Class 12.5, Use T₁, M and O.
 - .1 Ultimate Elongation: 175 - 200%.

- .2 Shore A Hardness: 40 - 45.
- .3 Tensile Strength: 2000 to 2400 kPa.
- .4 Maximum VOC: Activator - < 25 g/L, Base - < 100 g/L.
- .5 Colour to be selected from manufacturer's standard range.

2.3 ACCESSORIES

- .1 Primer: Type as recommended by sealant manufacturer. Primer to be compatible with joint forming materials.
- .2 Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer and compatible with joint forming materials.
- .3 Preformed Compressible and Non-Compressible back-up materials.
 - .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
 - .1 Extruded closed cell foam backer rod.
 - .2 Size: oversize 30 to 50 %.
 - .2 Neoprene or Butyl Rubber.
 - .1 Round solid rod, Shore A hardness 70.
 - .3 High Density Foam.
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
 - .4 Bond Breaker Tape.
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

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 All joint forming materials to be primed prior to sealant installation.
- .6 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.

3.7 CLEANING

- .1 Clean adjacent surfaces immediately and leave Work neat and clean.
- .2 Remove excess and droppings, using recommended cleaners as work progresses.

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 and Disposal.
- .3 Section 01 78 00 - Closeout Submittals.
- .4 Section 07 21 20 - Low Expanding Foam Sealant.
- .5 Section 07 92 00 - Joint Sealants.

1.2 **REFERENCES**

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-79.1, Insect Screens.
- .2 Canadian Standards Association (CSA)
 - .1 CSA-A440-00/A440.1, A440, Windows / Special Publication A440.1, User Selection Guide to CSA Standard A440, Windows.
 - .2 CAN/CSA-Z91, Health and Safety Code for Suspended Equipment Operations.

1.3 **SUBMITTALS**

- .1 Indicate materials and details in scale full size for head, jamb and sill, profiles of components, interior and exterior trim. Junction between combination units, elevations of unit, anchorage details, location of isolation coating, description of related components and exposed finishes fasteners, and caulking. Indicate location of manufacturer's nameplates.
- .2 Shop drawings to include continuation of air barrier and vapour barrier between wall assembly and vinyl window.
- .3 Include frame, sash, sill, glazing and weatherproofing method, insect screens, surface finish and hardware. Show location of manufacturer's nameplates.

1.4 TEST REPORTS

- .1 Submit test reports from approved independent testing laboratories, certifying compliance with specifications, for:
 - .1 Windows classifications
 - .2 Air tightness
 - .3 Water tightness
 - .4 Wind load resistance
 - .5 Condensation resistance
 - .6 Forced entry resistance
 - .7 Insect screens
 - .8 Glazing
 - .9 Safety drop - vertical sliding windows only
 - .10 Ease of operation - windows with operable lights
 - .11 Sash pull-off - vinyl windows

1.5 WARRANTY

- .1 Provide a written warranty for work under this Section from Manufacturer for failure due to defective materials and workmanship for thirty (30) years from the date of Substantial Completion.

1.6 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for windows for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

PART 2 PRODUCTS**2.1 MATERIALS**

- .1 Materials: to CSA-A440/A440.1 supplemented as follows:
- .2 All vinyl windows by same manufacturer.
- .3 Sash: vinyl.
- .4 Main frame: vinyl, thermally broken.
- .5 Screens: to CAN/CGSB-79.1.
 - .1 Insect screening mesh: count 18 x 14

- .2 Fasteners: tamper proof
- .3 Screen frames: aluminum, colour to match window frames
- .4 Mount screen frames for exterior replacement.
- .5 Provide full insect screens to cover entire window

2.2 WINDOW TYPE AND CLASSIFICATION

- .1 Types:
 - .1 To match existing in size and operation and as follows:
 - .1 Select Single Slider by Peter Kohler, or approved equal.
 - .2 Color by Owner.
 - .3 Glass: double glazed, clear.
 - .4 Screens: on all operable units.
- .2 Classification rating: to CSA-A440/A440.1 for various regions of Newfoundland and Labrador as follows:
 - .1 Bonavista A3, B6, C3, I40, F1, S1
- .3 Energy ratings: windows to be Energy Star certified to Natural Resources Canada Climate Zones for various regions of Newfoundland and Labrador as follows:
 - .1 Island Region (Except northern part Northern Peninsula)
 - .1 Zone 2 (≥ 3500 to <6000 HHDs)

2.3 FABRICATION

- .1 Fabricate in accordance with CSA-A440/A440.1 supplemented as follows:
- .2 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement of 1800 mm or less and plus or minus 3.0 mm for units with a diagonal measurement over 1800 mm.
- .3 Face dimensions detailed are maximum permissible sizes.
- .4 Brace frames to maintain squareness and rigidity during shipment and installation.

2.4 VINYL FINISHES

- .1 Vinyl finishes: in accordance with CSA-A440/A440.1, including appendices.

2.5 HARDWARE

- .1 Hardware:
 - .1 stainless steel or white bronze trimline camlocks to provide security and permit easy operation of units.
 - .2 Counter balance: stainless steel coil balance hardware.

2.6 AIR BARRIER AND VAPOUR RETARDER

- .1 Provide low expanding, single component polyurethane foam sealant installed at head, jamb and sill perimeter of window for sealing to building air barrier, vapour retarder and window frame. Foam sealant width to be adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder foam interior. Refer to Section 07 21 20 - Low Expanding Foam Sealant.

PART 3 EXECUTION**3.1 WINDOW INSTALLATION**

- .1 Install in accordance with CSA-A440.
- .2 Arrange components to prevent abrupt variation in colour.
- .3 Install shims between windows and building frame at each installation screw location. Shim and fasten windows in accordance with manufacturer's recommendations and CAN/CSA A440.4.

3.2 CAULKING

- .1 Seal joints between windows and window sills with sealant. Caulk between sill upstand and window-frame. Caulk butt joints in continuous sills.
- .2 Apply sealant in accordance with Section 07 92 00 - Joint Sealants. Conceal sealant within window units

except where exposed use is permitted by Owner's
Representative.

END OF SECTION

PART 1 **GENERAL****1.1** **SECTION INCLUDES**

- .1 Moisture testing of substrates.
- .2 Surface preparation of substrates as required for acceptance of paint, including cleaning, small crack repair, patching, caulking, and making good surfaces and areas to limits defined under MPI Repainting Maintenance Manual requirements.
- .3 Specific pre-treatments noted herein or specified in the MPI Repainting Maintenance Manual.
- .4 Sealing/touch-up, spot priming, and/or full priming surfaces for repainting in accordance with MPI Repainting Maintenance Manual requirements.

1.2 **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.
- .5 Section 01 78 00 - Closeout Submittals.
- .6 Section 09 91 23.01 - Interior Re-Painting.

1.3 **REFERENCES**

- .1 Maintenance Repainting Manual by the Master Painters Institute (MPI), including Identifiers, Evaluation, Systems, Preparation and Approved Product List.
- .2 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).
- .3 National Fire Code of Canada.

1.4 QUALITY ASSURANCE

- .1 Contractor shall have a minimum of five years proven satisfactory experience. Provide a list of last three comparable jobs including, job name and location, specifying authority, and project manager.
- .2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with applicable trade regulations.
- .3 Conform to latest MPI requirements for exterior repainting work including cleaning, preparation and priming.
- .4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with the latest edition of the MPI Approved Product List and shall be from a single manufacturer for each system used.
- .5 Paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Maintenance Repainting Manual and shall be compatible with other coating materials as required.
- .6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Owner's Representative
- .7 Standard of Acceptance: When viewed using natural prevailing sunlight at peak period of the day (mid-day) on surface viewed, surfaces shall indicate the following:
 - .1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.
 - .2 Soffits: No defects visible from grade at 45° to surface.
 - .3 Final coat to exhibit uniformity of colour and sheen across full surface area.

1.5 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

- .1 Provide paint products meeting MPI "Environmentally Friendly" E2 or E3 ratings based on VOC (EPA Method 24) content levels.

1.6 SCHEDULING OF WORK

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

1.7 SUBMITTALS

- .1 Submit full range colour sample chips for review and selection. Indicate where colour availability is restricted.
- .2 Submit product data and manufacturer's installation/application instructions for paints and coating products to be used.
- .3 Submit WHMIS Material Safety Data Sheets (MSDS) for paints and coating materials to be used.
- .4 Upon completion, submit records of products used. List products in relation to finish system and include the following:
 - .1 Product name, type and use (i.e. materials and location).
 - .2 Manufacturer's product number.
 - .3 Colour code numbers.
 - .4 MPI Environmentally Friendly classification system rating.
 - .5 Manufacturer's Material Safety Data Sheets.
- .5 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating, with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:

- .1 3 mm plate steel for finishes over metal surfaces.
- .2 13 mm birch plywood for finishes over wood surfaces.
- .3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
- .4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
- .6 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

1.8 QUALITY CONTROL

- .1 Provide a mock-up in accordance with requirements of Section 01 45 00 - Quality Control to Owner's Representative.
- .2 Prepare and repaint mock-up designated exterior surface or item to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Maintenance Repainting Manual standards for review and approval.
- .3 When approved, repainted surface and/or item shall become acceptable standard of finish quality and workmanship for similar on-site exterior repainting work.

1.9 EXTRA MATERIALS

- .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit one - four litre can of each type and colour of finish coating. Identify type and colour in relation to established colour schedule and finish system.
- .3 Deliver and store where directed by Owner's Representative.

1.10 DELIVERY, HANDLING AND STORAGE

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver and store materials in original containers, sealed, with labels intact.
- .3 Labels shall clearly indicate:

- .1 Manufacturer's name and address.
- .2 Type of paint or coating.
- .3 Compliance with applicable standard.
- .4 Colour number in accordance with established colour schedule.
- .4 Remove damaged, opened and rejected materials from site.
- .5 Observe manufacturer's recommendations for storage and handling.
- .6 Store materials and equipment in a secure, dry, well-ventilated area with temperature range between 7°C to 30°C. Store materials and supplies away from heat generating devices and sensitive products above minimum temperature as recommended by manufacturer.
- .7 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Owner's Representative. Upon completion of operations, return areas to clean condition to approval of Owner's Representative.
- .8 Remove paint materials from storage in quantities required for same day use.
- .9 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .10 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.11 SITE REQUIREMENTS

- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces.
 - .2 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air

- and substrate temperatures above 10°C for 24 hours before, during and after paint application until paint has cured sufficiently.
- .3 Where required, provide continuous ventilation for seven days after completion of application of paint.
 - .4 Provide temporary ventilating and heating equipment where permanent facilities are not available.
 - .5 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by General Contractor.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
- .1 Unless specifically pre-approved by Owner's Representative and applied product manufacturer, do not perform repainting work when:
 - .1 Ambient air and substrate temperatures are below 10°C.
 - .2 Substrate temperature is over 32°C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
 - .4 Relative humidity is above 85% or when dew point is less than 3°C variance between air/surface temperature.
 - .5 Rain or snow is forecast to occur before paint has thoroughly cured.
 - .6 It is foggy, misty, raining or snowing at site.
 - .2 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test existing painted concrete floors for moisture using a simple "cover patch test".
 - .3 Do not perform repainting work when maximum moisture content of substrate exceeds:
 - .1 12% for concrete and masonry (clay and concrete brick/block).
 - .2 15% for wood.
 - .3 12% for stucco.
 - .4 Test painted concrete, masonry and plaster surfaces for alkalinity as required.

.3 Application Requirements:

- .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind conditions are such that airborne particles will affect quality of finished surface.
- .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.
- .3 Apply paint when previous coat of paint is dry or adequately cured, unless otherwise pre-approved by specific coating manufacturer.
- .4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.
- .5 Do not apply paint when:
 - .1 Temperature is expected to drop below 10°C before paint has thoroughly cured.
 - .2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
 - .3 Surface to be painted is wet, damp or frosted.
- .6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
- .7 Schedule repainting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
- .8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

1.12 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 Place materials defined as hazardous or toxic in designated containers.
- .4 Ensure emptied containers are sealed and stored safely.

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

PART 2 **PRODUCTS****2.1** **MATERIALS**

- .1 Paint materials listed in the latest edition of the MPI Approved Product List (APL) are acceptable for use on this project.
- .2 Paint materials for repaint systems shall be products of a single manufacturer.
- .3 Low odour products: whenever possible, select products exhibiting low odour characteristics. If two products are otherwise equivalent, select the product with the lowest odour. Only qualified products with E2 or E3 "Environmentally Friendly" rating are acceptable for use on this project.
- .4 Paints, coatings, thinners, solvents, cleaners and other fluids used in repainting, shall:
 - .1 Be water-based, water soluble, water clean-up.
 - .2 Be non-flammable
 - .3 Not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
 - .4 Be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
 - .5 Be manufactured without compounds which contribute to smog in the lower atmosphere.
- .5 Paints and coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).
- .6 Paints and coatings must not be formulated or manufactured with formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .7 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:
 - .1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a

sewage treatment facility lacking secondary treatment.

- .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
- .8 Water-borne paints and stains, and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

2.2 COLOURS

- .1 Owner's Representative will provide Colour Schedule after Contract award.
- .2 Selection of colours will be from manufacturer's full range of colours.
- .3 Where specific products are available in a restricted range of colours, selection will be based on the limited range.
- .4 Second coat in a three coat repaint system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

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

2.4 GLOSS / SHEEN RATINGS

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

Gloss Level Category	Units @ 60°	Units @ 85°
G1 - matte finish	0 to 5	maximum 10
G2 - velvet finish	0 to 10	10 to 35
G3 - eggshell finish	10 to 25	10 to 35
G4 - satin finish	20 to 35	minimum 35
G5 - semi-gloss finish	35 to 70	
G6 - gloss finish	70 to 85	
G7 - high gloss finish	> 85	

- .2 Gloss level ratings of repainted surfaces shall be as specified herein.

2.5 EXTERIOR PAINTING SYSTEMS

- .1 The following paint formulas requires a two-coat finish as indicated in the MPI Repainting Maintenance Manual.
- .2 REX 2.1 - Asphalt Surfaces: Zone/Traffic Marking for Drive and Parking Areas, etc.
- .1 REX 2.1B - Alkyd Zone/Traffic Marking Finish.
- .3 REX 3.1 - Concrete Vertical Surfaces: (including horizontal soffits).
- .1 REX 3.1A - Latex G4 finish.
- .4 REX 3.2 - Concrete Horizontal Surfaces: (decks, stairs, parking and court areas, driveways, etc.).
- .1 REX 3.2A - Latex Floor Paint G4.
- .5 REX 4.1 - Clay Masonry Units: Pressed and Extruded Brick).
- .1 REX 4.1A - Latex G4 finish.
- .6 REX 4.2 - Concrete Masonry Units: (Concrete Block and Brick).
- .1 REX 4.2A - Latex G4 finish.
- .7 REX 5.1 - Structural Steel and Metal Fabrications: (columns, beams, joists, etc.).
- .1 REX 5.1F - 2 Component Epoxy finish.

- .8 REX 5.3 - Galvanized Metal: High Contact/High Traffic Areas (Doors, Frames, Railings, Pipes, Handrail, etc. Low Contact/Low Traffic Areas (Overhead Decking, Eavestrough (Gutters), Downpipes, Ducts, etc.).
 - .1 REX 5.3B - Alkyd G5 finish.
- .9 REX 6.2 - Dimension Lumber: (columns, beams, exposed joists, underside of decking, siding, fencing, etc.).
 - .1 REX 6.2A - Latex G4 (over latex primer).
 - .2 REX 6.2E - Semi-Transparent Stain.
- .10 REX 6.3 - Dressed Lumber: (doors, door and window frames, casings, battens, smooth fascias, etc.).
 - .1 REX 6.3L - Latex G4 finish.
- .11 REX 6.4 - Wood Panelling: (plywood siding, fascias, soffits, etc.).
 - .1 REX 6.4G - Latex G4 finish.
- .12 REX 6.5 - Wood Decks and Stairs/Steps: (using spaced lumber).
 - .1 REX 6.5A - Porch and Floor Acrylic Latex G4 finish (over primer).
 - .2 REX 6.5C - Deck Stain.

