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SPECIFICATION (Issue for Tender)
22 June 2020

Fort Smith GOCB Roof Replacement
Public Works and Government Services Canada (PWGSC)
Project No. R.015992.646

149 McDougal Road
Fort Smith, NT

www.pwgsc-tpsgc.gc.ca

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Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises renovation of a commercial building located at 149 McDougal Road, Fort Smith, Northwest Territories. Work includes selective demolition, installation of new modified bituminous membrane roof and new sheet metal roof, and minor mechanical and electrical work.

.2 Prior to selective demolition of existing roof, Work is to include:

.1 Static verification of existing mechanical systems.

.2 Sampling and testing of existing built-up roofs for asbestos-containing materials.

1.2 CONTRACT METHOD

.1 Construct Work under single stipulated price contract.

1.3 WORK SEQUENCE

.1 Construct Work in stages to accommodate continued use of premises during construction.

.2 Co-ordinate Progress Schedule and co-ordinate with occupancy during construction.

.3 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.

.4 Maintain fire access/control.

1.4 CONTRACTOR USE OF PREMISES

.1 Limit use of premises for Work, for storage, for access, to allow:

.1 Full occupancy.

.2 Public usage.

.2 Co-ordinate use of premises under direction of Departmental Representative.

.3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

.4 Remove or alter existing work to prevent injury or damage to portions of existing work that remain.

.5 Repair or replace portions of existing work that have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.

.6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.5 EXISTING SERVICES

.1 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.

.2 Submit schedule to and obtain approval from Departmental Representative for shutdown or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.

.3 Provide temporary services to maintain critical building and tenant systems.

.4 Provide adequate bridging over trenches that cross sidewalks or roads to permit normal traffic.

.5 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.6 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

.7 Record locations of maintained, re-routed and abandoned service lines.

.8 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.6 DOCUMENTS REQUIRED

.1 Successful bidding Contractor is to obtain required sets of Contract Documents for construction purposes, which includes two (2) sets for "as-built" and record purposes.

.1 Contractor is responsible for costs of printing, handling, and shipping of Contract Documents.

.2 Maintain at job site, one copy of each document as follows:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Reviewed Shop Drawings.

.5 List of Outstanding Shop Drawings.

.6 Change Orders.

.7 Other Modifications to Contract.

.8 Field Test Report, System Components List complete with Commissioning Verification Forms and Check Sheets, and Commissioning Issues/Resolution Log.

.9 Copy of Approved Work Schedule.

.10 Health and Safety Plan and Other Safety Related Documents.

.11 Other documents as specified.

END OF SECTION

Part 1 General

1.1 ACCESS AND EGRESS

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

1.2 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

.2 Maintain existing services to building and provide for personnel and vehicle access.

.3 Closures: Protect work temporarily until permanent enclosures are completed.

1.3 SITE STORAGE/LOADING

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

.3 Prevent overloading of parts of building.

1.4 EXISTING SERVICES

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

.2 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.3 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours’ notice for necessary interruption of mechanical or electrical service. Keep duration of interruptions to a minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.4 Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian and vehicular traffic and tenant operations.

.5 Provide alternative routes for personnel, pedestrian and vehicular traffic.

1.5 SPECIAL REQUIREMENTS

.1 Submit schedule in accordance with Section 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart.

.2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic, and security regulations.

.3 Keep within limits of work and avenues of ingress and egress.

1.6 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work.

.2 Provide and maintain adequate access to project site.

1.7 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions.

.2 Smoking is not permitted inside building.

.3 Confirm, with building management, outdoor locations where personnel may smoke.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

.6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.

.7 Reproduce and distribute copies of minutes within three days after meetings; transmit to Departmental Representative, meeting participants, and affected parties not in attendance.

.8 Representatives of Contractor, Subcontractor, and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

.1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Departmental Representative, Contractor, major Subcontractors, field inspectors, and supervisors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum five days before meeting.

.4 Agenda to include:

.1 Appointment of official representative of participants in the Work.

.2 Schedule of Work: in accordance with Section 01 32 16.19 - Construction Progress Schedules - Bar (GANTT) Chart.

.3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.

.5 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

.6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.7 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.

.8 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

.9 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.

.10 Monthly progress claims, administrative procedures, photographs, hold backs.

.11 Appointment of inspection and testing agencies or firms.

.12 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

.1 During course of Work and two weeks prior to project completion, schedule progress meetings every two weeks.

.2 Contractor, major Subcontractors involved in Work, and Departmental Representative are to be in attendance.

.3 Notify parties minimum three days prior to meetings.

.4 Record minutes of meetings; circulate to attending parties and affected parties not in attendance within three days after meeting.

.5 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems that impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules and expedite as required.

.10 Maintenance of quality standards.

.11 Review proposed changes for effect on construction schedule and on completion date.

.12 Other business.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally, Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five-day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or project element. Usually expressed as workdays or workweeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.

.4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 SUBMITTALS

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

.2 Submit to Departmental Representative, within 10 working days of Award of Contract, Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

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

1.4 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 Departmental Representative will review and return revised schedules within five working days.

.3 Revise impractical schedule and resubmit within five working days.

.4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.5 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:

.1 Award.
.2 Shop Drawings, Samples.
.3 Permits.
.4 Mobilization.
.5 Structural Steel.
.6 Siding and Roofing.
.7 Interior Architecture (Walls, Floors and Ceiling).
.8 Plumbing.
.9 Lighting.
.10 Electrical.
.11 Piping.
.12 Controls.

.13 Heating, Ventilating, and Air Conditioning.

.14 Millwork.

.15 Fire Systems.

.16 Testing and Commissioning.

1.6 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.7 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

.2 Weather related delays with their remedial measures will be discussed and negotiated.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

.1 Provide submittals listed for review to Departmental Representative. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension for such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples, and mock-ups in SI Metric units.

.4 Where items or information are not produced in SI Metric units, converted values are acceptable.

.5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated, and identified as to specific project will be returned without being examined, and considered rejected.

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

.7 Allow 10 working days for Departmental Representative's review of each submission.

.8 Verify field measurements and affected adjacent Work are co-ordinated.

.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 review.

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

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data that are to be provided by Contractor to illustrate details of a portion of Work.

.2 Submit drawings stamped and signed by professional engineer registered or licensed in the Northwest Territories.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross-references to design drawings and specifications.

.4 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.5 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.6 Accompany submissions with transmittal letter, containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.7 Submissions include:

- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

.8 After Departmental Representative's review, distribute copies.

.9 Submit electronic copy of shop drawings for each requirement requested in specification Sections, and as Departmental Representative may reasonably request.

.10 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental

Representative where shop drawings will not be prepared due to standardized manufacture of product.

.11 Submit electronic copies of test reports for requirements requested in specification Sections, and as requested by Departmental Representative.

.1 Report signed by authorized official of testing laboratory, indicating that material, product or system identical to material, product, or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been performed within 3 years of date of contract award for project.

.12 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project contract complete with project name.

.13 Submit electronic copies of manufacturers' instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards, and safety precautions.

.14 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative:

.1 Documentation of testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.15 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.16 Delete information not applicable to project.

.17 Supplement standard information to provide details applicable to project.

.18 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned, and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.19 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining general conformance with design intent.

.1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.3 SAMPLES

.1 Submit samples for review in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's business address.

.3 Notify Departmental Representative in writing, at time of submission, of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern, or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state so in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in samples that Departmental Representative may require, consistent with Contract Documents.

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

1.4 MOCK-UPS

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

1.5 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic copy of colour digital photography in jpg format, standard resolution, as directed by Departmental Representative.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Viewpoints and location: As determined by Departmental Representative.

.4 Frequency of photographic documentation: as directed by Departmental Representative.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Northwest Territories and Nunavut

.1 Safety Act, R.S.N.W.T. - Updated 2015.

.3 Occupational Health and Safety Regulations, 2018.

1.2 SAFETY PLAN

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

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.3 RESPONSIBILITY

.1 The "Prime Contractor" according applicable local jurisdiction, is responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

.3 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, and follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Territory having jurisdiction. Advise Departmental Representative verbally and in writing.

1.4 SUBMITTALS

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

.2 Submit site-specific Health and Safety Plan within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site-specific safety hazard assessment.

.2 Results of safety and health risk or hazard analysis for site tasks and operation.

.3 Requirements from Federal and Territorial authorities having jurisdiction regarding COVID-19 transmission prevention.

.3 Submit copies of Contractor's authorized representative's work site health and safety inspection reports weekly to Departmental Representative.

.4 Submit copies of reports or directions issued by Federal and Territorial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 10 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within five days after receipt of comments from Departmental Representative.

.7 Departmental Representative review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.8 Medical Surveillance: Where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

.9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.5 FILING OF NOTICE

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

.2 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.6 SAFETY ASSESSMENT

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

.2 Appoint accredited environmental agent to perform pre-demolition audit for asbestos-containing materials at existing built-up roofs, including main roof and post office roof.

.1 Include environmental agent’s recommendations for abatement if asbestos-containing materials are present.

1.7 MEETINGS

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

1.8 REGULATORY REQUIREMENTS

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

1.9 COMPLIANCE REQUIREMENTS

.1 Comply with Safety Act, General Safety Regulations, R.R.N.W.T. 2015.

.2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.10 UNFORESEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety co-ordinator, follow procedures in accordance with Acts and Regulations of Territory having jurisdiction, and advise Departmental Representative verbally and in writing.

1.11 HEALTH AND SAFETY CO-ORDINATOR

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

.1 Have site-related working experience.

.2 Have working knowledge of occupational safety and health regulations.

.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

.4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

.5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.12 POSTING OF DOCUMENTS

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

1.13 WHMIS

.1 Ensure that products used in project comply with Workplace Hazardous Materials Information System (WHMIS) Regulations and Chemical Substances of the OH&S Act and Regulations regarding use, handling, labelling, storage, and disposal of hazardous materials.

.2 Deliver copies of relevant Safety Data Sheets (SDS) to job site and Departmental Representative. SDS to be acceptable to Labour Canada and Health and Welfare Canada for controlled products that will be used in performance of this work. Locate SDS in accessible locations for workers and visitors throughout the site, bound and organized in binders.

.3 Train workers required to use or to work in close proximity to controlled products in accordance with OH&S Act and Regulations.

.4 Label controlled products at jobsite in accordance with OH&S and Regulations and WHMIS.

.5 Provide appropriate emergency facilities as specified in the SDS where workers might be exposed to contact with chemicals, including eye-wash facilities, emergency shower.

.1 Workers are to be trained in use of such emergency equipment.

.6 Provide appropriate personal protective equipment as specified in the SDS where workers are required to use controlled products.

.1 Properly fit workers for personal protective equipment

.2 Train workers in care, use, and maintenance of personal protective equipment.

.7 No controlled products are to be brought on-site without prior approved SDS.

.8 SDS are to remain on site at all times.

1.14 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.15 POWDER ACTUATED DEVICES

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

1.16 WORK STOPPAGE

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

1.17 FIRE PROTECTION

.1 Comply with requirements of the local Fire Commissioner's Office.

.2 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations and bylaws.

.3 Burning rubbish and construction waste materials is not permitted on site.

.4 Maintain placed or installed fire resistive construction to protect the portions of the Work during construction.

END OF SECTION

Part 1 General

1.1 REFERENCES TO REGULATORY REQUIREMENTS

.1 Perform Work in accordance with 2015 National Building Code of Canada (NBC) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code

.1 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

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

.2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.

.3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

1.3 BUILDING SMOKING ENVIRONMENT

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

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements: Except as otherwise specified, Constructor shall apply for, obtain, and pay fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:

.1 Regulatory requirements and fees in force on date of Bid submission, and

.2 A change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission

Part 2 Products

2.1 EASEMENTS AND NOTICES

.1 Departmental Representative will obtain permanent easements and rights of servitude that may be required for performance of Work.

.2 Contractor shall give notices required by regulatory requirements.

2.2 PERMITS

.1 Building Permit:

.1 Contractor shall apply for, obtain and pay for building permit on behalf of Owner, and other permits required for Work and its various parts.

.2 Contractor will require that specific Subcontractors obtain and pay for permits required by authorities having jurisdiction, where their Work is affected by Work requiring permits including asbestos abatement and control permits.

.3 Display building permit and other permits in a conspicuous location at Place of Work.

END OF SECTION

Part 1 General

1.1 INSPECTION

.1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.

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

.4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative will pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies may be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for re-testing and re-inspection.

1.3 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

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

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 REJECTED WORK

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

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.6 REPORTS

.1 Submit four copies of inspection and test reports to Departmental Representative.

.2 Provide copies to subcontractor of work being inspected or tested.

1.7 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

1.8 MOCK-UPS

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.

.2 Construct in locations acceptable to Departmental Representative.

.3 Prepare mock-ups for Departmental Representative review with reasonable promptness and in orderly sequence, to not cause delays in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.

.6 Mock-ups may remain as part of Work.

1.9 MILL TESTS

.1 Submit mill test certificates as requested.

1.10 EQUIPMENT AND SYSTEMS

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

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.3 WATER SUPPLY

.1 Departmental Representative will provide continuous supply of potable water for construction use.

.2 Arrange for connection with Departmental Representative and building operations staff. Pay costs for installation, maintenance, and removal.

1.4 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance, and fuel.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

.4 Provide ambient temperatures and humidity levels for storage, installation, and curing of materials.

.5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain temperatures of minimum 10°C in areas where construction is in progress.

.5 Ventilating:

.1 Prevent accumulations of dust, fumes, mists, vapours, or gases in areas occupied during construction.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system after cessation of work process to ensure removal of harmful contaminants.

.6 Maintain strict supervision of operation of temporary heating and ventilating equipment to:

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to outside.

.7 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.5 TEMPORARY POWER AND LIGHT

.1 Departmental Representative will provide temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 230 volts 30 amps.

.2 Arrange for connection with Departmental Representative and building operations staff. Pay costs for installation, maintenance, and removal.

.3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.

.4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

.5 Existing electrical power and lighting systems and those installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative, provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps that have been used for more than 3 months.

1.6 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations and bylaws.

.2 Burning rubbish and construction waste materials is not permitted on site.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA S269.2-M87 (R2003), Access Scaffolding for Construction Purposes.

.2 CAN/CSA Z321-96 (R2006), Signs and Symbols for the Workplace.

1.2 SUBMITTALS

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

1.3 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.

.2 Identify areas that have to be gravelled to prevent tracking of mud.

.3 Indicate use of supplemental or other staging area.

.4 Provide construction facilities in order to execute work expeditiously.

.5 Remove from site all such work after use.

1.4 SCAFFOLDING

.1 Scaffolding in accordance with CSA S269.2.

.2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, temporary stairs.

1.5 HOISTING

.1 Provide, operate and maintain hoists required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.

.2 Hoists to be operated by qualified operator.

1.6 OFFICES

.1 Provide office heated to 22°C, lighted 750 lx, ventilated, and of sufficient size to accommodate site meetings and furnished with drawing laydown table.

.2 Provide marked and fully stocked first-aid case in a readily available location.

.3 Subcontractors to provide their own offices as necessary. Direct location of these offices.

1.7 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.8 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.9 CONSTRUCTION SIGNAGE

.1 Signs and notices for safety and instruction in both official languages; graphic symbols to CAN/CSA Z321.

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

1.10 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Provide access and temporary relocated roads as necessary to maintain traffic.

.2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.

.3 Provide measures for protection, control, and diversion of traffic, including provision of watchpersons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs.

.4 Protect travelling public from damage to person and property.

.5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.

.6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor is responsible for repair of damage to roads caused by construction operations.

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

.1 Provide temporary controls to execute Work expeditiously.

.2 Remove from site all such work after use.

1.2 GUARD RAILS AND BARRICADES

.1 Provide as required by governing authorities.

.2 Provide secure, rigid guard rails and barricades around open shafts, open stair wells, open edges of floors and roofs.

.3 Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

.4 Provide protection to ensure safe passage of people around work area and to and from occupied portions of building.

1.3 WEATHER ENCLOSURES

.1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs until they are permanently enclosed.

.2 Erect enclosures to allow access for the installation of materials and to allow for work inside enclosure.

.3 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

.4 Design enclosures to withstand wind pressure and snow loading.

.5 Ensure that upon final construction, and during construction, the work is executed to prevent the entry of water, snow, and air into the interior of the building and to accept the responsibility to correct any deficient work. Bring to the attention of the Departmental Representative, prior to construction, details that may compromise weather tightness.

.6 Provide weather enclosures or other means as necessary to protect foundation excavations to maintain soil bearing capacity.

1.4 DUST TIGHT SCREENS

.1 Provide dust tight screens or insulated partitions to localize dust-generating activities, and for protection of occupants of building, workers, finished areas of Work, and public.

.2 Maintain and relocate protection until such work is complete.

.3 Coordinate location and security measures with Departmental Representative on Site.

1.5 ACCESS TO SITE

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

1.6 PUBLIC TRAFFIC FLOW

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

1.7 FIRE ROUTES

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

1.8 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.9 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm locations and installation schedule with Departmental Representative, minimum 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Within text of each specifications section, reference may be made to reference standards.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.2 QUALITY

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

.2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

.5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.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.

1.5 TRANSPORTATION

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

1.6 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.8 CO-ORDINATION

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

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.9 CONCEALMENT

.1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

1.10 REMEDIAL WORK

.1 Refer to Section 01 73 00 - Execution Requirements.

.2 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.

.3 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.11 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Departmental Representative of conflicting installation. Install as directed.

1.12 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.13 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.14 PROTECTION OF WORK IN PROGRESS

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

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit written request in advance of cutting or alteration which affects:

- .1 Structural integrity of elements of project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of operational elements.
- .4 Visual qualities of sight-exposed elements.

.3 Include in request:

- .1 Identification of project.
- .2 Location and description of affected Work.
- .3 Statement on necessity for cutting or alteration.
- .4 Description of proposed Work, and products to be used.
- .5 Alternatives to cutting and patching.
- .6 Written permission of affected separate contractor.
- .7 Date and time work will be executed.

1.2 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.3 EXECUTION

.1 Execute cutting, fitting, and patching to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.7 Employ experienced installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.9 Restore work with new products in accordance with requirements of Contract Documents.

.10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.11 Provide firestopping to maintain integrity of fire separations, including:

.1 Protecting penetrations at fire-resistance rated wall, ceiling or floor construction.

.2 Using construction joint fire stops and building perimeter fire stops to protect gaps at fire separations and between fire separations and other construction assemblies.

.12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Remove waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by building occupants or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use marked separate bins for recycling. Refer to Section 01 74 19 - Waste Management and Disposal.

.6 Dispose of waste materials and debris off site.

.7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

.1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris other than that caused by building occupants or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Clean mechanical and electrical fixtures.

.8 Remove stains, spots, marks and dirt from electrical and mechanical fixtures,

.9 Clean lighting reflectors, lenses, and other lighting surfaces.

.10 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.11 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.12 Remove dirt and other disfiguration from exterior surfaces.

.13 Sweep and wash clean paved areas.

.14 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

.15 Clean roofs, downspouts, and drainage systems.

.16 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Remove waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This Section includes requirements for management of construction waste and disposal, which forms the Contractor's commitment to reduce and divert waste materials from landfill and includes the following:

.1 Preparation of a Draft Construction Waste Management Plan that will be used to track the success of the Construction Waste Management Plan against actual waste diversion from landfill.

.2 Preparation of a Construction Waste Management Plan that provides guidance on a logical progression of tasks and procedures to be followed in a pollution prevention program to reduce or eliminate the generation of waste, the loss of natural resources, and process emissions through source reduction, reuse, recycling, and reclamation.

.3 Preparation of monthly progress reports indicating cumulative totals representing progress towards achieving diversion and reduction goals of waste materials away from landfill and identifying any special programs, landfill options or alternatives to landfill used during construction.

.4 Preparation of a Construction Waste Management Report containing detailed information indicating total waste produced by the project, types of waste material and quantity of each material, and total waste diverted and diversion rates indicated as a percentage of the total waste produced.

.2 Intent is that this project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors be employed by the Contractor.

1.2 DEFINITIONS

.1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.

.2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, re-modeling, repair and demolition operations.

.3 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.

.4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.

.5 Non-toxic: Not poisonous to humans either immediately or after a long period of exposure.

.6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

.7 Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

.8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form; recycling does not include burning, incinerating, or thermally destroying waste.

.9 Return: To give back reusable items or unused products to vendors for credit.

.10 Reuse: To reuse a construction waste material in some manner on the project site.

.11 Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

.12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.

.13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

.14 Toxic: Poisonous to humans either immediately or after a long period of exposure.

.15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

.16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:

.1 Solvents in paints and other coatings.

.2 Wood preservatives; strippers and household cleaners.

.3 Adhesives in particleboard, fiberboard, and some plywood; and foam insulation.

.4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.

.17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

.18 Construction Waste Management Plan: A project related plan for the collection, transportation, and disposal of the waste generated at the construction site; the purpose of the plan is to ultimately reduce the amount of material being landfilled.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the project and ensure that requirements of the Construction Waste Management Plan are followed.

.2 Preconstruction Meeting: Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings before starting any Work of the Contract attended by the Contractor, affected Subcontractors and Departmental Representative to discuss the Contractor's Construction Waste Management Plan and to develop mutual understanding of the requirements for a consistent policy towards waste reduction and recycling.

1.4 SUBMITTALS

.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Draft Construction Waste Management Plan (Draft CWM Plan): Submit to Departmental Representative a preliminary analysis of anticipated site generated waste by listing a minimum of five (5) construction or demolition waste streams that have potential to generate the most volume of material indicating methods that will be used to divert construction waste from landfill and source reduction strategies; Departmental Representative will provide commentary before development of Contractor's Construction Waste Management Plan.

