Part 1 General

1.1 CITY OF WINNIPEG OCCUPANCY

.1 The City of Winnipeg will vacate and turn over to the Contractor areas as shown on Drawings.

.2 The entire remainder of the Site will remain occupied by the City of Winnipeg and open to the Public from commencement of Work through to Total Performance.

.1 Notwithstanding the above, the Splash Pad area will be closed to the public to accommodate work of this Contract for a six-week duration. Dates to be determined following award of Contract.

.3 The City will provide or be responsible for:

.1 Operation and maintenance of existing building equipment and services of the Site, including equipment and services serving active construction areas.

.2 Maintenance of existing building finishes of the Site remaining occupied by the city and public, not turned over to the Contractor.

.3 Complying with Contractor safety procedures while within active construction areas.

.4 Provide or be responsible for the following:

.1 Safe and secure segregation of construction and publicly occupied areas.

.2 Protection of building services, equipment and finishes within construction areas and through public areas as required to access construction areas.

.3 Maintenance of existing Site turned over to the Contractor including, but not limited to:

.1 Snow clearing,

.2 Yard maintenance,

.3 Lighting,

.4 Mechanical and electrical equipment maintenance.

.4 Safety of Contractor and Sub-contractor activities.

.5 Safety of the Site as Prime Contractor.

.6 Site and facility security at all times.

.7 Restricting access to the Site to authorized construction personnel and individuals approved by the City.

.8 Operation and maintenance of building equipment and services of the Site installed as work of this Contract.

1.2 WORKING HOURS

.1 No restriction on working hours. Contractor is responsible for site and facility security and access requirements for the duration of the Work to Substantial Performance.

.1 Notwithstanding the above, scheduling of site reviews by the Contract Administrator are limited to between 9:00 a.m. and 4:00 p.m. Monday through Friday excluding statutory holidays.

.2 Notwithstanding the above, complete all Work in conformance with:

.1 City of Winnipeg Neighbourhood Livability By-Law no. 1/2008.

.3 Allow for hours of work restrictions in construction progress schedule.

1.3 MAINTAINING LIFE SAFETY SYSTEMS

.1 Maintain operational life safety systems and public access to exits in occupied areas during all stages of the Work.

.2 Determine nature and exact locations of existing fire and smoke sensors prior to the commencement of the Work. Avoid direct or indirect jarring while working in adjacent areas and exercise caution to avoid triggering these devices.

.3 Be responsible for costs incurred by the City on account of false fire alarms activated as a result of the execution of the Work without adequate precautions.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Administrative and procedural requirements for unit prices further to requirements specified in Part C – General Conditions and Part D – Supplementary Conditions.

.1 Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.2 UNIT PRICES

.1 Description:

.1 Unit prices are an amount incorporated in the Contract for a specific product or portion of Work with a specified product on a per unit basis.

.2 Requirements:

.1 Unit prices include requirements specified in C12.2.3, and:

.1 Labour and material.

.2 Cost for delivery.

.3 Handling.

.4 Temporary storage, including insurance.

.5 Demolition, surface preparation, and installation, where specified, shown on Drawings to be included in a Unit Price.

.6 Fees for overhead and profit.

.7 Insurance, bonds and applicable taxes.

.2 Unit prices exclude the following which are to be included in the Total Price as allocated to a Lump Sum class of work on Form B: Prices:

.1 Access requirements,

.2 Site protection of existing building equipment and finishes,

.3 Barriers and enclosures for the unit price Work,

.4 Safe Work procedure preparation,

.5 Construction facilities, utilities and controls to facilitate Unit Price work.

.3 Refer to individual Sections for construction activities requiring unit prices.

.3 Measurement and Payment Procedures:

.1 Unit prices are included in the Total Bid Price incorporating the estimated quantities provided.

.1 Unit prices are part of the Total Bid Price contract amount and not to be allocated to cash allowances, if included in the Contract.

.2 Actual quantities will be identified by the Contract Administrator in the presence of and with the assistance of the Contractor. The quantity will be measured and agreed upon by the Contractor and the Contract Administrator prior to commencement of the specified Unit Price Work.

.3 If the quantity is increased over that originally measured without consultation with the Contract Administrator, the Contractor will not be paid for the increased quantity.

.4 Increases in quantities of unit prices included in the Contract will be changed by a Change Order based on the unit prices included in the Contract and as entered on Form B: Prices.

.5 Decreases in quantities of unit prices included in the Contract will be changed by a Change Order based on the unit prices included in the Contract and as entered on Form B: Prices.

1.3 SCHEDULE OF UNIT PRICES:

.1 Supplemental reinforcing:

.1 Related section:

.1 Section 03 20 00 – Concrete Reinforcing.

.2 Unit prices:

.1 Supplemental reinforcing - Form B: Prices Item No.: 16.

.3 Measurement procedures:

.1 Measure reinforcing steel in kilograms of steel incorporated into Work, computed from theoretical unit mass specified in CSA-G30.18 for lengths and sizes of bars as indicated or authorized in writing by the Contract Administrator.

.2 Unit of measure: Per kilogram (kg).

.1 Minimum unit of payment: 0.5 kg.

.2 Supplemental dowels:

.1 Related section:

.1 Section 03 20 00 – Concrete Reinforcing.

.2 Unit prices:

.1 10M Dowels - Form B: Prices Item No.: 17.

.2 15M Dowels - Form B: Prices Item No.: 18.

.3 20M Dowels - Form B: Prices Item No.: 19.

.3 Measurement procedures:

.1 Dowels will be measured individually and will include dowel drilling, cleaning, preparation, epoxy supply and placement, and bar insertion, but excluding steel costs which will be covered by the supplemental reinforcing Unit Price per kilogram.

.2 The Contract Administrator and the Contractor will count and agree upon the numbers and lengths of bars as well as the number of bar embedment. These agreed upon number will form the basis for payment.

.3 Unit if measure: Per dowel.

.1 Minimum unit of payment: 1 dowel.

.3 Top surface concrete repairs:

.1 Related sections:

.1 Section 03 10 00 – Concrete Forming and Accessories.

.2 Section 03 20 00 – Concrete Reinforcing.

.3 Section 03 91 10 – Surface Preparation of Concrete Delamination Repair.

.4 Section 03 92 12 – Top Surface Concrete Repairs with Rapid Setting Mortar.

.2 Unit prices:

.1 0mm to 75mm depth – Form B: Prices Item No.: 20.

.2 75mm to 150mm depth – Form B: Prices Item No.:21.

.3 Through-slab – Form B: Prices Item No.: 22.

.3 Measurement procedures:

.1 In accordance with this section.

.2 Primary depth: Up to 75mm and at no point less than 25mm inches in depth.

.3 Secondary depth: Up to 150mm depth and at no point less than 75mm in depth.

.4 Repairs less than 25mm deep will be competed as a scaling repair.

.5 Unit of measure: m^2.

.1 Minimum payment for repair areas will be $0.1m^2$.

.4 Scaling repairs:

.1 Related sections:

.1 Section 03 91 10 – Surface Preparation of Concrete Delamination Repair.

.2 Section 03 92 20 – Scaling Repairs.

.2 Unit price:

.1 Scaling repair – Form B: Prices Item No.: 23.

.3 Measurement procedures:

.1 In accordance with this section.

.2 Depth: Up to 25mm inches in depth.

.1 Repairs deeper than 25mm will be completed as top surface concrete repair.

.3 Unit of measure: m^2.

.1 Minimum payment for repair areas will be $0.1m^2$.

.5 Concrete hand patching:

.1 Related sections:

.1 Section 03 91 10 – Surface Preparation of Concrete Delamination Repair.

.2 Section 03 93 10 – Hand Patching.

.2 Unit price:

.1 Hand Patching – Form B: Prices Item No.: 24.

.3 Measurement procedures:

.1 In accordance with this section.

.2 The unit price submitted will apply to removal depths of up to 50 mm and at no point less than 12mm in depth.

.1 Repairs over 50 mm in depth will be repaired via pressure grouting in accordance with Section 03 93 20.

.3 Unit of measure: m^2.

.1 Minimum payment for repair areas will be $0.05m^2$.

.6 Concrete pressure grouting repair:

.1 Related sections:

.1 Section 03 10 00 – Concrete Forming and Accessories.

.2 Section 03 20 00 – Concrete Reinforcing.

.3 Section 03 91 10 – Surface Preparation of Concrete Delamination Repair.

.4 Section 03 93 20 – Pressure Grouting.

.2 Unit price:

.1 Horizontal concrete slab soffit:

.1 0mm to 75mm depth – Form B: Prices Item No.: 25.

.2 75mm to 150mm depth – Form B: Prices Item No.:26.

.2 Vertical concrete wall/column:

.1 0mm to 75mm depth – Form B: Prices Item No.: 27.

.2 75mm to 150mm depth – Form B: Prices Item No.: 28.

.3 Measurement procedures:

.1 In accordance with this section.

.2 Primary depth: Up to 75mm and at no point less than 25mm inches in depth.

.3 Secondary depth: Up to 150mm depth and at no point less than 75mm in depth.

.4 Repair areas less than 25mm will be completed as a hand patch repair.

.5 Unit of measure: m^2.

.1 Minimum payment for repair areas will be $0.1m^2$.

.7 Form and pour concrete repair:

.1 Related sections:

.1 Section 03 10 00 – Concrete Forming and Accessories.

.2 Section 03 20 00 – Concrete Reinforcing.

.3 Section 03 91 10 – Surface Preparation of Concrete Delamination Repair.

.4 Section 03 93 30 – Form and Pour.

.2 Unit price:

.1 Vertical form and pour:

.1 0mm to 75mm depth – Form B: Prices Item No.: 29.

.2 75mm to 150mm depth – Form B: Prices Item No.: 30.

.3 Measurement procedures:

.1 In accordance with this section.

.2 Primary depth: Up to 75mm and at no point less than 25mm inches in depth.

.3 Secondary depth: Up to 150mm depth and at no point less than 75mm in depth.

.4 Repair areas less than 25mm will be completed as a hand patch repair.

.5 Unit of measure: m^2.

.1 Minimum payment for repair areas will be $0.1m^2$.

.8 Embedded galvanic anodes:

.1 Related sections:

.1 Section 03 98 10 – Embedded Galvanic Anodes.

.2 Unit price:

.1 Embedded galvanic anodes – Form B: Prices Item No.: 31.

.3 Measurement procedures:

.1 In accordance with this section.

.2 Repair patches to receive galvanic anodes, and frequency of installation, will be identified by the Contract Administrator.

.3 Unit of measure: per anode.

.1 Minimum payment for repair areas will be 1 anode.

.9 Flowable grout properties testing:

.1 Related sections:

.1 Section 03 92 12 – Top Surface Concrete Repairs with Rapid Setting Mortar.

.2 Section 03 92 20 – Scaling Repairs.

.3 Section 03 93 10 – Hand Patching.

.4 Section 03 93 20 – Pressure Grouting.

.5 Section 03 93 30 – Form and Pour with Repair Mortar.

.2 Unit price:

.1 Flowable grout properties testing – Form B: Prices Item No.: 32.

.3 Measurement procedures:

.1 In accordance with this section.

.2 Unit of measure: per mortar cube.

.1 Minimum payment for repair areas will be 1 mortar cube.

.10 Direct pull-out tensile tests:

.1 Related sections:

.1 Section 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.2 Section 03 92 12 – Top Surface Concrete Repairs with Rapid Setting Mortar.

.3 Section 03 92 20 – Scaling Repairs.

.4 Section 03 93 10 – Hand Patching.

.5 Section 03 93 20 – Pressure Grouting.

.6 Section 03 93 30 – Form and Pour with Repair Mortar.

.7 Section 09 30 13 – Ceramic Tiling.

.2 Unit price:

.1 Flowable grout properties testing – Form B: Prices Item No.: 33.

.3 Measurement procedures:

.1 In accordance with this section.

.2 Unit of measure: per test core.

.1 Minimum payment for repair areas will be 1 test core.

.11 Concrete testing agency fieldwork and reporting:

.1 Related sections:

.1 Section 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.2 Section 03 92 12 – Top Surface Concrete Repairs with Rapid Setting Mortar.

.3 Section 03 92 20 – Scaling Repairs.

.4 Section 03 93 10 – Hand Patching.

.5 Section 03 93 20 – Pressure Grouting.

.6 Section 03 93 30 – Form and Pour with Repair Mortar.

.7 Section 09 30 13 – Ceramic Tiling.

.2 Unit price:

.1 Concrete testing agency fieldwork and reporting – Form B: Prices Item No.: 34.

.3 Measurement procedures:

.1 In accordance with this section.

.2 Unit of measure: per site visit.

.1 Minimum payment for repair areas will be 1 site visit.

.12 Concrete testing scanning for reinforcing:

.1 Related sections:

.1 Section 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.2 Section 03 92 12 – Top Surface Concrete Repairs with Rapid Setting Mortar.

.3 Section 03 92 20 – Scaling Repairs.
.4 Section 03 93 10 – Hand Patching.
.5 Section 03 93 20 – Pressure Grouting.
.6 Section 03 93 30 – Form and Pour with Repair Mortar.
.7 Section 09 30 13 – Ceramic Tiling.

.2 Unit price:
.1 Concrete testing scanning for reinforcing – Form B: Prices Item No.: 35.

.3 Measurement procedures:
.1 In accordance with this section.
.2 Unit of measure: per site visit.
.1 Minimum payment for repair areas will be 1 site visit.

.13 Crack repair prior to ceramic tiling:

.1 Related sections:
.1 Section 09 30 13 – Ceramic Tiling.

.2 Unit price:
.1 Crack repair prior to ceramic tiling – Form B: Prices Item No.: 36.

.3 Measurement procedures:
.1 In accordance with this section.
.2 The unit price submitted will apply to removal depths of up to 50 mm and at no point less than 12mm in depth.
.1 Repairs over 50 mm in depth will be repaired via pressure grouting in accordance with Section 03 93 20.
.3 Unit of measure: m.
.1 Minimum payment for repair areas will be 0.1m.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies administrative and procedural requirements for meetings.

1.2 PRE-CONSTRUCTION MEETING

.1 Promptly after Contract award, the Contract Administrator will establish the time and location of a pre-construction meeting to review and discuss administrative procedures and responsibilities. Contract Administrator will notify Contractor at least seven (7) Calendar Days before the meeting.

.2 The Contractor shall arrange for the following senior representatives to be in attendance:

- .1 Contractor's project manager and site superintendent.
- .2 Major Subcontractors.

.3 Contract Administrator will chair the conference and record and distribute the minutes.

.4 Agenda:

- .1 Introductions
- .2 Communications
- .3 Award of Contract
- .4 Scope of Work
- .5 Subcontractors
- .6 Commencement
- .7 Schedule
- .8 Construction Sequence
- .9 Utilities
- .10 Project Issues
- .11 Site Meetings
- .12 Status Meetings
- .13 Safety
- .14 Security
- .15 Environmental
- .16 Regulatory
- .17 Mock-ups
- .18 Other

1.3 CONSTRUCTION PROGRESS MEETINGS

.1 In accordance with Part D – Supplementary Conditions, supplemented with the following:

- .1 Progress meetings to be scheduled every two weeks.
- .2 Contract Administrator will chair the meetings, and record and distribute the minutes.
- .3 The Contractor shall provide physical space and make arrangements for meetings.
- .4 The Contractor shall ensure that Subcontractors attend when it is appropriate to the discussion of the progress of the Work.
- .5 Agenda:
  - .1 Review of last meeting minutes and action items,
  - .2 Schedule,

.3 Progress status,
.4 Construction issues,
.5 Utilities,
.6 Project risks,
.7 Environment,
.8 Safety,
.9 Submittals,
.10 Work by others,
.11 Change control,
.12 Request for Information (RFI) log,
.13 Site security,
.14 Quality Control (QC) and Quality Assurance (QA),
.15 Other Business, and
.16 Date of Next Meeting.

1.4 POOL TANK EMPTYING AND FILLING CONFERENCE

.1 Convene meeting prior to tank emptying and filling operations minimum of one (1) week prior to the need to empty or fill the pool tank with water.

.2 Establish date, time and location of conference and notify parties concerned a minimum of seven (7) Calendar days before conference.

.3 Arrange for the following representatives to be in attendance:

.1 Contractor.
.2 Tiling subcontractor.
.3 Tiling manufacturer.
.4 Contract Administrator.
.5 City of Winnipeg Project Manager.
.6 City of Winnipeg Supervisor of Arena and Aquatic Assets.
.7 City of Winnipeg 7 Oaks Pool Foreman.
.8 City of Winnipeg Community Services representative, as required.

.4 The Contract Administrator will be responsible for recording minutes and circulating to the attending parties and affected parties not in attendance within seven (7) Calendar days after conference.

.5 Agenda for conference:

.1 Verify contact information.
.2 Verify schedule for tank emptying and filling.
.3 Verify responsibilities of Contractor and City for emptying and filling.
.4 Verify procedures for tank filling and operating.
.5 Verify tank emptying and filling flow rates.
.6 Verify tank emptying and filling water temperature.
.7 Verify other tile manufacturer tank emptying and filling requirements.
.8 Verify City of Winnipeg facility limitations and requirements.

1.5 PRE-INSTALLATION CONFERENCE

.1 Convene a pre-installation conference a minimum of one (1) week prior to beginning on site installation of Work or mock-up as required in individual technical sections.

.2 Establish date, time and location of conference and notify parties concerned a minimum of seven (7) Calendar days before pre-installation conference.

.3 Contractor and any Subcontractors and manufacturer's representatives involved in work and Contract Administrator to be in attendance.

.4 The Contract Administrator will be responsible for recording minutes and circulating to the attending parties and affected parties not in attendance within seven (7) Calendar days after conference.

.5 Agenda for conference:

.1 Verify project requirements, design and intent of design,

.2 Review installation and substrate conditions,

.3 Co-ordination with subtrades,

.4 Review Manufacturer's installation instructions and warranty requirements,

.5 Review compatibility of materials, and

.6 Review testing requirements.

.7 Review of facility protection.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This Section specifies Contractor's responsibilities for preparation and submission of schedules and other documentation related to tracking construction progress.

.2 The purpose of submitting progress schedules is to:

.1 Inform the City and Contract Administrator of actual progress versus planned progress, and

.2 Provide assurance that scheduling issues are being proactively identified and addressed in a timely manner, and that planned progress is being maintained as closely as possible.