PART 3 **EXECUTION**

3.1 **GENERAL**

- .1 Perform preparation and operations for exterior painting in accordance with MPI Maintenance Repainting requirements except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 **EXISTING CONDITIONS**

- .1 Prior to commencing work, thoroughly examine site conditions and existing exterior substrates to be repainted and report in writing to Owner's Representative damages, defects, unsatisfactory or unfavourable conditions of surfaces that will adversely affect this work.
- .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple

"cover patch test" and report findings to Owner's Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:

- .1 Concrete: 12%.
- .2 Clay and Concrete Block/Brick: 12%.
- .3 Wood: 15%.

.4 No repainting work shall commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to the Painting Subcontractor and Inspection Agency. Commencement of work shall not be held to imply acceptance of surfaces except as qualified herein.

.5 Degree of surface deterioration (DSD) shall be assessed using MPI Identifiers and Assessment criteria indicated in the MPI Maintenance Repainting Manual. MPI DSD ratings and descriptions are as follows:

Condition	Description
DSD-0	Sound Surface (includes visual (aesthetic) defects that do not affect film's protective properties).
DSD-1	Slightly Deteriorated Surface (indicating fading; gloss reduction, slight surface contamination, minor pin holes scratches, etc.).
DSD-2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, staining, etc.).
DSD-3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).
DSD-4	Substrate Damage (repair or replacement of surface required by others).

3.3 PROTECTION

- .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Owner's Representative.
- .2 Cover or mask windows and other ornamental hardware adjacent to areas being painted to prevent damage and

to protect from paint drops and splatters. Use non-staining coverings.

- .3 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .4 Protect factory finished products and equipment.
- .5 Protect general public and building occupants in and about the building.
- .6 Remove electrical cover plates, light fixtures, surface hardware on doors, and surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Items shall be securely stored and re-installed after painting is completed.
- .7 Move and cover exterior furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .8 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of Owner's Representative.

3.4 CLEANING AND PREPARATION

- .1 Clean and prepare exterior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and surface debris by wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Use trigger operated spray nozzles for water hoses.
 - .5 Allow surfaces to drain completely and to dry thoroughly.
 - .6 Use water-based cleaners in place of organic solvents where surfaces will be repainted using water based paints.
 - .7 Many water-based paints cannot be removed with water once dried. However, minimize the use of

kerosene or such organic solvents to clean up water-based paints.

- .2 Where required, pressure wash exterior surfaces prior to repainting in accordance with MPI standards for type of surfaces and recommended pressures to ensure complete removal of loose paint, stains, dirt, and foreign matter. This work to be carried out by qualified tradesman experienced in pressure water cleaning. Use of spray equipment such as water hose cleaning will not be considered satisfactory unless specified herein. Allow sufficient drying time and test surfaces using an electronic moisture meter before commencing work.
- .3 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with MPI requirements. Remove such contaminants from surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.
- .5 Do not apply paint until prepared surfaces have been accepted by Owner's Representative.
- .6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects from previously painting (e.g. runs, sags, etc.) that are visible from a distance up to 1000 mm.

3.5 APPLICATION

- .1 Method of application to be as approved by Owner's Representative. Apply paint by brush, roller, air sprayer, airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
 - .2 Work paint into cracks, crevices and corners.

- .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
- .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces to be free of roller tracking and heavy stipple.
- .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray Application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently necessary.
 - .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
 - .4 Back roll spray applications and brush out runs and sags immediately.
 - .5 Use brushes to work paint into cracks, crevices and places that are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Owner's Representative.
- .5 Apply paint coats in a continuous manner and allow surfaces to dry and properly cure between coats for minimum time period as recommended by manufacturer. Minimum dry film thickness of coats shall not be less than that recommended by the manufacturer. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Sand and dust between coats to remove visible defects.
- .7 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.
- .8 Finish to doors shall include all edges including top and bottom edges. Surfaces concealed by door hardware shall also be repainted unless otherwise pre-approved.

3.6 MECHANICAL / ELECTRICAL EQUIPMENT

- .1 Unless otherwise noted, repainting shall also include exposed to view/previously painted exterior mechanical and electrical equipment and components (panels, conduits, piping, hangers, ductwork, etc.).
- .2 Touch up scratches and marks and repaint such mechanical and electrical equipment and components with colour and finish to match existing finish unless otherwise noted or scheduled.
- .3 Do not paint over name plates or instruction labels.

3.7 FIELD QUALITY CONTROL

- .1 Field inspection of exterior painting operations to be carried out by Owner's Representative.
- .2 Advise Owner's Representative when each surface and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .3 Co-operate with Owner's Representative and provide access to areas of work.

3.8 CLEAN-UP

- .1 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- .2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.
- .3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
- .4 Clean equipment and dispose of wash water used for water borne materials, solvents used for oil based materials as well as cleaning and protective materials (e.g. rags, drop cloths, masking papers, etc.), paints, thinners, paint removers / strippers in accordance with the safety requirements of authorities having jurisdiction and as noted herein.
- .5 Painting equipment shall be cleaned in leak-proof containers that will permit particulate matter to settle out and be collected. Sediment remaining from

cleaning operations shall be disposed of in a manner acceptable to authorities having jurisdiction.

- .6 Paint and coatings in excess of repainting requirements shall be recycled as noted herein.

3.9 RESTORATION

- .1 Clean and re-install hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on affected exposed surfaces. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Owner's Representative. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Owner's Representative.

END OF SECTION

PART 1 **GENERAL****1.1** **SECTION INCLUDES**

- .1 Moisture testing of substrates.
- .2 Surface preparation of substrates as required for acceptance of paint, including cleaning, small crack repair, patching, caulking, and making good surfaces and areas to limits defined under MPI Repainting Maintenance Manual requirements.
- .3 Specific pre-treatments noted herein or specified in the MPI Repainting Maintenance Manual.
- .4 Sealing/touch-up, spot priming, and/or full priming surfaces for repainting in accordance with MPI Repainting Maintenance Manual requirements.
- .5 Provision of safe and adequate ventilation as required where toxic and/or volatile/flammable materials are being used over and above temporary ventilation supplied by others.

1.2 **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.
- .5 Section 01 78 00 - Closeout Submittals.

1.3 **REFERENCES**

- .1 Maintenance Repainting Manual by the Master Painters Institute (MPI), including Identifiers, Evaluation, Systems, Preparation and Approved Product List.
- .2 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).
- .3 National Fire Code of Canada.

1.4 QUALITY ASSURANCE

- .1 Contractor shall have a minimum of five years proven satisfactory experience. Provide a list of last three comparable jobs including, job name and location, specifying authority, and project manager.
- .2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in repainting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with applicable trade regulations.
- .3 Conform to latest MPI requirements for interior repainting work including cleaning, preparation and priming.
- .4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with the latest edition of the MPI Approved Product List and shall be from a single manufacturer for each system used.
- .5 Paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Maintenance Repainting Manual and shall be compatible with other coating materials as required.
- .6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Owner's Representative.
- .7 Standard of Acceptance: When viewed using final lighting source surfaces shall indicate the following:
 - .1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.
 - .2 Ceilings: No defects visible from floor at 45° to surface.
 - .3 Final coat to exhibit uniformity of colour and sheen across full surface area.

1.5 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

- .1 Provide paint products meeting MPI "Environmentally Friendly" E2 or E3 ratings based on VOC (EPA Method 24) content levels.

1.6 SCHEDULING OF WORK

- .1 Submit work schedule for various stages of painting to Owner's Representative for approval. Submit schedule a minimum of five (5) working days in advance of proposed operations.
- .2 Paint occupied facilities in accordance with approved schedule. Schedule operations to approval of Owner's Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.
- .3 Obtain written authorization from Owner's Representative for changes in work schedule.
- .4 Schedule repainting operations to prevent disruption by other trades if applicable and by occupants in and about the building.

1.7 SUBMITTALS

- .1 Submit full range colour sample chips for review and selection. Indicate where colour availability is restricted.
- .2 Submit product data and manufacturer's installation/application instructions for paints and coating products to be used.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets for paint and coating materials to be used.
- .4 Upon completion, submit records of products used. List products in relation to finish system and include the following:
 - .1 Product name, type and use (i.e. materials and location).
 - .2 Manufacturer's product number.
 - .3 Colour code numbers.
 - .4 MPI Environmentally Friendly classification system rating.
 - .5 Manufacturer's Material Safety Data Sheets (MSDS).
- .5 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating, with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:

- .1 3 mm plate steel for finishes over metal surfaces.
- .2 13 mm birch plywood for finishes over wood surfaces.
- .3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
- .4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
- .6 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

1.8 QUALITY CONTROL

- .1 Provide a mock-up in accordance with requirements of Section 01 45 00 - Quality Control to Owner's Representative.
- .2 Prepare and repaint mock-up designated interior room, surface or item to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Maintenance Repainting Manual standards for review and approval.
- .3 When approved, repainted room, surface and/or item shall become acceptable standard of finish quality and workmanship for similar on-site interior repainting work.

1.9 EXTRA MATERIALS

- .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit one - four litre can of each type and colour of finish coating. Identify type and colour in relation to established colour schedule and finish system.
- .3 Deliver and store where directed by Owner's Representative.

1.10 DELIVERY, HANDLING AND STORAGE

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver and store materials in original containers, sealed, with labels intact.
- .3 Labels shall clearly indicate:

- .1 Manufacturer's name and address.
- .2 Type of paint or coating.
- .3 Compliance with applicable standard.
- .4 Colour number in accordance with established colour schedule.
- .4 Remove damaged, opened and rejected materials from site.
- .5 Observe manufacturer's recommendations for storage and handling.
- .6 Store materials and equipment in a secure, dry, well-ventilated area with temperature range between 7°C to 30°C. Store materials and supplies away from heat generating devices and sensitive products above minimum temperature as recommended by manufacturer.
- .7 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Owner's Representative. After completion of operations, return areas to clean condition to approval of Owner's Representative.
- .8 Remove paint materials from storage in quantities required for same day use.
- .9 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .10 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.11 SITE REQUIREMENTS

- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces.
 - .2 Perform no repainting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air

- and substrate temperatures above 10°C for 24 hours before, during and after paint application and until paint has cured sufficiently.
- .3 Where required, provide continuous ventilation for seven days after completion of application of paint.
 - .4 Provide temporary ventilating and heating equipment where permanent facilities are not available.
 - .5 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by General Contractor.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
- .1 Unless specifically pre-approved by Owner's Representative and applied product manufacturer, perform no repainting work when:
 - .1 Ambient air and substrate temperatures are below 10°C.
 - .2 Substrate temperature is over 32°C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
 - .4 Relative humidity is above 85% or when dew point is less than 3°C variance between air/surface temperature.
 - .5 Rain or snow is forecast to occur before paint has thoroughly cured.
 - .6 It is foggy, misty, raining or snowing at site.
 - .2 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except use a simple "cover patch test" on concrete floors to be repainted.
 - .3 Perform no repainting work when maximum moisture content of substrate exceeds:
 - .1 12% for concrete and masonry (clay and concrete brick/block).
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
 - .4 Test painted concrete, masonry and plaster surfaces for alkalinity as required.

.3 Application Requirements:

- .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when ventilation conditions are such that airborne particles will not affect quality of finished surface.
- .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.
- .3 Apply paint when previous coat of paint is dry or adequately cured, unless otherwise pre-approved by the specific coating manufacturer.
- .4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.
- .5 Do not apply paint when:
 - .1 Temperature is expected to drop below 10°C before paint has thoroughly cured.
 - .2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
 - .3 Surface to be painted is wet, damp or frosted.
- .6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
- .7 Schedule repainting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
- .8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

1.12 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 Place materials defined as hazardous or toxic in designated containers.
- .4 Ensure emptied containers are sealed and stored safely.

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

PART 2 **PRODUCTS****2.1** **MATERIALS**

- .1 Paint materials listed in the latest edition of the MPI Approved Product List (APL) are acceptable for use on this project.
- .2 Paint materials for repaint systems shall be products of a single manufacturer.
- .3 Low odour products: whenever possible, select products exhibiting low odour characteristics. If two products are otherwise equivalent, select the product with the lowest odour. Only qualified products with E2 or E3 "Environmentally Friendly" rating are acceptable for use on this project.
- .4 Paints, coatings, thinners, solvents, cleaners and other fluids used in repainting, shall:
 - .1 Be water-based, water soluble, water clean-up.
 - .2 Be non-flammable.
 - .3 Not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
 - .4 Be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
 - .5 Be manufactured without compounds which contribute to smog in the lower atmosphere.
 - .6 Be manufactured in a manner where matter generating a 'Biochemical Oxygen Demand' (BOD) in undiluted production plant effluent discharged to a natural watercourse or a sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.
 - .7 Be manufactured in a manner where the total suspended solids (TSS) content in undiluted production plant effluent discharged to a natural watercourse or a sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.
- .5 Paints and coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).
- .6 Paints and coatings must not be formulated or manufactured with formaldehyde, halogenated solvents,

mercury, lead, cadmium, hexavalent chromium or their compounds.

- .7 Water-borne paints and stains, and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

2.2 COLOURS

- .1 Owner's Representative will provide Colour Schedule after Contract award.
- .2 Selection of colours will be from manufacturers full range of colours.
- .3 Where specific products are available in a restricted range of colours, selection will be based on the limited range.
- .4 Second coat in a three coat repaint system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

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

2.4 GLOSS/SHEEN RATINGS

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

Gloss Level Category	Units @ 60°	Units @ 85°
G1 - matte finish	0 to 5	maximum 10
G2 - velvet finish	0 to 10	10 to 35
G3 - eggshell finish	10 to 25	10 to 35
G4 - satin finish	20 to 35	minimum 35
G5 - semi-gloss finish	35 to 70	
G6 - gloss finish	70 to 85	
G7 - high gloss finish	> 85	

- .2 Gloss level ratings of repainted surfaces shall be as specified herein.

2.5 INTERIOR PAINTING SYSTEMS

- .1 The following paint formulas requires a two-coat finish as indicated in the MPI Repainting Maintenance Manual.
- .2 RIN 2.1 - Asphalt Surfaces: (zone/traffic marking on interior drive and parking areas, etc.).
- .1 RIN 2.1B - Alkyd Zone/Traffic Marking.
- .3 RIN 3.1 - Concrete Vertical Surfaces: (including soffits).
- .1 RIN 3.1A - Latex G4 finish.
- .4 RIN 3.2 - Concrete Horizontal Surfaces: (floors and stairs, etc.).
- .1 RIN 3.2A - Latex Floor Enamel G4.
- .5 RIN 4.1 - Clay Masonry Units: (pressed and extruded brick).
- .1 RIN 4.1A - Latex G4 finish.
- .6 RIN 4.2 - Concrete Masonry Units: (Concrete Block and Concrete Brick).
- .1 RIN 4.2A - Latex G4 finish.
- .7 RIN 5.1 - Structural Steel and Metal Fabrications.
- .1 RIN 5.1K - 2 Component Epoxy finish.
- .8 RIN 5.3 - Galvanized Metal: (High Contact/High Traffic Areas (Doors, Frames, Railings, Pipes, Handrails, etc.). Low Contact/Low traffic areas (Overhead Decking, Pipes, Ducts, etc.)

- .1 RIN 5.3C - Alkyd G5 finish.
- .9 RIN 6.2 - Dimension Lumber: (Columns, Beams, Exposed Joists, Underside of Decking, etc.)
 - .1 RIN 6.2A - Latex G4 (over latex primer).
- .10 RIN 6.3 - Dressed Lumber: (Including Doors, Door and Window Frames, Mouldings, etc.)
 - .1 RIN 6.3A - Latex G5 finish.
- .11 RIN 6.4 - Wood Panelling and Casework: (Partitions, Panels, Shelving, Millwork, etc.)
 - .1 RIN 6.4B - Latex G4 finish.
- .12 RIN 6.5 - Wood Floors and Stairs: (Including Hardwood Flooring).
 - .1 RIN 6.5A - Alkyd Floor Enamel G4 (over primer).
- .13 RIN 9.2 - Plaster and Gypsum Board: (gypsum wallboard, drywall, "sheet rock type material", etc.,
 - .1 RIN 9.2A - Latex G5 (over latex sealer) for walls.
 - .2 RIN 9.2A - Latex G1 (over latex sealer) for ceilings.
- .14 RIN 10.1 - Canvas and Cotton Coverings:
 - .1 RIN 10.1B - Alkyd G5 finish.