.2 Construction Waste Management Plan (CWM Plan): Submit a CWM Plan for this project prior to any waste removal from site and that includes the following information:

.1 Material Streams: Analysis of the proposed jobsite waste being generated, including material types and quantities forming a part of identified material streams in the Draft CWM Plan; materials removed from site destined for alternative daily cover at landfill sites and land clearing debris cannot be considered as contributing to waste diversion and will be included as a component of the total waste generated for the site.

.2 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials and incorporate into CWM Plan.

.3 Alternative Waste Disposal: Prepare a listing of each material proposed to be salvaged, reused, recycled, or composted during the course of the project, and the proposed local market for each material.

.4 Landfill Materials: Identify materials that cannot be recycled, reused or composted and provide explanation or justification; energy will be considered as a viable alternative diversion strategy for these materials where facilities exist.

.5 Landfill Options: The name of the landfill where trash will be disposed of; landfill materials will form a part of the total waste generated by the project.

.6 Materials Handling Procedures: A description of the means by which any recycled waste materials will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.

.7 Transportation: A description of the means of transportation of the recyclable materials, whether materials will be site separated and self hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site, and destination of materials.

1.5 PROJECT CLOSEOUT SUBMISSIONS

.1 Record Documentation: Submit as constructed information in accordance with Section 01 78 00 – Closeout Submittals as follows:

.1 Construction Waste Management Report (CWM Report): Submit a CWM Report for this project in a format acceptable to submittal requirements and that includes the following information:

.1 Accounting: Submit information indicating total waste produced by the project.

.2 Composition: Submit information indicating types of waste material and quantity of each material.

.3 Diversion Rate: Submit information indicating total waste diverted from landfill as a percentage of the total waste produced by the project.

.4 Transportation Documentation: Submit copies of transportation documents or shipping manifests indicating weights of materials, and other evidence of disposal indicating final location of waste diverted from landfill and waste sent to landfill.

.5 Alternative Daily Cover (ADC): Submit quantities of material that were used as ADC at landfill sites, and that form a part of the total waste generated by the project.

.6 Multiple Waste Hauling: Compile all information into a single CWM Report where multiple waste hauling and diversion strategies were used for the project.

.7 Photographs: Submit photographs of waste diversion facilities documenting location and signage describing usage of waste separation containers.

1.6 QUALITY ASSURANCE

.1 Resources for Development of Construction Waste Management Report (CWM Report): The following sources may be useful in developing the Draft Construction Waste Management Plan:

.1 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials and incorporate into CWM Plan.

.2 Waste-to-Energy Systems: Investigate local waste-to-energy incentives where systems for diverting materials from landfill for reuse or recycling are not available.

.2 Certifications: Provide proof of the following during the course of the Work:

.1 Compliance Certification: Provide proof that recycling center is third party verified and is listed as a Certified Facility through the registration and certification requirements of the Recycling Certification Institute.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Storage Requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the project waste and the available recycling and reuse programs in the project area.

.2 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:

.1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.

.2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.

.3 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

Part 2 Products

Not Used.

Part 3 Execution

3.1 CWM PLAN IMPLEMENTATION

.1 Manager: Contractor is responsible for designating an on-site party or parties responsible for instructing workers and overseeing and documenting results of the CWM Plan for the project.

.2 Distribution: Distribute copies of the CWM Plan to the job site foreman, each Subcontractor, the Departmental Representative and other site personnel as required to maintain CWM Plan.

.3 Instruction: Provide on site instruction to Subcontractors of appropriate separation, handling, and recycling, salvage, reuse, composting and return methods being used for the project at appropriate stages of the project.

.4 Separation Facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, composting and return:

.1 Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.

.2 Hazardous wastes shall be separated, stored, and disposed of in accordance with local regulations.

.5 Progressive Documentation: Submit a monthly summary of waste generated by the project to ensure that waste diversion goals are on track with project requirements:

.1 Submission of waste summary can coincide with application for progress payment, or similar milestone event as agreed upon between the Owner, Contractor and Departmental Representative.

.2 Monthly waste summary shall contain the following information:

.1 The amount in tonnes or m^3 and location of material landfilled,

.2 The amount in tonnes or m^3 and location of materials diverted from landfill, and

.3 Indication of progress based on total waste generated by the project with materials diverted from landfill as a percentage.

3.2 SUBCONTRACTOR'S RESPONSIBILITY

.1 Subcontractors shall cooperate fully with the Contractor to implement the CWM Plan.

3.3 SAMPLE CONSTRUCTION WASTE MANAGEMENT FORMS

.1 Sample waste tracking form as appended to this section can be used by the Contractor to establish their own forms for recording management of construction waste:

END OF SECTION

Project Name: Fort Smith GOCB Roof Replacement

Prime Contractor Name: **Contact Person:**

Telephone:

PWGSC Project Number: R.015992.646 **Fax:**

Material Category	Re-use		Recycling		Landfill		Material Destination	Responsible Sub-Contractor
	Estimated (tonnes)	Actual (tonnes)	Estimated (tonnes)	Actual (tonnes)	Estimated (tonnes)	Actual (tonnes)	Provide company name, address, contact person and phone number	
Division 2 - Existing Conditions								
Asphalt Paving Removal								
Fencing:								
Chain Link								
Wood								
Hazardous Materials:								
Contaminated Soil Removal								
Division 3 - Concrete								
Cast in Place Concrete								
Concrete Reinforcing								
Division 4 - Masonry								
Brick Masonry								
Clay Tile Masonry								
Concrete Unit Masonry								
Glass Unit Masonry								
Misc. Masonry								
Division 5 - Metals								
Structural Steel								
Steel Decking								
Metal Studs								
Aluminum								
Copper								
Cast Iron								
Stainless Steel								

Project Name: Fort Smith GOCB Roof Replacement

Prime Contractor Name: **Contact Person:**

Telephone:

PWGSC Project Number: R.015992.646 **Fax:**

Material Category	Re-use		Recycling		Landfill		Material Destination	Responsible Sub-Contractor
	Estimated (tonnes)	Actual (tonnes)	Estimated (tonnes)	Actual (tonnes)	Estimated (tonnes)	Actual (tonnes)	Provide company name, address, contact person and phone number	
Metal Fabrications								
Misc. Metals								
Division 6 - Wood, Plastics and Composites								
Lumber:								
Untreated								
Treated								
Plywood:								
Untreated								
Treated								
Trim, Moulding								
Cabinets/Counters								
Plastic Laminates								
Misc. Wood								
Misc. Plastics								
Misc. Composites								
Division 7 - Thermal and Moisture Protection								
Insulation:								
Fibreglass Batt								
Rigid								
Asbestos Containing								
Roofing Materials:								
Shingles								
Membrane								
Felt & Gravel								
Asbestos Containing								
Siding:								
Regular								
Asbestos Containing								

Project Name: Fort Smith GOCB Roof Replacement

Prime Contractor Name: **Contact Person:**

Telephone:

PWGSC Project Number: R.015992.646 **Fax:**

Material Category	Re-use		Recycling		Landfill		Material Destination	Responsible Sub-Contractor
	Estimated (tonnes)	Actual (tonnes)	Estimated (tonnes)	Actual (tonnes)	Estimated (tonnes)	Actual (tonnes)	Provide company name, address, contact person and phone number	
Flashing/Trim:								
Regular								
Asbestos Containing								
Other								
Division 8 - Openings								
Steel Doors & Frames								
Aluminum Doors & Frames								
Overhead Doors								
Door Hardware								
Windows								
Glazing								
Louvres and Vents								
Other								
Division 9 - Finishes								
Ceramic Tile								
Quarry Tile								
Acoustical Tile								
Wood Flooring								
Carpet								
Resilient Flooring								
Vinyl Flooring								
Acoustical Suspention								
Gypsum Board								
Plaster/Lath								
Wood Panelling								
Metal Ceilings								
Asbestos Containing Finishes								
Lead Containing Finishes								
Other								

Project Name: Fort Smith GOCB Roof Replacement

Prime Contractor Name: **Contact Person:**

Telephone:

PWGSC Project Number: R.015992.646 **Fax:**

Material Category	Re-use		Recycling		Landfill		Material Destination	Responsible Sub-Contractor
	Estimated (tonnes)	Actual (tonnes)	Estimated (tonnes)	Actual (tonnes)	Estimated (tonnes)	Actual (tonnes)	Provide company name, address, contact person and phone number	
Division 10 - Specialties								
Chalkboards								
Toilet Partitions								
Toilet Accessories								
Metal Lockers								
Metal Shelving								
Other								
Division 11 - Equipment								
Food Service Equipment								
Parking Control Equipment								
Other								
Division 12 - Furnishings								
Desks								
Chairs								
Tables								
Bookcases								
Filing Cabinets								
Horizontal Blinds								
Other								
Division 14 - Conveying Systems								
Elevators								
Wheelchair Lifts								
Other								

Project Name: Fort Smith GOCB Roof Replacement

Prime Contractor Name: **Contact Person:**

Telephone:

PWGSC Project Number: R.015992.646 **Fax:**

Material Category	Re-use		Recycling		Landfill		Material Destination	Responsible Sub-Contractor
	Estimated (tonnes)	Actual (tonnes)	Estimated (tonnes)	Actual (tonnes)	Estimated (tonnes)	Actual (tonnes)	Provide company name, address, contact person and phone number	
Division 22 - Plumbing and Division 23 - HVAC								
Piping								
Ducting								
Valves								
Water Heaters								
Heating Units								
Air Handling Units								
Sinks								
Toilets								
Showers								
Controls								
Furnace Oil Tanks								
Furnace Oil Collected								
Other								
Division 26 - Electrical								
Wires & Cables								
Conduits								
Cable Tray, Raceways								
Receptacle Outlets								
Receptacle Switches								
Switch Boxes								
Junction Boxes								
Smoke Detectors								
Misc. Electrical Controls								
Motors								
Generating Equipment								
Panelboards								
Transformers								
Batteries								
Uniterruptible Power Systems								
Lighting:								
Incandescent Light Fixtures								
Flourescent Light Fixtures								
PCB Containing:								
Wires & Cables								
Transformers								
Lighting								

Project Name: Fort Smith GOCB Roof Replacement

Prime Contractor Name: **Contact Person:**

Telephone:

PWGSC Project Number: R.015992.646 **Fax:**

Material Category	Re-use		Recycling		Landfill		Material Destination	Responsible Sub-Contractor
	Estimated (tonnes)	Actual (tonnes)	Estimated (tonnes)	Actual (tonnes)	Estimated (tonnes)	Actual (tonnes)	Provide company name, address, contact person and phone number	
Smoke Detectors								
Misc. Electrical Controls								
Other								
Division 27 - Communications								
Communication Equipment:								
Regular								
PCB Containing								
Other								
Division 33 - Utilities								
Manhole Structures								
Catchbasin Structures								
Site Water Distribution Piping								
Public Sanitary Utility Sewerage Piping								
Septic Tanks								
Storm Utility Drainage Piping								
Above Ground Fuel Storage Tanks								
Underground Fuel Storage Tanks								
Other								

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

.1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.

.2 Request Departmental Representative inspection.

.2 Departmental Representative Inspection:

.1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.

.2 Contractor to correct Work as directed.

.3 Completion Tasks: submit written certificates, in English, that tasks have been performed as follows:

.1 Work: completed and inspected for compliance with Contract Documents.

.2 Defects: corrected and deficiencies completed.

.3 Equipment and systems: tested, adjusted and balanced and fully operational.

.4 Certificates required by Fire Commissioner, Utility companies: submitted.

.5 Operation of systems: demonstrated to Owner's personnel.

.6 Work: complete and ready for final inspection.

.4 Final Inspection:

.1 When completion tasks are done, request final inspection of Work by Departmental Representative, and Contractor.

.2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.

.5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.

.6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.

.7 Final Payment:

.1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.

.2 When Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

1.2 FINAL CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning.

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

.2 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:

.1 Convene meeting one week prior to contract completion with Contractor's Representative and Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:

.1 Verify Project requirements.

.2 Review manufacturer's installation instructions and warranty requirements.

.2 Departmental Representative to establish communication procedures for:

.1 Notifying construction warranty defects.

.2 Determine priorities for type of defects.

.3 Determine reasonable response time.

.3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.

.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, three final copies of operating and maintenance manuals in English.

.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source and quality of products supplied.

1.3 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf, 219 x 279 mm, with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings.

.1 Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab.

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

.9 Provide 1:1 scaled CAD files in dwg format on CD or DVD.

1.4 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;

.1 Date of submission; names.

.2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.

.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: Mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data.

.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

.6 Training: Refer to Section 01 79 00 - Demonstration and Training.

1.5 AS-BUILT DOCUMENTS AND SAMPLES

.1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

.5 Reviewed shop drawings, product data, and samples.

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction.

.1 Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.

.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of black line opaque drawings, and in copy of Project Manual.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.

.1 Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 Referenced Standards to related shop drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

.7 Provide digital photos, if requested, for site records.

1.7 EQUIPMENT AND SYSTEMS

.1 For each item of equipment and each system include description of unit or system, and component parts.

.1 Give function, normal operation characteristics and limiting conditions.

.2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Include installed colour coded wiring diagrams.

.3 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.

.1 Include regulation, control, stopping, shut-down, and emergency instructions.

.2 Include summer, winter, and any special operating instructions.

.4 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.5 Provide servicing and lubrication schedule, and list of lubricants required.

.6 Include manufacturer's printed operation and maintenance instructions.

.7 Include sequence of operation by controls manufacturer.

.8 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.9 Provide installed control diagrams by controls manufacturer.

.10 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

.11 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.12 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.13 Include test and balancing reports as specified in Section 01 45 00 - Quality Control and 01 91 13 -General Commissioning Requirements.

.14 Additional requirements: as specified in individual specification sections.

1.8 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: as specified in individual specifications sections.

1.9 MAINTENANCE MATERIALS

.1 Spare Parts:

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue items.
  - .1 Submit inventory listing to Departmental Representative.
  - .2 Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

.2 Extra Stock Materials:

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

.3 Special Tools:

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue items.
  - .1 Submit inventory listing to Departmental Representative.
  - .2 Include approved listings in Maintenance Manual.

1.10 DELIVERY, STORAGE AND HANDLING

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.11 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.

.3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.

.6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within 10 days after completion of applicable item of work.
- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittal.

.7 Except for items put into use with Departmental Representative’s permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.8 Conduct joint 9-month warranty inspection, measured from time of acceptance, by Departmental Representative.

.9 Include information contained in warranty management plan as follows:

.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.

.2 Provide list for each warranted equipment, item, feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

.11 Organization, names and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.3 Contractor's plans for attendance at 9-month post-construction warranty inspections.

.4 Procedure and status of tagging of equipment covered by extended warranties.

.5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.10 Respond in timely manner to oral or written notification of required construction warranty repair work.

.11 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.12 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Departmental Representative.

.2 Attach tags with copper wire and spray with waterproof silicone coating.

.3 Leave date of acceptance until project is accepted for occupancy.

.4 Indicate following information on tag:

- .1 Type of product/material.
- .2 Model number.
- .3 Serial number.
- .4 Contract number.
- .5 Warranty period.
- .6 Inspector's signature.
- .7 Construction Contractor.

END OF SECTION

Part 1 General

1.1 TRAINEES

.1 Trainees: Personnel selected for operating and maintaining this facility. Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.

.2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.2 INSTRUCTORS

.1 Departmental Representative will provide:

- .1 Descriptions of systems.
- .2 Instruction on design philosophy, design criteria, and design intent.

.2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:

- .1 Start-up, operation, shutdown of equipment, components and systems.
- .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
- .3 Instructions on servicing, maintenance, and adjustment of systems, equipment and components.

.3 Contractor and equipment manufacturer to provide instruction on:

- .1 Start-up, operation, maintenance, and shutdown of equipment for which they have certified installation, started up, and carried out PV tests.

1.3 TRAINING OBJECTIVES

.1 Training to be detailed and duration to ensure:

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

1.4 TRAINING MATERIALS

.1 Instructors to be responsible for content and quality.

.2 Training materials to include:

.1 "As-Built" Contract Documents.
.2 Operating Manual.
.3 Maintenance Manual.
.4 Management Manual.
.5 TAB and PV Reports.

.3 Departmental Representative, Commissioning Manager, and Facility Manager will review training manuals.

.4 Training materials to be in a format that permits future training procedures to same degree of detail.

.5 Supplement training materials:

.1 Multimedia presentations.
.2 Manufacturer's training videos.
.3 Equipment models.

1.5 SCHEDULING

.1 Include time for training in Commissioning Schedule.

.2 Deliver training during regular working hours, training sessions to be three hours in length.

.3 Training to be completed prior to acceptance of facility.

1.6 RESPONSIBILITIES

.1 Be responsible for:

.1 Implementation of training activities.
.2 Coordination among instructors.
.3 Quality of training, training materials.

.2 Departmental Representative will evaluate training and materials.

.3 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative.

1.7 TRAINING CONTENT

.1 Training to include demonstrations by Instructors using the installed equipment and systems.

.2 Content includes:

.1 Review of facility and occupancy profile.
.2 Functional requirements.
.3 System philosophy, limitations of systems and emergency procedures.

.4 Review of system layout, equipment, components and controls.

.5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.

.6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.

.7 Maintenance and servicing.

.8 Troubleshooting diagnosis.

.9 Interaction among systems during integrated operation.

.10 Review of O&M documentation.

.3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:

.1 Verify installed equipment, systems and integrated systems operate in accordance with Contract Documents and design criteria and intent.

.2 Ensure appropriate documentation is compiled into the BMM.

.3 Effectively train O&M staff.

.2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.

.1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.

.2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

.3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

.4 Acronyms:

.1 BMM - Building Management Manual.

.2 Cx - Commissioning.

.3 EMCS - Energy Monitoring and Control Systems.

.4 O&M - Operation and Maintenance.

.5 PI - Product Information.

.6 PV - Performance Verification.

.7 TAB - Testing, Adjusting and Balancing.

1.2 COMMISSIONING OVERVIEW

.1 Section 01 91 13.13 - Commissioning (Cx) Plan.

.2 For Cx responsibilities refer to Section 01 91 13.13 - Commissioning (Cx) Plan.

.3 Cx to be a line item of Contractor's cost breakdown.

.4 Cx activities supplement field quality and testing procedures described in relevant technical sections.

.5 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.

.6 Departmental Representative will issue Interim Acceptance Certificate when:

.1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.

.2 Equipment, components, systems and integrated systems have been fully commissioned and functional per design intent to meet contract specification and project functional and operational requirements.

.3 Final O&M and Training Manual receive, review and approve by Departmental Representative for suitability.

.4 Successful completion of integrated system tests, air leakage tests and after meeting all requirements of the authority having jurisdiction.

1.3 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

.1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.

.2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.4 PRE-CX REVIEW

.1 Before Construction:

.1 Review Contract Documents, confirm in writing to Departmental Representative.

.1 Adequacy of provisions for Cx.

.2 Aspects of design and installation pertinent to success of Cx.

.2 During Construction:

.1 Co-ordinate provision, location and installation of provisions for Cx.

.3 Before start of Cx:

.1 Have completed Cx Plan up-to-date.

.2 Ensure installation of related components, equipment, sub-systems, systems is complete.

.3 Fully understand Cx requirements and procedures.

.4 Have Cx documentation shelf-ready.

.5 Understand completely design criteria and intent and special features.

.6 Submit complete start-up documentation to Departmental Representative.

.7 Have Cx schedules up-to-date.

.8 Ensure systems have been cleaned thoroughly.

.9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.

.10 Ensure "As-Built" system schematics are available.

.4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.5 CONFLICTS

.1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.6 SUBMITTALS

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

.1 Submit no later than 4 weeks after award of Contract:

.1 Draft Cx documentation.

.2 Preliminary Cx schedule.

.2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.

.3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 8 weeks prior to start of Cx.

.4 Provide additional documentation relating to Cx process required by Departmental Representative.

1.7 COMMISSIONING DOCUMENTATION

.1 Refer to Section 01 91 13.16 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.

.2 Departmental Representative to review and approve Cx documentation.

.3 Provide completed and approved Cx documentation to Departmental Representative.

1.8 COMMISSIONING SCHEDULE

.1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16.19 - Construction Progress Schedules - Bar (GANTT) Chart.

.2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:

.1 Approval of Cx reports.

.2 Verification of reported results.

.3 Repairs, retesting, re-commissioning, re-verification.

.4 Training.

1.9 COMMISSIONING MEETINGS

.1 Convene Cx meetings following project meetings: Section 01 32 16.19 - Construction Progress Schedules - Bar (GANTT) Chart and as specified.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage. Section 01 32 16.19 - Construction Progress Schedules - Bar (GANTT) Chart. Departmental Representative to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:

.1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meeting will be chaired by Commissioning Provider, who will record and distribute minutes.

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

1.10 EXTENT OF CX

.1 Commission Structural and Architectural Systems:

.1 Structural and architectural:

.1 Exterior systems:

.1 Roofing Assemblies – air leakage.

.2 Fall Protection System(s).

.2 Commission mechanical systems and associated equipment:

.1 HVAC and exhaust systems:

.1 HVAC systems:

.1 Air Handling Unit(s).

.2 Chiller Unit.

.3 Dx Cooling Unit(s).

.2 Rooftop exhaust systems.

.3 Commission electrical systems and equipment:

.1 Low voltage below 750 V:

.1 Low voltage equipment.

.2 Other systems and equipment:

.1 Lightning protection systems.

1.11 STARTING AND TESTING

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

1.12 WITNESSING OF STARTING AND TESTING

.1 Provide 14 days notice prior to commencement.

.2 Departmental Representative to witness of start-up and testing.

.3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

.1 Factory testing: manufacturer to:

.1 Coordinate time and location of testing.