1.2 SUBMITTALS

.1 Construction Schedule:

.1 Submit detailed work schedule in accordance with Part D – Supplementary Conditions.

.2 Submittals Schedule:

.1 Submit via e-mail in electronic PDF format.

.2 Submit initial schedule to Contract Administrator within twenty-one (21) Calendar Days after Contract award.

.3 Submit to Contract Administrator as a submission to the Contract Administrator in accordance with Section 01 33 00 Submittal Procedures.

.3 Progress Photographs:

.1 Submit photographs in electronic version via the Contract Administrator's SharePoint site as a submission to the Contract Administrator in accordance with Section 01 33 00 Submittal Procedures.

.2 Pre-Construction: Submit prior to mobilizing on site.

.3 Construction Progress:

.1 Submit monthly.

.2 Submit upon completion of key milestone activities as requested by the Contract Administrator.

1.3 DETAILED WORK SCHEDULE

.1 In accordance with Part D – Supplementary Conditions.

1.4 SUBMITTALS SCHEDULE

.1 Format and Content:

.1 Prepare a tabulated schedule identifying all required items for material procurement:

.1 Shop drawings.

.2 Product data.

.3 Sample submissions.

.1 Including:

.1 Samples required for testing.

.2 Prepare schedule in electronic format.

.3 Provide a separate line for each required submittal, organized by Specifications section name and number, and further broken down by individual Products and systems as required.

.4 For each required submittal, show:

.1 Planned earliest date for initial submittal.

.2 Earliest date for return of reviewed submittal by the Contract Administrator.

.3 Latest date for return of reviewed submittal without causing delay.

.5 Allow time in schedule for resubmission of submittals, should resubmission be necessary.

.2 Contract Administrator Review:

.1 The Contract Administrator will review the format and content of the initial schedule and request necessary changes, if any, within fourteen (14) Calendar Days after receipt.

.2 If changes are required, resubmit finalized schedule within seven (7) Calendar Days after return of the Contract Administrator reviewed copy.

.3 Submit updated submittals schedule monthly to the Contract Administrator.

1.5 SCHEDULE MANAGEMENT

.1 A schedule submitted as specified and accepted by the City and Contract Administrator shall become the baseline schedule and shall be used as the baseline for updates.

.2 At each regular progress meeting, review and discuss current construction progress and submittals schedules with Contract Administrator and the City, including activities that are behind schedule and planned measures to regain schedule slippage in key areas on or near the critical path.

.3 Activities considered behind schedule are those with start or completion dates later than the dates shown on the baseline schedule.

1.6 RECORDING ACTUAL SITE CONDITIONS ON AS-BUILT DRAWINGS

.1 Print a hard copy set of construction Drawings and Specifications for the purpose of creating as-built Drawings and Specifications. Record information in red ink on the hard copies, clearly identifying as-built deviations from the originally obtained construction Drawings and Specifications.

.2 Clearly label each drawing as “AS-BUILT DRAWING”. Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

.3 Record actual construction including:

.1 Field changes of dimension and detail.

.2 Changes made by Change of Work Orders and Field Instructions. Reference Change of Work Order and Field Instruction number.

.3 Clarifications made in Requests for Information (RFI). Reference RFI number.

.4 References to Shop Drawings, where Shop Drawings show more detail.

.4 Do not use as-built drawings for construction purposes.

1.7 PROGRESS PHOTOGRAPHS

.1 Conduct a pre-construction inspection of the facility existing conditions in the presence of the Contract Administrator to document existing conditions using digital photography. Pre-construction photographs will be used to evaluate pre-existing damage to finishes and responsibility of repair.

.2 Arrange for periodic digital photography to document and provide a photographic record of the progress of the Work.

.1 At minimum, photographic record to include the following:

.1 Pre-demolition.

.2 Substrate conditions following demolition.

.3 Construction sequencing.

.4 Final installation.

.3 Identify each photograph by project name and date taken.

.4 Do not use progress or any other project photographs for promotional purposes without the City's written consent.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies administrative and procedural requirements for submittals.

1.2 ADMINISTRATIVE

.1 Submit specified submittals to the Contract Administrator for review.

.2 Submit with reasonable promptness and in orderly sequence so as to not cause delay in the Work.

.3 Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time or for product substitutions or other deviations from the Drawings and Specifications.

.4 Where required by authorities having jurisdiction, provide submittals to such authorities for review and approval.

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

.6 Present Shop Drawings, product data, and samples in SI metric units. Where items or information is not produced in SI Metric units, converted values are acceptable.

.7 Review submittals, provide verified field measurements where applicable, and affix Contractor’s review stamp prior to submission to the Contract Administrator. The Contractor’s review stamp represents that necessary requirements have been determined and verified, and that the submittal has been checked and coordinated with requirements of the Work and Contract Documents.

.8 Verify field measurements and that affected adjacent work is coordinated.

.9 Submittals not meeting specified requirements will be returned with comments.

.10 Reproduction of construction Drawings to serve as background for Shop Drawings is not permitted.

.11 Do not propose substitutions or deviations from the Contract Documents via Shop Drawing, product data and sample submittals.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Indicate products, methods of construction, and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Work.

.2 Where products attach or connect to other products, indicate that such items have been coordinated, regardless of section under which adjacent items will be supplied and installed. Indicate cross-references to Drawings, Specifications and other already reviewed Shop Drawings.

.3 Accompany submittals with a transmittal information including:

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

.4 Shop Drawing submittals shall include:

- .1 Date and revision dates,
- .2 Project title and number,

.3 Name and address of:

.1 Subcontractor,

.2 Supplier, and

.3 Manufacturer.

.4 Contractor's stamp, date, and signature of Contractor's authorized representative responsible for Shop Drawing review, indicating that each Shop Drawing has been reviewed for compliance with Contract Documents and, where applicable, that field measurements have been verified.

.5 Details of appropriate portions of the 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, and

.10 Relationships to other parts of the Work.

.6 Contract Administrator’s review stamp: Allow sufficient space on each sheet of shop drawings for Contract Administrator’s comments and review stamp without requiring the stamp to overwrite text of the Shop Drawing.

.5 Product data submittals shall include safety data sheets (SDS) for all controlled products.

.6 Submit Shop Drawings where specified in the technical Specifications in electronic PDF format.

.7 Submit product data sheets or brochures where specified in the technical Specifications in electronic PDF format.

.8 Where a submittal includes information not applicable to the Work, clearly identify applicable information and strike out non-applicable information.

.9 Supplement standard information to include details applicable to Project.

.10 Allow fourteen (14) Calendar Days for Contract Administrator’s review of each submittal and incorporate in submittals schedule specified in Section 01 32 00 – Construction Progress Documentation.

.1 Allow additional seven (7) Calendar Days for mechanical, plumbing, electrical and architectural shop drawing reviews.

.11 If upon Contract Administrator’s review no errors or omissions are discovered, or if only minor corrections are required as indicated, submittal will be returned and fabrication or installation of Work may proceed.

.12 If upon Contract Administrator’s review significant errors or omissions are discovered, as so noted, copy will be returned for correction and resubmission. Do not commence fabrication or installation.

.13 Contract Administrator’s notations on submittals are intended to ensure compliance with the Contract Documents and are not intended to constitute a change in the Work requiring a change to the Contract Price or Contract Time. If the Contractor considers any Contract Administrator’s notation to be a change in the Work, promptly notify the Contract Administrator in writing before proceeding with the Work.

.14 Resubmit corrected submittals through same procedure indicated above, before any fabrication or installation of the Work proceeds. When resubmitting, notify the Contract

Administrator in writing of any revisions other than those requested by the Contract Administrator.

1.4 SAMPLES

.1 Submit single copy of samples for the Contract Administrator's review where specified in the technical Specifications. Label samples as to origin, Project name, and intended use.

.2 Deliver samples prepaid to Contract Administrator's business address.

.3 Notify Contract Administrator in writing of any deviations in samples from requirements of Contract Documents.

.4 Where a required colour, pattern or texture has not been specified, submit a full range of available products.

.5 The Contract Administrator's selection from samples is not intended to change the Contract Price or Contract Time. If a selection would affect the Contract Price or Contract Time, notify the Contract Administrator in writing immediately and prior to proceeding with the Work.

.6 Resubmit samples as required by Contract Administrator to comply with Contract Documents.

.7 Reviewed and accepted samples will establish the standard against which installed Work will be reviewed.

1.5 HEALTH AND SAFETY SUBMITTALS.

.1 In accordance with Part D – Supplementary Conditions and Section 01 35 29 – Safety Procedures.

1.6 SUBMISSIONS TO CONTRACT ADMINISTRATOR:

.1 Electronic versions via e-mail to:

.1 Contract Administrator in accordance with Part D – Supplementary Conditions.

.2 Contract Administration: contractadmin@crosierkilgour.com.

.2 Electronic versions via Contract Administrator's SharePoint site:

.1 Submit request to upload electronic submittals via Contract Administrator's SharePoint site via e-mail to:

.1 Contract Administrator in accordance with Part D – Supplementary Conditions.

.2 Contract Administration: contractadmin@crosierkilgour.com.

.2 Contract Administrator will provide an e-mail invitation and link to upload files to SharePoint site.

.3 Samples and hard copy versions to:

.1 Contract Administrator in accordance with Part D – Supplementary Conditions.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Province of Manitoba:

.1 The Workplace Safety and Health Act, Chapter W210 10/02 and associated regulations.

.2 Manitoba Workplace Safety and Health Regulation 217/2006.

.3 The Workers Compensation Act C.C.S.M c. W200.

1.2 PRIME CONTRACTOR

.1 Contractor shall be the Prime Contractor and serve as, and have the duties of the Prime Contractor in accordance with the Workplace Safety and Health Act (Manitoba).

.2 Without limiting the generality of D24.1, the Prime Contractor scope of services include all services indicated in The Workplace Safety and Health Act (Manitoba) and generally summarized below:

.1 Act as Safety Administrator.

.2 Conduct safety meetings for all contractors working on the Site.

.3 Conduct site safety orientations for all contractors working on the Site.

.4 Establish, implement and maintain an access control and screening method for the Site.

.5 Conduct daily toolbox meetings with all contractors on site to review planned work, job hazard assessments and control measures and safe work plans being implemented.

.6 Receive, review and return contractor safe work plans.

.7 Coordinate and organize boundaries between contractors.

.8 Ensure the facility is kept secure at all times.

.9 Schedule and manage security services.

.10 Building access control.

1.3 ACTION/INFORMATION SUBMITTALS

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

.2 Submit, by presentation to the Contract Administrator, the safety orientation for all contractor's personnel. This presentation must be made before commencement of the Work.

.3 Submit to the Contract Administrator one (1) copy of any Safety Data Sheet (SDS) as required. These sheets must be submitted before the controlled product is used on Site.

.4 Submit to the Contract Administrator:

.1 A safe work plan in accordance with Part D – Supplementary Conditions,

.2 Minutes of the weekly (toolbox) safety meetings,

.3 Accident investigations (if applicable),

.4 Site safety inspections,

.5 Training records as appropriate, requested,

.6 Hazardous materials:

.1 Assessments,

.2 Abatement plans,

.3 Engineered containment shop drawings.

.4 Inspection and monitoring reports,

.5 Completion reports.

.7 Qualifications of the environmental practitioner.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.2 Submit as a component of the Operation and Maintenance Manual:

.1 Hazardous materials abatement completion report.

.2 Inspection and air monitoring reports of hazardous materials abatement.

1.5 SAFETY ASSESSMENT

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

.2 Safety assessment to form basis of safe work procedures and site specific site safety plan.

1.6 MEETINGS

.1 Schedule, administer and record minutes for:

.1 Safety meetings,

.2 Weekly safety (toolbox) meetings.

.2 Schedule meetings at minimum frequency required under legislation.

.3 Discuss health and safety issues at each progress meeting in accordance with Section 01 31 19 – Project Meetings.

1.7 PROJECT/SITE CONDITIONS

.1 Refer to E2 for hazardous materials reports provided to the Contractor.

.2 The City has classified crawlspace areas as a confined space.

1.8 GENERAL SITE RULES

.1 Follow all posted traffic control signs.

.2 Ensure that all workers comply with "NO SMOKING" regulations in effect in areas of the Site.

.3 Wear personal protective equipment (PPE) in accordance with the Safe Work Plan.

.4 Use scaffolding that complies with regulations.

.5 Obtain a valid certificate of inspection for all cranes and boom trucks before coming on Site.

.6 Immediately remove any worker found to be impaired.

.7 Immediately report all hazardous situations to the Contract Administrator.

.8 Obtain and display at the Site SDS for all controlled products before the product is allowed on Site.

1.9 FIRST AID FACILITIES AND SERVICES

.9 The Contractor shall provide first aid services at the Site, including their Subcontractors, until Substantial Performance is achieved. Provide qualified first aiders to man the first aid facilities.

.10 Provide first aid coverage for the Site at all times, including periods outside of normal work hours (evenings, weekends, and holidays) as required to support the work of

Subcontractors. Coordinate with others to establish required durations and levels of first aid to support regular and non-regular work hours.

.11 Make all provisions and pay all installation, manpower, equipment, medical supplies, restocking and other costs for the first aid facilities in order to provide ongoing service for the Site in accordance with the requirements of this Specification.

.12 Locate the first aid facility in a convenient location within the Site. The Contractor shall provide and maintain unobstructed emergency vehicle access to the main door of the first aid facility, including appropriate signage as required.

.13 Arrange and supply transportation for injured workers both on and off Site.

.14 The Contract Administrator will review the Contractor's first aid facility, personnel, procedures, and safety and health program. The Contract Administrator is to have full access to the Work and the Contractor's first aid facilities and records at all times.

1.10 GENERAL REQUIREMENTS

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

.2 Keep copy of the relevant construction occupational safety and health regulations on Site at all times. Post the policies and notices for the information of workers.

.3 Ensure that workers are instructed and trained in safe and healthy working practices; take immediate action to correct any unsafe conditions and hold regular weekly safety (toolbox) meetings with all workers.

.4 Establish Job Safety and Health Procedures and provide copies for the Contract Administrator’s information.

.5 Provide Safety Orientation for all individuals accessing the site during Work of this Contract.

.1 Including, but not limited to:

.1 Contractors,

.2 Service personnel,

.3 Contract Administrator personnel,

.4 City of Winnipeg staff.

.2 All individuals accessing the Site must attend a Safety Orientation before access to the Site is granted.

.6 Ensure that the following essentials of the Workplace Hazardous Materials Information System are provided:

.1 Worker education on controlled Products.

.2 Workplace labelling and identification.

.3 Safety Data Sheets (SDS).

.7 Conduct formal safety inspections of Site. Inspections to be performed by one person from management and one person representing workers.

1.11 RESPONSIBILITY

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

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

1.12 COMPLIANCE REQUIREMENTS

.1 Comply with The Workers Compensation Act, Workplace Safety and Health Act Chapter W210 and Manitoba Workplace Safety and Health Regulation 217/2006.

1.13 ENVIRONMENTAL PRACTITIONER

.1 Hazardous material assessments, plan development, and associated worker training, and inspections and monitoring to be completed by an environmental practitioner.

.2 Environmental practitioner: An individual, who through education, experience and training is qualified to evaluate, monitor and control hazardous building materials.

.3 Qualifications:

.1 Certified Industrial Hygienist (CIH) through the Board for Global EHS Credentialling Inc. (BGC), or

.2 Registered Occupational Hygienist (ROH) through the Canadian Registered Board of Occupational Hygienists (CBROH), or

.3 Registered Occupational Hygiene Technologist (ROHT) through the Canadian Registered Board of Occupational Hygienists (CBROH), or

.4 Canadian Registered Safety Professional (CRSP) through the Board of Canadian Registered Safety Professionals, or

.5 Minimum fifteen (15) continuous years of experience in hazardous materials abatement including minimum five (5) years developing hazardous material abatement plans.

.4 Upon request, submit to the Contract Administrator, the name and qualifications of the environmental practitioner.

1.14 HAZARDOUS BUILDING MATERIALS

.1 Hazardous building materials are identified in the reports referenced in this section Article titled “Project/Site Conditions”.

.2 Develop and implement a specific hazardous materials abatement plan for each hazardous material impacted by Work of this Contract.

.1 Materials identified as presumed to contain asbestos to be included in the scope of work.

.3 Hazardous material abatement plans to include the following:

.1 Compliance with legislation and provincial regulations, codes and guidelines.

.2 Written safe work procedures for the handling, abatement, disposal and clean-up of hazardous materials to maintain worker and public exposure below levels specified in legislation, regulations, codes and guidelines.

.3 Worker protection requirements.

.4 Material handling and disposal requirements.

.5 Site isolation and containment requirements. Including isolation of existing building mechanical equipment.

.1 Maintain mechanical supply to areas of the facility scheduled to remain occupied by the City and public.

.2 Co-ordinate with:

.1 Section 01 52 00 – Temporary Utilities

.2 Section 01 56 00 – Temporary Barriers and Enclosures.

.3 Section 01 57 00 – Temporary Controls.

.3 Where isolation and containment relies on support of the existing building structure, prepare engineered shop drawings for the design of

the containment support structure. Submit engineered shop drawings sealed by a professional engineer licenced to practice in Manitoba.

.6 Administrative control measures.

.7 Mechanical control measures.

.8 Inspection requirements.

.1 Conducted by the environmental practitioner.

.2 Submit reports to the Contract Administrator.

.9 Air monitoring requirements, including at minimum:

.1 Conducted by the environmental practitioner.

.2 Submit a report of results to the Contract Administrator.

.1 Include comment on compliance of results to acceptable standards and any remedial action required.

.3 Frequency of monitoring,

.4 Monitoring method and laboratory analysis method. Methods shall be published and recognized by an international organization consistent with standard occupational hygiene industry practices.

.5 Acceptable air concentration results in accordance with legislation, regulations, codes, and guidelines.

.6 Monitoring for worker protection.

.7 Monitoring to detect migration of hazardous materials beyond containment areas.

.8 Monitoring of public areas.

.1 The City may conduct supplemental monitoring within public areas.

.9 Monitoring within containment areas upon completion of abatement, but prior to removal of containment.

.10 Procedures in the event of a spill or migration of hazardous materials beyond the containment.