PART 3 **EXECUTION**

3.1 **GENERAL**

- .1 Perform preparation and operations for interior painting in accordance with MPI Maintenance Repainting Manual requirements except where otherwise specified.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 **EXISTING CONDITIONS**

- .1 Prior to commencing work, thoroughly examine site conditions and existing interior substrates to be repainted. Report in writing to Owner's Representative damages, defects, or unsatisfactory or unfavourable conditions or surfaces that will adversely affect this work.
- .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter,

except test concrete floors for moisture using a simple "cover patch test" and report findings to Owner's Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:

- .1 Concrete: 12%.
- .2 Clay and Concrete Block/Brick: 12%.
- .3 Wood: 15%.

.4 No repainting work shall commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to the Painting Subcontractor and Inspection Agency. Commencement of work shall not be held to imply acceptance of surfaces except as qualified herein.

.5 Degree of surface deterioration (DSD) shall be assessed using MPI Identifiers and Assessment criteria indicated in the MPI Maintenance Repainting Manual. MPI DSD ratings and descriptions are as follows:

Condition	Description
DSD-0	Sound Surface (includes visual (aesthetic) defects that do not affect film's protective properties).
DSD-1	Slightly Deteriorated Surface (indicating fading; gloss reduction, slight surface contamination, minor pin holes scratches, etc.).
DSD-2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, staining, etc.).
DSD-3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).
DSD-4	Substrate Damage (repair or replacement of surface required by others).

3.3 PROTECTION

- .1 Protect existing surfaces and adjacent fixtures and furnishings from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Owner's Representative.
- .2 Cover or mask windows and other ornamental hardware adjacent to areas being painted to prevent damage and to protect from paint drops and splatters. Use non-staining coverings.
- .3 Protect items that are permanently attached such as Fire Labels on doors and frames.

- .4 Protect factory finished products and equipment.
- .5 Protect general public and building occupants in and about the building.
- .6 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and surface mounted equipment, fittings and fastenings prior to undertaking re-painting operations. Items shall be securely stored and re-installed after painting is completed.
- .7 Move and cover furniture and portable equipment as necessary to carry out repainting operations. Replace as painting operations progress.
- .8 As repainting operations progress, place "WET PAINT" signs in occupied areas to approval of Owner's Representative.

3.4 CLEANING AND PREPARATION

- .1 Clean and prepare interior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and to dry thoroughly. Allow sufficient drying time and test surfaces using an electronic moisture meter before commencing work.
 - .5 Use water-based cleaners in place of organic solvents where surfaces will be repainted using water based paints.
 - .6 Many water-based paints cannot be removed with water once dried. Minimize the use of kerosene or such organic solvents to clean up water-based paints.
- .2 Where required, pressure wash exterior surfaces prior to repainting in accordance with MPI standards for type of surfaces and recommended pressures to ensure

complete removal of loose paint, stains, dirt, and foreign matter. This work to be carried out by qualified tradesman experienced in pressure water cleaning. Use of spray equipment such as water hose cleaning will not be considered satisfactory unless specified herein. Allow sufficient drying time and test surfaces using an electronic moisture meter before commencing work.

- .3 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with MPI requirements. Remove such contaminants from surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.
- .5 Do not apply paint until prepared surfaces have been accepted by Owner's Representative.
- .6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

3.5 APPLICATION

- .1 Method of application to be as approved by Owner's Representative. Apply paint by brush, roller, air sprayer, airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy.

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

3.6 MECHANICAL / ELECTRICAL EQUIPMENT

- .1 Unless otherwise noted, repainting shall also include exposed to view / previously painted mechanical and electrical equipment and components (panels, conduits, piping, hangers, ductwork, etc.).
- .2 Touch up scratches and marks and repaint such mechanical and electrical equipment and components with colour, and sheen finish to match existing unless otherwise noted or scheduled.
- .3 Do not paint over name plates or instruction labels.
- .4 Leave unfinished exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish.
- .5 Keep sprinkler heads free of paint.
- .6 Do not paint interior transformers and substation equipment.

3.7 FIRE SEPARATIONS

- .1 Contractor to stencil on both sides of fire rated partitions the fire rating for that assembly (i.e.: **1 HR FIRE SEPARATION**).
- .2 Stenciled fire ratings to be minimum 100 mm high **RED** letters, minimum 150 mm above finished ceilings, and minimum 2400 mm o.c. along partition.

3.8 FIELD QUALITY CONTROL

- .1 Field inspection of exterior painting operations to be carried out by Owner's Representative.
- .2 Advise Owner's Representative when each surface and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .3 Co-operate with Owner's Representative and provide access to areas of work.

3.9 CLEAN-UP

- .1 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

- .2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.
- .3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
- .4 Clean equipment and dispose of wash water used for water borne materials, solvents used for oil based materials as well as other cleaning and protective materials (e.g. rags, drop cloths, masking papers, etc.), paints, thinners, paint removers/strippers in accordance with the safety requirements of authorities having jurisdiction and as noted herein.
- .5 Painting equipment shall be cleaned in leak-proof containers that will permit particulate matter to settle out and be collected. Sediment remaining from cleaning operations shall be recycled or disposed of in a manner acceptable to authorities having jurisdiction.
- .6 Paint and coatings in excess of repainting requirements shall be recycled as noted herein.

3.10 RESTORATION

- .1 Clean and re-install hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on affected exposed surfaces. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Owner's Representative. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Owner's Representative.

END OF SECTION

Part 1 GENERAL1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.

1.2 GENERAL

- .1 Conform to General Condition of Division 01.
- .2 The word "provide" shall mean "supply and install".
- .3 Provide new materials, equipment, and plant of proven design and quality, and of current models with published ratings for which replacement parts are readily available.
- .4 This section covers items common to Sections of Divisions 20 to 25, inclusive.

1.3 PERMITS, FEES

AND INSPECTION

- .1 Submit to Mechanical Inspection Department and Supply Authority drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Departmental Representative will provide drawings and specifications required by Mechanical Inspection Department and Supply Authority at no cost.
- .4 Notify Departmental Representative of changes required by Mechanical Inspection Department prior to making changes.
- .5 Furnish Certificates of Acceptance from Mechanical Inspection Department and authorities having jurisdiction on completion of work.

1.4 EQUIPMENT REQUIREMENT

AND INSTALLATION

- .1 Use product of one manufacturer, unless specified otherwise, for equipment or material of same type.
- .2 Follow manufacturers' installation instructions.
- .3 Line up equipment, rectangular cleanouts and similar items with building walls wherever possible.
- .4 Pipe drain lines to drains.
- .5 Mount Base mounted equipment on chambered edge housekeeping pads a minimum of 100 mm

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high and 50 mm larger than equipment dimensions.

- .6 Permit equipment maintenance with minimum disturbance to connecting piping, ductwork, other equipment or building structure.
- .7 Ensure easy access to bearings for lubrication or any other maintenance work.

1.5 TRIAL USAGE

- .1 Departmental Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, materials, and instruments required for testing.
- .2 Trial usage to apply systems only after prior approval of Departmental Representative.

1.6 DEFICIENCY LIST

- .1 List of work deficiencies will be issued at any time. Rectify work to satisfaction of Departmental Representative, immediately.
- .2 Submit request for takeover inspection in writing.

1.7 CO-ORDINATION

- .1 Co-ordinate work with work of other trades to avoid conflicts. Contractor shall be responsible for all extra duct, pipe, fittings, etc., as required to avoid interference
- .2 Locate distribution systems, equipment, and materials to provide minimum interferences and maximum usable space.
- .3 Locate domestic water piping below ductwork where possible.
- .4 Locate all existing underground services and make all parties aware of their existence and location.
- .5 Where interference occurs, obtain Departmental Representative's approval for relocation of equipment and materials, regardless of installation order.
- .6 Drawings show general arrangement of Mechanical Systems. Contractor shall be responsible for providing offsets and minor relocations to complete the installations.

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1.8 ACCESS DOORS

- .1 Supply and install as necessary to gain access to all concealed mechanical equipment for operating, inspecting, adjusting, servicing.
- .2 Sizes: Except as indicated otherwise, to be minimum sizes as follows:
 - .1 For body entry: 600 x 600 mm.
 - .2 For hand entry: 300 x 300 mm.
- .3 Construction: Rounded safety corners, concealed hinges, screwdriver latch, anchor straps, able to open 180.
- .4 Materials
 - .1 Tiled or marble surfaces and other special areas: Stainless steel with brushed satin or polished finish as directed by Departmental Representative.
 - .2 All other areas: Prime coated steel.
- .5 Provide fire rated access doors for installation in fire rated walls or ceilings.
- .6 Location: Ensure that equipment is clearly within view and accessible for operating, inspecting, adjusting, servicing without the need for special tools.
- .7 Apply temporary protective coating to finished surfaces. Remove coating after erection. Do not use coatings that will become hard to remove or leave residue.
- .8 Leave protective covering in place until final cleaning of building.
- .9 Acceptable Products: Zurn, La Hage, Wade, Buensod.

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 78 00 - Closeout Submittals.
- .3 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

1.2 EQUIPMENT LIST

- .1 Complete list of equipment and materials to be used on this project and forming part of tender documents by adding manufacturer's name, model number and details of materials, and submit for approval.
- .2 Submit for approval within 10 days after award of contract.

1.3 TRIAL USAGE

- .1 Departmental Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

1.4 PROTECTION OF OPENINGS

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

1.5 PAINTING

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.

1.6 SPARE PARTS

- .1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:
 - .1 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

1.7 SPECIAL TOOLS

- .1 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

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1.8 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .2 Where specified elsewhere in Mechanical Division, manufacturers to provide demonstrations and instructions.
- .3 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.
- .5 Where deemed necessary, Departmental Representative may record these demonstrations on video tape for future reference.

1.9 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Operation and maintenance manual to be approved by, and final copies deposited with, Departmental Representative before final inspection.
- .3 Operation data to include:
 - .1 Control schematics for each system including environmental controls.
 - .2 Description of each system and its controls.
 - .3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for each system and each component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Colour coding chart.
- .4 Maintenance data shall include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .5 Performance data to include:
 - .1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.

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- .2 Equipment performance verification test results.
 - .3 Special performance data as specified elsewhere.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .6 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless so directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
 - .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.

1.10 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings and product data shall show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances. eg. access door swing spaces.
- .3 Shop drawings and product data shall be accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify as to current model production.
 - .5 Certification of compliance to applicable codes.
- .4 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

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1.11 CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

1.12 AS-BUILT DRAWINGS

- .1 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of the work. Mark there on all changes as work progresses and as changes occur. This shall include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 On a weekly basis, transfer information to reproducible, revising reproduces to show all work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection at all times.
- .2 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 TAB to be performed using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .3 Submit copies of as-built drawings for inclusion in final TAB report.

Part 2 PRODUCTS

NOT APPLICABLE TO THIS SECTION

Part 3 EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section includes:
 - .1 Materials and installation of low-pressure metallic ductwork, joints and accessories.

1.2 REFERENCES

- .1 Codes and standards referenced in this section refer to the latest edition thereof.
- .2 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .3 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A 480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A 635/A635M, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
 - .3 ASTM A 653/A653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .4 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act (CEPA).
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .6 National Fire Protection Association (NFPA).
 - .1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
- .7 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible.

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- .2 SMACNA HVAC Air Duct Leakage Test Manual.
- .3 IAQ Guideline for Occupied Buildings Under Construction, 1st Edition.
- .8 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act (TDGA).

1.3 SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Division 01.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets for the following:
 - .1 Sealants.
 - .2 Tape.
 - .3 Proprietary Joints.

1.4 QUALITY ASSURANCE

- .1 Certification of Ratings:
 - .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Division 01.
 - .2 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings under Construction.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Protect on site stored or installed absorptive material from moisture damage.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Division 01.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

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- .4 Separate for reuse and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan.
 - .5 Place materials defined as hazardous or toxic in designated containers.
 - .6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
 - .7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 SEAL CLASSIFICATION

- .1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
> 1000	A
750	B
500	C
250	C
125	C

- .2 Seal classification:

- .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
- .2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant tape or combination thereof.
- .3 Class C: transverse joints and connections made air tight with gaskets, sealant tape or combination thereof. Longitudinal seams unsealed.

2.2 SEALANT

- .1 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 30°C to plus 93°C.

2.3 TAPE

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

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2.4 DUCT LEAKAGE

- .1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

2.5 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
 - .1 Rectangular: Centreline radius: 1.5 times width of duct.
 - .2 Round: smooth radius or five piece. Centreline radius: 1.5 times diameter.
- .3 Mitred elbows, rectangular:
 - .1 To 400 mm: with single thickness turning vanes.
 - .2 Over 400 mm: with double thickness turning vanes.
- .4 Branches:
 - .1 Rectangular main and branch: with radius on branch 1.5 times width of duct or 45° entry on branch.
 - .2 Round main and branch: enter main duct at 45° with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with volume control damper.
- .5 Transitions:
 - .1 Diverging: 20° maximum included angle.
 - .2 Converging: 30° maximum included angle.
- .6 Offsets:
 - .1 Full short radiused elbows as indicated.
- .7 Obstruction deflectors: maintain full cross-sectional area. Maximum included angles: as for transitions.

2.6 FIRESTOPPING

- .1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 - Firestopping.
- .2 Firestopping material and installation must not distort duct.

2.7 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653, G90 zinc coating.

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- .2 Thickness, fabrication and reinforcement: to SMACNA.
 - .3 Joints: to SMACNA or proprietary manufactured duct joint. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

2.8 HANGERS AND SUPPORTS

- .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct. Maximum size duct supported by strap hanger: 500 mm.
- .2 Hanger configuration: to SMACNA.
- .3 Hangers: galvanized steel angle with black steel rods to ASHRAE or SMACNA following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25x25x3	6
751 to 1050	40x40x3	6
1051 to 1500	40x40x3	10
1501 to 2100	50x50x3	10
2101 to 2400	50x50x5	10
2401 and over	50 x 50 x 6	10

- .4 Upper hanger attachments:
 - .1 For concrete: manufactured concrete inserts.
 - .1 Acceptable Product: Myatt, Grinnell, Hunt.
 - .2 For steel joist: manufactured joist clamp steel plate washer.
 - .1 Acceptable Product: Myatt, Grinnell, Hunt.
 - .3 For steel beams: manufactured beam clamps:
 - .1 Acceptable Product: Myatt, Grinnell, Hunt.

PART 3 EXECUTION

3.1 GENERAL

- .1 Do work in accordance with NFPA 90A, NFPA 90B, and SMACNA.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.

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- Insulate strap hangers 100 mm beyond insulated duct.
- .3 Support risers in accordance with SMACNA.
 - .4 Install breakaway joints in ductwork on sides of fire separation. Do not place fire stopping material in expansion space between damper sleeve and fire partition.
 - .5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
 - .6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

3.2 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with SMACNA or as follows:

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

3.3 SEALING AND TAPING

- .1 Apply sealant to outside of joint to manufacturer's recommendations.
- .2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations. Sealant and tape to be applied to full perimeter of duct.

3.4 LEAKAGE TESTS/COMMISSIONING

- .1 In accordance with SMACNA HVAC Duct Leakage Test Manual.
- .2 Do leakage tests in sections.
- .3 Make trial leakage tests as instructed to demonstrate workmanship.
- .4 Install no additional ductwork until trial test has been passed.
- .5 Test section minimum of 30 m long with not less than three branch takeoffs and two 90° elbows.
- .6 Complete test before insulation or concealment.

PART 1 GENERAL1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for duct accessories including flexible connections, access doors, vanes and collars.

1.2 RELATED SECTIONS

- .1 Division 01.

1.3 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.4 SUBMITTALS

- .1 Submittals in accordance with Division 01.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:
 - .1 Flexible connections
 - .2 Duct access doors.
 - .3 Turning vanes.
 - .4 Instrument test ports.
 - .2 Submit WHMIS MSDS. Indicate VOC's for adhesive and solvents during application and curing.
- .3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
 - .1 Certification of ratings: catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

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- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturer's Field Reports: manufacturer's field reports specified.
- .7 Closeout Submittals: submit maintenance and engineering data for incorporation into manual specified in Division 01.