.2 Provide testing documentation for approval by Departmental Representative.

.3 Arrange for Departmental Representative to witness tests.

.4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.

.2 Obtain manufacturers installation, start-up, and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.

.1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

.2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.3 Integrity of warranties:

.1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.

.2 Verify with manufacturer that testing as specified will not void warranties.

.4 Qualifications of manufacturer's personnel:

.1 Experienced in design, installation and operation of equipment and systems.

.2 Ability to interpret test results accurately.

.3 To report results in clear, concise, logical manner.

1.14 PROCEDURES

.1 Prior to demolition of existing roof, perform static verification of mechanical systems being removed and reinstalled. Include verification of:

.1 Incoming electrical voltage/phase/frequency.

.2 Supply and return temperatures.

.3 Pressures (fluid, air).

.4 Fan speeds (RPM).

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

.3 Conduct start-up and testing in following distinct phases:

.1 Included in delivery and installation:

.1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.

.2 Visual inspection of quality of installation.

.2 Start-up: follow accepted start-up procedures.

.3 Operational testing: document equipment performance.

.4 System PV: include repetition of tests after correcting deficiencies.

.5 Post-substantial performance verification: to include fine-tuning.

.4 Correct deficiencies and obtain acceptance from Departmental Representative after distinct phases have been completed and before commencing next phase.

.5 Document required tests on approved PV forms.

.6 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:

.1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.

.2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.

.3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.

.1 Rejected equipment to be removed from site and replaced with new.

.2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

.1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.

.2 Start-up documentation to include:

.1 Factory and on-site test certificates for specified equipment.

.2 Pre-start-up inspection reports.

.3 Signed installation/start-up check lists.

.4 Start-up reports,

.5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.2 With assistance of manufacturer develop written maintenance program and submit to Departmental Representative for approval before implementation.

.3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.17 TEST RESULTS

.1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide manpower and materials, assume costs for re-commissioning.

1.18 START OF COMMISSIONING

.1 Notify Departmental Representative at least 21 days prior to start of Cx.

.2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.19 INSTRUMENTS / EQUIPMENT

.1 Submit to Departmental Representative for review and approval:

.1 Complete list of instruments proposed to be used.

.2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:

.1 2-way radios.
.2 Ladders.
.3 Equipment as required to complete work.

1.20 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:

.1 Under actual operating conditions, over entire operating range, in all modes.
.2 On independent systems and interacting systems.

.2 Cx procedures to be repeatable and reported results are to be verifiable.

.3 Follow equipment manufacturer's operating instructions.

.4 EMCS trending to be available as supporting documentation for performance verification.

1.21 WITNESSING COMMISSIONING

.1 Departmental Representative to witness activities and verify results.

1.22 AUTHORITIES HAVING JURISDICTION

.1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures to avoid duplication of tests and to facilitate expedient acceptance of facility.

.2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.

.3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

1.23 EXTRAPOLATION OF RESULTS

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

1.24 EXTENT OF VERIFICATION

.1 Provide labour and instrumentation to verify up to 30% of reported results, unless specified otherwise in other sections.

.2 Number and location to be at discretion of Departmental Representative.

.3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.

.4 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.

.5 Perform additional commissioning until results are acceptable to Departmental Representative.

1.25 REPEAT VERIFICATIONS

.1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:

.1 Verification of reported results fail to receive Departmental Representative's approval.

.2 Repetition of second verification again fails to receive approval.

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

1.26 SUNDRY CHECKS AND ADJUSTMENTS

.1 Make adjustments and changes which become apparent as Cx proceeds.

.2 Perform static and operational checks as applicable and as required.

1.27 DEFICIENCIES, FAULTS, DEFECTS

.1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.

.2 Report problems, faults or defects affecting Cx to Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

1.28 COMPLETION OF COMMISSIONING

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

1.29 ACTIVITIES UPON COMPLETION OF COMMISSIONING

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

1.30 TRAINING

.1 In accordance with Section 01 79 00.13 – Demonstration and Training for Building Commissioning.

1.31 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

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

1.32 OCCUPANCY

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

1.33 INSTALLED INSTRUMENTATION

.1 Use instruments installed under Contract for TAB and PV if:

.1 Accuracy complies with these specifications.

.2 Calibration certificates have been deposited with Departmental Representative.

.2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.34 PERFORMANCE VERIFICATION TOLERANCES

.1 Application tolerances:

.1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.

.2 Instrument accuracy tolerances:

.1 To be of higher order of magnitude than equipment or system being tested.

.3 Measurement tolerances during verification:

.1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

1.35 OWNER'S PERFORMANCE TESTING

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE Guideline 0-2013 – The Commissioning Process.

.2 Canadian Standards Association (CSA)

.1 CSA Z320-11 (R2016), Building Commissioning.

.3 Underwriters' Laboratories of Canada (ULC)

1.2 GENERAL

.1 Provide a fully functional facility:

.1 Systems, equipment, and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.

.2 Facility user and O&M personnel have been fully trained in aspects of installed systems.

.3 Optimized life cycle costs.

.4 Complete documentation relating to installed equipment and systems.

.2 Term "Cx" in this section means "Commissioning".

.3 Use this Cx Plan as master planning document for Cx:

.1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.

.2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.

.3 Sets out deliverables relating to O&M, process and administration of Cx.

.4 Describes process of verification of how built works meet design requirements.

.5 Produces a complete functional system prior to issuance of Certificate of Occupancy.

.6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:

.1 Overview of Cx.

.2 General description of elements that make up Cx Plan.

.3 Process and methodology for successful Cx.

.4 Acronyms:

.1 Cx - Commissioning.

.2 BMM - Building Management Manual.

.3 EMCS - Energy Monitoring and Control Systems.
.4 WHMIS Safety Data Sheets (SDS).
.5 PI - Product Information.
.6 PV - Performance Verification.
.7 TAB - Testing, Adjusting and Balancing.
.8 WHMIS - Workplace Hazardous Materials Information System.

.5 Commissioning terms used in this Section:

.1 Bumping: short term start-up to prove ability to start and prove correct rotation.
.2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.3 DEVELOPMENT OF 100% CX PLAN

.1 Cx Plan to be 95% completed before added into Project Specifications.

.2 Cx Plan to be 100% completed within 8 weeks of award of contract to take into account:

.1 Approved shop drawings and product data.
.2 Approved changes to contract.
.3 Contractor's project schedule.
.4 Cx schedule.
.5 Contractor's, sub-contractor's, suppliers' requirements.
.6 Project construction team's and Cx team's requirements.

.3 Submit completed Cx Plan to Departmental Representative and obtain written approval.

1.4 REFINEMENT OF CX PLAN

.1 Revise, refine and update at each phase of Construction Documents Service.

.2 During construction phase, revise, refine and update Cx Plan to include:

.1 Changes resulting from Client program modifications.
.2 Approved design and construction changes.

.3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.

.4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.5 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

.1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.

.2 Project Manager may select Cx Team consisting of following members:

.1 Departmental Representative Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.

.2 Departmental Representative Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:

.1 Review of Cx documentation from operational perspective.

.2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.

.3 Protection of health, safety and comfort of occupants and O&M personnel.

.4 Monitoring of Cx activities, training, development of Cx documentation.

.5 Work closely with members of Cx Team.

.3 Departmental Representative is responsible for:

.1 Organizing Cx.

.2 Monitoring operations Cx activities.

.3 Witnessing, certifying accuracy of reported results.

.4 Witnessing and certifying TAB and other tests.

.5 Developing BMM.

.6 Ensuring implementation of final Cx Plan.

.7 Performing verification of performance of installed systems and equipment.

.8 Implementation of Training Plan.

.4 Construction Team: contractor, subcontractors, suppliers and support disciplines, is responsible for construction/installation in accordance with Contract Documents, including:

.1 Testing.

.2 TAB.

.3 Performance of Cx activities.

.4 Delivery of training and Cx documentation.

.5 Assigning one person as point of contact with Consultant and PSPC Cx Manager for administrative and coordination purposes.

.5 Departmental Representative: represents lead role in Operation Phase and onwards and is responsible for:

.1 Receiving facility.

.2 Day-To-Day operation and maintenance of facility.

1.6 CX PARTICIPANTS

.1 Employ the following Cx participants to verify performance of equipment and systems:

.1 Installation contractor/subcontractor:

.1 Equipment and systems except as noted.

.2 Ensure that Cx participant:

.1 Could complete work within scheduled time frame.

.2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O&M personnel, including:

.1 Changes to heating or cooling loads beyond scope of EMCS.

.2 Changes to EMCS control strategies beyond level of training provided to O&M personnel.

.3 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 3 months prior to starting date of Cx for review and approval.

1.7 EXTENT OF CX

.1 Commission structural and Architectural Systems:

.1 Structural and architectural:

.1 Fall Protection System(s).

.2 Commission mechanical systems and associated equipment:

.1 HVAC and exhaust systems:

.1 HVAC systems:

.1 Air Handling Unit(s).

.2 Chiller Unit.

.3 Dx Cooling Unit(s).

.2 Rooftop exhaust systems.

.3 Commission electrical systems and equipment:

.1 Low voltage below 750 V:

.1 Low voltage equipment.

.2 Other systems and equipment:

.1 Lightning protection systems.

1.8 DELIVERABLES RELATING TO O&M PERSPECTIVES

.1 General requirements:

.1 Compile English documentation.

.2 Documentation to be computer-compatible format ready for inputting for data management.

.2 Provide deliverables:

.1 Warranties.

.2 Project record documentation.

.3 Inventory of spare parts, special tools and maintenance materials.
.4 Maintenance and Data Manuals.
.5 Systems Operations Manuals.
.6 Final Standard Operating Procedures.
.7 WHMIS information.
.8 WHMIS Safety Data Sheets (SDS).

1.9 DELIVERABLES RELATING TO THE CX PROCESS

.1 General:

.1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.

.2 Definitions:

.1 Cx as used in this section includes:

.1 Cx of components, equipment, systems, subsystems, and integrated systems.

.2 Factory inspections and performance verification tests.

.3 Deliverables: provide:

.1 Cx Specifications.
.2 Startup, pre-Cx activities and documentation for systems, and equipment.
.3 Completed installation checklists (ICL).
.4 Completed product information (PI) report forms.
.5 Completed performance verification (PV) report forms.
.6 Results of Performance Verification Tests and Inspections.
.7 Description of Cx activities and documentation.
.8 Description of Cx of integrated systems and documentation.
.9 Tests of following witnessed by Departmental Representative Design Quality Review Team:

.1 Air Handler(s)
.2 Chiller Unit
.3 Dx Cooling Unit(s)
.4 Exhaust Fans

.10 Training Plans.
.11 Cx Reports.
.12 Prescribed activities during warranty period.

.4 Departmental Representative to witness and certify tests and reports of results provided to Departmental Representative.

.5 Departmental Representative to participate.

1.10 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

.1 Items listed in this Cx Plan include the following:

.1 Pre-Start-Up inspections: by Departmental Representative prior to permission to start up and rectification of deficiencies to Departmental Representative's satisfaction.

.2 Departmental Representative to use approved check lists.

.3 Departmental Representative will monitor these pre-start-up inspections.

.4 Include completed documentation with Cx report.

.5 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Departmental Representative and does not form part of Cx specifications.

.6 Departmental Representative will monitor these inspections and tests.

.7 Include completed documentation in Cx report.

.2 Pre-Cx activities - MECHANICAL:

.1 HVAC equipment and systems:

.1 "Bump" each item of equipment in its "stand-alone" mode.

.2 At this time, complete pre-start-up checks and complete relevant documentation.

.3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.

.4 Perform TAB on systems. TAB reports to be approved by Departmental Representative.

.3 Pre-Cx activities - ELECTRICAL:

.1 Lightning protection systems.

.1 Tested as per CAN/CSA-B72 – Installation Code for Lightning Protection Systems.

1.11 START-UP

.1 Start up components, equipment and systems.

.2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:

.1 Air Handler(s)

.2 Chiller Unit

.3 Dx Cooling Unit(s)

.4 Exhaust Fans

.3 Departmental Representative to monitor these start-up activities.

.1 Rectify start-up deficiencies to satisfaction of Departmental Representative.

.4 Performance Verification (PV):

.1 Contractor, sub-contractor, installing specialist sub-contractor, as appropriate, to perform.

.1 Witness and documentation by Cx Provider.

.2 Repeat when necessary until results are acceptable to Departmental Representative.

.2 Use modified generic procedures to suit project requirements.

.3 Departmental Representative to witness and certify reported results using approved PI and PV forms.

.4 Departmental Representative to approve completed PV reports.

.5 Departmental Representative reserves right to verify up to 30% of reported results at random.

.6 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

1.12 CX ACTIVITIES AND RELATED DOCUMENTATION

.1 Perform Cx using procedures acceptable to Departmental Representative.

.2 Departmental Representative to monitor Cx activities.

.3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.

.4 Departmental Representative to witness, certify reported results of, Cx activities and forward to Departmental Representative.

.5 Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

1.13 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

.1 Cx to be performed using procedures acceptable to Departmental Representative.

.2 Tests to be witnessed by Departmental Representative and documented on approved report forms.

.3 Upon satisfactory completion, Cx Provider to prepare Cx Report, to be certified by Departmental Representative and submitted to Departmental Representative for review.

.4 Departmental Representative reserves right to verify percentage of reported results.

.5 Integrated systems to include:

.1 HVAC and associated systems forming part of integrated HVAC systems.

1.14 INSTALLATION CHECK LISTS (ICL)

.1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.15 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.16 PERFORMANCE VERIFICATION (PV) REPORT

.1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.17 DELIVERABLES RELATING TO ADMINISTRATION OF CX

.1 General:

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

1.18 CX SCHEDULES

.1 Prepare detailed Cx Schedule and submit to Departmental Representative for review and approval at beginning of Construction Phase. Include:

.1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:

.1 Design criteria, design intents.

.2 Pre-TAB review: 28 days after contract award, and before construction starts.

.3 Cx procedures: 3 months after award of contract.

.4 Cx Report format: 3 months after contract award.

.5 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.

.6 Notification of intention to start TAB: 21 days before start of TAB.

.7 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.

.8 Notification of intention to start Cx: 14 days before start of Cx.

.9 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.

.10 Identification of deferred Cx.

.11 Implementation of training plans.

.12 Cx reports: immediately upon successful completion of Cx.

.2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Departmental Representative.

.3 6 months in Cx schedule for verification of performance in all seasons and wear conditions.

.2 After approval, incorporate Cx Schedule into Construction Schedule.

.3 Consultant, Contractor and Departmental Representative will monitor progress of Cx against this schedule.

1.19 CX REPORTS

.1 Submit reports of tests, witnessed and certified by Departmental Representative to Departmental Representative who will verify reported results.

.2 Include completed and certified PV reports in properly formatted Cx Reports.

.3 Before reports are accepted, reported results to be subject to verification by Departmental Representative.

1.20 PRELIMINARY AND FINAL CX

.1 Final Commissioning (Report) to include Final Commissioning Evaluation Report, updated Commissioning Report, post occupancy test results and evaluations and Updated Issues/Resolutions Log.

1.21 TESTS TO BE PERFORMED BY OWNER/USER

.1 None is anticipated on this project.

1.22 TRAINING PLANS

.1 Refer to Section 01 79 00.13 - Demonstration and Training for Building Commissioning.

1.23 FINAL SETTINGS

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

END OF SECTION

Part 1 General

1.1 INSTALLATION/START-UP CHECK LISTS

.1 Include the following data:

.1 Product manufacturer's installation instructions and recommended checks.

.2 Special procedures as specified in relevant technical sections.

.3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.

.2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Departmental Representative, supplemental additional data lists will be required for specific project conditions.

.3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.

.4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Departmental Representative. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.

.5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.2 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.

.2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Departmental Representatives approval.

1.3 PERFORMANCE VERIFICATION (PV) FORMS

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

.2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.

.3 Prior to PV of integrated system, complete PV forms of related systems and obtain Departmental Representative's approval.

1.4 SAMPLES OF COMMISSIONING FORMS

.1 Commissioning Provider will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.

.1 Static Verification:

.1 Air Handling Unit(s)
.2 Exhaust Fan(s)
.3 Reciprocating Chiller
.4 Dx Cooling Unit(s)

.2 Start-up:

.1 Air Handling Unit(s)
.2 Exhaust Fan(s)
.3 Reciprocating Chiller
.4 Dx Cooling Unit(s)

.3 Functional Performance Testing:

.1 Roof Assembly
.2 Air Handling Unit(s)
.3 Exhaust Fan(s)
.4 Reciprocating Chiller
.5 Dx Cooling Unit(s)

.2 Revise items on Commissioning forms to suit project requirements.

1.5 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS

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

.1 Additional commissioning forms to be in same format as provided by Commissioning Provider.

1.6 COMMISSIONING FORMS

.1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.

.2 Strategy for Use:

.1 Commissioning Provider provides Contractor project-specific Commissioning forms with Specification data included.

.2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.

.3 Confirm operation as per design criteria and intent.

.4 Identify variances between design and operation and reasons for variances.

.5 Verify operation in specified normal and emergency modes and under specified load conditions.

.6 Record analytical and substantiating data.

.7 Verify reported results.

.8 Form to bear signatures of recording technician and reviewed and signed off by Departmental Representative.

.9 Submit immediately after tests are performed.

.10 Reported results in true measured SI unit values.

.11 Provide Departmental Representative with originals of completed forms.

.12 Maintain copy on site during start-up, testing and commissioning period.

.13 Forms to be both hard copy and electronic format with typed written results in Building Management Manual in accordance with Section 01 92 00 – Facility Operation.

1.7 LANGUAGE

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

END OF SECTION

COMMISSIONING PLAN

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Fort Smith GOCB Roof Replacement
Client Project Number: R.015992.646
Republic Project Number: 456

1. Objectives

The Commissioning of this project shall certify that Public Services and Procurement Canada (PSPC) is provided with a fully functioning and collaborative project delivery and deliverable, through appropriate design and construction verification of the Owner's chosen roof assembly for the Fort Smith Government of Canada (GOC) Building roof replacement project. The Project will incorporate an integrated design and construction process involving interdisciplinary collaboration, with agreed upon design principles and decision-making protocols.

This Commissioning Plan will document the overall design intent of the Owner's chosen roof assembly and the affected building components, and the building systems affected by the Project. With a properly documented design intent through the careful selection of design solutions, materials, installation practices, and performance verification procedures, PSPC will minimize ongoing operations and maintenance costs. By defining Project Roles and Responsibilities for the duration of the Project, the Commissioning Plan not only ensures that all team members are aware of their duties, but also that the appropriate channels of communication are utilized, to ensure that the Project design intent is achieved. Throughout the construction phase the Commissioning Plan will demonstrate that the Project requirements of PSPC are being met by providing resolution for issues such as, but not limited to scheduling, roles and responsibilities, lines of communication and reporting, approvals, and coordination. Commissioning will support quality management of construction and installation through verification of building components and systems. The Project verification will demonstrate that the integrated systems perform at peak efficiencies. The Commissioning Plan will provide training through programming, operations and maintenance manuals, and standard operations procedures. The building operations/maintenance staff of the GOC building will be qualified and trained to ensure that PSPC will minimize ongoing operations and maintenance costs of the Owner's chosen roof assembly.

The Commissioning Plan is a dynamic document that is continually reviewed and updated and as such is subject to change during the course of the Project.