.1 Remedial measures required to facilitate clean-up of hazardous materials beyond containment area shall be the responsibility of the Contractor with no increase to Contract price or time.

.11 Worker training.

.12 Completion reporting. Record locations of hazardous materials abatement and prepare a report detailing the type and locations of hazardous materials abated from the site.

.4 Coordinate with qualified and insured abatement subcontractors or self-perform hazardous materials abatement in accordance with the abatement plan.

1.15 DUST CONTROL PLAN

.1 Develop, implement and maintain a dust control plan to address exposure to and migration of dust and other extraneous materials generated by Work of this Contract.

.2 Develop dust control plan as a silica abatement plan in accordance with this section Article titled “Hazardous Building Materials” where:

.1 Where work of this Contract involves sandblasting, grinding, coring, drilling, demolition and other work involving concrete, masonry and grout, or

.2 Where reports identified this section Article titled “Project/Site Conditions” identifies silica as being present in materials impacted by work of this Contract.

.3 Co-ordinate dust control plan with:

.1 Section 01 52 00 – Temporary Utilities

.2 Section 01 56 00 – Temporary Barriers and Enclosures.

.3 Section 01 57 00 – Temporary Controls.

.4 Legislation at the Place of Work.

.4 Dust control plan to address:

.1 Dust containment methods.

.2 Dust suppression methods.

.3 Worker protection.

.4 Administrative controls.

.5 Mechanical controls.

.6 Worker training.

.7 Shutdown of air handling units which have air intakes in the vicinity of the work.

.8 Methods to prevent dust contamination of:

.1 Fire alarm smoke detectors.

.2 Interior of ducts.

.3 Ventilation and mechanical equipment, including filters.

.4 Air-cooled mechanical and electrical equipment.

.5 Electrical equipment and junction boxes.

.6 Adjacent non-work areas and adjacent properties.

.9 Measures to verify effectiveness of designed controls.

.10 Develop procedures, investigation requirements and remedial measures to be implemented in the event that a release of dust is reported beyond containment areas.

.1 Remedial measures required to facilitate clean-up of dust beyond containment are the responsibility of the Contractor with no increase to the Contract Price or time.

1.16 UNFORSEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for an employee's right to refuse work in accordance with Acts and Regulations of Province/Territory having jurisdiction and advise the Contract Administrator verbally and in writing.

1.17 CORRECTION OF NON-COMPLIANCE

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

.1 The City, and

.2 The Contract Administrator.

.2 Provide the following with written report of action taken to correct non-compliance of health and safety issues identified:

.1 The City, and

.2 The Contract Administrator.

.3 If non-compliance of health and safety regulations is not corrected, the following may issue a stop Work order until the non-compliance is corrected:

.1 The City, and

.2 The Contract Administrator.

1.18 BLASTING

.1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by the Contract Administrator.

1.19 POWDER ACTUATED DEVICES

.1 Use powder actuated devices only after receipt of written permission from the Contract Administrator.

1.20 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.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies administrative and procedural requirements for quality.

.2 This Section describes administrative and procedural requirements for:

.1 Proactive Contractor activities to assure the quality of construction before and during execution of the Work.

.2 Reactive activities to verify that work completed conforms to the Contract Documents.

.3 Having inspection and testing agencies by the Contractor or the City does not relieve the Contractor of their responsibility to perform Work in accordance with the Contract Documents.

1.2 REFERENCE STANDARDS

.1 “Reference standards” means consensus standards, trade association standards, guides, and other publications expressly referenced in Contract Documents.

.2 Where an edition or version date is not specified, referenced standards shall be deemed to be the latest edition or revision issued by the publisher at the time of bid closing. However, if a particular edition or revision date of a specified standard is referenced in an applicable code or other regulatory requirement, the regulatory referenced edition or version shall apply.

.3 Reference standards establish minimum requirements. If the Contract Documents call for requirements that differ from a referenced standard, the more stringent requirements shall govern.

.4 If compliance with two or more reference standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Contract Administrator for clarification.

1.3 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit schedule of testing and inspection activities to the Contract Administrator, applicable subcontractors, testing agencies, and other affected parties including the following:

.1 List each testing and inspection agency.

.2 Identify types of tests and inspections for each agency, and cross reference to applicable specification Section number-title in Contract Documents.

.3 Description of test and inspection,

.4 Identify applicable reference standard,

.5 Identify test and inspection method, and

.6 Indicate number of each test and inspection required.

.3 Test Samples: Submit test samples required for testing in accordance with submittals schedule specified in Section 01 32 00 – Construction Progress Documentation.

.4 Reports: Submit reports in electronic PDF format prepared by inspecting and testing agencies for inspection and testing required by Contract Documents or by regulatory requirements, and performed by Contractor retained inspection and testing agencies to the Contract Administrator.

.1 Submit within seven Calendar Days after completion of inspection and testing.

.2 Provide copies to:

.1 Subcontractor of work being inspected or tested.

.2 Manufacturer or fabricator of material being inspected or tested.

.5 Certificates:

.1 Submit Product certificates as requested.

1.4 QUALIFICATIONS

.1 Contractor Qualifications: Contractors shall meet the following qualifications:

.1 Engaged full time with knowledge and experience in the risks, safety and environmental impacts, and all components of the line of work required by these Contract Documents.

.2 Demonstrated experience satisfactory to the City and Contract Administrator:

.1 Prime Contractor:

.1 Minimum of:

.1 Five (5) projects over past five (5) years as Prime Contractor as follows:

.1 Successful completion of projects of similar value as that required by these Contract Documents, and

.2 Successful completion of projects of similar nature, scope and complexity as that required by these Contract Documents.

.2 Proposed project manager:

.1 Minimum of:

.1 Five (5) projects over past five (5) years as project manager as follows:

.1 Successful completion of projects of similar value as that required by these Contract Documents, and

.2 Successful completion of projects of similar nature, scope and complexity as that required by these Contract Documents.

.3 Proposed superintendent:

.1 Minimum of:

.1 Five (5) projects over past five (5) years as superintendent as follows:

.1 Successful completion of projects of similar value as that required by these Contract Documents, and

.2 Successful completion of projects of similar nature, scope and complexity as that required by these Contract Documents.

.2 Subcontractor Qualifications: Sub-contractors shall meet the following qualifications

.1 Engaged full time with knowledge and experience in the risks, environmental impacts, and all components of the line of work required by these Contract Documents.

.2 As specified in technical sections.

.3 Installer qualifications: In accordance with Installer Qualifications of this Section.

.3 Manufacturers' Qualifications:

.1 Specializes in manufacturing the products specified in the technical sections of the Contract Documents.

.2 Successful record of performance with minimum of:

.1 Ten (10) years of documented experience.

.4 Suppliers' qualifications: Suppliers shall meet the following qualifications:

.1 Authorized to distribute manufacturer's products.

.2 Has capacity to supply required products without delaying the project.

.5 Fabricator's Qualifications: Fabricators shall meet the following qualifications:

.1 Experienced in producing products required by the Contract Documents.

.2 Successful record of in-service performance.

.3 Sufficient capacity to fabricate required products without delaying the Project.

.6 Installer Qualifications: Installers shall meet the following qualifications:

.1 Individual experienced in design and installation, application, and erection of materials to the extent required for this Project.

.1 Minimum of:

.1 Five (5) projects over past five (5) years.

.2 Successful record of in-service performance.

.7 Licenced Professionals Qualifications:

.1 Individual registered or licenced to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the Province of Manitoba.

1.5 INDEPENDENT INSPECTION AND TESTING AGENCIES

.1 Except as otherwise specified, the City will retain and pay for independent inspection and testing agencies to inspect, test, or perform other quality control reviews of parts of the Work.

.2 Retain and pay for inspection and testing that is for Contractor's own quality control or is required by regulatory requirements.

.3 Employment of the inspection and testing agencies by the Contractor or the City does not relieve the Contractor from the responsibility to perform the Work in accordance with the Contract Documents.

.4 Allow and arrange for inspection and testing agencies to have access to the Work, including access to off-site manufacturing and fabrication plants.

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

.5 For inspection and testing required by Contract Documents or by authorities having jurisdiction, provide Contract Administrator and inspection and testing agencies with timely notification in advance of required inspection and testing.

.6 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.

.7 Provide test samples required for testing in accordance with submittals schedule specified in Section 01 32 00 – Construction Progress Documentation.

.8 Provide labour, equipment and temporary facilities to obtain and handle test samples on Site.

.1 Provide sufficient space to store and cure test samples.

.9 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 the Contract Administrator at no cost to the City. Pay costs for retesting and reinspection.

1.6 INSPECTION AND TESTING AGENCY REPORTS

.1 Provide reports prepared by inspecting and testing agencies for inspection and testing required by Contract Documents or by regulatory requirements, and performed by Contractor retained inspection and testing agencies in accordance with this section Article titled “Action/Information submittals”.

.2 For inspection and testing performed by the City-retained inspection and testing agencies, copies of inspection and testing agency reports will be provided to Contractor.

1.7 TESTS

.1 Furnish test results as requested.

.2 Provide seal of professional engineer on tests as specified in the Contract Documents. Engineer to be registered within the Province of Manitoba.

.3 Cost of tests beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by the Contract Administrator and may be authorized as recoverable.

1.8 MOCK-UPS

.1 Prepare mock-ups of Work as specified in the Technical Specifications.

.1 If a mock-up location is not indicated in the Drawings or Specifications, locate where directed by the Contract Administrator.

.2 Prior to preparation and installation of mock-up, coordinate and schedule pre-installation meetings in accordance with Contract Documents.

.3 Modify mock-up as required until Contract Administrator approval is obtained.

.4 Approved mock-ups will establish an acceptable standard for the Work.

.5 Protect mock-ups from damage until the Work they represent is complete.

.6 Unless otherwise specified in the technical Specifications, approved mock-ups forming part of the Work may remain as part of the Work.

.7 Technical Specification sections specify whether mock-up may remain as part of Work or if it is to be removed and when.

.8 Prepare mock-ups for the Contract Administrator’s review with reasonable promptness and in orderly sequence, as to not cause delays in the Work.

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 TEMPORARY UTILITIES - GENERAL

.1 Provide temporary utilities as specified and as otherwise necessary to perform the Work expeditiously.

.2 Remove temporary utilities after use.

1.2 TEMPORARY WATER SUPPLY

.1 Connect to and use the City's existing water supply for temporary use during construction, subject to existing available volume and pressure.

.1 Usage at no cost to Contractor.

.2 Arrange and pay for necessary water supply connections and disconnections.

.3 Provide hoses, lines, connections, and other ancillary hardware required.

.4 Return services to their original condition at the temporary locations, or left in an altered condition only as approved by the City.

1.3 TEMPORARY HEATING AND VENTILATION

.1 Arrange and pay for temporary heating and ventilation required during construction.

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

.3 Vent construction heaters in enclosed spaces to the outside or use flameless type of construction heaters.

.4 Provide temporary heat for the Work as required to:

.1 Facilitate progress of Work.

.2 Protect the Work against dampness and cold.

.3 Prevent moisture condensation on surfaces, freezing, or other damage to finishes or stored Products.

.4 Maintain specified minimum ambient temperatures and humidity levels for storage, installation and curing of Products.

.5 Provide temporary ventilation for the Work as required to:

.1 Prevent accumulations of fumes, exhaust, vapours, gases and other hazardous, noxious, or volatile substances in enclosed spaces, as required to maintain a safe work environment meeting applicable regulatory requirements.

.2 Ensure that hazardous, noxious, or volatile substances do not migrate to the City's occupied spaces.

.3 Ventilate temporary sanitary facilities.

.6 Do not use permanent building heating and ventilation systems during construction.

1.4 TEMPORARY ELECTRICAL POWER AND LIGHTING

.1 Connect to and use the City's existing electrical supply for temporary use during construction.

.1 Usage at no cost to Contractor.

.2 Maximum power supply available for temporary use during construction is limited to existing power supply at the building.

.3 Arrange and pay for necessary connections and disconnections of temporary power and lighting in accordance with regulatory requirements.

1.5 SHUT DOWN AND START-UP OF EXISTING UTILITIES AND HVAC SYSTEMS

.1 Co-ordinate shut down and start-up of existing utilities and HVAC systems with the Contract Administrator and the City.

.2 Comply with the City facilities maintenance requirements for shut down and start-up of systems.

.1 Provide a minimum of 48 hours written notification to the City.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA S269.2-16, Access scaffolding for construction purposes.

1.2 SUBMITTALS

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

.2 Scaffolding: Where Manitoba Regulation 217/2006 requires scaffolds to be designed by a professional engineer, submit Shop Drawings bearing the seal of professional engineer registered in the Province of Manitoba.

.3 Site Storage Layout Plan:

.1 Where storage of materials on the floor structure are proposed, submit storage layout plan including the following:

.1 Design load of structure supporting the storage material.

.2 Load and area of each storage material.

.3 Location of each storage material in relation to supporting structure.

.4 Sequence of loading and unloading of storage material on existing structure.

.2 Site storage layout plan to be designed and sealed by a professional engineer licenced to practice in the Province of Manitoba.

1.3 CONTRUCTION FACILITIES - GENERAL

.1 Provide temporary construction facilities as necessary for performance of the Work and in compliance with applicable regulatory requirements.

.2 Maintain temporary construction facilities in good condition for the duration of the Work.

.3 Remove temporary construction facilities from place of the Work when no longer required.

1.4 CONSTRUCTION PARKING

.1 Limited parking will be permitted at the place of the Work:

.1 Construction parking shall not disrupt continuing operation of the facility.

1.5 VEHICULAR ACCESS

.1 Provide and maintain adequate access to place of the Work. Do not disrupt existing site roads.

.2 Restrict construction equipment and vehicular access to established roads on Site.

1.6 SITE OFFICES

.1 Further to Section E, provide Contractor Site office as follows:

.1 Provide a temperature controlled and ventilated office, with suitable lighting, of sufficient size to accommodate site meetings and furnished with drawing laydown table.

.2 Locate site office:

.1 Within the Contractor compound.

.2 As approved by the City as discussed at the pre-construction meeting.

1.7 SANITARY FACILITIES

.1 Provide sanitary facilities for workers.

.2 Do not use permanent washroom facilities during construction.

.3 Keep sanitary facilities clean and fully stocked with the necessary supplies.

.4 Exterior water connections are available for use by the Contractor for portable facilities.

1.8 FIRE PROTECTION

.1 Provide and maintain temporary fire protection systems and equipment during construction.

1.9 USE OF EXISTING ELEVATORS

.1 Existing elevators shall not be used for construction purposes.

1.10 SCAFFOLDING

.1 Provide and maintain scaffolding as required for access throughout duration of the Work.

.2 Design and erect scaffolding in accordance with Manitoba Regulation 217/2006 and CAN/CSA S269.2.

.3 Repair landscape and building damage caused by use of scaffolding.

1.11 AERIAL DEVICES

.1 Provide, use and maintain aerial devices in accordance with Manitoba Regulation 217/2006.

.2 Provide traffic control for use of aerial device around perimeter of building.

.3 Store aerial device within City designated area.

.4 Repair landscape damage caused by use of aerial device.

1.12 SITE STORAGE/LOADING

.1 Design site storage plan within limits of existing structure by an Engineer.

.2 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with product stockpiles.

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

1.13 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.

1.14 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Store materials resulting from demolition activities that are salvageable.

.4 Stack stored new or salvaged material not in construction facilities.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 BARRIERS AND ENCLOSURES - GENERAL

.1 Provide temporary barriers and enclosures necessary to delineate Contractor construction areas.

.2 Comply with applicable regulatory requirements.

.3 Maintain temporary barriers and enclosures in good condition for the duration of the Work.

.4 Remove temporary barriers and enclosures from Place of the Work when no longer required.

.5 Repair surface coatings, finishes which are damaged by temporary barriers and enclosures.

.6 Provide adequate signage, fencing, and other informational systems to inform the City staff of the work being undertaken.

1.2 FENCING

.1 Barricade area under construction with fencing to prevent the general public from improper access.

- .1 Erect temporary site enclosure around each active Work area using 1.8 m high pre-fabricated welded galvanized steel tube and wire mesh fence panels.
- .2 Provide metal bottom brackets with weights or other means to secure in place.
- .3 Provide locking top pins to secure fence sections together.
- .4 Secure fencing to adjacent structure for continuity of compound.

.2 Maintain site fencing in good repair until removed.

.3 Provide lockable access gates as required to facilitate construction access.

1.3 EXTERIOR HOARDING

.1 Erect temporary exterior site hoarding at locations of Contractor entrance/exit to the facility as shown on Drawings to comply with applicable regulatory requirements and as follows:

- .1 Use lumber framing and, minimum 13 mm thick exterior grade plywood.
- .2 Paint public side of hoarding with one coat primer and one coat exterior paint. Maintain public side of hoarding clean and in good repair until removed.
  - .1 Colour by: the Contract Administrator.
- .3 Provide secure lockable doors:
  - .1 Minimum 100mm wide x 2150mm high complete with suitable frames to receive hardware.
  - .2 Hardware:
    - .1 Door closer.
    - .2 Lockset:
      - .1 Lever type.
      - .2 To ANSI/BHMA A156.39-2905.
      - .3 Keying:
        - .1 5 pin tumbler C Keyway standard.
        - .2 Provide three keys to the Contract Administrator.

.4 Erect and maintain pedestrian walkways including roof and side covers, complete with pedestrian signage and electrical lighting.

1.4 INTERIOR HOARDINGS

.1 Provide interior hoarding partitions to segregate construction areas from publicly occupied areas as shown on Drawings.

.2 Where existing building construction safely and securely segregates publicly occupied areas from construction areas:

.1 Existing interior partitions to be maintained in place.

.2 Provide and maintain protection of windows with opaque coverings.

.1 Allow for fire and security observation ports.

.3 Construct interior hoarding partitions at openings and doors of existing building construction to maintain the segregation/isolation between publicly occupied areas and construction areas.

.3 Construct partitions using:

.1 38mm x 89mm wood stud framing at 600mm on centre.

.2 38mm x 89mm steel stud framing at 600mm on centre.

.3 12.5mm plywood on construction side. Painted on construction side as follows:

.1 One coat primer and one coat interior paint. Maintain construction side of hoarding clean and in good repair until removed.

.1 Colour by: Contract Administrator.