1.5 QUALITY ASSURANCE

- .1 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 subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
 - .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Division 01.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Division 01.
 - .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 (WMP).
 - .4 Separate for reuse and 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 Departmental's Representative.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

- .1 Frame: galvanized sheet metal frame 0.66 mm thick with fabric clenched by means of double locked seams.
- .2 Material:
 - .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40°C to plus 90°C, density of 1.3 kg/m².

2.3 ACCESS DOORS IN DUCTS

- .1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.
- .2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.
- .3 Gaskets: neoprene.
- .4 Hardware:
 - .1 Hold open devices.
 - .2 300 x 300 mm glass viewing panels.
 - .3 Up to 300 x 300 mm: two sash locks complete with safety chain.
 - .4 301 to 450 mm: four sash locks complete with safety chain.
 - .5 451 to 1000 mm: piano hinge and minimum two sash locks.
 - .6 Doors over 1000 mm: piano hinge and two handles operable from both sides.
 - .1 Hold open devices.
 - .2 300 X 300 mm glass viewing panels.

2.4 TURNING VANES

- .1 Factory or shop fabricated double thickness with trailing edge, to recommendations of SMACNA and as indicated.

2.5 INSTRUMENT TEST PORTS

- .1 1.6 mm thick steel zinc plated after manufacture.
- .2 Cam lock handles with neoprene expansion plug and handle chain.
- .3 28 mm minimum inside diameter. Length to suit insulation thickness.
- .4 Neoprene mounting gasket.

2.6 SPIN-IN COLLARS

- .1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.
- .2 Sheet metal thickness to co-responding round duct standards.

PART 3 EXECUTION**3.1 MANUFACTURER'S INSTRUCTIONS**

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

3.2 INSTALLATION

- .1 Flexible connections:
 - .1 Install in following locations:
 - .1 Inlets and outlets to supply air units and fans.
 - .2 Inlets and outlets of exhaust and return air fans.
 - .3 As indicated.
 - .2 Length of connection: 100 mm.
 - .3 Minimum distance between metal parts when system in operation: 75 mm.
 - .4 Install in accordance with recommendations of SMACNA.
 - .5 When fan is running:
 - .1 Ducting on sides of flexible connection to be in alignment.
 - .2 Ensure slack material in flexible connection.

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- .2 Access doors and viewing panels:
 - .1 Size:
 - .1 600 x 600 mm for person size entry.
 - .2 450 x 450 mm for servicing entry.
 - .3 300 x 300 mm for viewing.
 - .4 As indicated.
 - .2 Locations:
 - .1 Fire and smoke dampers.
 - .2 Control dampers.
 - .3 Devices requiring maintenance.
 - .4 Required by code.
 - .5 Reheat coils.
 - .6 Elsewhere as indicated.
 - .3 Instrument test ports.
 - .1 General:
 - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
 - .2 Locate to permit easy manipulation of instruments.
 - .3 Install insulation port extensions as required.
 - .4 Locations.
 - .1 For traverse readings:
 - .1 Ducted inlets to roof and wall exhausters.
 - .2 Inlets and outlets of other fan systems.
 - .3 Main and sub-main ducts.
 - .4 And as indicated.
 - .2 For temperature readings:
 - .1 At outside air intakes.
 - .2 In mixed air applications in locations as approved by Owner's Representative.
 - .3 At inlet and outlet of coils.
 - .4 Downstream of junctions of two converging air streams of different temperatures.
 - .5 And as indicated.
 - .4 Turning vanes:

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- .1 Install in accordance with recommendations of SMACNA and as indicated.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Have manufacturer's representative 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 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, 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 Departmental's Representative.

3.4 CLEANING

- .1 Perform cleaning operations as specified in Division 01 and in accordance with Manufacturer's recommendations.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Balancing dampers for mechanical forced air ventilation and air conditioning systems.

1.2 REFERENCES

- .1 Codes and standards referenced in this section refer to the latest edition thereof.
- .2 Sheet Metal and Air Conditioning National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Division 01. Include product characteristics, performance criteria, and limitations.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Division 01.
 - .2 Indicate the following:
 - .1 Specifications.
- .2 Quality assurance submittals: submit following in accordance with Division 01.
 - .1 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Health and Safety Requirements:

- .1 Do construction occupational health and safety in accordance with Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

- .1 Deliver, store and handle in accordance with Division 01.

.2 Waste Management and Disposal:

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

PART 2 PRODUCTS2.1 GENERAL

- .1 Manufacture to SMACNA standards.

2.2 SINGLE BLADE DAMPERS

- .1 Fabricate from same material as duct, 0.8 mm up to 450 mm wide, 1.6 mm maximum up to 1200 mm wide, V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness.
- .4 Inside and outside nylon or bronze end bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

2.3 MULTI-BLADED DAMPERS

- .1 Factory manufactured of material compatible with duct.
- .2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
- .3 Maximum blade height: 100 mm.
- .4 Bearings: pin in bronze bushings or self-lubricating nylon.
- .5 Linkage: shaft extension with locking quadrant.

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- .6 Channel frame of same material as adjacent duct, complete with angle stop.
 - .7 Maximum leakage: 2% at 500 Pa.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 For supply, return and exhaust systems, locate balancing dampers in each branch duct.
- .4 Runouts to registers and diffusers: located as close as possible to main ducts.
- .5 All dampers to be vibration free.
- .6 Ensure damper operators are observable and accessible.

3.3 CLEANING

- .1 Proceed in accordance with Division 01.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 GENERAL

1.1 SUMMARY

- .1 Section includes:
 - .1 Supply, return and exhaust grilles and registers, diffusers and linear grilles, for commercial and residential use.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

- .1 American Society of Heating Refrigerating and Air-Conditioning Engineers (ASHRAE).
 - .1 ASHRAE 70, Method of Testing for Rating the Performance of Air Ducts and Outlets.

1.4 SYSTEM DESCRIPTION

- .1 Performance requirements:
 - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.5 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate following:
 - .1 Capacity
 - .2 Throw and terminal velocity

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- .3 Noise criteria
- .4 Pressure drop
- .5 Neck velocity
- .2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Division 01.

1.8 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Include:
 - .1 Keys for volume control adjustment
 - .2 Keys for air flow pattern adjustment.

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PART 2 PRODUCTS

2.1 GENERAL

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity.
- .2 Frames:
 - .1 Full perimeter gaskets.
 - .2 Plaster frames where set into plaster or gypsum board.
 - .3 Concealed fasteners.
- .3 Concealed manual volume control damper operators as indicated.
- .4 Colour: standard or as directed by Owner's Representative.
- .5 Acceptable Product: E. H. Price, Titus, Nailor, Carnes, Airvector, Anemostat, Kruger.

2.2 MANUFACTURED UNITS

- .1 Grilles, registers and diffusers of same generic type to be product of one manufacturer.

2.3 SUPPLY GRILLES AND REGISTERS

- .1 See Schedule.

2.4 RETURN AND EXHAUST GRILLES AND REGISTERS

- .1 See Schedule.

2.5 DIFFUSERS

- .1 See Schedule.

2.6 LINEAR GRILLES

- .1 See Schedule.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install in accordance with manufacturers instructions.

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- .2 Install with flat head stainless steel or cadmium plated screws in countersunk holes where fastenings are visible.
 - .3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.
 - .4 Provide concealed safety chain on each grille, register and diffuser in gymnasium and similar game rooms and elsewhere.

3.3 CLEANING

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

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PART 1 - GENERAL1.1 GENERAL

- .1 This section covers items common to Sections of Division 26. This section supplements requirements of Division 01.

1.2 CODES AND STANDARDS

- .1 Do complete installation in accordance with CSA C22.1-2015 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1-M1987 except where specified otherwise.
- .3 Abbreviations for electrical terms: to CSA Z85- 1983.
- .4 Adhere to DFC Standards, latest editions.
- .5 Adhere to Canadian Electrical Code - current edition.

1.3 CARE, OPERATION AND START-UP

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

1.4 VOLTAGE RATINGS

- .1 Operating voltages: to CAN3-C235-83.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 PERMITS, FEES AND INSPECTION

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

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.2 Pay associated fees.

.3 Departmental Representative will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.

.4 Notify Departmental Representative of changes required by Electrical Inspection Department prior to making changes.

.5 Furnish Certificates of Acceptance from Electrical Inspection Department and authorities having jurisdiction on completion of work to Departmental Representative.

1.6 MATERIALS AND
EQUIPMENT

.1 Provide materials and equipment in accordance with Division 01.

.2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.

.3 Factory assembles control panels and component assemblies.

1.7 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.2 Clean and touch up surfaces of shop painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.8 EQUIPMENT
IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

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.2 Nameplates:

1. Lamicoid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate.

.5 Identification to be provided in English.

1.9 TESTING,
ACCEPTANCE AND
GUARANTEE

.1 The work of this Contractor shall be tested and installed and any devices not operational shall be remedied immediately. Tests required by local authorities shall be the responsibility of the Contractor. When the work is completed, it shall be tested in its entirety, and shall be in good working order before the Certificate of Acceptance shall be issued.

.2 A written guarantee shall be supplied to Canada by the Contractor covering the prompt making good of any and all defects in material and workmanship for the period of one (1) year from the date of acceptance and the making good of any such defects shall be completely the responsibility of the Contractor.

.3 The Contractor will be responsible for the supply of sufficient power on a temporary basis to allow testing of all equipment and systems. These will be tested in the

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		presence of the Departmental Representative.												
1.10 WIRE IDENTIFICATION	.1	Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.												
	.2	Maintain phase sequence and colour coding throughout.												
	.3	Colour code: to CSA C22.1.												
1.11 CONDUIT AND CABLE IDENTIFICATION	.1	Colour code conduits, boxes and metallic sheathed cables.												
	.2	Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.												
	.3	Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.												
		<table> <tr> <th></th><th><u>Prime</u></th><th><u>Auxiliary</u></th></tr> <tr> <td>up to 250 V</td><td>Yellow</td><td></td></tr> <tr> <td>up to 600 V</td><td>Yellow</td><td>Green</td></tr> <tr> <td>up to 5 kV</td><td>Yellow</td><td>Blue</td></tr> </table>		<u>Prime</u>	<u>Auxiliary</u>	up to 250 V	Yellow		up to 600 V	Yellow	Green	up to 5 kV	Yellow	Blue
	<u>Prime</u>	<u>Auxiliary</u>												
up to 250 V	Yellow													
up to 600 V	Yellow	Green												
up to 5 kV	Yellow	Blue												
1.12 CONDUCTOR TERMINATIONS	.1	Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors. Corrosion resistant to salt environment.												
1.13 MANUFACTURERS AND CSA LABELS	.1	Visible and legible, after equipment is installed.												
1.14 WARNING SIGNS	.1	As specified and to meet requirements of Electrical Inspection Department and Departmental Representative.												
	.2	Use decal signs, minimum size 175 x 250mm.												
1.15 MOUNTING HEIGHTS	.1	If mounting height of equipment is not indicated, verify before proceeding with												

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installation.

- .2 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - 1. Panelboards: as required by code or as indicated.

1.16 LOAD BALANCE

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

1.17 FIELD QUALITY CONTROL

- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
- .2 The work of this division to be carried out by a contractor who holds a valid Master Electrical contractor license as issued by the Province that the work is being constructed.
- .3 Conduct and pay for following tests:
 - 1. Power distribution system including phasing, voltage, grounding and load balancing.
 - 2. Circuits originating from branch distribution panels.
 - 3. Lighting and its controls.
 - 4. Motors, heaters and associated

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- control equipment including sequenced operation of systems where applicable.
- .4 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- .5 Insulation resistance testing.
1. Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 2. Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 3. Check resistance to ground before energizing.
- .6 Carry out tests in presence of Departmental Representative.
- .7 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .8 Submit test results for Departmental Representative's review.
- 1.18 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- .1 Submit shop drawings in accordance with Division 01 - Section 01 33 00 - Submittal Procedures.
- .2 Show on shop drawings details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.
- .3 Where applicable, include wiring, single line and schematic diagrams.
- .4 Include wiring drawings or diagrams showing interconnection with work of other divisions are required.
- .5 Each shop drawing shall be stamped and signed by the Contractor before submitting, stating that he has checked

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the drawings against the requirements as called for in the contract documents, and also in the case here the equipment attached to or connects to other equipment, that it has been properly coordinated with this equipment, whether supplied under the Electrical Division or under other Divisions.

- .6 Each shop drawing for non-catalogue items shall be prepared specifically for this project. If brochures are submitted for catalogue items, the brochures shall be marked definitely indicating the item or items to be supplied.
- .7 Work shall not be proceeded until final review of shop drawings are received by the Contractor.
- .8 Shop Drawing Review is for general compliance with contract documents. No responsibility is assumed by the Departmental Representative for correctness of dimensions or details. Corrections or comments made on the shop drawings during the Departmental Representative's review do not relieve the Contractor from compliance with the requirements of the drawings and specifications.

1.19 OPERATION AND
MAINTENANCE DATA

- .1 Submit operation and maintenance data in accordance with Division 01.
- .2 Include in manuals information based on following requirements:
 - 1. Operation and maintenance instructions to be sufficiently detailed with respect to design elements, construction features and component function and maintenance requirements, to permit effective startup. Operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

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2. Technical data to be in the form of approved shop drawings, project data, supplemented by bulletins, component illustrations, exploded views technical descriptions of items, and parts lists. Advertising of sales literature will not be accepted.

3. Provide wiring and schematic diagrams and performance curves.

4. Include names and addresses of local suppliers for all items included in maintenance manuals.

5. Material to be in English.

1.20 MATERIAL
SPECIFIED

.1 Where substitutions are to be submitted for materials bearing the clause "or approved equal", approval of the substitute item must be submitted to the Departmental Representative at least TEN DAYS PRIOR to the closing date of the tender. The proposed substitution shall show product name, complete specification and be equal to, or better than the named item. No increase in the tender price shall be made for such a substitution should it be accepted. Accepted equals will be listed in an addendum seven days prior to the Trade closing date.

.2 Where additional manufacturers are named under Articles entitled "Approved Manufacturers", the choice of which of the manufacturers named in reference to a particular article is to be used, shall be the Contractors.

.3 Materials or product specified without the clauses "or approved equal" or "approved manufacturers" shall be supplied as specified and no proposed substitution will be considered.

.4 Where approvals are granted for the use of other equipment any and all changes or additions required for the installation or operation of the approved equipment will be made by the Contractor at his own expense and no claims will be approved for any such

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changes, notwithstanding approval of shop drawings. Equipment that is accepted and installed and then does not perform as represented by original submitted data shall be replaced by the Contractor with equipment as specified, at no charge to the Canada.

1.21 QUALIFICATIONS
OF WORKERS

.1 Qualified trades people shall be used for all disciplines of the electrical work required for this project.

1.22 EXAMINATION OF
OTHER WORK

.1 This Division requires the examination of the material and work of all other Divisions upon which the work of this Section depends for proper completion. Any defect in work, levels, or materials, shall be reported to the Departmental Representative. The work of this Division shall not commence until such defects have been corrected.

1.23 DRAWINGS,
CHANGES
ACCESSIBILITY

.1 The drawings shall be considered to show the general character and scope of the work and not the exact details of the installation.

.2 The installation shall be completed with all supports and accessories required for a complete operative and satisfactory installation.

.3 The location, arrangement and connection of equipment and material as shown on the drawings represents a close approximation to the intent and requirements of the Contract.

.4 The right is reserved by the Departmental Representative to make reasonable changes required to accommodate conditions arising during the progress of the work. Such changes shall be done at no extra cost to Canada, unless the location, arrangement or connection is more than 1.5 m from that shown.

.5 Actual location of existing services shall be verified in the field where necessary before

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work is commenced.

.6 Changes and modifications necessary to ensure co-ordination and to avoid interference or conflicts with other trades, or to accommodate existing conditions, shall be made at no extra cost to Canada.

1.24 AS-BUILT
DRAWINGS

.1 The Departmental Representative will provide the Contractor with two (2) extra sets of white prints on which the Contractor shall clearly mark as the job progresses all changes and deviations from that shown on Contract drawings. On completion, forward to the Departmental Representative two (2) sets of drawings indicating all such changes and deviations.