2. Team Roles and Responsibilities

Building Owner/Representative	(Departmental Representative) Bhuwan Devkota
Building Operations/Maintenance Staff	TBD
Commissioning Authority/Provider	Republic Architecture Inc. (RAI) Matthew Davidson
Design Consultants	Republic Architecture Inc.; MCW Hemisphere Ltd.
Contractors/Sub-Contractors	TBD
Manufacturer's Representative (if applicable)	TBD
Independent Testing Specialist(s)	TBD

3. Commissioning Process, Roles and Responsibilities

3.1. Design-phase:

Building Owner/Representative	*Accepts* Cx specs; design-phase plan; and Cx plan
Building Operations/Maintenance Staff	*Participates:* Identify project specific Cx responsibilities; Cx focused drawing reviews of designs & specs; defines requirements for systems manuals; and determines operational training requirements
Commissioning Authority/Provider	*Leads:* design-phase Cx meetings; identifies project specific Cx responsibilities; preparation of verification checklists and test procedures; development of Cx specs; prepares Cx report; and updates Cx plan. *Participates:* Cx focused drawing reviews of designs & specs; and defines requirements for Cx manuals. *Leads/participates* in determination of operational training requirements
Design Consultants	*Leads:* Cx focused design reviews of drawings and specs; and defines requirements for systems manuals *Participates:* identifies project specific Cx responsibilities; verifies OPR and BOD for completeness and clarity; plans/prepares verification checklists and test procedures; and develops Cx specifications
Contractors/Sub-Contractors	N/A
Manufacturer's Representative (if applicable)	N/A
Independent Testing Specialist(s)	N/A

3.2. Construction Phase:

Building Owner/Representative	*Approves:* construction mock-ups; updated OPR & BOD; and accepts construction phase Cx documents
Building Operations/Maintenance Staff	*Participates:* Construction Cx phase kickoff and progress meetings; construction of mock-ups; performance and documentation of functional performance testing; verify, review, and conduct training; review maintenance and data manuals; review operations manual; and review standard operations manual
Commissioning Authority/Provider	*Leads:* Construction Cx phase kickoff and progress meetings; perform and document functional performance testing; prepare and update issues logs; verify, review, and conduct training; prepare Cx Report; update Cx Plan; prepare Cx Manual; and prepare standard operations manual *Participates:* integrate Cx activities into project schedule; review contractor submissions and shop drawings; construct mock-ups; update OPR and BOD; perform and document start-up; resolve issues resulting from all tests; review maintenance and data manuals; review operations manuals; and review standard operations manuals *Leads/participates:* perform and document static verification (prior to demolition and post-installation)$_1$
Design Consultants	*Leads:* Review contractor submissions and shop drawings; update OPR and BOD; resolve issues resulting from all tests; review maintenance and data manuals; review operations manual; and review standard operations manual *Participates:* Construction Cx phase kickoff and progress meetings; construct mock-ups; prepare and update issues logs; and verify, review, and conduct training
Contractors/Sub-Contractors	*Leads:* integrate Cx activities into project schedule; mock-ups; and perform and document start-up *Participates:* Construction Cx phase kickoff and progress meetings; review contractor submissions and shop drawings; perform and document functional performance testing; prepare and update issues logs; resolve issues resulting from all tests; verify, review, and conduct training; review maintenance and data manuals; review operations manuals; and review standard operations manuals *Leads/participates:* perform and document static verification (prior to demolition and post-installation)$_1$
Manufacturer's Representative (if applicable)	*Participates:* Construction Cx phase kickoff and progress meetings; construct mock-ups; perform and document static verification; perform and document start-up; perform and document functional performance testing; and verify, review; and conduct training
Independent Testing Specialist(s)	*Participates:* Construction Cx phase kickoff and progress meetings; construct mock-ups; perform and document static verification; perform and document start-up; and perform and document functional performance testing

3.3. Occupancy and Operations Phase:

Building Owner/Representative	*Accepts* occupancy and operations phase Cx documents
Building Operations/Maintenance Staff	*Participates:* Resolve outstanding Cx issues; perform seasonal/deferred testing; resolve issues resulting from seasonal/deferred testing; and complete final Cx Report
Commissioning Authority/Provider	*Leads:* Resolve outstanding Cx issues; perform seasonal/deferred testing; resolve issues resulting from seasonal/deferred testing; update issues log resulting from seasonal/deferred tests; and complete final Cx Report
Design Consultants	*Participates:* Resolve outstanding Cx issues; resolve issues resulting from seasonal/deferred testing; update issues log resulting from seasonal/deferred tests; and complete final Cx Report
Contractors/Sub-Contractors	*Participates:* Resolve outstanding Cx issues; perform seasonal/deferred testing; resolve issues resulting from seasonal/deferred testing; and update issues log resulting from seasonal/deferred tests; complete final Cx Report
Manufacturer's Representative (if applicable)	*Participates:* Resolve outstanding Cx issues; perform seasonal/deferred testing; and resolve issues resulting from seasonal/deferred testing
Independent Testing Specialist(s)	*Participates:* Resolve outstanding Cx issues; perform seasonal/deferred testing; and resolve issues resulting from seasonal/deferred testing

[1] As per the Terms of Reference (TOR), static verification of existing mechanical and electrical rooftop systems will be carried out prior to demolition of the existing roof assembly.

4. Schedule

Commissioning schedule to be prepared by Commissioning Provider and Contractor at start of construction phase.

5. Static Verification

5.1. Prior to the demolition of the existing roof, mechanical systems being removed (or affected by removal of rooftop mechanical systems) and reinstalled after completion of re-roofing will require static verification. Prior to the installation verification of reinstated mechanical systems, mechanical systems removed (or affected by removal of rooftop mechanical systems) will require static verification. Systems and verifications will include (where applicable):

- HVAC systems
  - Air Handler(s)
    - Cooling coil(s) gallons per minute; and
    - Verification of temperatures supplied by air handler(s) cooling system
  - Chiller
    - Incoming voltage/phase/amperage;
    - Chilled water flow gallons per minute;
    - Chilled water temp leaving chiller;
    - Refrigerant type installed in system;
    - Refrigerant pressures; and
    - Inspection for:
      - Physical Damage; and
      - Cleanliness
  - Air-Cooled Condenser
    - Incoming voltage/phase/amperage;
    - Refrigerant pressures;
    - Free rotation of fans; and
    - Inspection for physical damage

- DX Cooling Unit(s)
    - Incoming voltage/phase/amperage;
    - Refrigerant type installed in system;
    - Refrigerant pressures;
    - Recording of line set on system; and
    - Verification of cooling temperatures supplied by the evaporator unit(s)

5.2. Mechanical and refrigeration equipment and systems being put back into place will require static verification. The process of static verification includes the verification and documentation that all system elements are in accordance with the design requirements and shall include the following procedures as applicable:

- Inspections by authorities having jurisdiction;
- Documentation of all equipment and systems information;
- Pressure testing; and
- Engineer's review

6. <u>Start-up</u>

6.1. CSA Z320 check sheets will be tailored to the exact procedures required in the start-up of mechanical and refrigeration equipment and systems being put back into place.

6.2. Prior to HVAC equipment start-up, the following shall be completed, witnessed, and documented (where applicable):

- Static verification documentation;
- Field visual and mechanical inspections;
- Field electrical tests;
- Checks of equipment and systems for proper operation;
- Tests of mechanical interlock schemes;
- Operation of control circuits;
- Tests of safety interlocks; and
- Phase rotation

6.3. Start-up of HVAC equipment and systems shall include the following procedures (where applicable):

- Initial systems activations;
- Temperature measurements for water and air systems;
- Visual inspections after activation;
- Voltage measurements; and
- Operation of safety controls and interlocks

6.4. Start-up of refrigeration equipment and systems shall include the following procedures (where applicable):

- Temperature measurements;
- Verification of systems pressures; and
- Safety controls and interlocks

7. <u>Functional Performance Testing</u>

7.1. Functional performance testing of the low slope roof assemblies shall be tested as per "ASTM E1186 17 - Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems". As part of the functional performance testing of the roof assembly, a 3000mm X 3000m mock-up will be constructed as part of the permanent roof system. This mock-up will demonstrate the minimum quality of work for the installed roof assembly.

The lightning protection system shall be made good and be tested as per "CAN/CSA-B72-M87 Installation Code for Lightning Protection Systems." The system shall be installed and tested by a certified lightning protection system installation contractor. Testing will include approval by the Authority Having Jurisdiction. A check sheet will be provided by the installation contractor. The Commissioning provider will observe tests and record results for the Departmental Representative.

Mechanical and refrigeration equipment and systems shall be proven operational under all normal (part and full load) and abnormal or emergency conditions. If any check or test cannot be completed for ANY reason, this will be recorded along with an indication of when the test will be rescheduled. Any check or test that does not achieve acceptable performance will be repeated after the necessary corrective action has been taken. Retesting will be repeated until intended performance is achieved, or it is accepted by the Commissioning Provider that the intended performance cannot be achieved. If acceptable test results cannot be achieved, the Commissioning Team will identify corrective measures to provide advice on their implementation. When all individual system performances have been verified, the interface between systems will be checked.

7.2. Architectural systems requiring functional performance testing shall include (where applicable) but not be limited to:
- Roofing Assemblies:
  - Membrane(s); and
  - Membrane Flashing(s)

7.3. Electrical systems requiring functional performance testing shall include but not be limited to:
- Lightning Protection System

7.4. Functional performance testing of HVAC and refrigeration systems will include (where applicable):
- Start-up of equipment and systems;
- Verification of temperatures, flows (air), and pressures;
- Verification of safeties and alarms; and
- Verification of interlocks and system interfaces

8. Training

The full extent of building operations/maintenance staff training will be further developed during the Construction Support Service phase. Training will incorporate the Project Operations and Maintenance Manual and Standard Operations Procedures. Training events and activities will be based on the interim operations, maintenance, and data manuals of the chosen roof assembly.

9. Documentation

9.1. As per project milestones set out in the Terms of Reference (TOR), the following documentation will be included with deliverables:

- Pre-Design:
  - Project Commissioning Plan
- Construction Documents Service:
  - Updated Commissioning Plan with detailed Commissioning Strategies;
  - Commissioning forms and check sheets:
    - Static verification;
    - Installation verification;
    - Roof assembly verification and test;
    - Start-up and performance verification of M&E services replaced on roof; and
    - Commissioning Issues Log

- Construction Support Services:
  - Certificate of Interim Acceptance;
  - Interim Commissioning report:
    - System components list requiring Commissioning; and
    - Final performance verification forms and check sheets (Component, systems, and integrated systems design values to actuals):
      - Static;
      - Installation;
      - Start-up;
      - Functional performance; and
      - Integrated system verification
    - Site Observation Reports;
    - Commissioning Issues and Resolutions Log and Progress Report;
    - Final Training Sessions;
    - Post-Occupancy Changes;
    - Deferred Commissioning;
    - Unavailable or Incomplete Information; and
    - Systems Operations Manual and Standard Operating Procedures
  - Bi-weekly Commissioning site review reports;
  - System and Environmental Check Report(s); and
  - Final Commissioning report:
    - Final Commissioning Evaluation Report;
    - Updated Commissioning Report;
    - Post-Occupancy test results and evaluations; and
    - Updated Commissioning Issues/Resolutions Log
  - Progressive/Interim Acceptances with all required Project Team members signatures; and
  - Final Certificate of Completion

- Post Construction Services:
  - Warranty Deficiencies List;
  - Final Certificate of Completion;
  - Operations and Maintenance Manuals including:
    - Three hard copies; and
    - One PDF copy
  - Final Commissioning Manual for roof assembly;
  - Final Standard Operations Procedures;
  - Final Warranty Review Report:
    - Final certification of installation and warranty from manufacturers; and
    - Sign-off on Warranty

10. Final Acceptance

Final acceptance shall be completed when the Building Owner/Representative accepts the operations phase final Commissioning documents. Final Commissioning documents will be considered complete when outstanding Commissioning issues are resolved and logged.

11. Commissioning Strategies

Commissioning of this project shall utilize CSA Z320 check sheets tailored to the exact procedures and required results set forth in the below section. Check sheets are included as an appendix to the Commissioning Plan. The check sheets are generic in nature and subject to change after Tender and when more information on existing mechanical systems is obtained.

11.1. Static Verification:

Prior to the demolition of the existing roof, mechanical systems being removed (or affected by removal of rooftop mechanical systems) and reinstalled after completion of re-roofing will require static verification. Prior to the installation verification of reinstated mechanical systems, mechanical systems removed (or affected by removal of rooftop mechanical systems) will require static verification. Systems and verifications will include (where applicable):

- HVAC systems
  - Air Handler(s)
    - Cooling coil(s) gallons per minute; and
    - Verification of temperatures supplied by air handler(s) cooling system
  - Chiller
    - Incoming voltage/phase/amperage;
    - Chilled water flow gallons per minute;
    - Chilled water temp leaving chiller;
    - Refrigerant type installed in system;
    - Refrigerant pressures; and
    - Inspection for:
      - Physical Damage; and
      - Cleanliness
  - Air-Cooled Condenser
    - Incoming voltage/phase/amperage;
    - Refrigerant pressures;
    - Free rotation of fans; and
    - Inspection for physical damage
  - DX Cooling Unit(s)
    - Incoming voltage/phase/amperage;
    - Refrigerant type installed in system;
    - Refrigerant pressures;
    - Recording of line set on system; and
    - Verification of cooling temperatures supplied by the evaporator unit(s)

The process of static verification of mechanical and electrical equipment being put back into place includes the verification and documentation that all system elements are in accordance with the design requirements and shall include the following procedures as applicable:

- Inspections by authorities having jurisdiction;
- Documentation of all affected equipment and systems information;
- Pressure testing; and
- Engineer's review

11.2 Start-up:

Prior to the start-up of HVAC and electrical equipment, the following shall be completed by the required contractor(s) as applicable and witnessed and documented by the Commissioning Provider:

- Static verification documentation;
- Field visual and mechanical inspections;
- Field electrical tests;
- Checks of equipment and systems for proper operation;
- Tests of mechanical interlock schemes;
- Operation of control circuits;
- Tests of safety interlocks; and
- Phase rotation

The start-up of HVAC equipment and systems shall be completed by the required contractor(s) and witnessed and documented by the Commissioning Provider. Start-up will include (as applicable):

- Initial systems activations;
- Temperature measurements for water and air systems;
- Visual inspections after activation;
- Voltage measurements; and
- Operation of safety controls and interlocks

The start-up of refrigeration equipment and systems shall be completed by the required contractor(s) and witnessed and documented by the Commissioning Provider. Start-up will include (as applicable):

- Temperature measurements;
- Verification of systems pressures; and
- Safety controls and interlocks

11.3 Functional Performance Testing:

The roof assemblies and components shall be tested in accordance with FM Global requirements. Prior to the construction of the roof assemblies, a construction mock-up shall be installed and tested as per "ASTM E1186 17 - Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems". A 3000mm X 3000m mock-up will be constructed as part of the permanent roof system. This mock-up will demonstrate the minimum quality of work for the installed roof assembly. Testing will be performed by an independent testing specialist chosen by the Building Owner/Representative. Testing will be performed during and after the construction of the roof assemblies. Bi-weekly and as required field reviews will incorporate Commissioning site review reports as well as a Commissioning Issues/Resolutions Log. In addition to the contractual inspections by the Commissioning Provider, the roofing contractor will be supplied with daily check sheets to ensure that quality control is enforced during all phases of the demolition and installation of the roof assemblies.

The lightning protection system shall be made good and be tested as per the "CAN/CSA-B72-M87 Installation Code for Lightning Protection Systems." The system shall be installed and tested by a certified lightning protection system installation contractor. Testing will include approval by the Authority Having Jurisdiction. A check sheet will be provided by the installation contractor. The Commissioning provider will observe tests and record results for the Departmental Representative.

Mechanical and refrigeration equipment and systems shall be proven operational under all normal (part and full load) and abnormal or emergency conditions (if applicable). If any check or test cannot be completed for ANY reason, this will be recorded along with an indication of when the test will be rescheduled. Any check or test that does not achieve acceptable performance shall be repeated after the necessary corrective action has been taken. Retesting shall be repeated until intended performance is achieved, or it is accepted by the Commissioning Provider that the intended performance cannot be achieved. If acceptable test results cannot be achieved, the Commissioning Team shall identify corrective measures to provide advice on their implementation. When all individual system performances have been verified, the interface between systems shall be checked.

Architectural systems requiring functional performance testing shall include the following:

- Roofing Assemblies:
  - Membrane(s); and
  - Membrane Flashing(s)

Electrical systems requiring functional performance testing shall be completed by the electrical contractor and be witnessed and documented by the Commissioning Provider. Systems will include but not be limited to:

- Lightning Protection System

HVAC systems requiring functional performance testing shall be completed by the necessary contractor(s) and be witnessed and documented by the Commissioning Provider. Systems and tests will include (where applicable):

- Start-up of equipment and systems;
- Verification of temperatures, flows (air), and pressures;
- Verification of safeties and alarms; and
- Verification of interlocks and system interfaces;

Refrigeration systems requiring functional performance testing shall be completed by the necessary contractor(s) and be witnessed and documented by the Commissioning Provider. Systems and tests will include (where applicable):

- Start-up of equipment and systems;
- Verification of temperatures and pressures;
- Verification of safeties and alarms; and
- Verification of interlocks

AIR HANDLING UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

AIR HANDLING UNIT NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	
SERVICE		LOCATION	
MODEL NO.		SERIAL NO.	
SUPPLEMENTAL INFORMATION			

SYSTEM COMPONENTS	
COILS	**OBSERVED**
GPM (COOLING)	
TEMPERATURE SUPPLIED BY AHU (COOLING)	

GENERAL COMMENTS:

POSITION/TITLE	SIGNATURE	DATE

REVISION #: 0.1

AIR HANDLING UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
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	Winnipeg, MB - Manitoba R3C0N1		

AIR HANDLING UNIT NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	
SERVICE		LOCATION	
MODEL NO.		SERIAL NO.	

SUPPLEMENTAL INFORMATION

SYSTEM /EQUIPMENT DATA			
COILS	**DATA FROM (PRE-DEMO) STATIC VERIFICATION**	**SHOP DRAWINGS**	**INSTALLED**
GPM (COOLING)			
TEMPERATURE SUPPLIED BY AHU (COOLING)			

GENERAL COMMENTS:

POSITION/TITLE	**SIGNATURE**	**DATE**

REVISION #: 0.2

Air Leakage Test Results

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

TEST EQUIPMENT MAKE AND MODEL #		CALIBRATION DATE	
MEMBRANE TYPE	2-Ply SBS Modified Bitumen Roof Membrane	LOCATION	
LAP/JOINT TYPE		DRAWING REFERENCE	

TEST #	Pa	Result (Pass/Fail)	Marked (Y/N)	Repaired (Date)	Retest Date	Retest Result (Pass/Fail)
1						
2						
3						
4						
5						
6						
7						
8						

GENERAL NOTES:

TEST EQUIPMENT MAKE AND MODEL #		CALIBRATION DATE	
MEMBRANE TYPE	2-Ply SBS Modified Bitumen Roof Membrane	LOCATION	
LAP/JOINT TYPE		DRAWING REFERENCE	

TEST #	Pa	Result (Pass/Fail)	Marked (Y/N)	Repaired (Date)	Retest Date	Retest Result (Pass/Fail)
1						
2						
3						
4						
5						
6						
7						
8						

GENERAL NOTES:

REVISION # 0.2

Air Leakage Test Results

NAME:	Matthew Davidson	CLIENT:	PSPC
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ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

TEST EQUIPMENT MAKE AND MODEL #		CALIBRATION DATE	
MEMBRANE TYPE	2-Ply SBS Modified Bitumen Roof Membrane	LOCATION	
LAP/JOINT TYPE		DRAWING REFERENCE	

TEST #	Pa	Result (Pass/Fail)	Marked (Y/N)	Repaired (Date)	Retest Date	Retest Result (Pass/Fail)
1						
2						
3						
4						
5						
6						
7						
8						

GENERAL NOTES:

TEST EQUIPMENT MAKE AND MODEL #		CALIBRATION DATE	
MEMBRANE TYPE	2-Ply SBS Modified Bitumen Roof Membrane	LOCATION	
LAP/JOINT TYPE		DRAWING REFERENCE	

TEST #	Pa	Result (Pass/Fail)	Marked (Y/N)	Repaired (Date)	Retest Date	Retest Result (Pass/Fail)
1						
2						
3						
4						
5						
6						
7						
8						

GENERAL NOTES:

POSITION/TITLE	SIGNATURE	DATE

REVISION # 0.2

RECIPROCATING CHILLER AND

AIR-COOLED CONDENSER UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

RECIPROCATING CHILLER NAMEPLATE			
MANUFACTURER		EQUIPMENT	
SERVICE		LOCATION	
MODEL NO.		SERIAL NO.	

RECIPROCATING CHILLER	**INSTALLED/OBSERVED/COMMENTS**
CHILLED WATER FLOW (GPM)	
REFRIGERANT TYPE INSTALLED IN SYSTEM	
REFRIGERANT PRESSURES	
LEAVING CHILLED WATER TEMP (°C)	
VOLTAGE / PHASE / AMPERAGE	
CHECK UNIT FOR PHYSICAL DAMAGE	
LABELS VISIBLE	
UNIT IS CLEAN & FREE OF DEBRIS	
GENERAL COMMENTS:	

AIR-COOLED CONDENSER UNIT NAMEPLATE			
MANUFACTURER		EQUIPMENT	
SERVICE		LOCATION	ROOFTOP; Gridline 12 at D1
MODEL NO.		SERIAL NO.	

AIR-COOLED CONDENSER UNIT	**INSTALLED/OBSERVED/COMMENTS**
REFRIGERANT PRESSURES	
VOLTAGE / PHASE / AMPERAGE	
CHECK UNIT FOR PHYSICAL DAMAGE	
FANS ROTATE FREELY	
GENERAL COMMENTS:	

REVISION #: 0.2

NAME:	Matthew Davidson	CLIENT:	PSPC
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POSITION/TITLE	SIGNATURE	DATE

REVISION #: 0.2

RECIPROCATING CHILLER AND

AIR-COOLED CONDENSER UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
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ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
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RECIPROCATING CHILLER NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	
SERVICE		LOCATION	
MODEL NO.		SERIAL NO.	

AIR-COOLED CONDENSER UNIT NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	
SERVICE		LOCATION	ROOFTOP; Gridline 12 at D1
MODEL NO.		SERIAL NO.	