.4 12.5mm gypsum board on publicly occupied side. Complete with finished joints and painted on occupied side as follows:

.1 One coat primer and one coat interior paint. Maintain public side of hoarding clean and in good repair until removed.

.1 Colour by: Contract Administrator.

.5 Insulate with fibreglass batt insulation to fill wall stud space.

1.5 WEATHER ENCLOSURES

.1 Provide weather tight enclosures to unfinished window openings, tops of shafts and other openings in floors and roofs.

.2 Provide weather enclosures to protect floor areas where walls are not finished and to enclose work areas that require temporary heating.

.3 Design weather enclosures to withstand wind pressure and snow loading requirements.

1.6 DUST TIGHT SCREENS AND PARTITIONS

.1 In accordance with dust control plan specified in Section 01 35 29 – Safety Procedures.

.2 Provide dust tight screens and partitions to localize interior building areas from dust generating activities.

.3 Erect, maintain, and relocate screens and partitions as required to facilitate construction operations and the City's operational requirements.

1.7 FIRE ROUTES

.1 Maintain fire access routes, including overhead clearances, for use by emergency response vehicles.

1.8 PROTECTION OF BUILDING FINISHES

.1 Provide necessary temporary barriers and enclosures to protect existing and completed or partially completed finished surfaces from damage during performance of the Work.

1.9 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.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 TEMPORARY CONTROLS - GENERAL

.1 Provide temporary controls as necessary for performance of the Work and in compliance with applicable regulatory requirements.

.2 Maintain temporary controls in good condition for the duration of the Work.

.3 Remove temporary controls and Construction Equipment used to provide temporary controls from place of the Work when no longer required.

1.2 DUST AND PARTICULATE CONTROL

.1 In accordance with dust control plan specified in Section 01 35 29 – Safety Procedures.

.2 Execute Work by methods that minimize dust from construction operations and spreading of dust and debris on site or to adjacent properties.

.3 Provide temporary enclosures to prevent:

.1 Extraneous materials resulting from sandblasting or similar operations from contaminating air beyond immediate work area.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

.5 Use appropriate covers on trucks hauling fine, dusty, or loose materials.

1.3 DEWATERING

.1 Provide temporary drainage and pumping as necessary to dewater parts of the Work. Maintain such areas free of water arising from rain and surface run-off, as required to keep them stable, dry, and protected from damage due to flooding.

.2 Maintain standby equipment necessary to ensure continuous operation of dewatering system.

.3 Do not pump water containing suspended materials or other harmful substances into waterways, sewers or surface drainage systems. Treat or dispose of such water in accordance with applicable regulatory requirements

1.4 POLLUTION CONTROL

.1 Take measures to prevent contamination of soil, water, and atmosphere through uncontrolled discharge of noxious or toxic substances and other pollutants, potentially causing environmental damage.

.3 .3 Be prepared, by maintaining appropriate materials, equipment, and trained personnel on site, to intercept, clean up, and dispose of spills or releases that may occur. Promptly report spills and releases that may occur to:

.1 Authority having jurisdiction,

.2 Person causing or having control of pollution source, if known, and

.3 The City and Contract Administrator.

.4 Contact manufacturer of pollutant, if known and applicable, to obtain safety data sheets (SDS) and ascertain hazards involved and precautions and measures required in cleanup or mitigating actions.

.5 Take immediate action to contain and mitigate harmful effects of the spill or release.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 GENERAL

.1 Provide products that are not damaged or defective, and suitable for purpose intended, subject to specified requirements. If requested by the Contract Administrator, furnish evidence as to type, source and quality of products provided.

.2 Unless otherwise specified, maintain uniformity of manufacture for like items throughout.

.3 Permanent manufacturer's markings, labels, trademarks, and nameplates on products are not acceptable in prominent locations, except where required by regulatory requirements or for operating instructions, or when located in mechanical or electrical rooms.

.4 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.

.5 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.

.6 Should disputes arise as to quality or fitness of products, decision rests strictly with the Contract Administrator based upon requirements of Contract Documents.

1.2 PRODUCT OPTIONS

.1 Product options are subject to the provisions of B7 - Substitutes and are to be requested during bidding stage only:

.1 Wherever a product or manufacturer is specified by a single proprietary name, provide the named product only.

.2 Wherever more than one product or manufacturer is specified by proprietary name for a single application, provide any one of the named products.

.2 Wherever a product is specified by reference to a standard only, provide any product that meets or exceeds the specified standard. If requested by the Contract Administrator, submit information verifying that the proposed product meets or exceeds the specified standard.

.3 Wherever a product is specified by descriptive or performance requirements only, provide any product that meets or exceeds the specified requirements. If requested by the Contract Administrator, submit information verifying that the proposed product meets or exceeds the specified requirements.

.4 Wherever a product is specified by descriptive or performance requirements and specific products are identified as basis of design, provide the product identified as the basis of design or any product that meets or exceeds the specified requirements. If requested by the Contract Administrator, submit information verifying that a proposed product not identified as a basis of design meets or exceeds the specified requirements.

1.3 PRODUCT AVAILABILITY AND DELIVERY TIMES

.1 Promptly upon Contract award and periodically during construction, review and confirm product availability and delivery times. Order products in sufficient time to meet the construction progress schedule and the Contract Time.

.2 If a specified product is no longer available or has become unavailable due to unforeseen circumstances, submit a substitution request in the format of an RFI, along with an

appended substitution request form located in Section 01 61 00.10 – Substitution Request Form. Product substitutions without cause and that should have been proposed during the bid stage as outlined in 1.2.1 will not be contemplated by the Contract Administrator.

.1 If the alternative product is accepted for use in the Contract for reasonable cause, the Contract Administrator will prepare a Proposed Change Notice (PCN) and associated Change Work Order (CWO) to document the product change.

.3 If delivery delays are foreseeable, for any reason, promptly notify the Contract Administrator.

.1 If a delivery delay is beyond Contractor's control, the Contract Administrator will provide direction.

.2 If a delivery delay is caused by something that was or is within Contractor's control, Contractor shall propose actions to maintain the construction progress schedule for the Contract Administrator's review and acceptance.

.4 In event of failure to notify the Contract Administrator at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Contract Administrator 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 Store, handle, and protect products during transportation to place of the Work and before, during, and after installation in a manner to prevent damage, adulteration, deterioration and soiling.

.2 Comply with manufacturer's instructions for storage, handling and protection.

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

.4 Comply with the requirements of the workplace hazardous materials information system (WHMIS 2015) regarding use, handling, storage, and disposal of hazardous materials, including requirements for labeling and the provision of safety data sheets (SDS).

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

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

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

.8 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.

.9 Remove and replace damaged products.

.10 Touch-up damaged factory finished surfaces to Contract Administrator's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Submitted by (Company Name):

Date Submitted:

Submitted by (Company Address):

Submitted by (Submitter Name):

Submitted by (Company Address):

Submitted by (submitter e-mail address):

Specification Section Name:

Specification Section No.:

Manufacturer Information

Manufacturer Name:

Manufacturer Telephone No.:

Manufacturer Address:

Manufacturer Website Address:

Reason for Substitution

Product Data and Performance:

Provide side-by-side comparison of specified and substitution product data including applicable standard reference. Provide Manufacturer Technical Data Sheet for both specified and substitute product as attachment to this form.

Information	Specified Product	Substitute Product
Manufacturer Name:		
Product Name:		
Performance Data	**Results**	**Results**
e.g. Compressive Strength	55 MPa to ASTM C496	55 MPa to ASTM C496

Substitute Product Limitations:

Provide summary of limitations of substitute product and modifications required to system design to accommodate substitution request.

Project References:

Provide minimum of three project references where substitute product has successfully been used.

Project	Location	Prime Consultant	Year Constructed

The undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all aspects to the specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts as applicable is available for the proposed substitution as for specified product.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule, and will not result in any increase in costs to the City except as expressly set out herein.
- Proposed substitution does not affect dimensions and functional clearances.
- No payment to the Contractor will be made for changes to building design, including the Contract Administrator's design, detailing and construction costs caused by substitution. Contractor responsible for all costs associated with the substitution.

Submitted by (Print): e-mail address:

Submitted by (signature): Telephone No.:

Company:

Address:

Part 1 General

1.1 EXISTING UTILITIES AND STRUCTURES

.1 Before commencing excavation, drilling or other Work, establish or confirm location and extent of all existing underground utilities and structures in work area.

.2 Promptly notify Contract Administrator if underground utilities, structures, or their locations differ from those indicated in Contract Documents or in available project information. The Contract Administrator will provide appropriate direction.

.3 Record locations of maintained, re-routed and abandoned utility lines.

.4 Notify, the City and utility companies of intended interruption of services and obtain required permission.

.5 Where Work involves connecting to existing services, give the City minimum 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions.

.6 Immediately advise the Contract Administrator and confirm findings in writing where the following conditions are encountered:

.1 Unknown services.

.2 Embedded electrical conduit.

.7 Protect, relocate or maintain existing active services.

1.2 VERIFICATION OF EXISTING CONDITIONS

.1 Where work specified in any Section is dependent on the work of another Section or Sections having been properly completed, verify that work is complete and in a condition suitable to receive the subsequent work.

.1 Commencement of work of a Section that is dependent on the work of another Section or Sections having been properly completed, means acceptance of the existing conditions.

.2 Verify that ambient conditions are suitable before commencing the work of any Section and will remain suitable for as long as required for proper setting, curing, or drying of Products used.

.3 Ensure that substrate surfaces are clean, dimensionally stable, cured and free of contaminants.

.4 Notify the Contract Administrator in writing of unacceptable conditions.

1.3 MANUFACTURER'S INSTRUCTIONS

.1 Install, erect, or apply Products in strict accordance with manufacturer's instructions.

.2 Notify the Contract Administrator, in writing, of conflicts between Contract Documents and manufacturer's instructions where, in Contractor's opinion, conformance with Contract Documents instead of the manufacturer's instructions may be detrimental to the Work or may jeopardize the manufacturer's warranty.

.1 Where conflicts exist, the more stringent instruction will be enforced

.3 Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.

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

.5 Provide manufacturer's representatives with access to the Work at all times. Render assistance and facilities for such access so that manufacturer's representatives may properly perform their responsibilities.

1.4 CONCEALMENT

.1 Conceal pipes, ducts, and wiring in floors, walls and ceilings in finished areas:

.1 After review by the Contract Administrator and authority having jurisdiction, and

.2 Where locations differ from those shown on Drawings, after recording actual locations on as-built drawings.

.2 Provide incidental furring or other enclosures as required.

.3 Notify the Contract Administrator in writing of interferences before installation.

1.5 FASTENINGS - GENERAL

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials unless otherwise specified or shown on Drawings.

.2 Prevent electrolytic action and corrosion between dissimilar metals and materials by using suitable non-metallic strips, washers, sleeves, or other permanent separators to avoid direct contact.

.3 Use non-corrosive fasteners and anchors for securing exterior work, in spaces where high humidity levels are anticipated and as shown on Drawings.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage.

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

.6 Do not use fastenings or fastening methods that may cause spalling or cracking of material to which anchorage is made.

1.6 FASTENINGS - EQUIPMENT

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

.2 Bolts shall not project more than one diameter beyond nuts.

1.7 FIRE RATED ASSEMBLIES

.1 When penetrating fire rated walls, ceiling, or floor assemblies, completely seal voids with fire-stopping materials, smoke seals, or both, in full thickness of the construction element as required to maintain the integrity of the fire rated assembly.

1.8 CUTTING AND PATCHING

.1 Provide supports and shoring as required to ensure structural integrity of surroundings; provide devices and methods to protect other portions of the Work from damage.

.2 Provide protection from elements for areas that may be exposed by uncovering work.

.3 Coordinate and perform the Work to ensure that cutting and patching work is kept to a minimum.

.4 Perform cutting, fitting, patching, and remedial work to make the affected parts of the Work come together properly and complete the Work.

.5 Perform excavation and fill to make the affected parts of the Work come together properly and complete the Work.

.6 Provide openings in non-structural elements of the Work for penetrations of mechanical and electrical work.

.7 Perform cutting by methods to avoid damage to other work

.8 Provide proper surfaces to receive patching, remedial work, and finishing.

.9 Perform cutting, patching, and remedial work using competent and qualified specialists familiar with the Products affected, in a manner that neither damages nor endangers the Work.

.1 Provide cutting to clean true lines.

.10 Do not use pneumatic or impact tools without the Contract Administrator's prior approval.

.11 Ensure dust containment during cutting, patching and remedial work in accordance with Contract Documents.

.12 Ensure that cutting, patching, and remedial work does not jeopardize manufacturers' warranties.

.13 Refinish surfaces to match adjacent finishes. For continuous surfaces refinish to nearest intersection. For an assembly, refinish entire unit.

.14 Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces with suitable allowance for deflection, expansion, contraction, acoustic isolation, and firestopping.

.15 Maintain fire ratings of fire rated assemblies where cutting, patching, or remedial work is performed. Completely seal voids or penetrations of assembly with firestopping material to full depth or with suitably rated devices.

1.9 PROTECTION OF COMPLETED WORK AND WORK IN PROGRESS

.1 Adequately protect parts of the Work completed and in progress from any kind of damage.

.2 Promptly remove, replace, clean, or repair, as directed by the Contract Administrator, work damaged as a result of inadequate protection.

.3 Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the safety or integrity of the Work.

1.10 REMEDIAL WORK

.1 Notify the Contract Administrator of, and perform remedial work required to, repair or replace defective or unacceptable work. Ensure that properly qualified workers perform remedial work. Coordinate adjacent affected work as required.

.2 Unless otherwise specified, when replacing existing or previously installed Products in the course of cutting and patching work, use replacement Products of the same character and quality as those being replaced.

.3 Perform remedial work in accordance with Contract Documents.

.4 Where remedial work is not covered by Contract Documents, perform remedial work by specialists familiar with materials affected. Perform in a manner that does not:

.1 Cause damage to existing Work.

.2 Put existing Work at risk of damage/failure.

.3 Impact the warranty of existing Work.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies the cleaning and waste management requirements to be adhered to through the course of the Work.

1.2 REGULATORY REQUIREMENTS

.1 Comply with applicable regulatory requirements when disposing of waste materials.

.2 Obtain permits from authorities having jurisdiction and pay disposal fees where required for disposal of waste materials and recyclables.

1.3 GENERAL CLEANING REQUIREMENTS

.1 Provide adequate ventilation during use of volatile or noxious substances.

.1 Do not rely on building ventilation systems for this purpose.

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

.3 Prevent cross-contamination during the cleaning process.

.4 Notify the Contract Administrator of the need for cleaning caused by the City or other contractors.

1.4 PROGRESSIVE CLEANING AND WASTE MANAGEMENT

.1 Maintain the Work in a tidy and safe condition, free from accumulation of waste materials and construction debris.

.2 Provide appropriate, clearly marked, containers for collection of waste materials and recyclables.

.1 Locate containers:

.1 Where indicated during the pre-construction meeting.

.3 Remove waste materials and recyclables from work areas, separate, and deposit in designated containers at end of each Working Day. Collect packaging materials for recycling or reuse.

.4 Remove waste materials and recyclables from place of the Work at regular intervals.

.5 Clean interior building areas prior to start of finish work and maintain free of dust and other contaminants during finishing operations.

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

1.5 FINAL CLEANING

.1 Remove from Place of the Work surplus Products, waste materials, recyclables, temporary work, and construction equipment not required to perform any remaining work.

.2 Re-clean as necessary areas that have been accessed by Contractor’s workers.

.3 Remove stains, spots, marks, and dirt from finished surfaces, electrical and mechanical fixtures, furniture fitments, walls, floors and other surfaces within Work area.

.4 Remove dust from lighting reflectors, lenses, lamps, bulbs, and other lighting surfaces within Work area.

.5 Remove stains, spots, marks, and dirt from exterior facades within Work area.

.6 Clean exterior window glass and frames within Work area.

.7 Clean and sweep roofs and clear roof drains within Work area.

.8 Broom clean and wash exterior walks, steps and surfaces within extents of Work area.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Dispose of waste materials and recyclables at appropriate municipal landfills and recycling facilities in accordance with applicable regulatory requirements.

.2 Do not burn or bury waste materials at place of the Work.

.3 Do not dispose of volatile and other liquid waste such as mineral spirits, oil, paints and other coating materials, paint thinners, cleaners, and similar materials together with dry waste materials or on the ground, in waterways, or in storm or sanitary sewers. Collect such waste materials in appropriate covered containers, promptly remove from place of the Work, and dispose of at recycling facilities or as otherwise permitted by applicable regulatory requirements.

.4 Cover or wet down dry waste materials to prevent blowing dust and debris.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 Procedures and requirements for Substantial Performance of the Work and Total Performance of the Work.

1.2 SUBMITTALS

.1 Substantial Performance:

.1 Submit a written application for review of substantial performance, including attachments specified in this section in electronic PDF format via e-mail.

.2 Submit to:

.1 The Contract Administrator:

.1 In accordance with Part D – Supplementary Conditions.

.2 Contract administration: contractadmin@crosierkilgour.com.

.2 The City's project manager at e-mail address identified at the pre-construction meeting.

.2 Total Performance:

.1 Submit a written application for review of Total Performance, including attachments specified in this section in electronic PDF format via e-mail.

.2 Submit to:

.1 The Contract Administrator:

.1 In accordance with Part D – Supplementary Conditions.

.2 Contract administration: contractadmin@crosierkilgour.com.

.2 The City's project manager at e-mail address identified at the pre-construction meeting.

1.3 SUBSTANTIAL PERFORMANCE OF THE WORK

.1 The prerequisites to, and the procedures for, attaining substantial performance of the Work, or similar such milestone as provided for in the lien legislation applicable to the Place of the Work, shall be:

.1 In accordance with the lien legislation applicable to the place of the Work.

.2 As specified in this section.

.2 Further to Part D – Supplementary Conditions, the Contractor shall:

.1 Contractor's Inspection:

.1 Before applying for the Contract Administrator's review to establish Substantial Performance:

.1 Ensure that the specified prerequisites to Substantial Performance of the Work are completed,

.2 Conduct an inspection of the Work to identify defective, deficient, or incomplete work,

.3 Prepare a comprehensive and detailed list of items to be completed or corrected, and

.4 Provide an anticipated schedule and costs for items to be completed or corrected.

.2 Contract Administrator's Review:

.1 Submit to the Contract Administrator a written application for review of Substantial Performance.