1.25 CONTRIBUTION
IN AID

.1 Contractor shall include all contribution in aid expenses incurred by power utility company in contract price. Consult with power company prior to bidding for amount carried.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

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PART 1 - GENERAL

1.1 SECTION INCLUDES .1 Materials and installation for Wire and Box Connectors 0-1000 V.

1.2 RELATED SECTIONS .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

PART 3 - EXECUTION

- 3.1 INSTALLATION .1 Remove insulation carefully from ends of conductors and:
1. Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 C22.2 no 65.

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

.2 Section 26 05 20 - Wire and Box Connectors 0 - 1000 V.

1.2 REFERENCES

.1 CSA C22.2 No .0.3-96, Test Methods for Electrical Wires and Cables.

.2 CAN/CSA-C22.2 No. 131-M1989 (R1994), type Teck 90 cable.

1.3 PRODUCT DATA

.1 Submit product data in accordance Division 01.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600V insulation of chemically cross-linked thermosetting polyethylene material rated RW90 XLPE and RWU90 XLPE as indicated.

.3 All wiring shall be installed in conduit as indicated.

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper and ACM alloy, size as indicated.

.3 Insulation:

.1 Cross-linked polyethylene XLPE,

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rating - 600 V.

- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking aluminum, compliant to applicable Building Code classification for this project.
- .6 Overall covering: thermoplastic polyvinyl chloride material.
- .7 Fastenings:
 - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
 - .2 Channel type supports for two or more cables at 1500 mm centers.
 - .3 Threaded rods: 6 mm dia. to support suspended channels.
- .8 Connectors:
 - .1 Watertight and/or type approved for TECK cable, as indicated.
 - .2 Explosion proof for fuel storage shed as indicated.

2.3 Armoured Cables

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from aluminum strip.
- .4 Connectors: standard as required, complete with anti-short rings.

PART 3 - EXECUTION

3.1 INSTALLATION OF BUILDING WIRES

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

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Conduit Fastenings and Conduit Fittings.

2. Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors 0 - 1000 V.

3.2 Installation of TECK Cable 0 -1000 V

- .1 Install cables.
 - .1 Group cables wherever possible on channels.
- .2 Install cable concealed, securely supported by straps and hangers.
- .3 To be used in fuel storage shed and for new underground electrical feeder as indicated.

3.3 Installation of Armoured Cables (Ac-90)

- .1 Group cables wherever possible.
- .2 Use permitted only for work in movable partitions and vertical power supply drops to lighting fixtures.
- .3 Ensure all cables are terminated and made safe prior to ceiling being installed. All lighting drops to be terminated safely, with approved connectors, within an approved box, complete with cover.
- .4 To be used in office shed only.

PART 1 GENERAL (NOT APPLICABLE)PART 2 PRODUCTS2.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings as required.

PART 3 EXECUTION3.1 INSTALLATION

- .1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
 - .4 Strap AC-90 cable at box location plus every 900 mm.
- .6 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported

by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

- .7 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.
- .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .10 Do not use wire lashing, wood blocking, plastic strap or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental's Representative.
- .12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

PART 1 - GENERAL1.1 RELATED
DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SHOP DRAWINGS
AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Division 01 - Submittal Procedures.

PART 2 - PRODUCTS2.1 JUNCTION AND
PULL BOXES

.1 Weatherproof junction and pull boxes as indicated on drawings.

.2 Enclosures rating EEMAC 4X and threaded hubs. Corrosion resistant to salt environment.

PART 3 - EXECUTION3.1 JUNCTION & PULL
BOX INSTALLATIONS

.1 Install junction and pull boxes in locations as indicated on drawings.

.2 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.2 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Install size 2 identification labels indicating system name, voltage and phase.

PART 1 - GENERAL1.1 RELATED
DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCES

.1 CSA C22.1-2015, Canadian Electrical Code, Part 1.

PART 2 - PRODUCTS2.1 OUTLET AND
CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.
- .6 All conduits and boxes in garage shall be surface mounted rigid PVC. All conduits and boxes in office shed shall be Bx cable concealed in walls and ceilings.

2.2 CONDUIT BOXES

.1 PVC FS and FD boxes with factory threaded hubs and mounting feet for surface wiring of switches, receptacles and controls. See drawings for details.

2.3 FITTINGS GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 Provide correct size of openings in boxes for conduit. Reducing washers are not allowed.

PART 1 - GENERAL1.1 RELATED
DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 LOCATION OF
CONDUIT

.1 Drawings show all conduits in their approximate locations only.

1.3 APPROVALS,
CODES AND PERMITS

.1 All work shall be done in accordance with latest edition of the Canadian Electrical Code C22.1-2015.

.2 Contractor shall present the drawings to the Electrical Inspection Authority for approval and obtain a permit before starting work.

.3 Notify the Departmental Representative of any changes required before proceeding.

PART 2 - PRODUCTS2.1 CONDUIT

.1 Rigid PVC conduit: to CSA C22.2 No. 211.2. To be used below grade unless noted otherwise.

.2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

2.2 CONDUIT
FASTENINGS

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

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1 m oc.

.4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings for raceways: to CSA C22.2 No. 18-M1987.

.2 Factory 90° bends are required for 25 mm and larger conduits.

.3 Fittings manufactured for use with conduit specified, approved for encasement in slab.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding jumper suitable for linear expansion and 21 mm deflection in all directions as required.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 21 mm deflection in all directions as required.

.3 Weatherproof expansion fittings for linear expansion at entry to panel as required.

2.5 FISH CORD

.1 Polypropylene.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install all conduit, conduit fittings and accessories in accordance with the latest edition of the Canadian Electrical Code in a manner that does not alter, change or violate any part of the installed system components or the CSA/UL certification of these components.

.2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

Conduit, Conduit Fastenings and Conduit Fittings	Section 26 05 34
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.3 All conduits and wiring in garage shall be surface mounted rigid PVC conduit.

.4 All conduits and wiring in office shed shall be concealed in walls and ceilings.

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PART 1 GENERAL1.1 RELATED SECTIONS

- .1 Section 01 74 21 -
Construction/Demolition Waste
Management and Disposal.
- .2 Section 26 05 00 - Common Work Results
- Electrical.
- .3 Section 31 23 33.01 - Excavating,
Trenching and Backfilling.

1.2 REFERENCES

- .1 Canadian Standards Association, (CSA)
- .2 Insulated Cable Engineers Association,
Inc. (ICEA)

PART 2 PRODUCTS2.1 CABLE PROTECTION

- .1 38 x 140 mm planks pressure treated
with copper naphthenate or 5%
pentachlorophenol solution, water
repellent preservative.

2.2 MARKERS

- .1 Warning tape run entire length of
trench 200 mm below surface.

PART 3 EXECUTION3.1 DIRECT BURIAL OF CABLES

- .1 After sand bed specified in Section 31
23 33.01 - Excavating, Trenching and
Backfilling, is in place, lay cables
maintaining 75 mm clearance from each
side of trench to nearest cable. Do
not pull cable into trench.
- .2 Provide offsets for thermal action and
minor earth movements. Offset cables
150 mm for each 60 m run, maintaining
minimum cable separation and bending
radius requirements.
- .3 Underground cable splices not
acceptable.
- .4 Minimum permitted radius at cable
bends for rubber, plastic or lead

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covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.

.5 Cable separation:

.1 Maintain 75 mm minimum separation between cables of different circuits.

.2 Maintain 300 mm horizontal separation between low and high voltage cables.

.3 When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position.

.4 At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables.

.5 Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position.

.6 Install treated planks on lower cables 0.6 m in each direction at crossings.

.6 After sand protective cover specified in Section 31 23 33.01 - Excavating, Trenching and Backfilling, is in place, install continuous row of overlapping 38 x 140 mm pressure treated planks as indicated to cover length of run.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Perform tests using qualified personnel. Provide necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

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- .4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
 - .5 Pre-acceptance tests.
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
 - .6 Acceptance Tests
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armour and conductors not under test.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 91 13 - General Commissioning (Cx) Requirements.
- .3 Section 26 05 00 - Common Work Results - Electrical.
- .4 Section 26 28 16.02 - Moulded Case Circuit Breakers.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No.29, Panelboards and enclosed Panelboards.

1.4 SUBMITTALS

- .1 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

PART 2 PRODUCTS

2.1 PANELBOARDS

- .1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 250 V panelboards: bus and breakers rated for 18,000 A (symmetrical) minimum interrupting capacity or as indicated on electrical drawings.

- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Two keys for each panelboard and key panelboards alike.
- .6 Tin plated aluminum bus with neutral of same ampere rating as mains.
- .7 Mains: suitable for bolt-on breakers.
- .8 Trim with concealed front bolts and hinges.
- .9 Trim and door finish: baked grey enamel.
- .10 Complete with main breaker as indicated.
- .11 Panel to be Service Entrance rated.

2.2 BREAKERS

- .1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Nameplate for each panelboard size 4 engraved as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

PART 3 EXECUTION3.1 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 00 - Rough Carpentry. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results - Electrical or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION

PART 1 GENERAL1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 91 13 - General Commissioning (Cx) Requirements.
- .3 Section 26 05 00 - Common Work Results - Electrical.

1.2 SUBMITTALS

- .1 Include time-current characteristic curves for breakers with ampacity of 600 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

PART 2 PRODUCTS2.1 BREAKERS GENERAL

- .1 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .2 Common-trip breakers: with single handle for multi-pole applications.
- .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .4 Circuit breakers with interchangeable trips as indicated.
- .5 New circuit breakers in existing panelboards to have minimum symmetrical rms interrupting capacity rating as existing. Coordinate on site.
- .6 New circuit breakers in new panelboards to have minimum of 18,000 A symmetrical rms interrupting capacity rating.

2.2 THERMAL MAGNETIC
BREAKERS DESIGN A

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

PART 3 EXECUTION3.1 INSTALLATION

- .1 Install circuit breakers as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY .1 Section Includes:
1. Lighting.
.2 Related Sections:
1. Division 01 - Submittal Procedures.
2. Division 01 - Quality Requirements

1.3 SCOPE .1 All light fixtures shall be supplied and installed by this Contractor.

1.4 SHOP DRAWINGS AND PRODUCT DATA .1 Submit shop drawings in accordance with Division 01 - Submittal Procedures.
.2 Submit shop drawings for all.

PART 2 - PRODUCTS

2.1 MATERIALS .1 Type A fixture:
1. Rated 120 V, 60 Hz, LED, constructed of die cast aluminum, CSA listed for wet location complete with built in photocell.
2. Dark bronze in color.
.2 Type B fixture:
1. Rated 120 V, 60 Hz, 1200 mm in length, LED wrap, constructed of code gauge steel. Prismatic diffuser 100% acrylic.

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PART 3 - EXECUTION

3.1 INSTALLATION .1 Locate and install fixtures as indicated on drawings.

3.2 WIRING .1 Connect light fixtures to circuits as indicated.
.2 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.

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PART 1 GENERAL1.1 SECTION INCLUDES

- .1 Materials and installation for emergency lighting systems.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 91 13 - General Commissioning (Cx) Requirements.
- .3 Section 26 05 00 - Common Work Results - Electrical.
- .4 Section 26 05 21 - Wires and Cables (0-1000 V).
- .5 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No.141, Unit Equipment for Emergency Lighting.

1.4 SUBMITTALS

- .1 Data to indicate system components, mounting method, source of power and special attachments.

1.5 WARRANTY

- .1 For batteries, the ten years warranty period is extended to 120 months, with no-charge replacement during the first 5 years and pro-rate charge on the second 5 years from the date of Substantial Completion.

PART 2 PRODUCTS2.1 EQUIPMENT

- .1 Emergency lighting equipment: to CSA C22.2 No.141.
- .2 Supply voltage: 120 V, ac.
- .3 Output voltage: 12 V dc.
- .4 Operating time: 90 minutes.
- .5 Battery: sealed, maintenance free.

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- .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations.
 - .7 Solid state transfer circuit.
 - .8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
 - .9 Signal lights: solid state, for 'AC Power ON'.
 - .10 Lamp heads: integral on unit and remote, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: LED as indicated.
 - .11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
 - .12 Finish: standard.
 - .13 Auxiliary equipment:
 - .1 Test switch.
 - .2 Time delay relay.
 - .3 Battery disconnect device.
 - .4 AC input and DC output terminal blocks inside cabinet.
 - .5 Shelf.
 - .6 Cord and single twist-lock plug connection for AC.
 - .7 RFI suppressors.

2.2 WIRING OF REMOTE HEADS

- .1 Conduit: type EMT, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Conductors: RW90 type in accordance with Section 26 05 21 - Wires and Cables (0-1000 V) sized as indicated in accordance with manufacturer's recommendations.

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PART 3 EXECUTION3.1 INSTALLATION

- .1 Install unit equipment and remote mounted fixtures.
- .2 Direct heads.
- .3 Connect exit lights to unit equipment.
- .4 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 11 - Cleaning.
- .3 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 Atomic Energy Control Board Regulations
- .2 Canadian Code for Preferred Packaging
- .3 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No.141, Unit Equipment for Emergency Lighting.
 - .2 CSA C860, Performance of Internally-Lighted Exit Signs.
- .4 National Fire Protection Association (NFPA)
 - .1 NFPA 101, Life Safety Code.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures and disposal.

PART 2 PRODUCTS2.1 SELF-POWERED UNITS

- .1 Exit lights: to CSA C22.2 No.141-10 and CSA C860, packaged in accordance with the Canadian Code for Preferred Packaging guidelines.
- .2 Durable, extruded, one piece aluminum housing and face plates.
- .3 White LED light source.
- .4 Provide two pictogram films per face, for direction selection.

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- .5 Energy efficient - consume less than 2.5 Watts in AC or DC mode.
- .6 Running Man.
- .7 Supply voltage: 120 V, ac.
- .8 Output voltage: 12 V dc.
- .9 Operating time: minimum 90 minutes.
- .10 Battery: sealed, maintenance free, warranty to Section 26 52 00 - Emergency Lighting, 1.5 - Emergency Lights.
- .11 Signal lights: solid state, for 'AC Power ON'.
- .12 Mounting: suitable for universal mounting directly on junction box and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .13 Cabinet: finish: standard.
- .14 Weather proof as indicated.
- .15 Auxiliary equipment:
 - .1 Test switch.

2.2 DESIGN X1

- .1 Recessed, wall, end to wall, ceiling mounting as indicated.

PART 3 EXECUTION3.1 INSTALLATION

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Connect fixtures to exit light circuits using RW90 wire in EMT conduit.
- .3 Connect emergency lamp sockets to emergency circuits.
- .4 Ensure that exit light circuit breaker is locked in on position.
- .5 Provide tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

3.2 CLEANING

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

EXIT SIGNS

Section 26 53 00

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materials, excess materials, rubbish, tools
and equipment.

END OF SECTION

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PART 1 - GENERAL1.1 SCOPE OF WORK

- .1 Testing and commissioning are called for throughout the individual specifications. This does not relieve this trade from providing all testing and commissioning necessary to ensure that systems and equipment operate as required and that they interface with other systems and equipment as required.

1.2 SECTION INCLUDES

- .1 Commissioning of all building electrical systems and component including:
 - .1 Testing and adjustment.
 - .2 Demonstrations and Training.
 - .3 Instructions of all procedures for Owner's personnel.
 - .4 Updating as-built data.
 - .5 Co-ordination of Operation and Maintenance material.

1.3 RELATED SECTIONS

- .1 Section 01 78 00 - Closeout Submittals.
- .2 Section 26 05 00 - Common Work Results - Electrical.

1.4 REFERENCES

- .1 CSA (Canadian Standards Association).
- .2 Underwriters Laboratories of Canada.

1.5 QUALITY
ASSURANCE

- .1 Provide qualified trades persons, certified testing agencies, factory trained and approved by the Commissioning Team Leader.
- .2 Submit the names of all personnel to be used during the Commissioning activities for Owner Approval.

1.6 COMMISSIONING

- .1 The purpose of the commissioning process

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is to fully test all new mechanical and electrical components and operating procedures by challenging these systems to realistic operation conditions.

- .2 The Commissioning activities shall be co-ordinated by the General Contractor.
- .3 Commissioning activities for the electrical systems must have available up to date as-built drawing information and accurate Operations and Maintenance Manuals. These documents shall be a major part of this activity.
- .4 Contractor shall be responsible to update all documentation with information and any changes duly noted during the Commissioning exercise.
- .5 Contractor shall arrange for all outside suppliers, equipment manufacturers, test agencies and others as identified in the commissioning sections of this specification. The cost associated with this requirement shall be included as part of the tender price.