AIR-COOLED CONDENSER UNIT	**DATA FROM (PRE-DEMO) STATIC VERIFICATION**	**DATA FROM INSTALLATION VERIFICATION**	**INSTALLED**
REFRIGERANT PRESSURES			
VOLTAGE / PHASE / AMPERAGE			

AIR-COOLED CONDENSER UNIT START-UP & OPERATION		
VERIFICATION ITEMS (WHERE APPLICABLE)	**STATUS**	**COMMENTS**
COMPLETE INSTALLATION VERIFICATION		
FOR BELOW STEPS FOLLOW MANUFACTUER'S INSTUCTIONS (REFER TO PAGE 32 OF MANUAL)		
SYSTEM EVACUATION AND DEHYDRATION		
SYSTEM CHARGING		
CHECK OPERATION OF CONDENSER FAN MOTOR CONTROLS AND ROTATION OF FANS		
GENERAL COMMENTS:		

REVISION # 0.3

RECIPROCATING CHILLER AND

AIR-COOLED CONDENSER UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

RECIPROCATING CHILLER START-UP & OPERATION	
START-UP & OPERATION (Refer to Page 64 of manual for tables, diagrams, etc. AND Refer to Start-Up Checklist on pages CL-1 to CL-12. Actual Start-Up — Actual start-up should be done only under the supervision of a qualified refrigeration mechanic.	**COMPLETE**
INSTALLATION VERIFICATION COMPLETE	
1. Open all service valves.	
2. Using the Marquee display, if equipped, set leaving-fluid set point (CSP.1 is Set Point mode under sub-mode COOL), or QuickSet Pot. No cooling range adjustment is necessary.	
3. Start chilled fluid pump (if not configured for cooler pump control).	
4. Turn ENABLE/OFF/REMOTE CONTACT switch to ENABLE position.	
5. Allow unit to operate and confirm that everything is functioning properly. Check to see that leaving fluid temperature agrees with leaving set point (CSP.1 or CSP.2), **OR** if reset is used, with the control point (CTPT) in the Run Status mode under the sub-mode VIEW (if equipped with Scrolling Marquee display).	
6. Adjust the water regulating valve (where used) to obtain the most economical head pressure (based on the relative cost of water and electricity). Head pressure is normally 200 to 230 psig (1379 to 1586 kPa) for 30HK,HL units.	
7. Check the cooler leaving chilled water temperature to see that it remains well above 32 F (0° C), or the brine freezing point if the unit is a medium temperature brine unit.	
8. Recheck compressor oil level (see Check Oil Charge section).	
Check Refrigerant Charge — 30HK,HL,HW - Refer to notes on Page 64 of Manual.	
LIQUID CHARGING METHOD — Add charge to the unit through the liquid line service valve. Never charge liquid into the low-pressure side of the system.	
1. Frontseat (close) condenser liquid line shutoff valve.	
2. Connect a refrigerant cylinder loosely to the charging valve connection of the liquid line shutoff valve. Purge the charging hose and tighten the connections.	
3. Open the charging valve.	
4. If the system has been dehydrated and is under vacuum, break the vacuum with refrigerant gas. For R-22, build up system pressure to 58 psig and 32 F (400 kPa and 0° C). Invert the refrigerant cylinder so that the liquid refrigerant will be charged.	
5. For complete charge of 30HL and HWA units or where refrigerant cylinder cannot be weighed, follow charging by sight glass procedure. The use of sight glass charging is valid only when unit is operating at full capacity (no unloaders energized).	
6. The 30HL and HWA condenserless units are shipped with a holding charge only. After installation with the field-supplied system high side, the complete system should be charged until the sight glass is clear (with the unit running at full capacity). To achieve maximum system capacity, add additional charge equal to the difference between the condenser optimal charge and the condenser minimum charge, which can be obtained from the charge data provided in the condenser installation instructions.	
Refer to Page 65 for **Operation Sequence** and further information.	

VERIFICATION ITEMS (WHERE APPLICABLE)	**DATA FROM (PRE-DEMO) STATIC VERIFICATION**	**DATA FROM INSTALLATION VERIFICATION**	**INSTALLED**
REFRIGERANT TYPE INSTALLED IN SYSTEM			
REFRIGERANT PRESSURES			
CHILLED WATER FLOW (GPM)			
ENTERING CHILLED WATER TEMP (°C)			
LEAVING CHILLED WATER TEMP (°C)			
CONDENSER WATER FLOW (GPM)			
ENTERING CONDENSER WATER TEMP (°C)			
LEAVING CONDENSER WATER TEMP (°C)			

REVISION # 0.3

RECIPROCATING CHILLER AND

AIR-COOLED CONDENSER UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

VOLTAGE / PHASE / AMPERAGE			
GENERAL COMMENTS:			

POSITION/TITLE	**SIGNATURE**	**DATE**

REVISION # 0.3

RECIPROCATING CHILLER AND

AIR-COOLED CONDENSER UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

RECIPROCATING CHILLER NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	
SERVICE		LOCATION	
MODEL NO.		SERIAL NO.	

AIR-COOLED CONDENSER UNIT NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	
SERVICE		LOCATION	ROOFTOP; Gridline 12 at D1
MODEL NO.		SERIAL NO.	

AIR-COOLED CONDENSER UNIT	**DATA FROM (PRE-DEMO) STATIC VERIFICATION**	**SHOP DRAWINGS**	**INSTALLED**
STATIC VERIFICATION COMPLETE	N/A	N/A	
VOLTAGE / PHASE / AMPERAGE			
REFRIGERANT PRESSURES			

VERIFICATION ITEMS (WHERE APPLICABLE)	**STATUS**	**COMMENTS**
STATIC VERIFICATION COMPLETE		
MANUFACTURER'S INSTALLATION (Refer to Page 2 of Manual)		
NO PHYSICAL DAMAGE ON UNIT		
ALL BOLTS AND SCREWS ARE TIGHT AND FIELD JOINTS SEALED		
VIBRATION ISOLATORS INSTALLED		
TEMPERATURE SENSORS INSTALLED		
ISOLATING VALVES INSTALLED		
BALANCING VALVES INSTALLED		
UNIT CONTROLS COMPLETE		
STARTED AS PER MANUFACTURER’S REQUIREMENTS		
FAN ROTATION CORRECT		
VIBRATION ISOLATION OPERATION		
ISOLATION SUPPLIER’S INSPECTION REPORTS ATTACHED		
FLEXIBLE CONNECTIONS OPERATION		
NO SHORT CIRCULATION OF AIR FROM OUTLET TO INLET		
SEQUENCE OF OPERATION VERIFIED		
PIPING CONNECTIONS CORRECT		
PIPING INSULATION COMPLETE		
UNIT SAFETY REQUIREMENTS MET		

REVISION #: 0.2

RECIPROCATING CHILLER AND

AIR-COOLED CONDENSER UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

GENERAL COMMENTS:

RECIPROCATING CHILLER	**DATA FROM STATIC VERIFICATION**	**SHOP DRAWINGS**	**INSTALLED**
STATIC VERIFICATION COMPLETE	N/A	N/A	
REFRIGERANT TYPE INSTALLED IN SYSTEM			

PRE-START UP (Refer to Page 63 of Manual for tables, diagrams, etc.)	**COMPLETE**
STATIC VERIFICATION COMPLETE	
IMPORTANT: Prior to Pre-Start-Up, complete Start-Up Checklist for ComfortLink™ Chiller Systems at end of Manual (page CL-1). The Checklist assures proper start-up of unit, and provides a record of unit condition, application requirements, system information, and operation at initial start-up.	
1. Check all auxiliary components, such as air-cooled condenser, chilled liquid pumps, air-handling equipment, or other equipment to which the chiller supplies liquid. Consult manufacturer's instructions. Verify that chiller pump flow switch interlocks are properly installed. If the unit has field-installed accessories, be sure all are properly installed and wired correctly. Refer to unit wiring diagrams.	
2. Set QuickSet Setpoint Adjustment to the desired leaving fluid temperature or set Cooling Setpoint through Scrolling Marquee display (if equipped).	
3. Backseat (open) compressor suction and discharge shutoff valves. Close valves one turn to allow refrigerant pressure to reach the test gages.	
4. Open liquid line service valves.	
5. Fill chilled fluid circuit with clean water (with recommended inhibitor added) or other non-corrosive fluid to be cooled. Bleed all air out of high points of the system. Set flow rate according to job requirements. See Table 40 for 30H models. If chilled water is to be maintained at a temperature below 40 F (4.4 C) or outdoor temperatures are expected to be below 32 F (0° C) (30GTN models), a brine of sufficient concentration must be used to pre-	
6. Check tightness of all electrical connections.	
7. Open valve to capillaries from fluid regulating valve (when used).	
8. Open supply valve (or fill cooling tower, if used) for condenser water.	
9. Oil should be visible in the compressor sight glass. See Fig. 32. An acceptable oil level in the compressor is from 1/8 to 3/8 of sight glass. Adjust oil level as required. No oil should be removed unless the crank-case heater has been energized for at least 24 hours. See Check Oil Charge section on pg. 54 of Manual for Carrier-approved oils.	
10. Electrical power source must agree with unit nameplate.	
11. Crankcase heaters must be firmly locked into compressors, and must be on for 24 hours prior to start-up.	
12. Be sure system is fully charged with refrigerant ('Check Refrigerant Charge' on pg. 64 and 65 of Manual).	
13. Be sure compressor(s) floats freely on the mounting springs.	
14. If unit is a brine unit, check to ensure proper brine concentration is used to prevent freezing.	

REVISION #: 0.2

RECIPROCATING CHILLER AND

AIR-COOLED CONDENSER UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

RECIPROCATING CHILLER	**DATA FROM STATIC VERIFICATION**	**SHOP DRAWINGS**	**INSTALLED**
REFRIGERANT PRESSURES			
VOLTAGE / PHASE / AMPERAGE			

VERIFICATION ITEMS (WHERE APPLICABLE)	**STATUS**	**COMMENTS**
STARTUP LOG ATTACHED		
UNIT CONTROLS COMPLETE		
SAFETY INTERLOCKS COMPLETE		
REFRIGERANT & OIL SIGHT GLASSES		
OIL FILLED TO CORRECT LEVEL		
SUFFICIENT REFRIGERANT INSTALLED AND LEAK TESTED		
CORRECTION TABLES FOR VARYING CONDITIONS, WATER TEMP PROVIDED		
CORRECTION TABLES FOR VARYING CHILLED WATER TEMP PROVIDED		
PUMPS COMPLETED & STARTED		
CHEMICAL TREATMENT INSTALLED		
SYSTEM HAS BEEN PURGED		
STARTERS & DISCONNECTS CORRECT		
MANUFACTURERS STARTUP REPORT ATTACHED		

GENERAL COMMENTS:

POSITION/TITLE	**SIGNATURE**	**DATE**

REVISION #: 0.2

RECIPROCATING CHILLER AND

AIR-COOLED CONDENSER UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

RECIPROCATING CHILLER NAMEPLATE			
MANUFACTURER		EQUIPMENT	
SERVICE		LOCATION	
MODEL NO.		SERIAL NO.	

RECIPROCATING CHILLER	**INSTALLED/OBSERVED/COMPLETE**
CHECK UNIT FOR PHYSICAL DAMAGE	
LABELS VISIBLE	
UNIT IS CLEAN & FREE OF DEBRIS	
INSPECTED BY AHJ (IF APPLICABLE)	
ENGINEERS REVIEW (IF APPLICABLE)	

GENERAL COMMENTS:

AIR-COOLED CONDENSER UNIT NAMEPLATE			
MANUFACTURER		EQUIPMENT	
SERVICE		LOCATION	ROOFTOP; Gridline 12 at D1
MODEL NO.		SERIAL NO.	

AIR-COOLED CONDENSER UNIT	**INSTALLED/OBSERVED/COMPLETE**
PACKAGING/PROTECTION REMOVED	
NO PHYSICAL DAMAGE ON UNIT	
UNIT IS CLEAN & FREE OF DEBRIS	
ELECTRICAL CONNECTIONS COMPLETE	
PIPING AND PRESSURE TESTING COMPLETE	
FANS ROTATE FREELY	

REVISION #: 0.2

RECIPROCATING CHILLER AND

AIR-COOLED CONDENSER UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

INSPECTED BY AHJ (IF APPLICABLE)	
ENGINEERS REVIEW (IF APPLICABLE)	

GENERAL COMMENTS:

POSITION/TITLE	SIGNATURE	DATE

REVISION #: 0.2

Contractor Daily Installation

Check Sheet

NAME: _____ CLIENT: PSPC

COMPANY: _____ PROJECT: Fort Smith GOCB Roof Replacement

WEATHER CONDITIONS: _____ FILE NUMBER: R.015992.646

_____

ACTION ITEM (where applicable)	COMMENTS	√
Work area(s) indicated with gridline reference(s):		
Openings in roof assembly temporarily covered and secured:		
Slope is as required:		
Observe that roof drains are set to permit proper drainage:		
Pipes, conduits and other penetrations in the roof assembly are in place and ready to receive flashings:		
Sheet metal and roof accessories are in place or ready to be installed in conjunction with roofing as required:		
Material(s) installed:		
Watertight seal at end of day:		
Materials stored properly at end of day:		
Maintain (1) hour fire watch at end of day:		

GENERAL NOTES:

POSITION/TITLE	SIGNATURE	DATE

REVISION # 0.1

SPLIT SYSTEM AIR CONDITIONING UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

SPLIT SYSTEM CONDENSER NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	
SERVICE		LOCATION	
MODEL NO.		SERIAL NO.	

SPLIT SYSTEM CONDENSER	**INSTALLED/OBSERVED**
VOLTAGE / PHASE / AMPERAGE	
REFRIGERANT {TYPE} INSTALLED	
REFRIGERANT PRESSURES	
LINE SET	
TEMPERATURE SUPPLIED BY SYSTEM	
CHECK FOR PHYSICAL DAMAGE ON UNIT/WIRING	

GENERAL COMMENTS:

POSITION/TITLE	**SIGNATURE**	**DATE**

REVISION #: 0.2

SPLIT SYSTEM AIR CONDITIONING UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

SPLIT SYSTEM CONDENSER NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	
SERVICE		LOCATION	
MODEL NO.		SERIAL NO.	

SPLIT SYSTEM AIR CONDITIONING SYSTEM	**DATA FROM (PRE-DEMO) STATIC VERIFICATION**	**SHOP DRAWINGS**	**INSTALLED/COMPLETED**
COMPLETE INSTALLATION VERIFICATION	**N/A**	**N/A**	
TEMPERATURE SUPPLIED BY SYSTEM			

GENERAL COMMENTS:

POSITION/TITLE	**SIGNATURE**	**DATE**

REVISION #: 0.2

SPLIT SYSTEM AIR CONDITIONING UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

SPLIT SYSTEM CONDENSER NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	
SERVICE		LOCATION	
MODEL NO.		SERIAL NO.	

SPLIT SYSTEM CONDENSER	**DATA FROM (PRE-DEMO) STATIC VERIFICATION**	**SHOP DRAWINGS**	**INSTALLED**
VOLTAGE / PHASE / AMPERAGE			
REFRIGERANT {TYPE} INSTALLED			
REFRIGERANT PRESSURES			
LINE SET			

VERIFICATION ITEMS (WHERE APPLICABLE)	**STATUS**	**COMMENTS**
STATIC VERIFICATION COMPLETE		
VISUAL INSPECTION		
UNIT FREE OF PHYSICAL DAMAGE		
INSTALLATION & MOUNTING		
PIPING CONNECTIONS		
ACCESS FOR SERVICING		
PIPING INSULATION		
ISOLATING/BALANCING VALVES		
THERMOSTAT INSTALLED		
SAFETY INTERLOCK(s) CHECKED		
MECHANICAL INTERLOCK SCHEME(s) TESTED		
OPERATION OF CONTROL CIRCUITS		

GENERAL COMMENTS:

POSITION/TITLE	**SIGNATURE**	**DATE**

REVISION #: 0.3

SPLIT SYSTEM AIR CONDITIONING UNIT

NAME:	Matthew Davidson	CLIENT:	PSPC
COMPANY:	Republic Architecture Inc.	PROJECT:	Fort Smith GOCB Roof Replacement
ADDRESS:	385 St. Mary Avenue	FILE NUMBER:	R.015992.646
	Winnipeg, MB - Manitoba R3C0N1		

SPLIT SYSTEM CONDENSER NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	
SERVICE		LOCATION	
MODEL NO.		SERIAL NO.	

SPLIT SYSTEM CONDENSER	**INSTALLED/OBSERVED/COMPLETE**
ELECTRICAL CONNECTIONS COMPLETE	
PIPING COMPLETE AND PRESSURE TESTED	
CHECK FOR PHYSICAL DAMAGE ON UNIT	
UNIT CLEAN	

GENERAL COMMENTS:

POSITION/TITLE	**SIGNATURE**	**DATE**

REVISION #: 0.2

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Shane Solomon MAA SAA AAA OAA

Commissioning Issues and Resolutions Log

Month/Day/2020 – Month/Day/2020

Fort Smith GOCB Roof Replacement

Client Project Number: R.015992.646

Republic Project Number: 456

Item #	Date	Identified By	Decision	Action Plan	Approved By	Date Approved
1						
2						
3						
4						
5						
6						
7						

Part 1 General

1.1 DEFINITIONS

.1 Acronyms:

.1 BMM - Building Management Manual.
.2 Cx - Commissioning.
.3 HVAC - Heating, Ventilation and Air Conditioning.
.4 PI - Product Information.
.5 PV - Performance Verification.
.6 TAB - Testing, Adjusting and Balancing.
.7 WHMIS - Workplace Hazardous Materials Information System.

1.2 GENERAL REQUIREMENTS

.1 Standard letter size paper 216 mm x 279 mm.

.2 Drawings, diagrams and schematics to be professionally developed.

.3 Electronic copy of data to be in a format accepted and approved by Departmental Representative.

1.3 APPROVALS

.1 Prior to commencement, co-ordinate requirements for preparation, submission and approval with Departmental Representative.

1.4 GENERAL INFORMATION

.1 Provide Departmental Representative the following for insertion into appropriate Part and Section of BMM:

.1 Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project - as indicated in Section 1.2 of BMM.
.2 Summary of architectural, structural, fire protection, mechanical and electrical systems installed and commissioned - as indicated in Section 1.4 of BMM.
.1 Including sequence of operation as finalized after commissioning is complete as indicated in Section 2.0 of BMM.
.3 Description of building operation under conditions of heightened security and emergencies as indicated in Section 2.0 of BMM.
.4 System, equipment and components Maintenance Management System (MMS) identification - Section 2.1 of BMM.
.5 Information on operation and maintenance of architectural systems and equipment installed and commissioned - Section 2.0 of BMM.

.6 Information on operation and maintenance of fire protection and life safety systems and equipment installed and commissioned - Section 2.0 of BMM.

.7 Information on operation and maintenance of mechanical systems and equipment installed and commissioned - Section 2.0 of BMM.

.8 Operating and maintenance manual - Section 3.2 of BMM.

.9 Final commissioning plan as actually implemented.

.10 Completed commissioning checklists.

.11 Commissioning test procedures employed.

.12 Completed Product Information (PI) and Performance Verification (PV) report forms, approved and accepted by Departmental Representative.

.13 Commissioning reports.

1.5 CONTENTS OF OPERATING AND MAINTENANCE MANUAL

.1 For detailed requirements refer to Section 01 78 00 - Closeout Submittals.

.2 Departmental Representative to review and approve format and organization within 12 weeks of award of contract.

.3 Include original manufactures brochures and written information on products and equipment installed on this project.

.4 Record and organize for easy access and retrieval of information contained in BMM.

.5 Include completed PI report forms, data and information from other sources as required.

.6 Inventory directory relating to information on installed systems, equipment and components.

.7 Approved project shop-drawings, product and maintenance data.

.8 Manufacturer's data and recommendations relating manufacturing process, installation, commissioning, start-up, O&M, shutdown and training materials.

.9 Inventory and location of spare parts, special tools and maintenance materials.

.10 Warranty information.

.11 Inspection certificates with expiration dates, which require on-going re-certification inspections.

.12 Maintenance program supporting information including:

.1 Recommended maintenance procedures and schedule.

.2 Information to removal and replacement of equipment including, required equipment, points of lift and means of entry and egress.

1.6 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES

.1 Provide Departmental Representative supporting documentation relating to installed equipment and system, including:

- .1 General:
  - .1 Finalized commissioning plan.
  - .2 WHMIS information manual.
  - .3 Approved "as-built" drawings and specifications.
  - .4 Procedures used during commissioning.
  - .5 Cross-Reference to specification sections.
  - .6 Inspection certificates, construction permits.
- .2 Fire prevention, suppression and protection:
  - .1 Test reports.
  - .2 PV reports.
- .3 Mechanical:
  - .1 Installation permits, inspection certificates.
  - .2 Piping pressure test certificates.
  - .3 Ducting leakage test reports.
  - .4 TAB and PV reports.
  - .5 Charts of valves and steam traps.
  - .6 Copies of posted instructions.
- .4 Electrical:
  - .1 Installation permits, inspection certificates.
  - .2 TAB and PV reports.
  - .3 Electrical work logbook.
  - .4 Charts and schedules.
  - .5 Locations of cables and components.
  - .6 Copies of posted instructions.

.2 Assist Departmental Representative with preparation of BMM.

1.7 LANGUAGE

.1 English and French Language to be in separate binders.

1.8 USE OF CURRENT TECHNOLOGY

.1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.

.2 Obtain Departmental Representative's acceptance before starting Work.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group:

.1 CAN/CSA S269.2-M87, Access Scaffolding for Construction Purposes.

.2 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

.2 Department of Justice Canada (Jus)

.1 Canadian Environmental Assessment Act (CEAA), 2012

.2 Canadian Environmental Protection Act (CEPA), 2012

.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.2 Hazardous Materials Information Review Act, 1985.

1.2 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose off site, unless indicated to be removed and salvaged or removed and reinstalled.

.2 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative.

.3 Remove and Reinstall: Detach items from existing construction, prepare them for re-use, and re-install them where indicated.

.4 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.

.5 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate selective demolition work so that work of this Section adheres to aesthetic criteria established by the Drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.

.2 Coordination: Coordinate with Departmental Representative for the material ownership as follows:

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

.3 Pre-demolition Meeting: Conduct a pre-demolition meeting at Project site, in accordance with requirements listed in Section 01 31 19 – Project Meetings, to confirm extent of salvaged and demolished materials; and to review Contractor's demolition plan prepared by a professional engineer.

1.4 SUBMITTALS

.1 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Schedule of Selective Demolition Activities: Coordinate with Section 01 32 16.19 – Construction Progress Schedule – Bar (GANTT) Chart, and indicate the following:

.1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.

.2 Coordinate with Departmental Representative's building manager and user group regarding on-going site operations and limit the number of interruptions during regular business hours.

.3 Interruption of utility services.

.4 Coordination for shutoff, capping, and continuation of utility services.

.5 Locations of temporary partitions and means of egress, including for others affected by selective demolition operations.

.6 Coordination with continuing occupancy of portions of existing building.