.2 Include the following in the application:

.1 Project name and City tender number,

.2 Name of contractor submitting the request,

.3 Description of the Work Substantial Performance is being requested,

.4 Date request submitted,

.5 Date review requested, and

.6 Results of Contractor Inspection, including:

.1 List of items to be completed or corrected.

.2 Verification that items have been completed or corrected, or

.3 Schedule and costs for items to be completed or corrected.

.3 Upon receipt of the Contractor's application for review, together with the Contractor's list of items to be completed or corrected, the Contract Administrator, the City, and the Contractor shall jointly review the Work being requested for Substantial Performance.

.4 The Contract Administrator will advise the Contractor whether or not the Work is considered to have attained Substantial Performance. The Contract Administrator will add additional items, if any, to the Contractor's list of items to be completed or corrected. Provide the Contract Administrator with a copy of the revised list.

.5 Maintain the list of items to be completed or corrected and promptly correct or complete defective, deficient and incomplete work. The Contractor's inspection and Contract Administrator's review procedures specified above shall be repeated until the Work is considered to have attained Substantial Performance and no items remain on the Contractor's list of items to be completed or corrected.

.6 When the Contract Administrator determines that the Work has attained Substantial Performance, the Contract Administrator will issue a Certificate of Substantial Performance for the Work.

.3 Certificate of Substantial Performance

.1 The Certificate of Substantial Performance will:

.1 Document deadline for application of liens and release of statutory holdback requirements in accordance with lien legislation applicable to the place of the Work.

1.4 TOTAL PERFORMANCE

.1 The prerequisites to attaining Total Performance of the Work are described in Part C - General Conditions and Part D – Supplementary Conditions.

.1 Completion of all close-out submittals in accordance with Section 01 78 00 – Close-out Submittals is considered a pre-requisite for Total Performance.

.2 Review Before Total Performance:

.1 Schedule a review for Total Performance as specified below upon completion of the prerequisites for Total Performance as specified in Part C - General Conditions and Part D – Supplementary Conditions.

.2 Contractor's Inspection:

.1 Before applying for the Contract Administrator's review to establish Total Performance:

.1 Review any previously issued Certificates of Substantial Performance and associated lists of items for completion and correction.

.1 Ensure items on lists are now complete.

.2 Create an updated list of items to be completed or corrected.

.2 Ensure that the specified prerequisites to Total Performance are completed.

.3 Conduct an inspection of the Work to identify defective, deficient, or incomplete work.

.4 Prepare a comprehensive and detailed list of items to be completed or corrected.

.5 Provide an anticipated schedule and costs for items to be completed or corrected.

.3 Contract Administrator's Review:

.1 Submit a written application for review of Total Performance.

.2 Include the following in application:

.1 Project name and City tender number,

.2 Name of Contractor submitting the request,

.3 Date request submitted,

.4 Date review requested, and

.5 Results of Contractor Inspection, including:

.1 Updated lists from previously issued Certificates of Substantial Performance.

.2 List of items to be completed or corrected.

.3 Verification that items have been completed or corrected, or

.4 Schedule and costs for items to be completed or corrected.

.6 Verification of Contract Administrator's final review of closeout submittals in accordance with Section 01 78 00 – Closeout Submittals.

.3 Upon receipt of the Contractor's application for review, together with the Contractor's list of items to be completed or corrected and verifications of completed pre-requisites for Total Performance, the Contract Administrator, the City, and the Contractor shall jointly review the Work for Total Performance.

.4 The Contract Administrator will advise the Contractor whether or not the Work has attained Total Performance. Add additional items, if any, to the Contractor's list of items to be completed or corrected. Provide the Contract Administrator with a copy of the revised list.

.1 Include on the list verifications for the following if required by the Contract Documents:

.1 Close-out submittals.

.5 Maintain the list of items to be completed or corrected and promptly correct or complete defective, deficient and incomplete work.

.6 The Contractor's inspection and Contract Administrator's review procedures specified above shall be repeated until the Work attains Total Performance and no items remain on the Contractor's list of items to be completed or corrected.

.7 When the Contract Administrator determines that the Work has attained Total Performance, the Contract Administrator will issue a Certificate of Total Performance.

.3 Certificate of Total Performance:

.1 The Certificate of Total Performance will document the:

.1 Date of Total Performance, and

.2 Commencement of warranty period.

1.5 FINAL PAYMENT

.1 In accordance C12.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 OPERATION AND MAINTENANCE MANUAL

.1 Prepare a comprehensive operation and maintenance manual, in the English language, using personnel qualified and experienced for this task.

.2 Submissions:

.1 Draft version:

.1 Submit an initial draft of the operation and maintenance manual in electronic PDF format to:

.1 The Contract Administrator:

.1 In accordance with Part D – Supplementary Conditions.

.2 Contract administration: contractadmin@crosierkilgour.com.

.2 If required by Contract Administrator review comments, revise manual contents and resubmit for Contract Administrator review. If required, repeat this process until the Contract Administrator returns the submittal with no additional change comments.

.3 Schedule draft submission to Contract Administrator to allow:

.1 Minimum seven (7) Calendar days for each Contract Administrator review.

.2 Preparation and submission of the final version before the specified date of Total Performance.

.2 Final version:

.1 Upon Contract Administrator return of the draft version with no additional change comments, prepare the final version.

.2 Submit final version:

.1 In electronic PDF format to:

.2 The Contract Administrator:

.1 In accordance with Part D – Supplementary Conditions.

.2 Contract administration: contractadmin@crosierkilgour.com.

.3 Hard copies: Provide three (3) bound hard copy sets to the Contract Administrator in accordance with Part D – Supplementary Conditions.

.3 Submit before the specified date of Total Performance in the Contract.

1.2 OPERATION AND MAINTENANCE MANUAL FORMAT

.1 Organize data in the form of an instructional manual.

.2 Binders: vinyl, hard covered, three D-rings, loose leaf, 216 x 279 mm (8.5” x 11”), with spine and face pockets.

.3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

.4 Binder cover and title sheet:

Operation and Maintenance Manual
City of Winnipeg
7 Oaks Pool
Pool Renewal

City of Winnipeg

Contract Administrator: Crosier Kilgour

Contractor: Insert name of Contractor.

Date of Submission

.5 Arrange content by Section number and sequence of Table of Contents.

.6 Table of Contents:

.1 Title of project;

.2 Date of submission;

.3 Contact Information:

.1 Table 1 – Primary: names, addresses, telephone numbers and name of responsible parties for:

.1 City of Winnipeg.

.2 Contract Administrator.

.3 Contractor.

.2 Table 2 – Secondary: names, addresses, telephone numbers and name of responsible parties for:

.1 Sub-consultants, including field of expertise.

.2 Sub-contractors, including scope of work.

.4 Schedule of products indexed by specification section:

.1 Sub-divide each section with the following:

.1 Shop Drawings.

.2 Product Data/brochures.

.1 Supplement product data with typewritten text in format and style consistent with document.

.3 Permits, certificates, letters of assurance and other relevant documents issued by or required by authorities having jurisdiction.

.4 Test reports.

.5 Warranties.

.6 Manufacturer use, care and cleaning instructions.

.7 Training materials.

.7 Provide tabbed fly leaf for each separate Section, with typed description of Product and major component parts of equipment,

.8 Text: Manufacturer's printed data, or typewritten data, and

.9 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.3 OPERATION AND MAINTENANCE MANUAL – GENERAL CONTENT

.1 Table of contents for each volume.

.2 Introductory information including:

.1 Date of manual submission.

.2 Complete contact information for Contract Administrator, subconsultants, other consultants, and Contractor, with names of responsible parties.

.3 Schedule of Products and systems indexed to content of volume.

.3 For each Product or system, include complete contact information for Subcontractors, Suppliers and manufacturers, including local sources for supplies and replacement parts.

.4 Product Data: mark each sheet to clearly identify specific products, options, and component parts, and data applicable to installation. Delete or strike out inapplicable information. Supplement with additional information as required.

.5 Reviewed Shop Drawings.

.6 Permits, certificates, letters of assurance and other relevant documents issued by or required by authorities having jurisdiction.

.7 Warranties.

.8 Operating and maintenance procedures, incorporating manufacturer's operating and maintenance instructions, in a logical sequence.

1.4 OPERATION AND MAINTENANCE MANUAL - WARRANTIES CONTENT

.1 Separate each warranty with index tab sheets keyed to table of contents listing.

.2 List each warrantor with complete contact information.

.3 Verify that documents are in proper form and contain full information. Ensure that warranties are for the correct duration and are in the City's name.

1.5 SPARE PARTS, MAINTENANCE MATERIALS, AND SPECIAL TOOLS

.1 Supply spare parts, maintenance materials, and special tools in quantities specified in technical Specifications sections.

.2 Ensure spare parts and maintenance materials are new, not damaged nor defective, and of same quality, manufacturer, and batch or production run as installed Products.

.3 Provide tags for special tools identifying their function and associated Product.

.4 Deliver to and store items at a location directed by the Contract Administrator at place of the Work. Store in original packaging with manufacturer's labels intact and in a manner to prevent damage or deterioration.

.5 Catalogue all items and submit to Contract Administrator an inventory listing organized by Specifications section. Include Contract Administrator reviewed inventory listing in operation and maintenance manual.

1.6 AS-BUILT DRAWINGS

.1 Mark-up drawings and label as "As-Built" drawings in accordance with Section 01 32 00 – Construction Progress Documentation.

.2 Scan marked-up "As-Built" drawings and submit in electronic PDF format to the Contract Administrator:

.1 In accordance with Part D – Supplementary Conditions.

.2 Contract administration: contractadmin@crosierkilgour.com.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Methods and procedures for deconstruction of structures and parts of structures.

1.2 REFERENCES

.1 Reference Standards:

.1 Manitoba Regulation 217/2006, Workplace Safety and Health Regulation.

1.3 MEASUREMENT PROCEDURE

.1 No measurement will be made for demolition of items to facilitate Work identified as a lump sum price component.

.2 Include demolition costs for demolition required to facilitate Work identified as a unit price component under the appropriate unit price.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Train workers and subcontractors to carry out work in accordance with appropriate deconstruction techniques.

.2 Project supervisor to have previous deconstruction experience and must be present on site throughout project.

1.5 POOL TANK EMPTYING AND FILLING CONFERENCE

.1 In accordance with Section 01 31 19 – Project Meetings.

1.6 SITE CONDITIONS

.1 Hazardous Materials:

.1 Should material resembling asbestos or other hazardous material be encountered, stop work, take preventative measures, and notify the Contract Administrator immediately.

.1 Do not proceed until written instructions have been received from the Contract Administrator.

.2 Notify the Contract Administrator before disrupting building access or services.

.2 Existing Conditions:

.1 Ensure that materials, equipment and procedures safely supporting existing structure and construction live loads; that allow work to be accomplished and that minimize risk of damage to historic and archaeological elements.

.2 Protect entrance and egresses to the building.

.3 Vehicle and barrier free access to the building entrances and exits must be maintained at all times during the course of the work.

.4 The City must be given a minimum seven days advance notice prior to commencement of repairs.

.3 Dust Control Plan: in accordance with Section 01 35 29 – Safety Procedures.

.4 Protection:

.1 Protect existing structures and services designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of the Contract Administrator and at no cost to the City.

.2 In all circumstances ensure that demolition work does not adversely affect adjacent areas and operations below Work Area.

.3 Do not dispose of waste of volatile materials such as, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout the project.

.4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.

.5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.

.6 Prevent movement, settlement or damage of adjacent structures, services. Provide bracing, shoring. Repair damage caused by deconstruction.

.7 Support affected structures and, if safety of structure being deconstructed and adjacent structures appears to be endangered, take preventative measures. Cease operations and immediately notify the Contract Administrator.

.8 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems.

Part 2 Products

2.1 EQUIPMENT

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

.2 Where possible use water efficient wetting equipment/attachments when minimizing dust.

.3 Protect existing items designated to remain and materials designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of the Contract Administrator and at no cost to the City.

.4 Demonstrate that tools are being used in manner which allows for salvage of materials in best condition possible.

.5 Locate and protect any utility lines which may be affected by the work and if necessary, notify utility companies before starting demolition.

.6 The parking deck has a structural live load capacity of 50 pounds per square foot; thus, equipment and stockpiling of material must not exceed this limit.

Part 3 Execution

3.1 EXAMINATION

.1 Before starting work, verify existing conditions and variations. Notify the Contract Administrator of discrepancies.

.2 Conduct inspection with the Contract Administrator to determine extent of masonry and concrete repair areas.

3.2 PREPARATION

.1 Remove items adjacent to area of demolition to provide clear workspace. Store in area designated by the Contract Administrator.

.2 Take pre-demolition photographs of Work Area prior to demolition.

.3 Pool tank emptying and filling:

.1 As specified in Part D – Supplementary Conditions, D2.1(b).

3.3 DISASSEMBLY

.1 Conduct demolition to minimize interference with adjacent building areas.

.2 Maintain protected, wheelchair accessible egress and access at all times to the building entrance.

.3 Remove debris created by the execution of the Work progressively from the site to appropriate disposal grounds. Do not damage adjacent finishes or surfaces.

.4 Do not disturb adjacent items designated to remain in place.

.5 Salvage Materials:

- .1 Carefully remove and store reusable site materials.
- .2 Dismantle items containing materials for salvage.
- .3 Stockpile salvaged materials at locations as approved by the Contract Administrator.

.6 Deconstruct in accordance with Manitoba Regulation 217/2006 and other applicable safety standards.

3.4 REMOVAL FROM SITE

.1 Transport material designated for disposal to approved facilities in accordance with applicable regulations.

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

3.5 CLEANING AND RESTORATION

.1 Keep site clean and organized throughout deconstruction.

.2 Upon completion of demolition, remove debris, trim surfaces and leave work site clean.

.3 Upon completion of project, reinstate parking surfaces, walkways, affected by Work to condition which existed prior to beginning of Work and match condition of adjacent, undisturbed areas.

.4 In addition to the progressive removal of waste materials and debris from building and site, leave the site clean, perform the following before final inspection by the Contract Administrator.

- .1 Spray-wash all exterior building finishes in construction area and any adjacent building areas soiled by the construction processes.
- .2 Broom clean and wash exterior walks, steps and platforms soiled from delivery or removal materials.
- .3 Remove all dirt and other disfigurations from exterior surfaces.
- .4 Sweep clean all paved areas.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

- .1 CSA-A23.1-09/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-O86S1-19 Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
- .3 CSA O121-17, Douglas Fir Plywood.
- .4 CSA O153-13, Poplar Plywood.
- .5 CSA O437 Series-93, Standards for OSB and Waferboard.
- .6 CSA S269.1-16, Falsework for Construction Purposes.
- .7 CAN/CSA-S269.3-M92, Concrete Formwork, National Standard of Canada.

1.2 MEASUREMENT PROCEDURES

.1 No measurement will be made under this Section. Include costs in items of work for which concrete formwork is required.

Part 2 Products

2.1 MATERIALS

.1 Formwork materials:

- .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CAN/CSA-O86, CSA O437 Series, and CSA-O153.
- .2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.

.2 Form ties:

- .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

.3 Form release agent: non-toxic, biodegradable, low VOC.

.4 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene.

.5 Falsework materials: to CSA-S269.1.

Part 3 Execution

3.1 FABRICATION AND ERECTION

.1 Fabricate and erect falsework in accordance with CSA S269.1.

.2 Refer to drawings for concrete members requiring architectural exposed finishes.

.3 Do not place shores and mud sills on frozen ground.

.4 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.5 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

.6 Align form joints and make watertight. Keep form joints to minimum.

.7 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

.8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.9 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.10 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Leave formwork in place for following minimum periods of time after placing concrete.

.1 Structural slab repairs: Three (3) days or the time it takes to reach 70% of the 28 day design strength, whichever is greater.

.2 Through-slab repairs: Three (3) days or the time it takes to reach 70% of the 28 day design strength, whichever is greater.

.3 Vertical grouting repairs: Three (3) or the time it takes to reach 20 MPa, whichever is greater.

.4 Vertical Form and Pour repairs: Three (3) or the time it takes to reach 20 MPa, whichever is greater.

.5 Miscellaneous curbs, pads, etc.: One (1) day.

.2 Remove formwork when concrete has reached 70% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.4 Space reshoring in each principal direction at not more than 3000 mm apart.

.5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Concrete reinforcing and dowels to complete concrete repairs as shown on Drawings and as supplemental to that shown on Drawings as directed by the Contract Administrator under Unit Price components.

1.2 REFERENCES

.1 ASTM International

.1 ASTM A1064/A1064M-24, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.2 ASTM A143/A143M-07 (2020), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.3 ASTM A775/A775M-22, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

.2 CSA International

.1 CSA-A23.1-19/A23.2-19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A23.3-19, Design of Concrete Structures.

.3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

.4 CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CAN/CSA-G164-18 (R2023), Hot Dip Galvanizing of Irregularly Shaped Articles.

.6 CSA W186-21, Welding of Reinforcing Bars in Reinforced Concrete Construction.

.3 Reinforcing Steel Institute of Canada (RSIC)

.4 RSIC-2020, Reinforcing Steel Manual of Standard Practice.

1.3 MEASUREMENT PROCEDURES

.1 No measurements for reinforcing steel will be made for concrete reinforcing and dowel installation identified as stipulated price work on Drawings. Include reinforcing steel costs in the lump sum price components of the work to which they correspond.

.2 No measurements for reinforcing steel will be made for concrete reinforcing and dowel installation identified as unit price work on Drawings. Include reinforcing steel costs shown on unit price repair details in the unit price repair type to which they correspond.

.3 Where the Contract Administrator directs supplemental reinforcing in addition to that shown on Drawings, the supplemental reinforcing unit price will apply in accordance with Section 01 22 00 – Unit Prices.

.4 Where the Contract Administrator directs supplemental reinforcing in addition to that shown on Drawings, the supplemental dowels unit price will apply in accordance with Section 01 22 00 – Unit Prices.

1.4 SUBMITTALS

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

.2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba.

.1 Indicate placing of reinforcement and:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by the Contract Administrator, with identifying code marks to permit correct placement without reference to structural drawings.

.5 Indicate sizes, spacings and locations of chairs, spacers and hangers.

.2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.

Part 2 Products

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by the Contract Administrator.