1.7 SUBMITTALS

- .1 As-built drawings and data books must be available two weeks prior to commissioning for review and use by the consultant and Commissioning Team prior to the start of the commissioning activities.

1.8 PREPARATION

- .1 Provide test instruments required for all activities as defined in the manufacturer's installation documents.
- .2 Verify all systems are in compliance with the requirements of the manufacturer's installation documents prior to the precommissioning check out operation.
- .3 Confirm all scheduled activities have identified personnel available.
- .4 Where systems or equipment do not operate

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as required, make the necessary corrections or modifications, re-test and re-commission.

1.9 SYSTEM DESCRIPTION

- .1 Perform all start up operations, control adjustment, trouble shooting, servicing and maintenance of each item of equipment as defined in the manufacturer's installation documentation.
- .2 Owner will provide list of personnel to receive instructions and will co-ordinate their attendance at agreed upon times.
- .3 Prepare and insert additional data in the operations and maintenance manuals and update as-built drawings when need for additional data becomes apparent during the commissioning exercise.
- .4 Where instruction is specified in the commissioning manual, instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .5 Conduct presentation on Owner's premises. Owner will provide space.

1.10 FINAL REPORT

- .1 This trade shall assemble all testing data and commissioning reports and submit them to the Owner.
- .2 Each form shall bear signature of recorder, and that of supervisor of reporting organizer.

1.11 SCHEDULE OF ACTIVITIES

- .1 Commissioning activities shall be conducted based on pre-established schedule with all members of the commissioning team.
- .2 Adhering to the established schedule is

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very important as the co-ordination and scheduling of the participants will be difficult to alter once this is established. Close co-ordination of this schedule is important.

- .3 In the event project cannot be commissioned in the allotted time slot, the contractor shall pay for all costs associated with assembling the Commissioning Team at a later date. If the contractor has not performed his duties to reach commissioning stage as outlined earlier, he will incur all expenses of other trades and the Commissioning Team due to his non-compliance.

PART 2 - PRODUCTS NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION NOT APPLICABLE TO THIS SECTION

PART 1 GENERAL**1.1 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).

1.2 QUALITY ASSURANCE/REGULATORY REQUIREMENTS

- .1 Shore and brace excavations, protect slopes and banks and perform all work in accordance with Provincial and Municipal regulations whichever is more stringent.

1.3 TESTS AND INSPECTIONS

- .1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by Owner's Representative.
- .2 Not later than one week before backfilling or filling, provide to designated testing agency, 23 kg sample of backfill for fill material proposed for use.
- .3 Do not begin backfilling or filling operations until material has been approved for use by Owner's Representative.
- .4 Not later than 48 hours before backfilling or filling with approved material, notify Owner's Representative so that compaction tests can be carried out by designated testing agency.
- .5 Before commencing work, conduct, with Owner's Representative, condition survey of existing structures, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

1.4 EXISTING CONDITIONS

- .1 Before commencing work verify the location of all buried services on and adjacent to the site.

PART 2 PRODUCTS**2.1 MATERIALS**

- .1 Class A: to Section 31 23 33.

PART 3 EXECUTION**3.1 PROTECTION/PROTECTION**

- .1 Protect excavations from freezing.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Owner's Representative's Consultants approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

3.2 CLEARING AND GRUBBING

- .1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
- .2 Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade elsewhere.
- .3 Dispose of cleared and grubbed material off site daily to disposal areas acceptable to authority having jurisdiction.

3.3 EXCAVATION

- .1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial regulations.
- .2 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required.
- .3 Excavate as required to carry out work, in all materials met.
 - .1 Do not disturb soil or rock below bearing surfaces.
 - .2 Notify Owner's Representative when excavations are complete.
 - .3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work. Excavation taken below depths shown without Owner's Representative written authorization to be filled with concrete of same strength as for footings at Contractor's expense.
- .4 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground.
 - .1 Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.
- .5 Excavate for slabs and paving to subgrade levels.
 - .1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

3.4 BACKFILLING

- .1 Inspection: do not commence backfilling until fill material and spaces to be filled have been inspected and approved by Owner's Representative.
- .2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.

- .4 Compaction of subgrade: compact existing subgrade to same compaction as specified for fill.
 - .1 Fill excavated areas with selected subgrade material or gravel and sand compacted as specified for fill.
- .5 Placing:
 - .1 Place backfill, fill and basecourse material in 150 mm lifts. Add water as required to achieve specified density.
- .6 Compaction: compact each layer of material to following densities for material to ASTM D698,
 - .1 To underside of basecourses: 95%.
 - .2 Basecourses: 100%.
 - .3 Elsewhere: 90%.
- .7 In trenches:
 - .1 Up to 300 mm above pipe or conduit: sand placed by hand.
 - .2 Over 300 mm above pipe or conduit: native material approved by Owner's Representative.
- .8 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.

3.5 GRADING

- .1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by the Owner's Representative.
 - .1 Grade to be gradual between finished elevations.

3.6 SHORTAGE AND SURPLUS

- .1 Supply all necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.
- .2 Dispose of surplus material off site.

3.7 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 **GENERAL****1.1** **RELATED SECTIONS**

- .1 Section 01 35 43 - Environmental Procedures.
- .2 Section 31 23 33 - Excavation, Trenching and Backfilling.

1.2 **DEFINITIONS**

- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than a specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- .4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of all fallen timber and surface debris.
- .5 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size (100 mm) to not less than a specified depth below existing ground surface.

1.3 **QUALITY ASSURANCE**

- .1 Safety Requirements: worker protection.
 - .1 Workers must wear gloves, dust masks, eye protection, protective clothing, when applying herbicide materials.
 - .2 Workers must wear gloves, dust masks, safety boots, protective clothing, eye protection, safety vests when clearing and grubbing.

1.4 STORAGE AND PROTECTION

- .1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, root systems of trees which are to remain.
- .2 Repair any damaged items to approval of Owner's Representative. Replace any trees designated to remain, if damaged, as directed by Owner's Representative.

PART 2 PRODUCTS (NOT APPLICABLE)**PART 3 EXECUTION****3.1 PREPARATION**

- .1 Inspect site and verify with Owner's Representative, items designated to remain.
- .2 Locate and protect utility lines. Preserve in operating condition active utilities traversing site:
 - .1 Notify Owner's Representative immediately of damage to or when unknown existing utility lines are encountered.
 - .2 When utility lines which are to be removed are encountered within area of operations, notify Owner's Representative in ample time to minimize interruption of service.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep roads and walks free of dirt and debris.

3.2 CLEARING

- .1 Clearing includes felling, trimming and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags brush and rubbish occurring within cleared areas.
- .2 Clear as directed by Owner's Representative, by cutting at a height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left

from clearing operations to be not more than 1000 mm above ground surface.

- .3 Cut off branches and cut down trees overhanging area cleared as directed by Owner's Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by Owner's Representative.

3.3 CLOSE CUT CLEARING

- .1 Close cut clearing to ground level.
- .2 Cut off branches down trees overhanging area cleared as directed by Owner's Representative.
- .3 Cut off unsound branches on trees designated to remain as directed by Owner's Representative.

3.4 ISOLATED TREES

- .1 Cut off isolated trees as directed by Owner's Representative at height of not more than 300mm above ground surface.
- .2 Grub out isolated tree stumps.
- .3 Prune individual trees as indicated.
- .4 Trim trees designated to be left standing within cleared areas of dead branches 4.0 cm or more in diameter; and trim branches to heights as indicated.
- .5 Cut limbs and branches to be trimmed close to bole of tree or main branches.

3.5 UNDERBRUSH CLEARING

- .1 Clear underbrush from areas as indicated at ground level.

3.6 GRUBBING

- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots and designated stumps from indicated grubbing area.

- .2 Grub out stumps and roots to not less than 200 mm below ground surface.
- .3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m³.
- .4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.7 REMOVAL AND DISPOSAL

- .1 Remove cleared and grubbed materials off site.
- .2 Cut timber greater than 125 mm diameter to 3000mm lengths and stockpile as indicated. Unless otherwise notified, stockpiled timber becomes property of the Owner.
- .3 Dispose of cleared and grubbed materials off site.
- .4 Remove diseased trees identified by Owner's Representative and dispose of this material to approval of Owner's Representative.

3.8 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for immediate grading operations stripping of topsoil to approval of Owner's Representative.

3.9 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 **GENERAL****1.1** **RELATED SECTIONS**

- .1 Section 31 11 00 - Clearing and Grubbing.
- .2 Section 31 23 33 - Excavation, Trenching and Backfilling.

1.2 **REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m³),

1.3 **EXISTING CONDITIONS**

- .1 Location of underground utility lines and buried objects are unknown.

1.4 **PROTECTION**

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

PART 2 **PRODUCTS****2.1** **MATERIALS**

- .1 Fill material: to Section 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Excavated or graded material existing on site may be suitable to use as fill for grading work if approved by Owner's Representative.

PART 3 EXECUTION**3.1 STRIPPING OF TOPSOIL**

- .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Owner's Representative.
- .2 Commence topsoil stripping of areas after area has been cleared of brush, weeds and grasses and removed from site.
- .3 Stockpile in locations as directed by Owner's Representative. Stockpile height not to exceed 2 m.
- .4 Dispose of unused topsoil as directed by Owner's Representative.

3.2 GRADING

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 Rough grade to following depths as indicated below finished grades.
- .3 Slope rough grade away from building 1:50 minimum.
- .4 Grade ditches to depth as indicated.
- .5 Compact filled and disturbed areas to corrected maximum dry density to ASTM D698, as follows:
 - .1 85% under landscaped areas.
 - .2 95% under paved and walk areas.
- .6 Do not disturb soil within branch spread of trees or shrubs to remain.

3.3 SURPLUS MATERIAL

- .1 Remove surplus material and material unsuitable for fill, grading or landscaping as directed by Owner's Representative.

END OF SECTION

PART 1 **GENERAL****1.1** **RELATED SECTIONS**

- .1 Section 31 22 13 - Rough Grading.

1.2 **REFERENCES**

- .1 American Society for Testing and Materials (ASTM).
 - .1 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .6 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CA/CGSB-8.2, Sieves, Testing, Woven Wire, Metric
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001, Cementitious Materials for Use in Concrete.
 - .2 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/ Methods of Test and Standard Practices for Concrete.

1.3 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock excavation: excavation of material from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 1 m³. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in work.
- .3 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .4 Waste material: excavated material unsuitable for use in work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.
- .6 Unsuitable materials:
 - .1 Weak and compressible materials under excavated areas.
 - .2 Frost susceptible materials under excavated areas.
 - .3 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1.

<u>Sieve Designation</u>	<u>%Passing</u>
2.00 mm	100
0.10 mm	45-100
0.02 mm	10-80
<u>0.005 mm</u>	<u>0-45</u>

- .2 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

1.4 EXISTING CONDITIONS

.1 Buried services:

- .1 Before commencing work verify location of buried services on and adjacent to site.
- .2 Prior to commencing excavation work, notify applicable Owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Owners or authorities having jurisdiction to clearly mark such locations to prevent disturbance during work.
- .3 Confirm locations of buried utilities by careful test excavations.
- .4 Maintain and protect from damage, water, sewer, electric, telephone and other utilities and structures encountered as indicated.
- .5 Where utility lines or structures exist in area of excavation, obtain direction of Owner's Representative before removing or re-routing.
- .6 Record location of maintained, re-routed and abandoned underground lines.
- .7 Confirm locations of recent excavations adjacent to area of excavation.

.2 Existing buildings and surface features:

- .1 Conduct, with Owner's Representative condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by work.
- .2 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Owner's Representative.
- .3 Where required for excavation, cut roots or branches as approved by Owner's Representative.

PART 2 **PRODUCTS****2.1** **MATERIALS**

- .1 Backfill Type 1 (Class A) and Type 2 fill:

- .1 Crushed, pit run or screened stone, gravel or sand.
- .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

Sieve Designation	%Passing	
	Type1	Type2
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10

- .2 Type 3 fill: selected material from excavation or other sources, approved by Owner's Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

PART 3 **EXECUTION****3.1** **SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.2 **PREPARATION/PROTECTION**

- .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.

- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Owner's Representative's approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage. Protect buried services that are required to remain undisturbed.

3.3 STRIPPING OF TOPSOIL

- .1 Commence topsoil stripping of areas as indicated by Owner's Representative after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to depths as indicated by Owner's Representative. Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Owner's Representative. Stockpile height not to exceed 2 m.
- .4 Dispose of unused topsoil as directed by Owner's Representative.

3.4 STOCKPILING

- .1 Stockpile fill materials in areas designated by Owner's Representative. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.

3.5 SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 30 - Health and Safety Requirements and Occupational Health and Safety Act for the Province of Newfoundland and Labrador.
- .2 Obtain permit from authority having jurisdiction.
- .3 Construct temporary works to depths, heights and locations as required.
- .4 During backfill operation:
 - .1 Remove sheeting and shoring from excavations.

- .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
- .5 Upon completion of substructure construction remove excess materials from site and restore as indicated.

3.6 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while work is in progress.
- .2 Submit for Owner's Representative's review details of proposed dewatering or heave prevention methods.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in manner not detrimental to public and private property, or any portion of work completed or under construction.

3.7 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation in accordance with Section 02 41 13 - Selective Site Demolition.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .5 For trench excavation, unless otherwise authorized by Owner's Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

- .6 Keep excavated and stockpiled materials a safe distance away from edge of trench as directed by Owner's Representative.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material off site.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .11 Notify Owner's Representative when bottom of excavation is reached.
- .12 Obtain Owner's Representative approval of completed excavation.
- .13 Remove unsuitable material from trench bottom to extent and depth as directed by Owner's Representative.
- .14 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
 - .2 Fill under other areas with Type 2 fill compacted to not less than 95% of corrected maximum dry density.
- .15 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.8 **FILL TYPES AND COMPACTION**

- .1 Use fill of types as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698 corrected maximum dry density.
 - .1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 95%.
 - .2 Within building area: use Type 2 to underside of base course for floor slabs. Compact to 98%.

- .3 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill to underside of slab. Compact base course to 100%.
- .4 To correct over excavation in trenches: use Type 2 fill to underside of sand bedding compacted to 95%.

3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated.
- .2 Place bedding and surround material in unfrozen condition.

3.10 BACKFILLING

- .1 Vibratory compaction equipment: approved by Owner's Representative.
- .2 Do not proceed with backfilling operations until Owner's Representative has inspected and approved installations.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfill around installations.
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed work to equalize loading. Difference not to exceed 600 mm.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures.
 - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to

withstand earth and compaction pressure, and approval obtained from Owner's Representative, or

- .2 If approved by Owner's Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Owner's Representative.

3.11 RESTORATION

- .1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Owner's Representative.
- .2 Clean and reinstate areas affected by work as directed by Owner's Representative.

END OF SECTION

Appendix A:

Hazardous Material Assessment Report

Hazardous Building Material Assessment

**Salmon Cove River Compound
Port Rexton, NL**

Submitted to:

Fisheries and Oceans Canada
Real Property Safety and Security
St. John's, NL, A1C 5X1

Submitted by:

AFN Engineering Inc.
29 Brad Gushue Crescent
St. John's, NL, A1H 0A3

July, 2017

Executive Summary

AFN Engineering Inc. (AFN) was retained by Fisheries and Oceans Canada (DFO) Real Property Safety and Security, to conduct a Hazardous Building Material assessment of the three (3) buildings located at the Salmon Cove River Compound in Port Rexton, NL. The facility was originally established in 1976 and currently supports DFO Conservation & Protection operations based out of the Clarendville detachment office. The site consists of a 21.4m x 9.2m wood-frame warehouse providing operational storage, a 5.5m x 4.6m cabin, a 4.3m x 3.7m cinderblock fuel storage shed, and a fenced compound. The site is road-accessible off the north side of Route 230 running towards Bonavista, NL.

The purpose of the assessment was to identify the presence of hazardous building materials in the buildings, to ensure the materials are properly handled and disposed during future structure refurbishment activities.