.2 Demolition Plan: Submit a plan of demolition area indicating extent of temporary facilities and supports, methods of removal and demolition prepared by a professional engineer in accordance with requirements of Authority Having Jurisdiction, and as follows:

.1 Proposed Dust Control and Noise Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Departmental Representative reserves the right to make modifications where proposed methods interfere with the Departmental Representative's ongoing operation

.2 Inventory: Submit a list of items that have been removed and salvaged after selective demolition is complete.

.3 Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

.4 Pre-demolition photographs: Submit photographs indicating existing conditions of adjoining construction and site improvements prior to starting Work. Include finish surfaces that may be misconstrued as damage caused by selective demolition operations.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements: Comply with governing environmental notification requirements and regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction and in accordance with the following:

.1 Federal Workers' Compensation Service and Territorial Workers' Compensation Boards/Commissions.

.2 Government of Canada, Labour Program: Workplace Safety and Territorial Occupational Health and Safety Standards and Programs.

.3 Conform to the local municipal bylaws and regulations governing this type of work.

1.6 SITE CONDITIONS

.1 Portions of building immediately adjacent to selective demolition area will be occupied.

.1 Conduct selective demolition so that operations will not be disrupted.

.2 Provide not less than 72 hours' notice to Departmental Representative of activities that will affect operations.

.2 Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities and as follows:

.1 Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.

.3 Departmental Representative assumes no responsibility for condition of areas to be selectively demolished:

.1 Conditions existing at time of Pre-Bid Site Review will be maintained by Departmental Representative as far as practical.

.4 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in the Work.

.1 Refer to Section 01 41 00 – Regulatory Requirements for directives associated with specific material types.

.2 Hazardous materials will be as defined in the Hazardous Materials Act.

.3 If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Departmental Representative. Hazardous materials will be removed by Departmental Representative under a separate contract or as a change to the Work.

.5 Storage or sale of removed items or materials on site will not be permitted.

.6 Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

.7 Maintain fire protection facilities in service during selective demolition operations.

Part 2 Products

2.1 MATERIALS

.1 Temporary Support Structures: Design temporary support structures required for demolition work and underpinning, and other foundation supports necessary for the project using a qualified professional engineer registered or licensed in province of the Work.

.2 Repair Materials: Use repair materials identical to existing materials:

.1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

.2 Use materials whose installed performance equal or surpasses that of existing materials.

.3 Comply with material and installation requirements specified in individual technical specification Sections.

.3 Retained Materials: Retain items identified for re-use in new construction.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that utilities have been disconnected and capped.

.2 Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

.3 Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

.4 Notify the Departmental Representative where existing mechanical, electrical, or structural elements conflict with intended function or design:

.1 Investigate and measure the nature and extent of conflict and submit a written report to Departmental Representative.

.2 Departmental Representative will issue additional instructions or revise drawings as required to correct conflict.

.5 Engage a professional engineer to survey condition of building when removing elements that may result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

.6 Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

.1 Coordinate existing services indicated to remain and protect them against damage during selective demolition operations.

.2 Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.

.1 Confirm with as-built drawings, and information provided by site staff regarding utilities and protection of shut-off required.

.2 Arrange to shut off affected utilities with utility companies.

.3 If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.

.4 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

.3 Coordinate with Mechanical and Electrical Divisions for shutting off, disconnecting, removing, and sealing or capping utilities.

.4 Do not start selective demolition work until utility disconnecting and sealing have been completed and verified.

3.3 PREPARATION

.1 Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

.2 Conduct selective demolition and debris removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities:

.1 Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Departmental Representative and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

.2 Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.

.3 Protect existing site improvements, appurtenances, and landscaping to remain.

.4 Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

.3 Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain in accordance with Section 01 51 00, and as follows:

.1 Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

.2 Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

.3 Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

.4 Cover and protect furniture, furnishings, and equipment that have not been removed.

.4 Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities in accordance with Section 01 52 00 - Construction Facilities.

.1 Provide temporary weather tight enclosure for building exterior.

.2 Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures.

.3 Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

.5 Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise in accordance with Section 01 51 00 – Temporary Utilities.

.6 Provide and maintain shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished:

.1 Strengthen or add new supports when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

.1 Dust Control: Provide water mist, temporary enclosures, or other suitable methods reviewed and accepted by the Departmental Representative to limit spread of dust and dirt. Comply with governing environmental protection regulations, and as limited below:

.1 Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

.2 Wet mop floors to eliminate tracking of dirt, wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.

.2 Remove and transport debris to prevent spillage on adjacent surfaces and areas.

.3 Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

.4 Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.5 SELECTIVE DEMOLITION

.1 Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

.1 Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

.2 Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

.3 Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

.4 Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame cutting operations. Maintain fire watch and portable fire suppression devices during flame cutting operations.

.5 Maintain adequate ventilation when using cutting torches.

.6 Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

.7 Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

.8 Dispose of demolished items and materials promptly.

.9 Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.

.2 Comply with Departmental Representative’s requirements for using and protecting stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.

.3 Removed and Salvaged Items:

.1 Clean salvaged items.

.2 Pack or crate items after cleaning.

.3 Identify contents of containers.

.4 Store items in a secure area until delivery to Departmental Representative.

.5 Protect items from damage during storage.

.4 Removed and Reinstalled Items:

.1 Clean and repair items to functional condition adequate for intended re use. Paint equipment to match new equipment.

.2 Pack or crate items after cleaning and repairing.

.3 Identify contents of containers.

.4 Protect items from damage during transport and storage.

.5 Reinstall items in locations indicated.

.6 Comply with installation requirements for new materials and equipment.

.7 Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

.5 Existing Items to Remain:

.1 Protect construction indicated to remain against damage and soiling during selective demolition.

.2 Items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

.6 Roofing: Remove no more existing roofing than can be waterproofed in one day. Refer to Section 07 52 00 – Modified Bituminous Membrane Roofing for new roofing requirements.

.7 Air Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 CLOSEOUT ACTIVITIES

.1 Patching and Repairs: Promptly repair damage to adjacent construction caused by selective demolition operations and as follows:

.1 Patch to produce surfaces suitable for new materials where repairs to existing surfaces are required,

.2 Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

.2 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) and as follows:

.1 Promptly dispose of demolished materials.

.2 Do not allow demolished materials to accumulate onsite.

.3 Do not burn demolished materials.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

.1 ASTM A307-12, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM F3125/F3125M-15, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 1181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA)

.1 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CSA W59-13, Welded Steel Construction (Metal Arc Welding).

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.5 Process Industry Practices

.1 PIP STE05501, Fixed Ladders and Cages Design Guide.

1.2 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for ladders; include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit two copies of WHMIS SDS in accordance with Section 01 35 29.06 – Health and Safety Requirements.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Northwest Territories.

.2 Indicate construction details, sizes of steel sections, and anchorage to building structure.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect ladders from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 PERFORMANCE REQUIREMENTS

.1 Design metal ladder construction and connections to vertical and horizontal live load requirements in accordance with NBCC 2015 and PIP STE05501.

.2 Detail and fabricate ladders in accordance with PIP STE05501.

2.2 MATERIALS

.1 Steel sections: to CSA G40.20/G40.21 Grade 300 W.

.2 Steel bar: to CSA G40.20/G40.21, Grade 260 W.

.3 Welding materials: CSA W59.

.4 Bolts: ASTM A307, galvanized.

.5 High strength bolts: ASTM F3125/F3125M, galvanized.

2.3 FABRICATION

.1 Fabricate in accordance with PIP STE05501.

.2 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.

.3 Accurately form connections with exposed faces flush:

.1 Make mitres and joints tight.

.4 Grind or file exposed welds and steel sections smooth.

.5 Shop fabricate items in sections as large and complete as practicable.

2.4 FINISHES

.1 Galvanizing: Hot dipped galvanizing with zinc coating 600 g/m^2 to CAN/CSA G164.

2.5 STEEL LADDER

.1 Form ladder rails from 64 mm x 10 mm steel bar.

.2 Form ladder rungs from 20 mm diameter x 460 mm length smooth steel bar. Weld to stringers, spaced vertically, at minimum 300 mm and maximum 400 mm on centre.

.1 Space ladder rungs uniformly throughout length of ladder.

.2 Ensure top rung of ladder is level with top of parapet served by ladder.

.3 Galvanize ladder after fabrication.

.4 Paint ladder on site in accordance with Section 09 91 00 – Painting.

Part 3 Execution

3.1 EXAMINATION

.1 Verify conditions of substrates are acceptable for metal ladders installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Departmental Representative of unacceptable conditions.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION OF LADDERS

.1 Install in accordance with PIP STE05501.

.2 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide galvanized anchor bolts, bolts and plates for connecting ladders to structure.

.3 Perform welding work in accordance with CSA W59 unless specified otherwise.

.4 Touch up galvanizing to bolts, welds, and burned or scratched surfaces at completion of erection, using zinc-rich coating to CAN/CGSB 1.181.

3.3 CLEANING

.1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: Remove waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

3.4 PROTECTION

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

.2 Repair damage to adjacent materials caused by metal ladder installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B18.6.1-1981 (R2016), Wood Screws.

.2 ASTM International

.1 ASTM A123/A123M-13, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealled) by the Hot-Dip Process.

.3 ASTM D3498-03 (2011), Standard Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems.

.4 ASTM F1667-13, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.3 Canadian Standards Association (CSA)

.1 CAN/CSA O80-Series-08, Wood Preservation.

.2 CSA O112.9-10 (R2014), Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).

.3 CSA O121-08 (R2013), Douglas Fir Plywood.

.4 CSA O141-05 (R2014), Softwood Lumber.

.5 CSA O151-09 (R2014), Canadian Softwood Plywood.

.6 CSA O325-07 (R2012), Construction Sheathing.

.4 Master Painters Institute (MPI)

.1 MPI Architectural Painting Specifications Manual, current edition.

.5 National Lumber Grades Authority (NLGA)

.1 NLGA Standard Grading Rules for Canadian Lumber (2014 edition).

.6 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC S102-10, Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wood products and accessories. Include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Where required, submit drawings stamped and signed by professional engineer registered or licensed in the Northwest Territories.

1.3 QUALITY ASSURANCE

.1 Lumber 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 DELIVERY, STORAGE, AND HANDLING

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

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wood from damage.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 FRAMING STRUCTURAL AND PANEL MATERIALS

.1 Lumber: Softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:

.1 CSA O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.2 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:

.1 Use S2S or S4S materials.

.2 Board sizes: "Standard" or better grade.

.3 Dimension sizes: "Standard" light framing or better grade.

.3 Plywood, OSB and wood based composite panels: CSA O325.

.4 Douglas fir plywood (DFP): CSA O121, standard construction.

.5 Canadian softwood plywood (CSP): CSA O151, standard construction.

.6 Treated wood products: To CSA O80 Series.

2.2 ACCESSORIES

.1 Air seal: Closed cell polyurethane or polyethylene.

.2 Sealants: In accordance with Section 07 92 00 - Joint Sealants.

.3 General purpose adhesive: CSA O112.9.

.4 Nails, spikes and staples: ASTM F1667.

.5 Screws: ASME B18.6.1.

.6 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.7 Proprietary fasteners: Toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.

.8 Joist hangers: Minimum 1 mm thick sheet steel, galvanized ZF001 coating designation.

.9 Fasteners: Hot dipped galvanized steel to ASTM A123/A123M or ASTM A653/A653M for high humidity and treated wood locations, unfinished steel elsewhere.

.10 Panel edge clips (“H clips”): Galvanized steel, sized to plywood sheathing.

Part 3 Execution

3.1 EXAMINATION

.1 Verify conditions of substrates are acceptable for product installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Departmental Representative of unacceptable conditions.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PREPARATION

.1 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

.2 Install pressure-treated wood in locations where wood will be in contact with concrete.

3.3 FRAMING

.1 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.

.2 Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.

.3 Install members true to line, levels and elevations, square and plumb.

.4 Construct continuous members from pieces of longest practical length.

.5 Construct framing and curb members full length without splices.

.6 Install spanning members with "crown-edge" up.

.7 Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists. Frame rigidly into joists.

.8 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

.9 Frame, anchor, fasten, tie, and brace members to provide necessary strength and rigidity.

.10 Countersink bolts where necessary to provide clearance for other work.

3.4 FURRING AND BLOCKING

.1 Install rough bucks, nailers, and linings to rough openings as required to provide backing for frames and other work.

.2 Install wood cants, fascia backing, nailers, curbs, and other wood supports as required and secure using galvanized steel fasteners.

.3 Install sleepers as indicated.

3.5 EQUIPMENT/ELECTRICAL MOUNTING BOARD

.1 Equipment/Electrical mounting board:

.1 Douglas Fir plywood, good one side.

.2 Size: 1220 x 2440 mm x 19 mm (48 x 96 x ¾ inch).

.3 Finish: Fire-retardant paint finish to MPI INT 6.4PP; white or to match wall colour unless otherwise specified; finish on all six surfaces prior to installation to ensure proper sealing.

.4 Fastening: Exposed stainless steel fasteners, at 400 mm (16 inches) o.c. unless otherwise specified.

3.6 ROOF SHEATHING

.1 Confirm roof substrate is level before installation of plywood sheathing. Shim as necessary to provide a level nailing surface.

.2 Install panels with surface grain perpendicular to roof framing. Stagger end joints.

.3 Install H-clips on unsupported edges of plywood sheathing, one clip spaced evenly between roof joists.

.4 Attach plywood sheathing using wood screws, or ring-type or ardox nails.

.1 Space fasteners at maximum 150 mm (6 inches) on center at supported sheathing ends and edges.

.2 Space fasteners at maximum 300 mm (12 inches) on center at intermediate supports.

.5 Install panels with 3 mm (1/8 inch) space between panel ends and edge joints.

3.7 CLEANING

.1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.4 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

3.8 PROTECTION

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

.2 Repair damage to adjacent materials caused by rough carpentry installation.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM C167-18, Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.

.2 ASTM C518-10, Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

.2 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC S102-10, Test for Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC S114-05, Test for Determination of Non-Combustibility in Building Materials.

.3 CAN/ULC-S702-09, Standard for Mineral Fibre Insulation for Buildings.

1.2 SUBMITTALS

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

.2 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for batt insulation; include product characteristics, performance criteria, physical size, and limitations.

.3 Certificates: Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect materials from damage.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 BATT INSULATION

.1 Batt insulation for exterior walls including parapets: To CAN/ULC S702, Type 1; semi-rigid mineral wool batt insulation.

.1 Non-combustibility (CAN/ULC S114): Pass.

.2 Surface burning characteristics (CAN/ULC S102):

.1 Flame spread: 0.

.2 Smoke developed: 0.

.3 Density (ASTM C167): 32 kg/m^3.

.4 Thermal resistance (ASTM C518): R14 at 89 mm (3-1/2 inch) thickness.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that conditions of substrate are acceptable for batt insulation application in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Departmental Representative of unacceptable conditions.

.3 Proceed with installation only after unacceptable conditions have been remedied.

.2 Verify sealants required at junctions with adjacent building components or at mechanical and electrical conduit and duct penetrations are installed.

.3 Confirm mechanical and electrical service lines in walls and ceilings to be insulated have been inspected.

3.2 INSULATION INSTALLATION

.1 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.3 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

.4 Do not excessively compress insulation to fit into spaces.

.5 Offset both vertical and horizontal joints in multiple layer applications.

.6 Do not enclose insulation until it has been inspected by Departmental Representative.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM C472-99 (2014), Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete.

.2 ASTM C473-16, Physical Testing of Gypsum Panel Products.

.3 ASTM C1177/C1177M-13, Glass Mat Gypsum Substrate for Use as Sheathing.

.4 ASTM C1278/C1278M-07a, Fiber-Reinforced Gypsum Panel.

.5 ASTM D41/D41M-11 (2016), Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

.6 ASTM D412-16, Vulcanized Rubber and Thermoplastic Elastomers – Tension.

.7 ASTM D624-00 (2020), Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

.8 ASTM D994/D994M-11 (2016), Preformed Expansion Joint Filler for Concrete (Bituminous Type).

.9 ASTM D1876-08 (2015)e1, Peel Resistance of Adhesives (T-Peel Test).

.10 ASTM D2240-15e1, Rubber Property – Durometer Hardness.

.11 ASTM D5147/D5147M-14, Sampling and Testing Modified Bituminous Sheet Material.

.12 ASTM D6164-11, Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

.13 ASTM E96/E96M-14, Water Vapor Transmission of Materials.

.14 ASTM E154-08a, Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

.15 ASTM E1186-17, Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.

.16 ASTM E2178-13, Air Permeance of Building Materials.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 37-GP-56M-80b(A1985), Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.

.3 Canadian Roofing Contractors Association (CRCA)

.1 CRCA Roofing Specifications Manual – current edition.

.4 CSA Group (CSA)

.1 CSA A123.21-10, Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems.

.2 CSA B272-93, Prefabricated Self-Sealing Roof Vent Flashings.

.5 Underwriters Laboratories' of Canada (ULC)

.1 CAN/ULC S704-11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.2 SUBMITTALS

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

.2 Product Data:

.1 Provide roofing components data sheets describing materials' physical properties; include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements, and indicate VOC content for products used in Work.

.3 Provide shop drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Northwest Territories.

.2 Indicate flashing, control joints, tapered insulation details.

.3 Indicate layout for tapered insulation.

.4 Provide wind uplift calculations.

.4 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.

.5 Reports: indicate procedures followed, ambient temperatures and wind velocity during application.

1.3 QUALITY ASSURANCE

.1 Mock-ups:

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

.2 Fabricate 3000 x 3000 mm sample roofing panel using identical project materials and methods to include typical seam.

.3 Mock-up will be used:

.1 To judge quality of work, substrate preparation, operation of equipment and material application.

.4 Locate where directed.

.5 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with sheet metal flashing work.

.6 When accepted, mock-up will demonstrate minimum standard of quality required for this Work.

.7 Approved mock-up may remain as part of finished Work.

1.4 FIRE PROTECTION

.1 Fire Extinguishers:

.1 Maintain one cartridge operated type or stored pressure rechargeable type with hose and shut-off nozzle,

.2 ULC labelled for A, B, and C class protection.

.3 Size 4.5 kg on roof per torch applicator, within 6 m of torch applicator.

.2 Maintain fire watch for 1 hour after each day's roofing operations cease.

1.5 DELIVERY, STORAGE, AND HANDLING

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

.2 Storage and Handling Requirements:

.1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.

.2 Provide and maintain dry, off-ground weatherproof storage.

.3 Store rolls of felt and membrane in upright position. Store membrane rolls with salvage edge up.

.4 Remove only in quantities required for same day use.

.5 Where climatic conditions warrant, store membrane rolls in heated enclosures prior to use, as recommended by manufacturer; remove only in quantities required for same day use.

.6 Place plywood runways over completed Work to enable movement of material and other traffic.

.7 Store sealants within manufacturer’s recommended temperature range.

.8 Store insulation protected from deleterious materials.

.9 Store materials on pallets or dunnage.

.10 Cover materials not currently in use with opaque covers.

1.6 SITE CONDITIONS

.1 Ambient Conditions

.1 Do not install roofing when temperature remains below -18°C for torch application.

.2 Minimum temperature for adhesives and self-adhesive products in accordance with manufacturer’s recommendations.

.2 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.7 WARRANTY

.1 Warranty: Provide written warranty against failure of roofing system and leakage as agreed upon by Departmental Representative, Contractor, roofing sub-contractor, and membrane manufacturer.

.1 Warranty: 15 years for material and 2 years for workmanship, covering but not limited to:

.1 Labour and material for repair, replacement of roofing components from structural deck up.

.2 Leakage or failure of roof system due to natural causes.

.3 Non-prorated.

Part 2 Products

2.1 PERFORMANCE CRITERIA

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

.2 Roofing System: to CSA A123.21 for wind uplift resistance.

2.2 DECK COVERING

.1 Plywood: Refer to Section 06 10 00 – Rough Carpentry.

.2 Glass Mat, Gypsum Board: to ASTM C1177, fibreglass mat faces, thickness as indicated.

.1 Compressive strength (ASTM C473): 6.2 MPa (900 psi).

.2 Fire performance (ASTM E84):

.1 Flame spread: 0.

.2 Smoke developed: 0.

.3 Fasteners: Corrosion-resistant screws.

.4 Provide galvanized steel stress plates for gypsum sheathing attachment, minimum 75 mm diameter.

2.3 VAPOUR BARRIER

.1 Self-adhesive vapour barrier membrane: SBS modified bitumen laminated to polyethylene facer.

.1 Bottom face: Covered with release film.

.2 Thickness: Minimum 0.8 mm.

.3 Tensile strength (ASTM D5147): 9.5 kN/m MD; 13 kN/m XMD.

.4 Lap adhesion (ASTM D1876): 1000 N/m.

.5 Water absorption (ASTM D5147): Maximum 0.1%.

.6 Water vapour permeance (ASTM E96, Procedure B): 1.7 ng/Pa·s·m^2.

.7 Air permeability (ASTM E2178): <0.001 L/sec·m^2.

.2 Primer: As recommended by vapour barrier manufacturer for substrate and application temperature.

2.4 POLYISOCYANURATE INSULATION

.1 To CAN/ULC-S704, Type 1, flame spread classification: less than 500, thickness as indicated.

.2 Supply insulation in minimum two layers, with top layer sloped.

.3 Adhesive: To CSA A123.21, polyurethane-based, two-part, low-rise, for cold-adhered installation.

2.5 PROTECTION BOARD

.1 Protection board: Rigid panels comprised of asphaltic-mineral core faced on both sides with asphalt-saturated glass mat reinforcement.

- .1 Puncture resistance (ASTM E154): 500 N.
- .2 Water absorption (ASTM D994): 0.25%.
- .3 Compressive strength (ASTM C472): Minimum 1600 kPa.
- .4 Shore hardness (ASTM C1278): Pass.

.2 Adhesive: To CSA A123.21, polyurethane-based, two-part, low-rise, for cold-adhered installation.