.2 Reinforcing steel: All reinforcing steel to be CAN/CSA-G30.18M grade 400R deformed bars except column ties and beam stirrups which shall be grade 400W.

.3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.

.4 Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M.

.5 Epoxy Coating of non-prestressed reinforcement: to ASTM A775/A775M.

.6 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/m².

.1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.

.2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.

.1 Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.

.3 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.

.1 In this case, no restriction applies to temperature of solution.

.1 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2. All accessories to be non-corroding.

.2 Mechanical splices: subject to approval of the Contract Administrator.

.3 Plain round bars: to CSA-G40.20/G40.21.

.4 Dowel adhesive: Acceptable products:

.1 Hilti HIT HY-200 by Hilti Canada.

.2 Sikadur AnchorFix 3001 by Sika Canada Inc.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.2 Obtain Contract Administrator's written approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of the Contract Administrator, weld reinforcement in accordance with CSA W186.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide the Contract Administrator with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.

.2 Upon request inform the Contract Administrator of proposed source of material to be supplied.

Part 3 Execution

3.1 PREPARATION

.1 Galvanizing to include chromate treatment.

.1 Duration of treatment to be 1 hour per 25 mm of bar diameter.

.2 Upon request, conduct bending tests to verify galvanized bar fragility in accordance with ASTM A143/A143M.

3.2 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by the Contract Administrator.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars, which develop cracks or splits.

3.3 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.

.2 Prior to placing concrete, obtain the Contract Administrator's approval of reinforcing material and placement.

.3 Ensure cover to reinforcement is maintained during concrete pour.

3.4 DOWELING PROCEDURES

.1 For bars that are indicated as being dowelled, drill in and grout bars into slab as follows:

.1 10M bars, 150 mm.

.2 15M bars, 200 mm.

.3 20M bars, 300 mm.

.2 Use only approved adhesive to manufacturer's instructions.

.3 Clean hole thoroughly prior to application of adhesive. Use injection or caulking gun to ensure that the adhesive fills the bottom of the hole prior to embedment of bar.

3.5 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of galvanized reinforcing steel with compatible finish to provide continuous coating.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This Section covers the removal of deteriorated concrete and surface preparation for the repair of deteriorated concrete resulting from reinforcing steel corrosion and is applicable to horizontal, vertical, and overhead repairs. Work in this Section includes:

.1 Removal geometry and configuration.

.2 Removal process.

.3 Edge preparation.

.4 Reinforcement repair.

.5 Surface preparation of the removal cavity prior to placing a repair material.

1.2 RELATED SECTIONS

.1 Section 03 10 00 – Concrete Forming and Accessories.

.2 Section 03 20 00 – Concrete Reinforcing.

.3 Section 03 92 12 – Top Surface Repairs with Rapid Setting Mortar

.4 Section 03 92 20 – Scaling Repairs

.5 Section 03 93 10 – Hand Patching

.6 Section 03 93 20 – Pressure Grouting

.7 Section 03 93 30 – Form and Pour

.8 Section 03 98 10 – Embedded Galvanic Anodes.

1.3 MEASUREMENT PROCEDURES

.1 No measurement of surface preparation of concrete delamination repair will be made for lump sum identified concrete repairs. Include costs for surface preparation in the appropriate lump sum concrete repair work.

.2 Concrete areas of repair as unit price repair will be identified and quantified in accordance with Section 01 22 00 – Unit Prices.

.3 Refer to applicable Sections for measurement procedures for each type of repair.

.4 Concrete direct pull-out tensile testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.5 Scanning of concrete for reinforcing steel to accommodate concrete testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

1.4 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA- A23.2-19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA A283-19, Qualification Code for Concrete Testing Laboratories.

.2 International Concrete Repair Institute (ICRI)

.1 ICRI Guideline No. 310.2R–2013, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.5 DEFINITIONS

.1 Delamination: A separation along a plane parallel to a surface as in the separation of a coating from a substrate or the layers of a coating from each other, or in the case of a concrete slab, a horizontal splitting, cracking, or separation of a slab in a plane roughly parallel to, and generally near, the upper surface.

.2 Laitance: A weak layer of cement and aggregate fines on a concrete surface that is usually caused by an overwet mixture, overworking the mixture or excessive finishing, underwater concrete placement, or combinations thereof.

.3 Sounding: A technique to evaluate the condition of hardened concrete by striking the surface with a hammer; sound concrete will exhibit a clear ringing sound, whereas dull or hollow sounds indicate delaminated areas.

.4 Spall: A fragment, usually in the shape of a flake, detached from a larger mass by a blow, by the action of weather, by pressure, or by expansion within the larger mass; a small spall involves a roughly circular depression not greater than 120 mm in depth and 150 mm in any dimension; a large spall, may be roughly circular or oval or in some cases elongated, is more than 20 mm in depth and 150 mm in greatest dimension

.5 Substrate: The layer immediately under a layer of different material to which it is typically bonded; an existing concrete surface that receives an overlay, partial-depth repair, protective coating, or some other maintenance or repair procedure.

.6 Surface Preparation: The process whereby a method or combination of methods is used to remove deteriorated or contaminated concrete and roughen and clean a substrate to enhance bond of a repair material or protective coating.

.7 Surface Profile: The topographic contour of the exposed surface of a material or substrate.

1.6 SUBMITTALS

.1 Qualification Statements:

.1 General:

.1 Submit the following information for each qualification statement project example:

.1 Name and location of project.

.2 Name and contact information for the:

.1 Building owner.

.2 Prime consultant.

.3 Name of prime contractor and site superintendent.

.4 Total contract value.

.5 Name of concrete restoration contractor and superintendent.

.6 Concrete restoration contract value.

.7 Date of construction.

.8 Description of prime project.

.9 Description of types of concrete restoration.

.2 Upon request by the Contract Administrator submit the following:

.1 Prime Contractor:

.1 Prime Contractor Qualification Statements:

.1 Minimum three project examples as prime contractor completed in the past five years demonstrating successful performance of the specified qualifications.

.2 Superintendent Qualification Statements:

.1 Minimum three project examples as a prime contractor site superintendent completed in the past five years demonstrating successful performance of the specified qualifications.

.2 Concrete Restoration Subcontractor:

.1 Concrete Restoration Subcontractor Qualification Statements:

.1 Minimum five examples of local projects as a concrete restoration subcontractor completed in the past three years demonstrating successful performance of the specified qualifications.

.2 Concrete Restoration Subcontractor Superintendent Qualification Statements:

.1 Minimum five examples of local projects as a concrete restoration subcontractor superintendent completed in the past three years demonstrating successful performance of the specified qualifications.

.3 Testing Agency:

.1 Certification confirming member in good standing with the Canadian Council of Independent Laboratories for the specified testing procedure(s).

1.7 QUALITY ASSURANCE

.1 Prime Contractor Qualifications:

.1 Prime Contractor:

.1 Engaged full time as a prime contractor with knowledge and experience in the risks, safety and environmental impacts involved in managing a concrete restoration subcontractor completing concrete restoration as required by these Contract Documents.

.2 Prime Contractor Superintendent:

.1 Experienced as a prime contractor site superintendent with knowledge and experience in the risks, safety and environmental impacts involved in supervising and coordinating a concrete restoration contractor completing concrete restoration as specified by these Contract Documents.

.2 Concrete Restoration Subcontractor Qualifications:

.1 Concrete Restoration Subcontractor:

.1 Engaged full time as a specialty concrete restoration subcontractor with knowledge and experience in the risks, technical, safety and environmental impacts involved in concrete restoration as required by these Contract Documents.

.2 Concrete Restoration Superintendent:

.1 Experienced as a specialty concrete restoration subcontractor site superintendent with knowledge and experience in the risks, technical, safety and environmental impacts involved in supervising and coordinating concrete restoration as specified by these contract documents.

.2 Successful completion of the Concrete Surface Repair Technician (CSRT) – Grade 1 Certification Program administered by the International Concrete Repair Institute (ICRI).

.3 Ensure all personnel involved with concrete restoration are adequately trained and familiar with the requirements of this and related concrete restoration sections.

.3 Testing agency Qualifications:

.1 Independent third party testing agency certified:

.1 In accordance with CSA A283, and

.2 By the Canadian Council of Independent Laboratories (CCIL) for the testing procedures specified in related concrete sections.

.4 Field Mock-ups:

.1 Complete a field mock-up for each type of repair. Locations to be site determined.

.2 Field mock-up shall be a minimum of 0.2m^2 and incorporate all aspects of the concrete surface preparation described in this Section. Trial repairs areas shall be chosen to include exposure of embedded reinforcing steel.

.3 Field mock-up areas shall be used as a standard against which subsequent work shall be judged.

1.8 PRE-INSTALLATION CONFERENCE

.1 In accordance with Section 01 31 19 – Project Meetings.

.2 Convene pre-installation conference for concrete restoration as specified by the following sections:

.1 Section 03 10 00 – Concrete Forming and accessories.
.2 Section 03 20 00 – Concrete Reinforcing.
.3 Section 03 92 12 – Top Surface Repairs with Rapid Setting Mortar.
.4 Section 03 92 20 –Scaling Repairs.
.5 Section 03 93 10 – Hand Patching.
.6 Section 03 93 20 – Pressure Grouting.
.7 Section 03 93 30 – Form and Pour.
.8 Section 03 98 10 – Embedded Galvanic Anodes.

Part 2 Products

2.1 EQUIPMENT

.1 Electric or pneumatic chipping hammers are to be used for demolition within the following limits:

.1 Initial bulk removal of delaminated concrete above corroded reinforcing steel: maximum 14 kg electric or pneumatic chipping hammers.

.2 Final removal and undercutting of reinforcing steel: maximum 1kg electric chipping hammers.

.3 Bulk removal of full depth repairs: electric or pneumatic jack hammers with weight ratings above 14kg may be used upon approval by the Contract Administrator.

.4 Chisel-type blades are to be used for removal only. Do not use pointed chisels for removal.

.2 Sandblast equipment shall consist of:

.1 Air compressor of sufficient capacity to drive the equipment and blast media selected.

.2 Blast media hopper (meters the media into the air stream passing through the hose and nozzle).

.3 Moisture and oil separators to insure clean, dry air supply.

.4 Blast nozzle and hose.

.5 Materials. The blast medium consistent with equipment, site conditions, and capable of obtaining specified surface profile.

.3 High pressure waterblast: capable of maintaining a sustained pressure of not less than 27,600 Kpa (4,000 psi).

Part 3 Execution

3.1 EXAMINATION

.1 The location number and extent of unit price repairs shown on Drawings are indicative only. Repairs areas will be identified on-site by the Contract Administrator in the presence of and with the assistance of the Contractor. The approximately periphery of the repair will be marked on the surface of the member and the location and extent recorded on drawings.

.2 Right-angle geometry avoiding re-entrant corners and obtain uniformity of depth.

.3 Allow time in the Schedule for survey and inspection work carried out by the Contract Administrator ahead of repairs. Provide sufficient safe access to enable review of all areas designated for repairs.

.4 Make available as required throughout the Contract labour to carry out the following under the direction of the Contract Administrator:

.1 Identification of repairs.

.2 Sample chipping and/or drilling.

.3 Operators for access equipment.

.5 Make available as required throughout the Contract equipment for the use of the Contract Administrator:

.1 Marking paint and chalk.

.2 Hammer and chain for sounding surveys.

.3 Tape measure.

3.2 PREPARATION

.1 All necessary measures shall be taken to provide protection to the general public, occupants of the building.

.2 Remove or protect all surface attachments (e.g. signs, notices, electrical fittings) from the areas to be repaired or from positions that obstruct access or which may be damaged from Work.

.3 Carefully store items removed during the course of the works. Reinstall when restoration work is complete.

.4 The Contractor shall make good or rectify any damage caused as a result of insufficient protection.

.5 Provide temporary access required to facilitate Work.

.6 The perimeter of the through-slab must be adequately shored. The Contractor is responsible for confirmation of shoring requirements prior to commencement of, and during demolition.

.1 Costs of shoring to be included in the unit price.

3.3 CONCRETE DELAMINATION REMOVAL

.1 Refer Drawing details.

.2 Remove all loose and or delaminated concrete above corroded reinforcing steel.

.3 Do not operate hammers or mechanical chipping tools at an angle in excess of 45° measured from the surface of the slab.

.4 Use chipping to extend concrete removal along reinforcing bars and ensure bars are completely free of corrosion and well bonded to the surrounding concrete. Notify the Contract Administrator of increases in areas.

.5 Where the bond between existing concrete and reinforcing steel or mesh has been destroyed (either by the concrete's deterioration or corrosion of the reinforcing steel) or if the chipping operation has caused more than 1/3 the periphery of a bar to be exposed for a distance of 150 mm or more, the concrete adjacent to the bar shall be removed by maximum 7kg electric chipping hammers to provide sufficient clearance between the reinforcement and concrete.

.1 Provide a minimum 20 mm clearance, or 6 mm larger than the largest aggregate in the repair material, whichever is greater.

.6 If non-corroded reinforcing steel is exposed, do not damage the bar’s bond to the surrounding concrete. If bond between the bar and concrete is destroyed, exposing the bar will be required.

.7 The perimeter of the areas marked as delaminated are to be saw cut to a depth of 12 mm). Feather edging is not permitted. If reinforcing steel is encountered, the saw depth must be immediately reduced as required. Check depth of the cut regularly.

.8 Ensure sawcut encompasses the boundaries of corrosion that have been established.

.9 Ensure the entire area within the saw cut is removed to a depth consistent with the type of repair and repair material specified in other Sections.

.10 Chip patch edges to provide a clean vertical edge along the patch perimeter to the required minimum depth.

.11 Conduct soundings to determine if any further unsound or delaminated concrete is present, which must be removed.

.12 After all delaminated, unsound, or loose material is removed, the Contractor shall request an inspection from the Contract Administrator. This inspection is to be completed in the presence of the Contractor and if any further Work is required, the Contractor is to complete it immediately. The purpose of this inspection is to provide assurance to the Contract Administrator that all loose material has been removed and the substrate is sound.

3.4 SURFACE PREPARATION OF CONCRETE AND REINFORCING STEEL

.1 Refer to Drawing details.

.2 Within 24 hours prior to infilling, remove loose and deteriorated concrete, laitance, dust, dirt, oil, and any other material that could interfere with the bond of the new concrete from the substrate by combination of the following methods:

- .1 Wire brush and vacuum,
- .2 Sandblast,
- .3 High pressure waterblast at a minimum 4,000 psi.

.3 Provide a uniform surface profile of ICRI-CSP-5 or better unless otherwise indicated on Drawings. Sample surfaces are available for inspection in the Contract Administrator's office. These samples will be used as the standard of acceptance.

.4 Surface preparation applies equally to any horizontal or vertical concrete surfaces to which the concrete is to bond.

.5 Exposed reinforcing steel to be cleaned to near white metal and totally free of rust for the full circumference of the bar.

.6 Secure any reinforcement which is loose by tying to other secured bars or by other methods approved by the Contract Administrator.

.7 Vacuum clean surface and/or air blast with oil free compressed air to remove residue and spent media created by surface preparation.

.8 Maintain substrate in a clean condition using polyethylene film until the patch material is ready to be placed.

.9 After all surface preparation is complete the Contractor shall request an inspection from the Contract Administrator to review the existing reinforcing steel. The purpose of this inspection is to provide assurance that all heavy corrosion and scale is removed from the bar. At that time, the Contract Administrator will review the condition of the reinforcing steel and determine if the addition of supplemental reinforcing steel will be required. At locations identified by the Contract Administrator, provide supplemental reinforcing steel to Section 03 20 00.

.10 Upon direction by the Contract Administrator, final clean the concrete substrate by high pressure waterblast at minimum 4,000 psi to remove any residual dust and dirt.

.11 Maintain substrate in a saturated condition for a period of not less than 8 hours prior to infilling. Do not allow the concrete surface to dry. If the concrete surface becomes wet and subsequently dries, the surface preparation and cleaning procedure must be repeated.

3.5 FIELD QUALITY CONTROL

.1 Coordinate site work and inspections with the Contract Administrator. Provide minimum 24 hours notice prior to each phase of the work.

.2 The Contract Administrator inspection to be completed at the following times:

- .1 Prior to demolition to identify and quantify repair locations and types.
- .2 Following initial demolition to confirm all loose, deteriorated, or unsound concrete has been removed from the substrate.
- .3 Following concrete substrate preparation to review concrete surface profile and condition of reinforcing steel.

.3 Direct pull-out tensile tests:

.1 Direct pull-out tensile tests of the substrate will be completed in accordance with CSA-A23.2-6B, Procedure A.

.2 Costs for direct pull-out tensile tests as a unit price in accordance with Section 01 22 00 – Unit Prices and Form B – Prices.

.3 Testing agency conducting direct pull-out tensile tests to be certified for CSA A23.2-6B (Procedure A) by the Canadian Council of Independent Laboratories (CCIL).

.4 Coordinate testing throughout the course of the work but not less than the following:

.1 Prior to demolition:

.1 Minimum of three (3) direct tensile tests from each of the following locations within the extents of work area:

.1 Top surface,

.2 Under slab (soffit),

.3 Tank side of tank walls, and

.4 Crawlspace side of tank walls.

.2 The purpose of the testing is to provide an estimate of the insitu tensile strength of the concrete substrate.

.3 Test locations will be chosen by the Contract Administrator which will correspond to locations which appear sound as determined by hammer and chain drag soundings.

.2 After demolition:

.1 Minimum of three (3) direct tensile tests from each of the following locations within the extents of work area:

.1 Top surface,

.2 Under slab (soffit),

.3 Tank side of tank walls, and

.4 Crawlspace side of tank walls.

.2 Where possible, test locations will be completed within a 16,400mm radius of the pre-demolition samples for comparison. Otherwise, test locations will be chosen by the Contract Administrator.

.3 After infilling:

.1 Refer to associated technical sections of each type of repair for requirements for direct pull-out tensile testing after infilling of repair.

.5 Prior to coring for direct pull-out tensile testing, scan substrate to ensure existing reinforcing will not be severed by the testing procedure.

.1 Contractor will be responsible for the following where existing reinforcing is severed by the test procedure at no additional cost to the City:

.1 Design repair and re-establishment of reinforcing procedure by a professional engineer licenced in the Province of Manitoba.

.2 Repair and re-establishment of reinforcing in accordance with the repair procedure.