A summary of the findings is included below:

- Asbestos was not detected in: (i) the wall insulation along the overhead door of the warehouse; or (ii) the roofing materials of the warehouse, fuel storage shed or cabin. Due to the age of the site, it is noted that there is potential for asbestos to be present in areas that were not sampled, including but not limited to, electrical and mechanical components and insulators such as wiring and gaskets inside electrical panels, electronic and/or mechanical equipment, hidden fire rated building materials, and underground infrastructure and piping.
- The paint sample collected from the fuel storage shed indicated that the paint is lead/mercury based. The paint is peeling/flaking throughout (interior and exterior). Due to the poor condition of the paint, there is potential for the flaking/peeling paint to have impacted the soils surrounding the fuel storage shed.
- Mould is present in the warehouse. All mould/water stained building materials should be removed and the source of the problem identified/remediated.
- There are various household hazardous waste products (cleaners, jerry cans with fuel, etc.) in the warehouse and fuel storage shed. Disposal of these items, if required, should be to a hazardous waste facility or otherwise in accordance with the NL Waste Management Regulations under the "Waste Management Act". It is noted that there are drums outside the fuel storage shed as well. Intrusive sampling of the site soils for potential hydrocarbon impacts was outside the current work scope.

- Fire extinguishers were noted in the warehouse. The manufacturer's code on the fire extinguishers indicated that they are dry chemical. When decommissioned, disposal of the fire extinguishers should be to a household hazardous waste depot.

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1.0 Introduction

AFN Engineering Inc. (AFN) was retained by Fisheries and Oceans Canada (DFO) Real Property Safety and Security, to conduct a Hazardous Building Material assessment of the three (3) buildings located at the Salmon Cove River Compound in Port Rexton, NL.

The facility was originally established in 1976 and currently supports DFO Conservation & Protection operations based out of the Clarenville detachment office. The site consists of a 21.4m x 9.2m wood-frame warehouse providing operational storage, a 5.5m x 4.6m cabin, a 4.3m x 3.7m cinderblock fuel storage shed, and a fenced compound. The site is road-accessible off the north side of Route 230 running towards Bonavista, NL.

The purpose of the assessment was to identify the presence of hazardous building materials in the building, to ensure the materials are properly handled and disposed during future structure refurbishment activities.

A general site plan is included in **Appendix A**. Photographs of the buildings are included in **Appendix B**. The Laboratory Certificates associated with the sampling program are included in **Appendix C**.

2.0 Scope of Work

The scope of work for this project consisted of the following:

- Conduct a walk-through inspection of the building to identify the potential and/or actual presence of hazardous building materials, including:
 - Asbestos-Containing Materials (ACMs)
 - Lead based paint (LBP)
 - Mercury based thermostats
 - Polychlorinated biphenyls (PCBs)
 - Sources of ozone depleting substances (ODSs)
 - Other potentially hazardous building materials
- Inspect the Site for evidence of areas that are impacted by suspected visible mould growth.
- Sampling and laboratory testing of suspected ACMs to confirm the presence or absence of asbestos fibres.

- Sampling and laboratory testing of paint to determine concentrations of lead, mercury and PCBs.
- Review of accessible fluorescent lights for PCB containing light ballasts.
- Review of the Site for the presence of potential sources of ODSs and other hazardous materials.
- Prepare a written report documenting the methodologies and findings of the hazardous building material assessment.

3.0 Hazardous Material Assessment

The Regulatory framework and results of the sampling program are outlined in the following sections. Note that all samples were submitted to Maxxam Analytics Inc. (Maxxam) in St. John's, Newfoundland. Maxxam are a Canadian Association for Laboratory Accreditation (CALA) certified laboratory. Maxxam has an in-house Quality Assurance (QA) program that consists of analyzing matrix spike, spiked blank, and method blank samples. The results of the matrix spike and blank samples are compared to established Quality Control (QC) limits to assess the quality of the results.

3.1 Asbestos Containing Materials (ACMs)

General

ACMs are regulated by the Asbestos Abatement Regulations, 1998 under the Occupational Health and Safety Act (O.C. 98-730) in Newfoundland and Labrador. These regulations provide safe handling procedures for ACMs to minimize exposure to airborne asbestos fibres. Materials containing greater than 1% asbestos by dry weight is considered asbestos material.

Assessment

Suspect asbestos containing materials were identified in the buildings. The suspect areas were identified as wall insulation and roofing shingles. It is noted that the cabin was renovated sometime after the 2000 hurricane Igor event and in this regard, the flooring and other interior building materials associated with the cabin were not sampled for asbestos.

A total of four (4) samples were collected for analysis. All samples were collected by removing approximately 6 cm² of materials (where possible) and placing the sampled materials in a ziploc plastic bag.

The results of the asbestos analysis are summarized in Table 1.

Table 1: Summary of Asbestos Sampling

Structure	Sample ID	Location	Condition	Results*
Warehouse	A-1	Insulation around wall/overhead door interface	Poor condition	Not detected
Warehouse	A-2	Roofing shingle	Fair condition	Not detected
Fuel storage shed	A-3	Roofing shingle	Fair condition	Not detected
Cabin	A-4	Roofing shingle	Fair condition	Not detected

***Shading and bold indicates asbestos containing material (ACM) 1% by volume or greater.**

As noted in Table 1, all samples were non-detect for asbestos.

It is noted that there is potential for asbestos to be present in areas that were not sampled, including but not limited to, electrical and mechanical components and insulators such as wiring and gaskets inside electrical panels, electronic and/or mechanical equipment, hidden fire rated building materials, and underground infrastructure and piping. It is noted that no samples of the compounds at roofing penetrations were taken due to limited access.

3.2 Polychlorinated Biphenyls (PCBs)

General

PCBs are commonly associated with dielectric fluids within electrical equipment such as transformers, fluorescent light ballasts and capacitors manufactured in Canada prior to approximately 1980. The federal Environment Contaminants Act (1976) prohibited the use of PCBs in heat transfer equipment installed after September 1, 1977 and in transformers and capacitors installed after July 1, 1980.

PCB containing equipment is considered hazardous waste upon removal for the purpose of disposal. PCB wastes were previously regulated by the federal Storage of PCB Material Regulations (SOR/92-507) under the Canadian Environmental Protection Act and the provincial Storage of PCB Waste Regulations, 2003 under the Environmental Protection Act. The Storage of PCB Material Regulations have been repealed by new PCB Regulations (SOR/2008-273).

Assessment

Fluorescent light ballasts appear to have been previously located in the warehouse, however they have all been replaced with LED lights (see Appendix B).

The paint sample collected from the interior walls of the warehouse (sample labelled “P-1”), was non-detect for PCBs (see Appendix C).

3.3 Lead

General

There are no provincial guidelines available to regulate the concentration of lead in paint. In 1976, the Hazardous Materials Product Act – Liquid Coating established the maximum acceptable limit for amount of lead in interior paint at 0.5% (equivalent to 5000 mg/kg). An industry agreement excluded it from exterior paint in 1990. Subsequent to this, the Surface Coating Materials Regulations were promulgated (in 2005), reducing the allowable lead content of paints to 0.06% (600 mg/kg). This level was later reduced in 2009 to 0.009% (90 mg/kg).

Samples in excess of 5000 mg/kg of lead are subject to leachate extraction analysis. The Transportation of Dangerous Goods (TDG) Regulations, the Export and Import of Hazardous Waste and Hazardous Recyclable Materials (EIHW&HRM) Regulations apply to material with a lead leachate concentration in excess of 5mg/L, and therefore require regulated disposal.

Assessment

One (1) paint sample was collected from the interior wall of the warehouse. One (1) additional paint sample was collected from the walls of the fuel storage shed (composite sample of the interior/exterior paint). Approximately 5g of sample was collected as required by the analytical laboratory. The results of the analysis is included in Table 2.

Table 2: Summary of Paint Sampling – Lead

Building	Sample ID	Description	Condition	Lead Concentration (mg/kg)
Warehouse	P-1	Interior painted plywood wall in warehouse	Good condition	140 mg/kg
Fuel storage shed	P-2	Interior/exterior composite sample scraped from concrete walls	Poor condition – peeling/flaking	8,800 mg/kg

* Shading indicates concentrations exceed guidelines

Notes:

1. Surface Coating Materials Regulations for lead in paint is 90 mg/kg. The TDG and EIIHW&HRM regulations for lead in leachate is 5 mg/L.
2. Bold and shading indicate levels of lead leachate > 90mg/kg.

The documented concentrations of lead in paint on the walls of the fuel storage shed (interior/exterior walls) was 8,800 mg/kg, indicating that the paint is likely leachable and would not be permitted disposal in the regular waste stream.

3.4 Mercury

General

There are no provincial guidelines available to regulate the concentration of mercury in paint. The management of mercury is regulated under the Surface Coating Materials Regulations, 2005 under the Hazardous Products Act (0.001% or 10 mg/kg) to determine the maximum acceptable concentration of mercury in paint. For comparison purposes, the 2006 Canadian Council of Ministers of the Environment Canadian Environmental Quality Guidelines (CCME-CEQG) for mercury in soil at commercial sites have been used (24 mg/kg).

Samples in excess of 24 mg/kg (commercial) of mercury are subject to leachate extraction analysis. The Transportation of Dangerous Goods Regulations, the Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulations apply to material with a mercury leachate concentration in excess of 0.1mg/L, and therefore require regulated disposal.

Assessment

Similar to the lead paint sample, one (1) paint sample was collected from the interior walls of the warehouse and another was collected from the interior/exterior concrete walls of the fuel storage shed. Approximately 5g of sample was collected as required by the analytical laboratory. The results of the analysis is included in Table 3.

The results of the analysis are included in Table 3.

Table 3: Summary of Paint Sampling – Mercury

Building	Sample ID	Description	Condition	Mercury Concentration (mg/kg)
Warehouse	P-1	Interior painted plywood wall in warehouse	Good condition	3.7 mg/kg
Fuel storage shed	P-2	Interior/exterior composite sample scraped from concrete walls	Poor condition – peeling/flaking	51 mg/kg

* Shading indicates concentrations exceed guidelines

Notes:

1. Surface Coating Materials Regulations for mercury in paint is 10 mg/kg. The TDG and EIIHW&HRM regulations for lead in leachate is 0.1 mg/L.
2. Bold and shading indicate levels of lead leachate > 10mg/kg.

Since the results of the analysis were greater than 10mg/kg for mercury in sample P-2, the paint is considered to be mercury based.

3.5 Ozone Depleting Substances (ODSs)

General

Ozone depleting substances are regulated under the provincial Halocarbon Regulations, 2005 under the Environmental Protection Act and the Ozone-depleting Substances Regulations, 1998 under the Canadian Environmental Protection Act, 1999. The federal regulations were amended in 2001, 2002 and 2004. The Federal Halocarbon Regulations 2003 under the Canadian Environmental Protection Act, 1999 applies to refrigeration and air-conditioning systems on federal government properties. Halocarbon containing equipment should be serviced, charged, and/or properly disposed of by a licensed contractor. An equipment service log should be maintained for each piece of equipment. Halocarbon containing equipment with a capacity greater than 19 kW requires an annual leak testing.

Assessment

Fire extinguishers were noted in the warehouse. The manufacturer's code on the fire extinguisher indicated that they are dry chemical. When decommissioned, disposal of the fire extinguishers should be to a household hazardous waste depot.

There were no air conditioning units or refrigeration equipment noted at the time of the site visit.

3.6 Mould

General

There are currently no regulations in Canada related specifically to mould in buildings. There have been no exposure limits established for concentrations of mould in air. However, a safe work environment is mandated in Canada by federal and provincial occupational health and safety acts and related regulations. In addition, Health Canada outlines investigation methods and guidelines for mould in private and public buildings:

- “Residential Indoor Air Quality Guidelines: Moulds”, Health Canada, 2007;
- “Fungal Contamination in Public Buildings: Health Effects and Investigation Methods”, Health Canada, 2004; and
- “Indoor Air Quality in Office Buildings: A Technical Guide”, Health Canada, Report of the Federal-Provincial Advisory Committee on Environmental and Occupational Health, 1995.

There are numerous resources for the investigation and remediation of mould. The following documents provide procedures for remediation of mould in buildings:

- “Mould Guidelines for the Canadian Construction Industry”, Canadian Construction Association, 2004;
- “Fighting Mould – The Homeowners Guide”, Canada Mortgage and Housing Corporation (CMHC), 2007; and
- “Should You Test the Air in Your Home for Mould?”, CMHC, 2006.

Assessment

Mould was noted on the walls and ceilings of the warehouse (see pictures in Appendix B). All mould/water stained building materials should be removed and the source of the problem identified/remediated.

3.7 Urea Formaldehyde Foam Insulation

General

UFFI was developed in Europe in the 1950s. It was used in Canada, primarily between 1977 and 1980, when it was banned from use under the federal Hazardous Products Act. To produce the urea formaldehyde foam, excess formaldehyde is added to the urea to ensure complete curing during the insulation process. Excess formaldehyde was given off within one to two days of

injection during the curing process. If exposed to water or moisture, the UFFI may start to deteriorate, resulting in a release of formaldehyde gas.

Assessment

There was no evidence noted in the current investigation, to suggest that UFFI is present in the buildings. In this regard, no potential UFFI samples were collected.

3.8 Other

There are various household hazardous waste products (cleaners, jerry cans with fuel, etc.) in the warehouse and fuel storage shed. Disposal of these items, if required, should be to a hazardous waste facility or otherwise in accordance with the NL Waste Management Regulations” under the “Waste Management Act”.

It is noted that there are drums outside the fuel storage shed as well. Intrusive sampling of the site soils for potential hydrocarbon impacts was outside the current work scope.

4.0 Conclusions and Recommendations

- Asbestos was not detected in: (i) the wall insulation along the overhead door of the warehouse; or (ii) the roofing materials of the warehouse, fuel storage shed or cabin. Due to the age of the site, it is noted that there is potential for asbestos to be present in areas that were not sampled, including but not limited to, electrical and mechanical components and insulators such as wiring and gaskets inside electrical panels, electronic and/or mechanical equipment, hidden fire rated building materials, and underground infrastructure and piping.
- The paint sample collected from the fuel storage shed indicated that the paint is lead/mercury based. The paint is peeling/flaking throughout (interior and exterior). Due to the poor condition of the paint, there is potential for the flaking/peeling paint to have impacted the soils surrounding the fuel storage shed.
- Mould is present in the warehouse. All mould/water stained building materials should be removed and the source of the problem identified/remediated.
- There are various household hazardous waste products (cleaners, jerry cans with fuel, etc.) in the warehouse and fuel storage shed. Disposal of these items, if required,

should be to a hazardous waste facility or otherwise in accordance with the NL Waste Management Regulations” under the “Waste Management Act”. It is noted that there are drums outside the fuel storage shed as well. Intrusive sampling of the site soils for potential hydrocarbon impacts was outside the current work scope.

- Fire extinguishers were noted in the warehouse. The manufacturer’s code on the fire extinguishers indicated that they are dry chemical. When decommissioned, disposal of the fire extinguishers should be to a household hazardous waste depot.

5.0 Limitations

This report was prepared exclusively for the purposes, project and Site location outlined in the report. The report is based on information provided to, or obtained by AFN Engineering Inc. ("AFN") as indicated in the report, and applies solely to Site conditions existing at the time of the Site investigation. Although a reasonable investigation was conducted by AFN, AFN's investigation was by no means exhaustive and can not be construed as a certification of the absence of any contaminants from the Site. Rather, AFN's report represents a reasonable review of available information within an agreed work scope, schedule and budget. It is therefore possible that currently unrecognized contamination or potentially hazardous materials may exist at the Site, and that the levels of contamination or hazardous materials may vary across the Site. Further review and updating of the report may be required as local and Site conditions, and the regulatory and planning frameworks, change over time.