2.6 MEMBRANE

.1 Base sheet: to CGSB 37-GP-56M, polyester reinforcement.

- .1 Styrene-Butadiene-Styrene (SBS) elastomeric polymer prefabricated sheet, polyester reinforcement, nominal weight 180 g/m^2.
- .2 Application: Heat-welded.
- .3 Top and bottom surfaces:
  - .1 Thermofusible plastic film.
- .4 Base sheet membrane properties: to CGSB 37-GP-56M.
  - .1 Strain energy (longitudinal/transversal): 9.0/7.0 kN/m.
  - .2 Breaking strength (longitudinal/transversal): 17.0/12.5 kN/m.
  - .3 Ultimate elongation (longitudinal/transversal): 60/65 %.
  - .4 Tear resistance: 60 N.
  - .5 Cold bending at -30°C: no cracking.
  - .6 Softening point: ³ 110 degrees C.
  - .7 Static puncture resistance: ≥ 400 N.
  - .8 Dimensional Stability: -0.3 / 0.3 %.

.2 Cap sheet membrane: to CGSB 37-GP-56M, polyester reinforcement.

- .1 Styrene-Butadiene-Styrene (SBS) elastomeric polymer prefabricated sheet, polyester reinforcement, nominal weight 250 g/m^2.
- .2 Application: Heat-welded.
- .3 Top surface: Granules.
  - .1 Colour: As selected by Departmental Representative from manufacturer’s standard range.

.4 Bottom surface: Thermofusible plastic film.

.5 Cap sheet membrane properties: to CGSB 37-GP-56M.

.1 Strain energy (longitudinal/transversal): 10/10 kN/m.

.2 Breaking strength (longitudinal/transversal): 17/16 kN/m.

.3 Ultimate elongation (longitudinal/transversal): 60/65 %.

.4 Tear resistance: 75 N.

.5 Static puncture resistance: ≥ 400 N.

.6 Cold bending at -30°C: no cracking.

.7 Softening point: 110 degrees C.

.8 Dimensional Stability: -0.8 / 0.2 %.

2.7 MEMBRANE FLASHING

.1 Base sheet membrane flashing: To CGSB-37.56-M, polyester reinforced, 180 g/m^2, self-adhering membrane with heat-fusible top face.

.2 Cap sheet membrane flashing: To CGSB-37.56-M, polyester reinforced, 250 g/m^2, heat-welded membrane with heat-fusible film under face and granule-coated top face.

2.8 ACCESSORIES

.1 Vent stack flashings: To CSA B272, aluminum, 1100 alloy, 1.6 mm thick, insulated, EPDM top and base seals, bituminous painted deck flange.

.2 Expansion joint: Purpose-made, monolithic, EPDM with flanges.

.1 Flanges: Faced both sides with woven polyacrlonitrile.

.2 Core: Expandable.

.3 Hardness (ASTM D2240): 45 ± 5.

.4 Tensile strength (ASTM D412C): 10 MPa.

.5 Elongation (ASTM D412C): 700%.

.6 Tear resistance (ASTM D624B): > 10 N/mm.

.3 Roof penetration detailing system: Curb and mastic system, purpose-made, acceptable to roof membrane manufacturer.

.1 Curbs: Segmented precast polyester resin curb, adhered with structural polyether-based sealant.

.2 Mastic: Polyether based, single component, moisture-curing, self-levelling pourable sealant.

2.9 SEALERS

.1 Caulking: Elastomeric polyurethane sealant, refer to Section 07 92 00 - Joint Sealants.

Part 3 Execution

3.1 QUALITY OF WORK

.1 Perform roofing work in accordance with CRCA recommendations.

.2 Fit interface of the walls and roof assemblies with durable rigid material providing connection point for continuity of air barrier.

.3 Assembly, component and material connections will be made in consideration of appropriate design loads.

3.2 EXAMINATION OF ROOF DECKS

.1 Verification of Conditions:

.1 Inspect deck conditions including parapets, construction joints, roof drains, plumbing vents and ventilation outlets to determine readiness to proceed.

.2 Evaluation and Assessment: Prior to beginning of work ensure:

.1 Decks are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris. Do not use calcium or salt for ice or snow removal.

.2 Curbs have been built.

.3 Roof drains have been installed at proper elevations relative to finished roof surface.

.4 Plywood and lumber nailer plates have been installed to deck, walls and parapets as indicated.

.3 Do not install roofing materials during rain or snowfall.

3.3 PROTECTION OF IN-PLACE CONDITIONS

.1 Cover walls, walks, sloped roofs, and adjacent work where materials to be hoisted or used.

.2 Use warning signs and barriers. Maintain in good order until completion of Work.

.3 Clean off drips and smears of bituminous material immediately.

.4 Dispose of rainwater off roof and away from face of building until roof drains or hoppers installed and connected.

.5 Protect roof from traffic and damage. Comply with precautions deemed necessary by DCC Representative.

.6 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.

.7 Metal connectors and decking will be treated with rust proofing or galvanization.

3.4 DECK SHEATHING

.1 Mechanically fasten glass mat gypsum board to wood deck with plates and screws, in patterns and amounts as recommended by manufacturer for applicable wind uplift conditions.

.2 Install sheathing with end joints staggered and fully supported.

3.5 VAPOUR BARRIER (GYPSUM BOARD/PLYWOOD DECK)

.1 Apply deck primer to substrate at the rate recommended by manufacturer.

.2 Install self-adhering vapour barrier in accordance with manufacturer's instructions.

.3 Lap sides minimum 75 mm and ends minimum 150 mm.

.4 Apply pressure over whole surface of vapour barrier membrane to effect full adhesion to substrate.

3.6 CONVENTIONAL MEMBRANE ROOFING (CMR) APPLICATION

.1 Insulation: fully adhered, adhesive application:

- .1 Adhere insulation to laminated vapour barrier using two-part polyurethane adhesive.
- .2 Place boards in parallel rows with joints staggered between layers, and in firm contact with one another.
- .3 Cut end pieces to suit.
- .4 Apply adhesive at rates recommended for local wind uplift, particularly recommendations for corners and perimeter.

.2 Tapered insulation application:

- .1 Install tapered insulation as top insulation layer, in accordance with reviewed shop drawings. Stagger joints between layers 150 mm minimum.

.3 Protection Board: adhesive application:

- .1 Adhere protection board to insulation using two-part polyurethane adhesive.
- .2 Place boards in parallel rows with end joints staggered. Cap joints approximately 25 mm.
- .3 Cut ends to suit and apply adhesive at rates recommended by manufacturer for local wind uplift.

.4 Base sheet application:

- .1 Starting at low point of roof, perpendicular to slope, unroll base sheet, align and reroll from both ends.
- .2 Unroll and torch base sheet onto substrate taking care not to burn membrane or its reinforcement or substrate.
- .3 Lap sheets 75 mm minimum for side and 150 mm minimum for end laps.

.4 Apply membrane free of blisters, fishmouths, and wrinkles.

.5 Cap sheet application:

.1 Starting at low point on roof, perpendicular to slope, unroll cap sheet, align and reroll from both ends.

.2 Unroll and torch cap sheet onto base sheet taking care not to burn membrane or its reinforcement.

.3 Lap sheets 75 mm minimum for side laps and 150 mm minimum for end laps. Offset joints in cap sheet 300 mm minimum from those in base sheet.

.4 Application to be free of blisters, fishmouths and wrinkles.

.5 Perform membrane application in accordance with manufacturer's recommendations.

.6 Flashings:

.1 Perform work in accordance with manufacturer's recommendations.

.2 Install cap sheet flashing at perimeters, expansion joints, roof-to-wall junctions, roof dividers, roof curbs, and penetrations.

.3 Complete installation of flashing base sheet stripping prior to installing membrane cap sheet.

.4 Install base and cap sheet onto substrate in 1 metre wide strips.

.5 Lap flashing base sheet to membrane base sheet minimum 150 mm and seal.

.6 Lap flashing cap sheet to membrane cap sheet minimum 150 mm and torch weld. Fully embed granules of field membranes below flashing membrane lap.

.7 Provide 75 mm minimum side lap and seal.

.8 Properly secure flashings to their support, without sags, blisters, fishmouths or wrinkles.

.7 Roof penetrations:

.1 Install vent stack covers and other roof penetration sealing systems and seal to membrane in accordance with manufacturers’ recommendations and details.

3.7 FIELD QUALITY CONTROL

.1 Quality control: Arrange for inspection by independent testing agency to monitor quality of installation and roofing in accordance with Section 01 45 00 – Quality Control.

.1 Schedule site visits to review Work:

.1 Three times during progress of Work, including built-in-place mock-up.

3.8 COMMISSIONING

.1 Commissioning: Arrange for independent testing agency acceptable to Departmental Representative to perform air leakage testing for roof assembly in accordance with ASTM E1186.

.1 Commissioning provider will observe tests and record results for Departmental Representative.

.2 Air leakage testing will follow these general guidelines:

.1 An approved air leakage detection fluid is placed at membrane lap or joint to be tested.

.2 Using an approved air leakage testing instrument, the test chamber is placed over the area to be tested and depressurized to 500 Pa. Results are recorded.

.3 Any observed air movement will result in a failed test. Failed tests will be marked, repaired, and retested.

.4 Tests will be performed at a minimum of 8 locations per membrane type.

.5 Each failed test shall result in an additional 2 tests conducted in like areas.

3.9 CLEANING

.1 Remove bituminous markings from finished surfaces.

.2 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their instructions.

.3 Repair or replace defaced or disfigured finishes caused by work of this section.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

.1 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM D523-14, Standard Test Method for Specular Gloss.

.3 ASTM D822/D822M-13, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.4 ASTM D903-98(2010), Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.

.5 ASTM D1970/D1970M-14, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

.6 ASTM D5601-94, Standard Test Method for Tearing Resistance of Roofing and Waterproofing Materials and Membranes.

.7 ASTM D5602/D5602M-11, Standard Test Method for Static Puncture Resistance of Roofing Membrane Specimens.

.8 ASTM E96/E96M-15, Standard Test Methods for Water Vapor Transmission of Materials.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 37.5-M89, Cutback Asphalt Plastic Cement.

.3 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act (CEPA), 1999.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.5 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act (TDGA), 1992.

1.2 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for sheet metal roofing and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Northwest Territories.

.2 Show arrangements of sheets and joints, types and locations of fasteners, and relationship of panels to structural frame.

.3 Indicate fastening requirements of metal panels to supporting substrate.

.4 Samples:

.1 Submit duplicate manufacturer samples of each sheet metal material, showing thicknesses, finishes and colours.

1.3 QUALITY ASSURANCE

.1 Mock-ups:

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

.2 Fabricate sample roofing panel, 2 panels wide x full length, using identical project materials and methods to include typical seam.

.3 Mock-up will be used:

.1 To judge workmanship, substrate preparation, operation of equipment and material application.

.4 Locate where directed.

.5 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with sheet metal flashing work.

.6 When accepted, mock-up will demonstrate minimum standard of quality required for this Work.

.7 Accepted mock-up may remain as part of finished Work.

1.4 DELIVERY, STORAGE, AND HANDLING

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

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect sheet metal roofing from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.5 WARRANTY

.1 Warranty: Provide written warranty against failure of roofing system and leakage as agreed upon by Departmental Representative, Contractor, roofing sub-contractor, and material manufacturers.

.1 Warranty: 15 years for material and 2 years for workmanship, covering but not limited to:

.1 Labour and material for repair, replacement of roofing components from structural deck up.

.2 Leakage or failure of roof system due to natural causes.

.3 Non-prorated.

Part 2 Products

2.1 SHEET METAL MATERIALS

.1 Zinc coated steel sheet: To ASTM A653/A653M, commercial quality, with Z275 galvanized coating, smooth surface, prefinished.

.1 Steel base thickness: 0.76 mm (22 gauge).

.2 Pre-finish steel with factory applied silicone modified polyester.

.1 Specular gloss: 30 units +/- 5 in accordance with ASTM D523.

.2 Coating thickness: Minimum 25 micrometres.

.3 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822 as follows:

.1 Outdoor exposure period 1000 hours.

.2 Humidity resistance exposure period 1000 hours.

.4 Colour: As selected by Departmental Representative from manufacturer's standard range.

2.2 ACCESSORIES

.1 Isolation coating: Alkali resistant bituminous paint.

.2 Plastic cement: To CAN/CGSB-37.5.

.3 Underlayment: Self-adhered SBS rubber modified laminated to slip-resistant synthetic film on top surface, release film on bottom surface.

.1 Thickness: 1.0 mm.

.2 Water vapour permeance (ASTM E96): < 1.0 ng/m^2·s.

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

.5 Rubber-asphalt sealing compound: To CAN/CGSB 37.29.

.6 Cleats: of same material, and temper as sheet metal: 50 mm minimum wide.

.1 Thickness: same as sheet metal being secured.

.7 Fasteners: Exposed; same material as sheet metal, colour matched to sheet metal, with neoprene washers; hex head, 9.5 mm (3/8 inch) hex head.

.8 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.9 Touch-up paint: As recommended by sheet metal roofing manufacturer.

2.3 FABRICATION

.1 Form individual pieces in 2400 mm maximum lengths. Make allowances for expansion at joints.

.2 Hem exposed edges on underside 12 mm, mitre and seal.

.3 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.4 Apply minimum 0.2 mm dry film thickness coat of plastic cement to both faces of dissimilar metals in contact.

.5 Protect metals against oxidization by back painting with isolation coating where indicated.

Part 3 Execution

3.1 EXAMINATION

.1 Verify conditions of substrate are acceptable for sheet metal roofing installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Departmental Representative of unacceptable conditions.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Include underlay under sheet metal roofing.

.1 Secure in place and lap joints 100 mm minimum.

.2 Install sheet metal roof panels using cleats spaced as recommended by manufacturer for local wind uplift conditions.

.3 Secure cleats with 2 fasteners each and cover with cleat tabs.

.4 Form panels in one piece without seams.

.5 Flash roof penetrations with material matching roof panels and make watertight.

.6 Form seams in direction of water-flow and make watertight.

3.3 STANDING SEAM ROOFING

.1 Use pre-finished pre-formed steel to make roofing with standing seams.

.2 Fold lower end of each pan under 20 mm.

.1 Slit fold 25 mm away from corner to form tab where pan turns up to make standing seam.

.2 Fold upper end of each pan over 50 mm.

.3 Hook 20 mm fold on lower end of upper pan into 50 mm fold on upper end of underlying pan.

.3 Apply sheet metal roofing beginning at eaves. Loose lock pans to valley flashing and edge strips at eaves and gable rakes.

.4 Finish standing seams 25 mm high on flat surfaces. Bend up one side edge 40 mm and other 45 mm.

.1 Make first fold 6 mm wide single fold and second fold 12 mm wide, providing locked portion of standing seam with 5 plies in thickness.

.2 Fold lower ends of seams at eaves over at 45° angle.

.3 Terminate standing seams at ridge and hips by turning down in tapered fold.

.5 Form valleys of sheets not exceeding 3 m in length. Lap joints 150 mm in direction of flow.

.1 Extend valley sheet minimum 150 mm under roofing sheets.

.2 At valley line, double fold valley and roofing sheets and secure with cleats spaced 450 mm on centre.

3.4 CLEANING

.1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.4 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by sheet metal roofing installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International

.1 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM D523-14, Standard Test Method for Specular Gloss.

.3 ASTM D822/D822M-13, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.4 ASTM F1667-13, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.2 Canadian Roofing Contractors Association (CRCA)

.1 Roofing Specifications Manual, current edition.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 37.5-M89, Cutback Asphalt Plastic Cement.

.2 CAN/CGSB 51.32-M77, Sheathing, Membrane, Breather Type.

.4 Canadian Standards Association (CSA)

.1 CSA A123.3-05 (R2010), Asphalt Saturated Organic Roofing Felt.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 Architectural Sheet Metal Manual, 2012.

1.2 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications, and datasheets; and include product characteristics, performance criteria, physical size, finishes, and limitations.

.2 Submit WHMIS SDS - Safety Data Sheets for products used on the project.

.3 Samples:

.1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes, and colours.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal: Remove waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 SHEET METAL MATERIALS

.1 Zinc coated steel sheet: ASTM A653/A653M, 0.60 mm (24 gauge) base metal thickness, commercial quality, with G90/Z275 designation zinc coating.

.1 Pre-finish sheet metal with factory applied silicone modified polyester.

.1 Specular gloss: 30 units +/- 5 in accordance with ASTM D523.

.2 Coating thickness: Minimum 25 micrometres.

.3 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822 as follows:

.1 Outdoor exposure period 1000 hours.

.2 Humidity resistance exposure period 1000 hours.

.4 Colour: As selected by Departmental Representative from manufacturer's standard range.

2.2 ACCESSORIES

.1 Isolation coating: Alkali resistant bituminous paint.

.2 Plastic cement: to CAN/CGSB 37.5.

.3 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.

.4 Sealants: Refer also to Section 07 92 00.

.1 Sealing Tape: Polyisobutylene compound sealing tape with 100% solids and pressure sensitive release-paper backing. Provide non-toxic, non-staining permanent elastic tape.

.2 Elastomeric Sealant: Elastomeric polyurethane polymer sealant to ASTM C920, as required for watertight installation.

.3 Butyl Sealant: Single-component, solvent-release butyl rubber sealant to ASTM C1311, for use in joints with limited movement.

.4 Bituminous Coating: Cold-applied asphalt mastic, compounded for 0.4 mm (15-mil) dry film thickness per coat.

.5 Cleats: Same material and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.

.6 Fasteners: Same material as sheet metal, to ASTM F1667, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.

.7 Washers: Same material as sheet metal, 1 mm thick with rubber packings.

.8 Touch-up paint: as recommended by prefinished material manufacturer.

2.3 FABRICATION

.1 Fabricate metal flashings and other sheet metal work as indicated.

.2 Form pieces in 2400 mm maximum lengths.

.1 Make allowance for expansion at joints.

.3 Hem exposed edges on underside 12 mm.

.1 Mitre and seal corners with sealant.

.4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.4 METAL FLASHINGS

.1 Form flashings, copings, and fascias to profiles indicated of minimum 0.60 mm thick galvanized prefinished steel.

2.5 SOFFIT

.1 Zinc coated steel sheet: ASTM A653/A653M, 0.38 mm (28 gauge) base metal thickness, commercial quality, with G90/Z275 designation zinc coating.

.1 Pre-finish sheet metal with factory applied silicone modified polyester.

.1 Provide non-vented and non-perforated soffit.

.2 Include soffit and fascia trims.

2.6 CAP FLASHINGS

.1 Form metal cap flashing of sheet metal for base flashings as detailed.

.1 Provide slotted fixing holes and steel/plastic washer fasteners.

Part 3 Execution

3.1 EXAMINATION

.1 Verify existing conditions before starting work.

.2 Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

.3 Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

.1 Install starter and edge strips, and cleats before starting sheet metal installation.

3.3 INSTALLATION

.1 Install sheet metal work in accordance with SMACNA Architectural Sheet Metal Manual.

.2 Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

.3 Fit flashings tightly in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

.4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.

.1 Flash joints using S-joints forming tight fit over hook strips.

.5 Lock end joints and caulk with sealant.

.6 Install pans, where shown around items projecting through roof membrane.

.7 Install splash pans as indicated.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning.

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

.3 Leave work areas clean, free from grease, finger marks, and stains.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Architectural Aluminum Manufacturers Association (AAMA)

.1 AAMA 812-04 (2012), Voluntary Practice for Assessment of Single Component Aerosol Expanding Polyurethane Foams for Sealing Rough Openings of Fenestration Installations.

.2 ASTM International

.1 ASTM C719-14, Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants under Cyclic Movement (Hockman Cycle).

.2 ASTM C834-10, Standard Specification for Latex Sealants.

.3 ASTM C881/C881M-15, Epoxy Resin-Base Bonding Systems for Concrete.

.4 ASTM C920-14, Standard Specification for Elastomeric Joint Sealants.

.5 ASTM C1016-14, Determination of Water Absorption of Sealant Backing (Joint Filler) Material.

.6 ASTM C1193-13, Standard Guide for Use of Sealants.

.7 ASTM C1311-10, Standard Specification for Solvent Release Sealants.

.8 ASTM C1330-02 (2013), Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.

.9 ASTM D1623-09, Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.

.10 ASTM D5249-10(2016), Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints.

.11 ASTM E814-13a, Standard Test Method for Fire Tests of Penetration Firestop Systems.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.

.2 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.

.3 CAN/CGSB 19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.

.4 CAN/CGSB 19.21-M87, Sealing and Bedding Compound, Acoustical.

.5 CAN/CGSB 19.24-M90, Multi-component, Chemical Curing Sealing Compound.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

1.2 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants. Include product characteristics, performance criteria, physical size, finish and limitations.

.2 Manufacturer's product to describe:

.1 Caulking compound.

.2 Primers.

.3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

.3 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Manufacturer's Instructions:

.1 Submit instructions to include installation instructions for each product used.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: Submit operation and maintenance data for incorporation into manual.

1.4 QUALITY ASSURANCE

.1 Compatibility: Verify sealants used are compatible with their respective joint substrates.

.2 Provide sealants with appropriate expansion and contraction properties for the joints being sealed.

.3 Perform sealant application work to ASTM C1193.

1.5 DELIVERY, STORAGE, AND HANDLING

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

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

1.6 SITE CONDITIONS

.1 Ambient Conditions:

.1 Proceed with installation of joint sealants only when:

.1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4°C.

.2 Joint substrates are dry.

.3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.2 Joint-Width Conditions:

.1 Proceed with installation of joint sealants only where joint widths are within range allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Safety Data Sheets (SDS) acceptable to Health Canada.