.3 Submit repair procedure to the Contract Administrator for review prior to repair work proceeding.

.6 The tensile strength after completion of the surface preparation must be within 70% of the tests prior to demolition but not less than 1.0 MPa.

.7 The Contract Administrator reserves the right to take additional tests if concrete substrate is suspect.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 The top surface of slabs exhibiting extensive spalling and/or delamination are to be repaired by mechanical removal of the deteriorated concrete and infilling with a rapid-setting mortar.

.2 All spalling and/or delaminated concrete must be removed down to sound concrete in accordance with Section 03 91 10.

1.2 RELATED SECTIONS

.1 Section 03 10 00 – Concrete Forming and Accessories.

.2 Section 03 20 00 – Concrete Reinforcing.

.3 Section 03 91 10 – Surface Preparation of Concrete Delamination Repair.

.4 Section 03 93 10 – Hand Patching.

.5 Section 03 98 10 – Embedded Galvanic Anodes.

.6 Section 09 30 13 – Ceramic Tiling.

.7 Section 22 05 00 – Common Work Results for Plumbing.

.8 Section 26 05 26 – Grounding and Bonding.

1.3 MEASUREMENT PROCEDURES

.1 No measurements will be conducted for top surface concrete repairs shown on Drawings as Stipulated Price work. Include concrete restoration costs in the lump sum price component of the work to which they correspond.

.2 Top surface and through slab repairs identified as a unit price, will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.3 Concrete testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.4 Concrete direct pull-out tensile testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.5 Scanning of concrete for reinforcing steel to accommodate concrete testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

1.4 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA- A23.2-19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM C39/C39M-24, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

.2 ASTM C109/C109M-23, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. (50-mm) Cube Specimens).

.3 ASTM C191-21, Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle.

.4 ASTM C309-19, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.5 ASTM C496/C496M-17, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.

.6 ASTM C666/C666M-15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

.7 ASTM C672/C672M-12, Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals.

.8 ASTM C928/C928M-20a, Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs.

.9 ASTM C1202-22e1, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.

1.5 QUALITY ASSURANCE

.1 Qualifications: In accordance with Section 03 91 10 – Surface Preparation of Concrete Delamination Repair.

.2 Field Mock-up:

.1 Install field mock-up at Project site or pre-selected area of building or location approved by the Contract Administrator. Install material in accordance with this Section.

.2 Field mock-up will be standard for judging workmanship on remainder of Project.

.3 Manufacturer's representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.6 PRE-INSTALLATION CONFERENCE

.1 In accordance with Section 01 31 19 – Project Meetings.

.2 Convene and coordinate pre-installation conference for concrete restoration including the following sections:

.1 Section 03 91 10 – Surface Preparation for Concrete Delamination Repair.

.2 Section 03 10 00 - Concrete Forming and Accessories.

.3 Section 03 20 00 – Concrete Reinforcing.

.4 Section 03 98 10 – Embedded Galvanic Anodes.

.5 Section 09 30 13 – Ceramic Tiling.

.6 Section 22 05 00 – Common Work Results for Plumbing.

.7 Section 26 05 26 – Grounding and Bonding.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Comply with Section 01 61 00.

.2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

.4 Keep materials in manufacturer's original, unopened containers and packaging until installation.

.5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.8 PROJECT CONDITIONS

.1 Environmental Requirements:

.1 Ensure that substrate surface and ambient air temperature are minimum of 4°C and rising at application time and remain above 4°C for at least 24 hours after application. Ensure that frost or frozen surfaces are thawed and dry.

.2 Ensure that substrate surface and ambient air temperature are below of 32°C and remain below 32°C for at least 8 hours after application.

.3 Do not apply material if snow, rain, fog, and mist are anticipated within 12 hours after application. Allow surfaces to attain temperature and conditions specified before proceeding with application.

Part 2 Products

2.1 MATERIALS

.1 Rapid Setting Repair Mortar: One-component, shrinkage-compensated, cement-based mortar with extended working time for repairing horizontal concrete surfaces.

.1 Provide mortar material complying with the following requirements:

.1 Compliance: ASTM C928.

.2 Compressive Strength, ASTM C109, 2-inch (51-mm) cubes:

.1 3 Hours: 3,000 psi (21 MPa).

.2 1 Day: 6,000 psi (41 MPa).

.3 28 Days: 8,000 psi (55 MPa).

.3 Compressive Strength, ASTM C39, 3-inch by 6-inch (76-mm by 152-mm) cylinders:

.1 28 Days: 7,400 psi (51 MPa).

.4 Set Time, ASTM C191, 72 degrees F (22 degrees C):

.1 Initial: 50 minutes.

.2 Final: 80 minutes.

.5 Splitting Tensile Strength, ASTM C496:

.1 1 Day: 400 psi (3 MPa).

.2 28 Days: 450 psi (3 MPa).

.6 Freeze-Thaw Resistance, ASTM C666, Procedure A, at 300 cycles:

.1 100 percent relative dynamic modulus.

.7 Scaling Resistance, ASTM C672, at 25 cycles:

.1 Zero rating; no scaling.

.8 Length Change, ASTM C928:

.1 Drying Shrinkage: Minus 0.05 percent.

.2 Wetting Expansion: Plus 0.03 percent.

.9 Rapid Chloride Permeability, ASTM C1202:

.1 Less than 300 Coulombs.

.10 Coefficient of Thermal Expansion, CRD C39:

.1 6.8 x 10^{-6} in/in/degree F (12.6 x 10^{-6} cm/cm/degree C).

.2 Acceptable Product:

.1 SikaEmaco T 1061 by Sika.

2.2 ACCESSORIES

.1 Aggregate Extension: extend mortar material with washed, graded, 3/8 inch (10 mm), low-absorption, saturated surface-dry aggregate at mortar manufacturers recommended rates.

.1 For repair areas 50 – 100 mm in depth, the minimum recommended addition is 6.8 – 11.4 kg of 10 mm washed, graded, rounded, SSD, low-absorption, high-density aggregate per 22.7 kg bag.

.2 For areas greater than 100 mm in depth, the minimum recommended addition is 11.4 – 22.7 kg of 10 mm washed, graded, rounded, SSD, low-absorption, high-density aggregate per 22.7 kg bag.

.3 The maximum aggregate extension is 22.7 kg of pea gravel per bag.

.2 Evaporation retardant: Acceptable Product:

.1 Sikagard-50 ER by Sika at an application rate in accordance with manufacturer's written directions.

.3 Cure and sealing compound: to ASTM C309, Type 1.

.1 Acceptable product(s):

.1 Florseal WB by Sika Canada Inc. at an application rate in accordance with manufacturer's written directions.

Part 3 Execution

3.1 PREPARATION

.1 Protection: Protect adjacent Work areas and finish surfaces from damage during repair mortar application.

.2 Coordinate with the following sections for incorporating surface mounted fixtures and anchors, waterproofing, plumbing, grounding, and galvanic anode installation into the repair as shown on Drawings:

.1 Section 03 98 10 – Embedded Galvanic Anodes.

.2 Section 09 30 13 – Ceramic Tiling.

.3 Section 22 05 00 – Common Work Results for Plumbing.

.4 Section 26 05 26 – Grounding and Bonding.

.3 Surface Preparation:

.1 Complete concrete delamination repairs to 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.4 The repair area must be thoroughly cleaned and well soaked prior to infilling. The surface should be thoroughly wetted for a period of not less than two (2) hours. The repair areas shall be kept continuously wet until just before infilling. Any standing water must be removed prior to grouting.

.5 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.6 Obtain the Contract Administrator's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.

.7 Through slab repair forming:

.1 Provide formwork in accordance with Section 03 10 00 – Concrete Forming and Accessories to match existing profiles.

.2 Design and install formwork and shoring to accommodate the mass and pressure of the repair material.

.3 Securely anchor formwork to substrate. Size and space anchors to prevent deflection of the forms placement and curing.

.4 Construct forms to fit tightly against existing concrete surfaces. Seal around edge of formwork with sealant to prevent leakage during grouting.

.5 Anchors:

.1 Completely removable,

.2 Patch anchor holes with grout mixed to dry pack consistency, and

.3 Completely fill all anchor holes.

.6 A minimum of 30mm concrete cover over the primary reinforcing steel will be required, thus, an adjustment of the formwork such as a notch may be required to ensure sufficient cover.

.7 Provide drainage outlets in formwork for presoaking and, if beneath a soffit, provide air venting. Provide suitable access points to pour mixed repair mortar into place.

.8 Use form-release agent to facilitate removal of forms from cast material.

.9 Within two (2) hours immediately prior to placement of repair material, test formwork to determine watertightness. Completely fill formwork with clean water and let stand for not less than 15 minutes. Seal areas of leakage prior to placement of repair material. Re-test as required.

3.2 INFILLING PROCEDURES

.1 Obtain Contract Administrator's approval before placing repair material. Provide minimum 24 hours notice.

.2 Maintain the substrate in a saturated surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.3 Mixing of rapid-setting horizontal extended mortar:

.1 Mix materials in accordance with manufacturer's instructions.

.2 Ensure repair mortar is thoroughly mixed.

.3 Do not use free-fall mixers.

.4 Never mix partial bags.

.4 Bonding Slurry Application:

.1 Apply the bonding slurry consisting of neat rapid-setting mortar to a saturated surface dry (SSD) substrate with no standing water and dry to the touch. A SSD substrate typically exhibits a colour change of dark grey to light grey. Remove standing water by vacuuming.

.2 Scrub plastic slurry into substrate with stiff bristled broom or brush to produce a uniform thickness of 3mm over entire area.

.3 Place repair material while the bonding slurry is still plastic. Do not apply more slurry than can be covered with concrete before it dries. Do not retemper. If the bond slurry dries prior to placement of the concrete, removal of the dried slurry

will be required. The concrete substrate will then be cleaned and prepared in accordance with the requirements described in the previous sections.

.5 Immediately place repair material, into the prepared patch area from one side to the other. Work the repair material firmly into the bottom and sides of the patch, and underneath reinforcing steel, to assure good bond.

.6 Ensure that rate of placing is sufficient to complete proposed placing, finishing and curing operations within scheduled time. Limit batch sizes as required if placing procedures are slower than anticipated.

.7 Continuously consolidate and finish to matching elevations, ensuring patch thickness and required elevations are maintained.

.8 Ensure reinforcement, floor drains, inserts, etc. are not disturbed during concrete placement.

3.3 FINISHING

.1 Following consolidation and screeding, the surface shall be immediately bull-floated to close and smooth the surface.

.2 Apply evaporation retardant at manufacturers recommended coverage rate immediately following final finishing. Do not apply evaporation retardant during any finishing operation nor should it be worked into the surface.

.3 Protect freshly placed concrete from exposure to dust, debris and precipitation.

3.4 CURING

.1 Concrete repairs to be cured for a minimum of 3 days at 10°C.

.2 Immediately after final finishing, apply evaporation retardant to prevent drying shrinkage until the concrete has enough strength to support the placement of the wet burlap.

.3 Burlap to be thoroughly presoaked by immersing it in water for a period of at least 24 hours immediately prior to placement.

.4 Commence wet curing as soon as the surface will support the weight of the wetted burlap without deformation. Burlap to be applied in one layer with strips overlapping at least 75mm and be securely held in place without marring the concrete surface.

.5 Wet curing with burlap and water must be maintained throughout entire curing period.

.6 Workers shall not be allowed on the overlay for 12 hours after placement. Do not place load upon new concrete until curing period is over.

3.5 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Contract Administrator in accordance with CSA-A23.1 and Section 01 40 00 - Quality Requirements and as described herein.

.2 The Contractor will pay for costs of tests as a unit price in accordance with Section 01 22 00 – Unit Prices.

.3 Inspection or testing by the Contract Administrator will not augment or replace Contractor quality control nor relieve contractual responsibility.

.4 Flowable Grout Properties Testing:

.1 In accordance with CSA-A23.2-1B.

.2 Costs for tests as a unit price in accordance with Section 01 22 00 – Unit Prices and Form B – Prices.

.3 Testing agency conducting tests:

.1 To be certified for CSA A23.2-1B by the Canadian Council of Independent Laboratories (CCIL).

.2 To prepare test samples in accordance with ASTM C109.

.4 Frequency of tests:

.1 Not less than one test per 4m^2 of patching material placed and not less than one test for each day of placement.

.5 Direct pull-out tensile tests:

.1 Direct pull-out tensile (bond) tests of the substrate will be completed in accordance with CSA-A23.2-6B, Procedure A.

.2 Costs for direct pull-out tensile tests as a unit price in accordance with Section 01 22 00 – Unit Prices and Form B – Prices.

.3 Testing agency conducting direct pull-out tensile tests to be certified for CSA A23.2-6B (Procedure A) by the Canadian Council of Independent Laboratories (CCIL).

.4 Frequency of tests:

.1 Divide extent of work area into three equally sized areas and label as Phase 1, 2 and 3.

.2 Minimum three (3) tests within the first phase of repairs.

.3 Not less than one (1) bond test for each subsequent phase.

.4 The Contract Administrator reserves the right to direct additional bond tests to be conducted if concrete or bonding system is suspect.

.5 Prior to coring for direct pull-out tensile testing, scan substrate to ensure existing reinforcing will not be severed by the testing procedure.

.1 Scanning will be measured and paid as a Unit Price.

.2 Contractor will be responsible for the following where existing reinforcing is severed by the test procedure at no additional cost to the City:

.1 Design repair and re-establishment of reinforcing procedure by a professional engineer licenced in the Province of Manitoba.

.2 Repair and re-establishment of reinforcing in accordance with the repair procedure.

.3 Submit repair procedure to the Contract Administrator for review prior to repair work proceeding.

.6 Infilling of the core hole will be the responsibility of the Contractor. Unless otherwise directed by the Contract Administrator, repair in accordance with this Section or Section 03 93 10.

3.6 DEFECTIVE CONCRETE

.1 Defective concrete: bond strengths below minimum specified value, cracking, spalling, scaling and concrete not conforming to required lines, details, dimensions, tolerances, finishes or specified requirements.

.2 Repair or replacement of defective concrete will be determined by the Contract Administrator, based on the specifications and the above guidelines.

.3 Do not patch, fill, touch up, repair or replace exposed concrete except upon express direction of the Contract Administrator for each individual use.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This section covers the removal and replacement of scaled surface areas of the structural deck to provide a smooth surface.

.2 The scaling will be removed with a bush hammer and subsequently infilled with thin patching compound. Topping shall be removed and replaced using the same material, extended with aggregate.

1.2 RELATED SECTIONS

.1 Section 03 91 10 – Surface Preparation of Concrete Delamination Repair.

.2 Section 03 93 10 – Hand Patching.

.3 Section 03 98 10 – Embedded Galvanic Anodes.

.4 Section 09 30 13 – Ceramic Tiling.

.5 Section 22 05 00 – Common Work Results for Plumbing.

.6 Section 26 05 26 – Grounding and Bonding.

1.3 MEASUREMENT PROCEDURES

.1 No measurements will be conducted for scaling concrete repairs shown on Drawings as Stipulated Price work. Include concrete restoration costs in the lump sum price component of the work to which they correspond.

.2 Scaling repairs identified as a unit price, will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.3 Concrete testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.4 Concrete direct pull-out tensile testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.5 Scanning of concrete for reinforcing steel to accommodate concrete testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

1.4 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C109/C109M-23, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. (50-mm) Cube Specimens).

.2 ASTM C266-21, Standard Test Method for Time of Setting of Hydraulic-Cement Paste by Gillmore Needles.

.3 ASTM C309-19, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.4 ASTM C348-21, Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.

.5 ASTM C469/C469M-22, Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression.

.6 ASTM C496/C496M-17, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.

.7 ASTM C666/C666M-15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

.8 ASTM C672/C672M-12, Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals.

.9 ASTM C882/C882M-23, Standard Test Method for Bond Strength of Bonding Systems Used With Concrete By Slant Shear.

.10 ASTM C928/C928M-20a, Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs.

.11 ASTM C1202-22e1, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.

.2 Canadian Standards Association (CSA)

.1 CSA A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.3 International Concrete Repair Institute

.1 ICRI Guideline No. 310.2R–2013, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.5 QUALITY ASSURANCE

.1 Qualifications: In accordance with Section 03 91 10 – Surface Preparation of Concrete Delamination Repair.

.2 Field Mock-up:

.1 Install field mock-up at Project site or pre-selected area of building or location approved by the Contract Administrator. Install material in accordance with this Section.

.2 Field mock-up will be standard for judging workmanship on remainder of Project.

.3 Manufacturer's representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.6 PRE-INSTALLATION CONFERENCE

.1 In accordance with Section 01 31 19 – Project Meetings.

.2 Convene and coordinate pre-installation conference for concrete restoration including the following sections:

.1 Section 03 91 10 – Surface Preparation for Concrete Delamination Repair.

.2 Section 03 98 10 – Embedded Galvanic Anodes.

.3 Section 09 30 13 – Ceramic Tiling.

.4 Section 22 05 00 – Common Work Results for Plumbing.

.5 Section 26 05 26 – Grounding and Bonding.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Comply with Section 01 61 00.

.2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

.4 Keep materials in manufacturer's original, unopened containers and packaging until installation.

.5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.8 PROJECT CONDITIONS

.1 Environmental Requirements:

.1 Ensure that substrate surface and ambient air temperature are minimum of 4°C and rising at application time and remain above 4°C for at least 24 hours after application. Ensure that frost or frozen surfaces are thawed and dry.

.2 Ensure that substrate surface and ambient air temperature are below of 32°C and remain below 32°C for at least 8 hours after application.

.3 Do not apply material if snow, rain, fog, and mist are anticipated within 12 hours after application. Allow surfaces to attain temperature and conditions specified before proceeding with application.