This report was prepared by AFN for the sole benefit of our Client (DFO). The material in the report reflects AFN's judgment in light of the information available to AFN at the time of preparation. Any use which a third party (eg., a party other than our Client) makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. AFN accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Appendix A

Site Plan

MTM Coordinates (Metres) NAD83 Zone 1			
Monument	Northing	Easting	
934011	5360746.256	283543.555	
934012	5361625.545	282778.748	

Legend:

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— x —
- Found

Iron Pin

Capped Iron Pin

Cross Cut in Steel Fence Rail

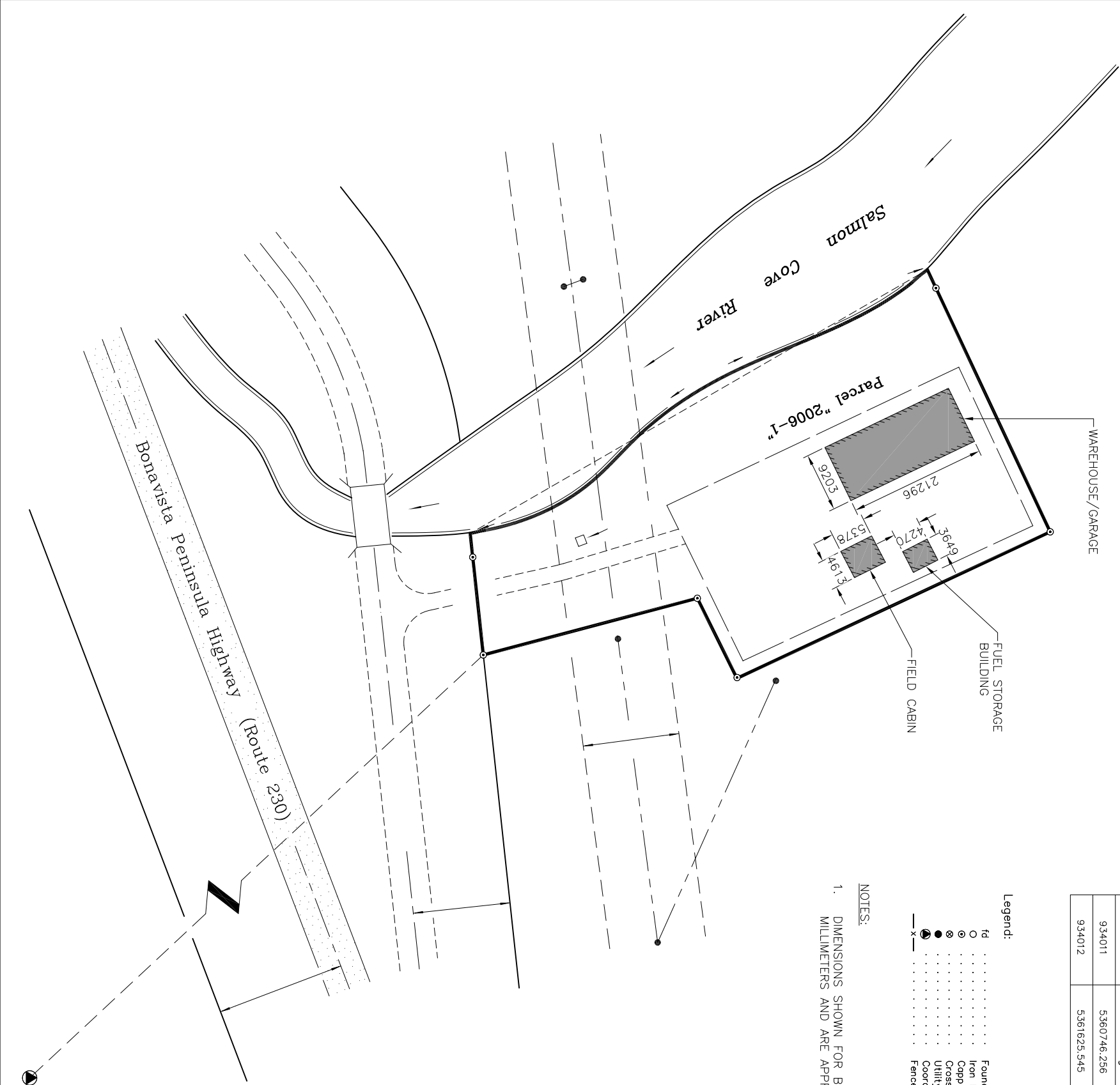
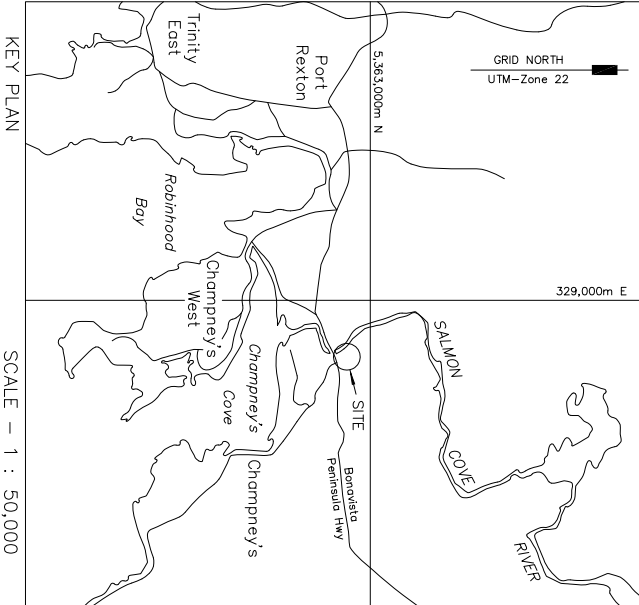
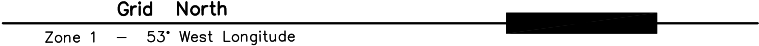
Utility Pole

Coordinate Monument

Fence Line

NOTES:

1. DIMENSIONS SHOWN FOR BUILDINGS ARE IN MILLIMETERS AND ARE APPROXIMATE.



SALMON COVE RIVER

Appendix B

Photographs



Warehouse/garage (exterior view)



Warehouse/garage (interior view)



Dry chemical fire extinguisher in warehouse/garage



Ceiling mounted light fixtures in warehouse/garage



Mould on ceiling surface in warehouse/garage



Mould on ceiling and wall in warehouse/garage



Rotted siding on back of warehouse/garage
(sample of paint flaking and siding substrate
collected for lead analysis)



Fuel cans in warehouse/garage



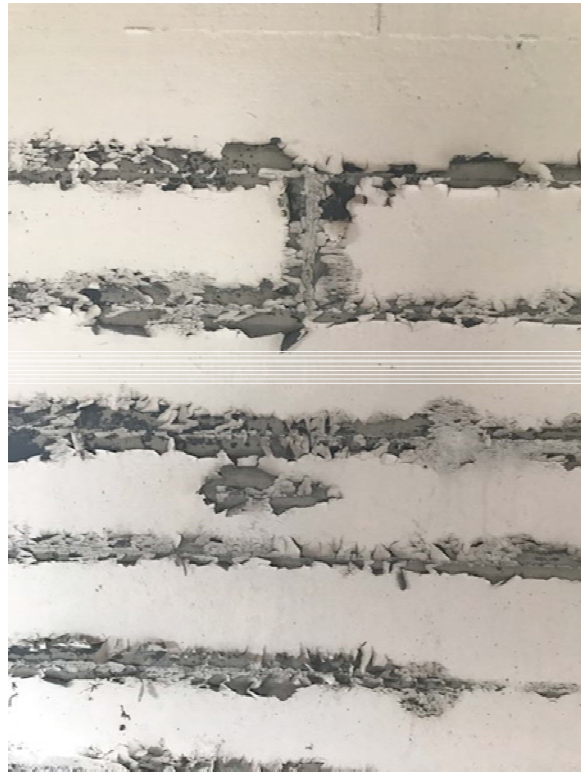
Fuel storage building (exterior view)



Fuel storage building (interior view)



Paint peeling/flaking from exterior walls (fuel storage building)



Paint peeling/flaking from interior walls (fuel storage building) – sample collected for lead in paint analysis



Interior view – field cabin



Interior view – field cabin

Appendix C

Laboratory Certificates

Your Project #: 5-927
Your C.O.C. #: 5-927

Attention: NEIL HUNT

AFN Engineering Inc
29 Brad Gushue Crescent
St. John's, NL
A1H 0A3

Report Date: 2017/07/05

Report #: R4576606

Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7D5511

Received: 2017/06/28, 09:30

Sample Matrix: Paint
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Metals Paint Acid Extr. ICPMS (1)	1	2017/06/30	2017/06/30	ATL SOP 00058	EPA 6020A R1 m
PCBs in Paint by GC/ECD (1, 2)	1	2017/06/30	2017/07/05		EPA 8082A m
PCB Aroclor sum (paint) (1)	1	N/A	2017/07/05	N/A	Auto Calc.

Sample Matrix: SOLID
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Asbestos by PLM (3, 4)	4	N/A	2017/07/04	CAM SOP-00475	EPA/600/R-93/116
Metals Bulk Acid Extr. ICPMS (1)	1	2017/06/30	2017/06/30	ATL SOP 00058	EPA 6020A R1 m
PCBs in Paint by GC/ECD (1, 2)	1	2017/06/30	2017/07/05		EPA 8082A m
PCB Aroclor sum (paint) (1)	1	N/A	2017/07/05	N/A	Auto Calc.

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your Project #: 5-927
Your C.O.C. #: 5-927

Attention: NEIL HUNT

AFN Engineering Inc
29 Brad Gushue Crescent
St. John's, NL
A1H 0A3

Report Date: 2017/07/05

Report #: R4576606

Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7D5511

Received: 2017/06/28, 09:30

(1) This test was performed by Maxxam Bedford

(2) Non accredited test method. Best laboratory practices and all routine QC procedures were employed.

(3) This test was performed by Maxxam Analytics Mississauga

(4) Maxxam Analytics' Asbestos Laboratory is accredited by NVLAP for bulk asbestos analysis by polarized light microscopy, NVLAP Code 600136-0.

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Maxxam Analytics' scope of accreditation includes EPA-600/M4-82-020: "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" and EPA-600/R-93/116: "Method for the Determination of Asbestos in Bulk Building Materials".

Encryption Key



Maxxam
05 Jul 2017 12:45:58

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Melissa DiPinto, Project Manager

Email: mdipinto@maxxam.ca

Phone# (709) 754 0203

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ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		EQN524		
Sampling Date		2017/06/24		
COC Number		5-927		
	UNITS	P-2	RDL	QC Batch
Metals				
Acid Extractable Lead (Pb)	mg/kg	8800	5.0	5053249
Acid Extractable Mercury (Hg)	mg/kg	51	1.0	5053249
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

POLYCHLORINATED BIPHENYLS BY GC-ECD (PAINT)

Maxxam ID		EQN524		
Sampling Date		2017/06/24		
COC Number		5-927		
	UNITS	P-2	RDL	QC Batch
PCBs				
Aroclor 1016	mg/kg	<5.0	5.0	5053487
Aroclor 1221	mg/kg	<5.0	5.0	5053487
Aroclor 1232	mg/kg	<5.0	5.0	5053487
Aroclor 1248	mg/kg	<5.0	5.0	5053487
Aroclor 1242	mg/kg	<5.0	5.0	5053487
Aroclor 1254	mg/kg	<5.0	5.0	5053487
Aroclor 1260	mg/kg	<5.0	5.0	5053487
Calculated Total PCB	mg/kg	<5.0	5.0	5049894
Surrogate Recovery (%)				
Decachlorobiphenyl	%	46		5053487
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

ASBESTOS (SOLID)

Maxxam ID		EQN525	EQN526	EQN527	EQN528		
Sampling Date		2017/06/24	2017/06/24	2017/06/24	2017/06/24		
COC Number		5-927	5-927	5-927	5-927		
	UNITS	A-1	A-2	A-3	A-4	RDL	QC Batch
Number of Layers	%	1.0	1.0	1.0	1.0		5056574
Layer 1 Homogenous?	%	Yes	Yes	Yes	Yes		5056574
Layer 1 Colour	%	YELLOW	BLACK	BLACK	BLACK		5056574
Layer 1 Description	%	FOAM	ROOFING	ROOFING	ROOFING		5056574
Layer 1 Asbestos	%	ND	ND	ND	ND		5056574
Layer 1 Cellulose	%			25	25	0.5	5056574
Layer 1 Fibrous Glass	%		20			0.5	5056574
Layer 1 Non Fibrous Material	%	100	80	75	75	0.5	5056574
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							
ND = Not detected							

ELEMENTS BY ATOMIC SPECTROSCOPY (SOLID)

Maxxam ID		EQN523		
Sampling Date		2017/06/24		
COC Number		5-927		
	UNITS	P-1	RDL	QC Batch
Metals				
Acid Extractable Lead (Pb)	mg/kg	140	5.0	5053250
Acid Extractable Mercury (Hg)	mg/kg	3.7	1.0	5053250
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOLID)

Maxxam ID		EQN523		
Sampling Date		2017/06/24		
COC Number		5-927		
	UNITS	P-1	RDL	QC Batch
PCBs				
Aroclor 1016	mg/kg	<5.0	5.0	5053487
Aroclor 1221	mg/kg	<5.0	5.0	5053487
Aroclor 1232	mg/kg	<5.0	5.0	5053487
Aroclor 1248	mg/kg	<5.0	5.0	5053487
Aroclor 1242	mg/kg	<5.0	5.0	5053487
Aroclor 1254	mg/kg	<5.0	5.0	5053487
Aroclor 1260	mg/kg	<5.0	5.0	5053487
Calculated Total PCB	mg/kg	<5.0	5.0	5051595
Surrogate Recovery (%)				
Decachlorobiphenyl	%	45		5053487
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	25.4°C
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Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5053249	BAN	Matrix Spike	Acid Extractable Lead (Pb)	2017/06/30		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2017/06/30		98	%	75 - 125
5053249	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2017/06/30		100	%	75 - 125
			Acid Extractable Mercury (Hg)	2017/06/30		101	%	75 - 125
5053249	BAN	Method Blank	Acid Extractable Lead (Pb)	2017/06/30	<5.0		mg/kg	
			Acid Extractable Mercury (Hg)	2017/06/30	<1.0		mg/kg	
5053249	BAN	RPD	Acid Extractable Lead (Pb)	2017/06/30	0.42		%	35
			Acid Extractable Mercury (Hg)	2017/06/30	4.9		%	35
5053250	BAN	Matrix Spike [EQN523-01]	Acid Extractable Lead (Pb)	2017/06/30		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2017/06/30		99	%	75 - 125
5053250	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2017/06/30		100	%	75 - 125
			Acid Extractable Mercury (Hg)	2017/06/30		101	%	75 - 125
5053250	BAN	Method Blank	Acid Extractable Lead (Pb)	2017/06/30	<5.0		mg/kg	
			Acid Extractable Mercury (Hg)	2017/06/30	<1.0		mg/kg	
5053250	BAN	RPD [EQN523-01]	Acid Extractable Lead (Pb)	2017/06/30	4.2		%	35
			Acid Extractable Mercury (Hg)	2017/06/30	3.3		%	35
5053487	LGE	Matrix Spike [EQN524-01]	Decachlorobiphenyl	2017/07/05		37	%	30 - 130
			Aroclor 1254	2017/07/05		5.1 (1)	%	30 - 130
5053487	LGE	Spiked Blank	Decachlorobiphenyl	2017/07/05		57	%	30 - 130
			Aroclor 1254	2017/07/05		73	%	30 - 130
5053487	LGE	Method Blank	Decachlorobiphenyl	2017/07/05		78	%	30 - 130
			Aroclor 1016	2017/07/05	<5.0		mg/kg	
			Aroclor 1221	2017/07/05	<5.0		mg/kg	
			Aroclor 1232	2017/07/05	<5.0		mg/kg	
			Aroclor 1248	2017/07/05	<5.0		mg/kg	
			Aroclor 1242	2017/07/05	<5.0		mg/kg	
			Aroclor 1254	2017/07/05	<5.0		mg/kg	
			Aroclor 1260	2017/07/05	<5.0		mg/kg	
5053487	LGE	RPD [EQN524-01]	Aroclor 1016	2017/07/05	NC		%	50
			Aroclor 1221	2017/07/05	NC		%	50
			Aroclor 1232	2017/07/05	NC		%	50
			Aroclor 1248	2017/07/05	NC		%	50
			Aroclor 1242	2017/07/05	NC		%	50
			Aroclor 1254	2017/07/05	NC		%	50
			Aroclor 1260	2017/07/05	NC		%	50

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

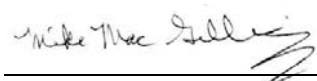
(1) Matrix Spike: results are outside acceptance limit. Analysis was repeated with similar results.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Banu Gorgen-Keough, Supervisor



Mike MacGillivray, Scientific Specialist (Inorganics)



Rosemarie MacDonald, Scientific Specialist (Organics)

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