Part 2 Products

2.1 SEALANT MATERIALS

.1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.2 When low toxicity caulks are not possible, confine usage to areas that off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.

.3 Where sealants are qualified with primers, use only these primers.

.4 Air/vapour barrier sealant and adhesive: To ASTM C920, Type S, Grade NS, Class 35, single component, low odour, moisture cure, medium modulus, low VOC.

.5 Elastomeric Polyurethane Sealant: To CAN/CGSB 19.13, Type 2; and ASTM C920, Type S, Grade NS, Use NT, M, A and O; non-sag, single component, moisture curing hybrid polyurethane.

.1 Typical uses: Expansion and control joints.

.6 Spray foam sealant: Spray applied polyurethane, closed cell, low pressure build foam, complying with AAMA 812.

.7 Butyl: To CGSB 19-GP-14M and ASTM C1311, single component, butyl rubber sealant.

.1 Typical uses: Gutter and flashing sealing, roof vents, metal panel joining.

.8 Preformed compressible and non-compressible back-up materials:

.1 Polyethylene foam: Extruded closed cell round foam backer rod, to ASTM C1330 Type C.

.1 Compression recovery to ASTM D5249: Minimum 96%.

.2 Tensile strength to ASTM D1623: Minimum 200 kPa.

.3 Water absorption to ASTM C1016 Procedure B: Maximum 0.03 g/cm^3.

.4 Size: oversize 30 to 50%.

.2 Neoprene or butyl rubber:

.1 Round solid rod, Shore A hardness 70.

.3 High density foam:

.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m^3 density, or neoprene foam backer, size as recommended by manufacturer.

.4 Bond breaker tape:

.1 Polyethylene bond breaker tape that will not bond to sealant.

.9 Primer: As recommended by sealant manufacturer, where required, for adhesion of sealant to substrate.

2.2 JOINT CLEANER

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

.2 Primer: in accordance with sealant manufacturer's written recommendations.

Part 3 Execution

3.1 EXAMINATION

.1 Verify conditions of substrates are acceptable for joint sealants installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Departmental Representative of unacceptable conditions.

.3 Proceed with installation only after unacceptable conditions have been remedied.

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 that may impair Work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime joint substrates as recommended by sealant manufacturer 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 accordance with sealant manufacturer's instructions.

3.6 APPLICATION

.1 Sealant:

.1 Mask edges of joint where irregular surface or sensitive joint border exists, to provide neat joint.

.2 Apply sealant in continuous beads.

.3 Apply sealant using gun with proper size nozzle.

.4 Use sufficient pressure to fill voids and joints solid.

.5 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.

.6 Tool exposed surfaces before skinning begins to give slightly concave shape.

.7 Remove excess compound promptly as work progresses and upon completion.

.2 Curing:

.1 Cure sealants in accordance with sealant manufacturer's instructions.

.2 Do not cover up sealants until proper curing has taken place.

3.7 CLEANING

.1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Clean adjacent surfaces immediately.

.3 Remove excess and droppings, using recommended cleaners as work progresses.

.4 Remove masking tape after initial set of sealant.

.2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: Remove waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

3.8 PROTECTION

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

.2 Repair damage to adjacent materials caused by joint sealants installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.3 Master Painters Institute (MPI)

.1 MPI Architectural Painting Specifications Manual.

.2 MPI Approved Products List.

.4 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.2 SCHEDULING

.1 Submit work schedule for various stages of painting to Departmental Representative for review. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Departmental Representative for changes in work schedule.

.3 Schedule painting operations to prevent disruption of occupants.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit product data and instructions for each paint and coating product to be used.

.2 Submit product data for the use and application of paint thinner.

.3 Submit Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDS) for products used in the project. Indicate VOCs during application and curing.

.3 Samples:

.1 Submit full range colour sample chips to indicate where colour availability is restricted.

.2 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Manufacturer's Instructions:

.1 Submit manufacturer's application instructions.

.4 Closeout Submittals: Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour numbers.

1.4 MAINTENANCE

.1 Extra Materials:

.1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.

.2 Quantity: provide one x 4 litre can of each type and colour of primer and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

.3 Delivery, storage and protection: comply with Departmental Representative requirements for delivery and storage of extra materials.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

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

.2 Acceptance at Site:

.1 Identify products and materials with labels indicating:

.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.

.3 Remove damaged, opened and rejected materials from site.

.4 Storage and Protection:

.1 Provide and maintain dry, temperature controlled, secure storage.

.2 Store materials and supplies away from heat generating devices.

.3 Store materials and equipment in well-ventilated area within temperature range 7°C to 30°C.

.5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.

.7 Remove paint materials from storage only in quantities required for same day use.

.8 Fire Safety Requirements:

.1 Provide one 9 kg 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 National Fire Code of Canada requirements.

.9 Waste Management and Disposal:

.1 Remove waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional, and Municipal regulations.

.3 Ensure emptied containers are sealed and stored safely.

.4 Dispose unused paint and coating materials at official hazardous material collections site.

.5 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

.6 Material that cannot be reused is to be treated as hazardous waste and disposed of in an appropriate manner.

.7 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.8 To reduce the amounts of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:

.1 Retain cleaning water for water-based materials to allow sediments to be filtered out.

.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.

.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.

.4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.

.5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.9 Set aside and protect surplus and uncontaminated finish materials. Turn over to Departmental Representative for maintenance purposes.

1.6 SITE CONDITIONS

.1 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless pre-approved with written approval by product manufacturer, perform no painting when:

.1 Ambient air and substrate temperatures are below 10°C.

.2 Substrate temperature is above 32°C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.

.4 The relative humidity is under 85% or when the dew point is more than 3°C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3°C below the ambient or surface temperature.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

.6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.

.2 Surface and Environmental Conditions:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.

.3 Apply paint when previous coat of paint is dry or adequately cured.

.3 Additional interior application requirements:

.1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

.2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

Part 2 Products

2.1 MATERIALS

.1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

.2 Provide paint materials for paint systems from single manufacturer.

.3 Conform to latest MPI requirements for painting work, including preparation and priming.

2.2 COLOURS

.1 Selection of colours to be from manufacturer’s full range of colours.

.2 Where specific products are available in restricted range of colours, selection to be based on limited range.

.3 Second coat in three-coat system to be tinted slightly lighter colour than topcoat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Perform colour-tinting operations prior to delivery of paint to site. Obtain written approval from Departmental Representative for tinting of painting materials.

.2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.

.4 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

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

	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1 - Matte Finish (flat)	Max. 5	Max. 10
Gloss Level 2 - Velvet-Like Finish	Max.10	10 to 35
Gloss Level 3 - Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 - Satin-Like Finish	20 to 35	min. 35
Gloss Level 5 - Traditional Semi-Gloss Finish	35 to 70	
Gloss Level 6 - Traditional Gloss	70 to 85	
Gloss Level 7 - High Gloss Finish	More than 85	

.2 Gloss level ratings of painted surfaces as indicated.

2.5 EXTERIOR PAINTING SYSTEMS

.1 Metal Fabrications: Access ladders.

.1 EXT 5.3C – Epoxy over epoxy primer, G5 finish.

.1 Coat 1: Epoxy primer, MPI #101.

.2 Coats 2 and 3; Epoxy, MPI #177.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.

3.2 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

.1 Prior to commencing work, examine site conditions and existing substrates to be painted and repainted. Report to Departmental Representative damages, defects, or unsatisfactory or unfavourable conditions or surfaces that will adversely affect this work.

.2 Do not commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to Painting Subcontractor.

3.4 PREPARATION

.1 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 surfaces as directed by Departmental Representative.

.2 Protect items that are permanently attached such as fire labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect passing pedestrians, building occupants, and general public in and about the building.

.2 Surface Preparation:

.1 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to be acceptable to Departmental Representative.

.3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual and Maintenance Repainting Manual requirements. Refer to MPI Manual for specific requirements and as follows:

.1 Remove dust, dirt, and other surface debris by vacuuming and wiping with dry, clean cloths.

.2 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

.3 Allow surfaces to drain completely and allow to dry thoroughly.

.4 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes and vacuum cleaning.

.5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.

.6 Touch up of shop primers with primer as specified.

.7 Do not apply paint until prepared surfaces are acceptable to Departmental Representative.

.8 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 Departmental Representative. Apply paint by brush and roller. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

.1 Apply paint in uniform layer using brush and/or roller type suitable for application.

.2 Work paint into cracks, crevices and corners.

.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.

.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.

.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.

.4 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.5 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time as recommended by manufacturer.

3.6 FIELD QUALITY CONTROL

.1 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.2 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

3.7 RESTORATION

.1 Remove protective coverings and warning signs as soon as practical after operations cease.

.2 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.3 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.

.4 Restore areas used for storage, cleaning, mixing, and handling of paint to clean condition as approved by Departmental Representative.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data.

.3 Shop Drawings:

.1 Indicate on drawings:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.2 Shop drawings and product data accompanied by:

.1 Manufacturer to certify current model production.

.2 Certification of compliance to applicable codes.

.3 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.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data

.1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.3 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.4 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.5 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.

.2 Make changes as required and re-submit as directed by Departmental Representative.

.6 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

.1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.8 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Departmental Representative for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.9 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in dry location indoors off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect material from .nicks, scratches, and blemishes

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 FIELD QUALITY CONTROL

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.

.3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 19- Waste Management and Disposal.

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

3.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA):

.1 CSA S350 M1980 (R2003) , Code of Practice for Safety in Demolition of Structures.

1.2 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes , cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.3 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative ready for reuse.

.4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.

.6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Action Submittals: Provide the following in accordance with Section 01 33 00– Submittal Procedures before starting work of this Section:

.1 Construction Waste Management Plan (CWM Plan): Submit plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19– Construction Waste Management and Disposal.

.2 Landfill Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes .

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.

.2 Scheduling: Account for Departmental Representative's continued occupancy requirements during selective demolition with Section 02 41 19.13 and schedule staged occupancy and worksite activities as a defined Activity item in accordance with Section 01 32 16.19 – Construction Progress Schedule.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements: Perform work of this Section in accordance with the following:

.1 Provincial/Territorial Workers' Compensation Boards/Commissions

.2 Provincial/Territorial Occupational Health and Safety Standards and Programs

1.6 SALVAGE AND DEBRIS MATERIALS

.1 Demolished items become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain Departmental Representative's property .

.2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation.

Part 2 Products

2.1 MATERIALS

.1 General Patching and Repair Materials: Refer to Section 02 41 19.13 for listing of patching and repair materials incidental to removal or demolition of components associated with work of this Section.

.2 Plumbing Repair Materials: Use only new materials required for completion or repair matching materials damaged during performance of work of this Section; new materials are required to meet assembly or system characteristics as existing systems indicated to remain and carry CSA approval labels required by the Authority Having Jurisdiction.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Departmental Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.2 PREPARATION

.1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:

.1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.

.2 Notify Departmental Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

.3 Prevent debris from blocking drainage inlets.

.4 Protect mechanical systems that must remain in operation.

.2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the Departmental Representative and users is minimized and as follows:

.1 Prevent debris from endangering the safe access to and egress from occupied buildings.

.2 Notify Departmental Representative and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.3 EXECUTION

.1 Removal and Demolition : Coordinate requirements of this Section with information contained in Section 02 41 19.13 and as follows:

.1 Disconnect and cap mechanical services in accordance with requirements of local Authority Having Jurisdiction.

.2 Do not disrupt active or energized utilities without approval of the Departmental Representative .

.3 Erect and maintain dust proof and weather tight partitions to prevent the spread of dust and fumes to occupied building areas; remove partitions when complete.

.4 Demolish parts of existing building to accommodate new construction and remedial work as indicated.

.5 At end of each day's work, leave worksite in safe condition.

.6 Perform demolition work in a neat and workmanlike manner:

.1 Remove any tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.

.2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.

3.4 CLOSEOUT ACTIVITIES

.1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re use in new construction.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM A126-04(2009) , Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.2 ASTM B62-09 , Standard Specification for Composition Bronze or Ounce Metal Castings.

.2 CSA Group (CSA)

.1 CSA-B64 Series-11 , Backflow Preventers and Vacuum Breakers.

.2 CSA B79-08 , Commercial and Residential Drains and Cleanouts.

.3 CAN/CSA-B356-10 , Water Pressure Reducing Valves for Domestic Water Supply Systems.

.3 Efficiency Valuation Organization (EVO)

.1 International Performance Measurement and Verification Protocol (IPMVP).

.1 IPMVP 2007 Version.

.4 National Research Council Canada (NRC)

.1 National Plumbing Code of Canada 2015 (NPC).

.5 Plumbing and Drainage Institute (PDI)

.1 PDI-G101-R2010 , Testing and Rating Procedure for Grease Interceptors with Appendix of Installation and Maintenance.

.2 PDI-WH201-R2010 , Water Hammer Arresters Standard.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings:

.1 Convene pre-installation meeting 1 week prior to beginning work of this Section on-site installation , with contractor's representative Departmental Representative in accordance with Section 01 31 19- Project Meetings to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building construction subtrades.

.4 Review manufacturer's written installation instructions and warranty requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS SDS 01 35 29.06- Health and Safety Requirements. Indicate VOC's:

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Northwest Territories, Canada.

.2 Indicate on drawings to indicate construction and assembly details dimensions number of anchors, materials, finishes, method of anchorage, and accessories.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Manufacturers' Field Reports: manufacturers' field reports specified.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.

.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors, in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect plumbing materials from nicks, scratches, and blemishes .

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse by manufacturer and return of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan or Waste Reduction Workplan in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 ROOF DRAINS

.1 Refer to schedule on drawings.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing specialities and accessories installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative .

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative .

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

.1 Install in accordance with National Plumbing Code of Canada (NPC), .

.2 Install in accordance with manufacturer's instructions and as specified.

3.4 TESTING AND ADJUSTING

.1 General:

.1 Test and adjust plumbing specialties and accessories in accordance with Section 01 91 13- General Commissioning Requirements: General Requirements, supplemented as specified.

.2 Timing:

.1 After start-up deficiencies rectified.

.2 After certificate of completion has been issued by authority having jurisdiction.

.3 Roof drains:

.1 Check location at low points in roof.

.2 Check security, removability of dome.

.3 Adjust weirs to suit actual roof slopes, meet requirements of design.

.4 Clean out sumps.

.5 Verify provisions for movement of roof systems.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.

.3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 19- Waste Management and Disposal.

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

3.6 PROTECTION

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

.2 Repair damage to adjacent materials caused by plumbing specialties and accessories installation.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group

.1 CSA C22.1,, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.

.2 CSA C22.2 No. 2018

.3 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 DEFINITIONS

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for new equipment and material.

.3 Shop drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Northwest Territories, Canada.

.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.5 Submit full size drawings and product data to the authority having jurisdiction and/or the inspection authorities.

.6 If changes are required, notify Departmental Representative of these changes before they are made.

.4 Certificates:

.1 Provide CSA certified material and equipment.

.2 Where CSA certified equipment and material is not available, submit such material and equipment to the inspection authorities and/or the authority having jurisdiction for special approval before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract.

.5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.5 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for new electrical components including conduit.

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in dry location, off of the ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect equipment and materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Division 0.

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification labels and/or nameplates for control items in English.

.4 Use one nameplate and/or label for each language if required and indicated in Division 01.

2.2 MATERIALS AND EQUIPMENT

.1 Provide material and/or equipment in accordance with Section 01 61 00- Common Product Requirements.

.2 Material and/or equipment to be CSA certified. Where CSA certified material and/or equipment is not available, obtain special approval from inspection authorities and/or the authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

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

.2 Control wiring and conduit: in accordance with Section 26 29 03- Control Devices except for conduit, wiring and connections below 50 V which are related to control systems as shown on mechanical drawings or specified in mechanical sections.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of Departmental Representative.

.2 Decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

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

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, 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 coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Type	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Other Security Systems	Red	Yellow

2.8 FINISHES

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

.1 Paint outdoor electrical equipment "equipment green" finish to the manufactures standard finish, confirm during shop drawing phase of the project.

.2 Paint indoor switchgear and distribution enclosures light gray to the manufactures standard finish, confirm during shop drawing phase of the project

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for the electrical work indicated.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

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

.2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

3.3 NAMEPLATES AND LABELS

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

3.4 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

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

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.6 FIELD QUALITY CONTROL

.1 Load Balance:

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

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 45 00- Quality Control.

.1 Power distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and its control.

.4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.5 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

.3 Carry out tests in presence of Departmental Representative.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.7 SYSTEM STARTUP

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

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19- Waste Management and Disposal.

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group

.1 CSA C22.1,, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.

.2 CSA C22.2 No. 2018

.3 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122-2008, The Authoritative Dictionary of IEEE Standards Terms.

1.2 PRODUCT DATA

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

Part 2 Products

2.1 BUILDING WIRES

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

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

.3 Copper conductors: size as indicated, with thermoplastic insulation type TWH rated at 600 V.

.4 Neutral supported cable: 3 phase insulated conductors of Copper and one neutral conductor of Copper steel reinforced, size as indicated. Type: NS90 Insulation: Type NSF-2 flame retardant rated 600 V.

2.2 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00- Common Work Results for Electrical.

.2 Conductors:

.1 Grounding conductor: as indicated copper.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Cross-linked polyethylene XLPE.

.2 Rating, 600 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking.

.6 Overall covering: thermoplastic polyvinyl chloride, and compliant to applicable Building Code classification for this project.

.7 Fastenings:

.1 One hole aluminum 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

.3 Threaded rods: 6 mm diameter to support suspended channels.

.8 Connectors:

.1 Watertight, approved for TECK cable.

2.3 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Type: flame retardant as required jacket over thermoplastic armour and compliant to applicable Building Code classification for this project/ wet locations.

.5 Connectors: anti short connectors.

2.4 CONTROL CABLES

.1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:

.1 Insulation: thermoplastic.

.2 Sheath: cotton braid / thermoplastic jacket, and armour of closely wound aluminum wire.

.2 Type: low energy 300 V control cable: solid annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:

.1 Insulation: TW PVC.

.2 Shielding: wire braid conductor group.

.3 Overall covering: PVC jackets.

.3 Type: 600 V conductors, sizes as indicated annealed copper

.1 Insulation: PVC, RW90 (x-link) cross-linked polyethylene type.

.2 Shielding: braid.

.3 Overall covering PVC.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

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

.2 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Cable Colour Coding: to Section 26 05 00- Common Work Results for Electrical.

.2 Conductor length for parallel feeders to be identical.

.3 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.4 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34- Conduits, Conduit Fastenings and Conduit Fittings.

3.4 INSTALLATION OF TECK 90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable exposed, securely supported by straps.

3.5 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

3.6 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)

.1 CSA C22.1- 2018, Canadian Electrical Code, Part 1, 24th Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Provide shop drawings: in accordance with Section 01 33 00- Submittal Procedures.

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Northwest Territories, Canada.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for recycling and reuse in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on turned edge or flat covers.

Part 3 Execution

3.1 JUNCTION, PULL BOXES INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.2 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00- Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating voltage and phase and system name or as indicated by the Department Representative.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)

.1 CAN/CSA C22.2 No. 18 (currently enforceable edition), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.

.2 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

.3 CSA C22.2 No. 211.2-M1984(currently enforceable edition), Rigid PVC (Unplasticized) Conduit.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

.1 Submit cable manufacturing data.

.3 Quality assurance submittals:

.1 Test reports: submit certified test reports.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19- Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 Products

2.1 CONDUITS

.1 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.2 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller.

.1 Two hole steel straps for conduits larger than 50 mm.

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

.3 Channel type supports for two or more conduits.

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

2.3 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.

.1 Set-screws are not acceptable.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

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

2.5 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

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

.2 Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury.

.3 Use rigid pvc conduit in corrosive areas.

.4 Use flexible metal conduit for work in movable metal partitions.

.5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.6 Minimum conduit size for lighting and power circuits: 19 mm .

.7 Bend conduit cold:

.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.8 Mechanically bend steel conduit over 19 mm diameter.

.9 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.10 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.11 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Group conduits wherever possible on surface and/or suspended channels.

.3 Do not pass conduits through structural members except as indicated.

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

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 00- Cleaning.

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Institute of Electrical and Electronics Engineers, Inc. (IEEE)

.1 IEEE 837-14 Standard for Qualifying Permanent Connections Used in Substation Grounding.

.2 CSA Group (CSA)

.1 CAN/CSA-B72-M87(R2013) , Installation Code for Lightning Protection Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Northwest Territories, Canada.

.2 Indicate materials and methods of attachment of conductors to sky wire, air terminals, and electrodes.

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in dry location, off the ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect lighting protection devices from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop a Construction Waste Management Plan related to Work of this Section and in accordance with Division 01.

Part 2 Products

2.1 MATERIALS

.1 Lightning Rods: solid rod.

.2 Conductor: copper]

.3 Fastenings and attachment straps: copper.

.4 Ground electrodes: reuse existing

.5 Use copper conductors, terminals, connectors and fastenings for buildings sheathed in other than aluminum.

.6 Connections: copper connections formed by thermit process..

2.2 DESCRIPTION

.1 System to consist of metallic air terminals, lightning conductors connecting air terminals to ground and interconnected ground electrodes, and/or ground cables.

2.3 REGULATORY REQUIREMENTS

.1 System subject to: approval by authority having jurisdiction.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for lightning protection installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Departmental Representative.

3.2 INSTALLATION

.1 Install lightning protection to CAN/CSA-B72.

.2 Bond discharge conductors to service mast or other non-current-carrying electrical parts.

.3 Submit certificate of installation to the Departmental Representative.

3.3 INSPECTION

.1 Obtain inspection certificate from Departmental Representative for discharge conductor passing through any fire supporting membrane.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.

.3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 19- Waste Management and Disposal.

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

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by lightning protection installation.

END OF SECTION