Part 2 Products

2.1 MATERIALS

1. One-component high-performance, cementitious mortar that produces high-early strength and contains modified cement, aggregate, and additives meeting the following performance requirements:
   1. Properties
      .1 Complies with ASTM C928.
      .2 Compressive Strength, ASTM C109:
         .1 3 Hour: minimum 6 MPa
         .2 1 Day: minimum 30 MPa.
         .3 7 Days: minimum 50 MPa.
      .3 Set Time, ASTM C266, minimum 21°C:
         .1 Initial: 75 minutes or less
         .2 Final: 90 minutes or less.
      .4 Flexural Strength, ASTM C348:
         .1 1 Day: minimum 4 MPa.
         .2 7 Days: minimum 6 MPa.
      .5 Modulus of Elasticity at 28 days, ASTM C469: 35 ± 5 GPa.
      .6 Splitting Tensile Strength, ASTM C496:
         .1 1 Day: minimum 3.5 MPa.
         .2 7 Days: minimum 7.5 MPa.
      .7 Slant Shear Bond Strength, ASTM C882 Modified:
         .1 1 Day: minimum 12 MPa.
         .2 7 Days: minimum 20 MPa.
      .8 Rapid chloride permeability, AASHTO-T277/ASTM C1202: less than 1,000 coulombs.
      .9 Scaling Resistance (weight loss, lb/ft²), ASTM C672:
         .1 25 cycles: CaCl2: 0.003, NaCl: 0.067
         .2 50 cycles: CaCl2: 0.005, NaCl: 0.084
      .10 Freeze-Thaw Resistance, ASTM C666, (Procedure A) 100% Relative Dynamic Modulus at 300 cycles: 98.5.

2. Acceptable product:
   .1 SikaEmaco T 430, by Sika.

2.2 ACCESSORIES

.1 Evaporation retardant: Acceptable Product:

.1 Sikagard-50 ER by Sika at an application rate in accordance with manufacturer's written directions.

.2 Cure and sealing compound: to ASTM C309, Type 1.

.1 Acceptable product(s):

.1 Florseal WB by Sika Canada Inc. at an application rate in accordance with manufacturer's written directions.

Part 3 Execution

3.1 EXAMINATION

.1 Coordinate with the following sections for incorporating surface mounted fixtures and anchors, waterproofing, plumbing, grounding, and galvanic anode installation into the repair as shown on Drawings:

.1 Section 03 98 10 – Embedded Galvanic Anodes.
.2 Section 09 30 13 – Ceramic Tiling.
.3 Section 22 05 00 – Common Work Results for Plumbing.
.4 Section 26 05 26 – Grounding and Bonding.

3.2 SCALING REMOVAL PROCEDURES

.1 The Contract Administrator will mark out the perimeter of the scaled or debonded areas, which are to be removed as specified herein.

.2 The Contractor must saw-cut the perimeter of the scaled repair area to 6mm using wet cut methods. Removal of the scaled material shall be accomplished by the use of a short stroke electric chipping hammer with a sharp bush hammer bit to remove the surface scaling within the marked-out areas.

.3 Minimum depth of removal will be 6mm, and maximum depth will be 25mm for scaling repairs.

.4 Once the areas have been bush hammered, the Contractor must chain drag all areas to determine if any further unsound material is present, which must be removed.

.5 Once the areas are determined by the Contractor to be sound, request a final inspection from the Contract Administrator. This inspection shall be done in the presence of the Contractor, who shall complete any further work at the time of the inspection.

.6 Within 24 hours prior to infilling, remove loose and deteriorated concrete, laitance, dust, dirt, oil, and any other material that could interfere with the bond of the new concrete from the substrate by combination of the following methods:

.1 Wire brush and vacuum,
.2 Sandblast,
.3 High pressure waterblast at a minimum 4,000 psi.

.7 Provide a uniform surface profile of ICRI-CSP-5 or better unless otherwise indicated on Drawings. Sample surfaces are available for inspection in the Contract Administrator's office. These samples will be used as the standard of acceptance.

.8 Vacuum clean surface and/or air blast with oil free compressed air to remove residue and spent media created by surface preparation.

.9 Maintain substrate in a clean condition using polyethylene film until the overlay is ready to be placed.

3.3 INFILL PROCEDURE

.1 Obtain the Contract Administrator's approval before placing repair material. Provide minimum 24 hours notice.

.2 Maintain the substrate in a saturated surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.3 Mixing of rapid-setting horizontal mortar:

.1 Mix materials in accordance with manufacturer's instructions.

.2 Ensure repair mortar is thoroughly mixed.

.3 Do not use free-fall mixers.

.4 Never mix partial bags.

.4 Bonding Slurry Application:

.1 Apply the bonding slurry consisting of neat rapid-setting mortar to a saturated surface dry (SSD) substrate with no standing water and dry to the touch. A SSD substrate typically exhibits a colour change of dark grey to light grey. Remove standing water by vacuuming.

.2 Scrub plastic slurry into substrate with stiff bristled broom or brush to produce a uniform thickness of 3mm over entire area.

.3 Place repair material while the bonding slurry is still plastic. Do not apply more slurry than can be covered with concrete before it dries. Do not re-temper. If the bond slurry dries prior to placement of the concrete, removal of the dried slurry will be required. The concrete substrate will then be cleaned and prepared in accordance with the requirements described in the previous sections.

.5 Immediately place repair material, into the prepared patch area from one side to the other. Work the repair material firmly into the bottom and sides of the patch, and underneath reinforcing steel, to assure good bond.

.6 Ensure that rate of placing is sufficient to complete proposed placing, finishing and curing operations within scheduled time. Limit batch sizes as required if placing procedures are slower than anticipated.

.7 Continuously consolidate and finish to matching elevations, ensuring patch thickness and required elevations are maintained.

.8 Ensure reinforcement, floor drains, inserts, etc. are not disturbed during concrete placement.

3.4 FINISHING

.1 Following consolidation and screeding, the surface shall be immediately bull-floated to close and smooth the surface.

.2 Texture surface with a soft bristled broom to provide a non-slip broomed finish.

.3 Apply evaporation retardant at manufacturers recommended coverage rate immediately following final finishing. Do not apply evaporation retardant during any finishing operation nor should it be worked into the surface.

.4 Protect freshly placed concrete from exposure to dust, debris and precipitation.

3.5 CURING

.1 Concrete repairs to be cured for a minimum of 3 days at 10°C. Provide supplemental heat and hoarding as required throughout curing period.

.2 Immediately after final finishing, apply evaporation retardant to prevent drying shrinkage until the concrete has enough strength to support the placement of the wet burlap.

.3 Burlap to be thoroughly presoaked by immersing it in water for a period of at least 24 hours immediately prior to placement.

.4 Commence wet curing as soon as the surface will support the weight of the wetted burlap without deformation. Burlap to be applied in one layer with strips overlapping at least 75mm and be securely held in place without marring the concrete surface.

.5 Wet curing with burlap and water must be maintained throughout entire curing period.

.6 Workers shall not be allowed on the overlay for 12 hours after placement. Do not place load upon new concrete until curing period is over.

3.6 FIELD QUALITY CONTROL

.1 The Contractor will pay for costs of tests as a unit price in accordance with Section 01 22 00 – Unit Prices.

.2 Inspection or testing by the Contract Administrator will not augment or replace Contractor quality control nor relieve contractual responsibility.

.3 Flowable Grout Properties Testing:

- .1 In accordance with CSA-A23.2-1B.
- .2 Costs for tests as a unit price in accordance with Section 01 22 00 – Unit Prices and Form B – Prices.
- .3 Testing agency conducting tests:
  - .1 To be certified for CSA A23.2-1B by the Canadian Council of Independent Laboratories (CCIL).
  - .2 To prepare test samples in accordance with ASTM C109.
- .4 Frequency of tests:
  - .1 Not less than one test per 4m^2 of patching material placed and not less than one test for each day of placement.

.4 Direct pull-out tensile tests:

- .1 Direct pull-out tensile (bond) tests of the substrate will be completed in accordance with CSA-A23.2-6B, Procedure A.
- .2 Costs for direct pull-out tensile tests as a unit price in accordance with Section 01 22 00 – Unit Prices and Form B – Prices.

.3 Testing agency conducting direct pull-out tensile tests to be certified for CSA A23.2-6B (Procedure A) by the Canadian Council of Independent Laboratories (CCIL).

.4 Frequency of tests:

.1 Divide extent of work area into three equally sized areas and label as Phase 1, 2 and 3.

.2 Minimum three (3) tests within the first phase of repairs.

.3 Not less than one (1) bond test for each subsequent phase.

.4 The Contract Administrator reserves the right to direct additional bond tests to be conducted if concrete or bonding system is suspect.

.5 Prior to coring for direct pull-out tensile testing, scan substrate to ensure existing reinforcing will not be severed by the testing procedure.

.1 Scanning will be measured and paid as a Unit Price.

.2 Contractor will be responsible for the following where existing reinforcing is severed by the test procedure at no additional cost to the City:

.1 Design repair and re-establishment of reinforcing procedure by a professional engineer licenced in the Province of Manitoba.

.2 Repair and re-establishment of reinforcing in accordance with the repair procedure.

.3 Submit repair procedure to the Contract Administrator for review prior to repair work proceeding.

.6 Infilling of the core hole will be the responsibility of the Contractor. Unless otherwise directed by the Contract Administrator, repair in accordance with this Section or Section 03 93 10.

3.7 DEFECTIVE CONCRETE

.1 Defective concrete: bond strengths below minimum specified value, cracking, spalling, scaling and concrete not conforming to required lines, details, dimensions, tolerances, finishes or specified requirements.

.2 Repair or replacement of defective concrete will be determined by the Contract Administrator, based on the specifications and the above guidelines.

.3 Do not patch, fill, touch up, repair or replace exposed concrete except upon express direction of the Contract Administrator for each individual use.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Slab soffit areas, beams, columns, and walls exhibiting extensive spalling and/or delamination requiring localized repairs less than 50 mm in depth will be repaired by removing the deteriorated concrete, cleaning and preparing the substrate, and patching the area with a cementitious patching material

1.2 RELATED SECTIONS

.1 Section 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.2 Section 03 93 20 – Pressure Grouting.

.3 Section 03 98 10 – Embedded Galvanic Anodes.

.4 Section 09 30 13 – Ceramic Tiling.

.5 Section 22 05 00 – Common Work Results for Plumbing.

.6 Section 26 05 26 – Grounding and Bonding.

1.3 MEASUREMENT PROCEDURES

.1 No measurements will be conducted for hand patching concrete repairs shown on Drawings as Stipulated Price work. Include concrete restoration costs in the lump sum price component of the work to which they correspond.

.2 Hand patching repairs identified as a unit price, will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.3 Concrete testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.4 Concrete direct pull-out tensile testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.5 Scanning of concrete for reinforcing steel to accommodate concrete testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

1.4 REFERENCES

.1 American Concrete Institute (ACI)

.1 ACI 546-04, Concrete Repair Guide.

.2 ACI RAP-6, Vertical and Overhead Spall Repair by Hand Application.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM C109/C109M-23, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. (50-mm) Cube Specimens).

.1 ASTM C157/C157M-17, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.

.2 ASTM C309-19, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.3 ASTM C469/C469M-22, Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression.

.4 ASTM C666/C666M-15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

.5 ASTM C672/C672M-12, Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals.

.3 Canadian Standards Association (CSA)

.1 CSA A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

1.5 QUALITY ASSURANCE

.1 Qualifications: In accordance with Section 03 91 10 – Surface Preparation of Concrete Delamination Repair.

.2 Field Mock-up:

.1 Install field mock-up at Project site or pre-selected area of building or location approved by the Contract Administrator. Install material in accordance with this Section.

.2 Field mock-up will be standard for judging workmanship on remainder of Project.

.3 Manufacturer’s representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

.4 aspects; surface preparation, repair, and workmanship.

1.6 PRE-INSTALLATION CONFERENCE

.1 In accordance with Section 01 31 19 – Project Meetings.

.2 Convene and coordinate pre-installation conference for concrete restoration including the following sections:

.1 Section 03 91 10 – Surface Preparation for Concrete Delamination Repair.

.2 Section 03 98 10 – Embedded Galvanic Anodes.

.3 Section 09 30 13 – Ceramic Tiling.

.4 Section 22 05 00 – Common Work Results for Plumbing.

.5 Section 26 05 26 – Grounding and Bonding.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Comply with Section 01 61 00.

.2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

.4 Keep materials in manufacturer’s original, unopened containers and packaging until installation.

.5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.8 PROJECT CONDITIONS

.1 Environmental Requirements:

.1 Ensure that substrate surface and ambient air temperature are minimum of 4°C and rising at application time and remain above 4°C for at least 24 hours after application. Ensure that frost or frozen surfaces are thawed and dry.

.2 Ensure that substrate surface and ambient air temperature are below of 32°C and remain below 32°C for at least 8 hours after application.

.3 Do not apply material if snow, rain, fog, and mist are anticipated within 12 hours after application. Allow surfaces to attain temperature and conditions specified before proceeding with application.

Part 2 Products

2.1 MATERIALS

.1 Patching Mortar: Infilling with a one-component, thixotropic, rheoplastic, cement-based, fiber-reinforced, shrinkage-compensated, sulfate-resistant structural repair mortar.

.1 Drying shrinkage to ASTM C157:

.1 less than 0.10% at 28 days.

.2 Compressive Strength to ASTM C109:

.1 Minimum 7 MPa at 3 hours.

.2 Minimum 21 MPa at 1 day.

.3 Minimum 28 MPa at 7 days.

.3 Modulus of elasticity to ASTM C469:

.1 $25x10^3$ MPa ± $10x10^3$ MPa.

.4 Freeze/Thaw Resistance to ASTM C 666, Procedure A:

.1 Minimum 96.0% RDM at 300 cycles.

.5 Salt Scale Resistance to ASTM C672:

.1 Less than 0.05 kg/m² at 50 cycles.

.2 Acceptable product(s):

.1 SikaEmaco S 488 CI by Sika.

.2 Planitop X by Mapei.

2.2 ACCESSORIES

.1 Evaporation retardant: Acceptable Product:

.1 Sikagard-50 ER by Sika at an application rate in accordance with manufacturer's written directions.

.2 Cure and sealing compound: to ASTM C309, Type 1.

.1 Acceptable product(s):

.1 Florseal WB by Sika Canada Inc. at an application rate in accordance with manufacturer's written directions.

Part 3 Execution

3.1 PREPARATION

.1 Protection: Protect adjacent Work areas and finish surfaces from damage during repair mortar application.

.2 Coordinate with the following sections for incorporating surface mounted fixtures and anchors, waterproofing, plumbing, grounding, and galvanic anode installation into the repair as shown on Drawings:

.1 Section 03 98 10 – Embedded Galvanic Anodes.

.2 Section 09 30 13 – Ceramic Tiling.

.3 Section 22 05 00 – Common Work Results for Plumbing.

.4 Section 26 05 26 – Grounding and Bonding.

.3 Surface Preparation:

.1 Complete concrete delamination repairs to 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.4 The repair area must be thoroughly cleaned and well soaked prior to infilling. The surface should be thoroughly wetted for a period of not less than two (2) hours. The repair areas shall be kept continuously wet until just before infilling. Any standing water must be removed prior to grouting.

.5 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

3.2 APPLICATION PROCEDURES

.1 Obtain the Contract Administrator's approval before placing repair material. Provide minimum 24 hours notice.

.2 The patch material must be installed and cured in strict accordance with manufacturer's specifications.

.3 Apply repair mortar to a saturated surface dry (SSD) substrate with no standing water and dry to the touch. A SSD substrate typically exhibits a colour change of dark grey to light grey.

.4 Apply a bond slurry, consisting of neat patching mortar, to the prepared surface. Thoroughly scrub a thin layer of normal consistency mortar into the saturated surface with a stiff bristle brush to produce a uniform thickness of approximately 3mm over entire area.

.5 Apply repair mortar by hand towelling on vertical or overhead surfaces in depths ranging from 12mm to 50mm.

.1 Vertical Applications: Repair mortar can be applied on vertical applications up to a 50mm depth per lift.

.2 Overhead Applications: Do not exceed 38mm thickness per lift. For depths greater than 38mm, limit succeeding lifts to 25mm thickness.

.3 Multiple Passes: Place succeeding lifts after repair mortar has developed initial set. Scarify the surface of the first lift to ensure integral bond between successive layers.

3.3 FINISHING

.1 Level surface of repair mortar using a float or screed.

.2 Apply final finish when mortar has begun to stiffen using a wooden, plastic, or synthetic sponge float or trowel.

.3 Spray apply undiluted evaporation reducer lightly to aid in finishing.

.4 Trim or shape to the desired profile if required.

3.4 CURING

.1 Apply two coats of curing compound in accordance with manufacturer's specifications. Apply the first coat immediately after completing finishing operations. Apply the second coat about 24 hours later.

3.5 CURING

.1 Protect fresh mortar from premature evaporation.

.2 Concrete repairs to be cured for a minimum of 7 days at 10°C. Provide supplemental heat and hoarding as required throughout curing period.

.3 Apply two coats curing compound in accordance with manufacturer's specifications. Apply the first coat immediately upon removal of forms. Apply the second coat about 24 hours later.

3.6 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Contract Administrator in accordance with CSA-A23.1 and Section 01 40 00 - Quality Requirements and as described herein.

.2 The Contractor will pay for costs of tests as a unit price in accordance with Section 01 22 00 – Unit Prices.

.3 Inspection or testing by the Contract Administrator will not augment or replace Contractor quality control nor relieve contractual responsibility.

.4 Flowable Grout Properties Testing:

.1 In accordance with CSA-A23.2-1B.

.2 Costs for tests as a unit price in accordance with Section 01 22 00 – Unit Prices and Form B – Prices.

.3 Testing agency conducting tests:

.1 To be certified for CSA A23.2-1B by the Canadian Council of Independent Laboratories (CCIL).

.2 To prepare test samples in accordance with ASTM C109.

.4 Frequency of tests:

.1 Not less than one test per 4m^2 of patching material placed and not less than one test for each day of placement.

.5 Direct pull-out tensile tests:

.1 Direct pull-out tensile (bond) tests of the substrate will be completed in accordance with CSA-A23.2-6B, Procedure A.

.2 Costs for direct pull-out tensile tests as a unit price in accordance with Section 01 22 00 – Unit Prices and Form B – Prices.

.3 Testing agency conducting direct pull-out tensile tests to be certified for CSA A23.2-6B (Procedure A) by the Canadian Council of Independent Laboratories (CCIL).

.4 Frequency of tests:

.1 Divide extent of work area into three equally sized areas and label as Phase 1, 2 and 3.

.2 Minimum three (3) tests within the first phase of repairs.

.3 Not less than one (1) bond test for each subsequent phase.

.4 The Contract Administrator reserves the right to direct additional bond tests to be conducted if concrete or bonding system is suspect.

.5 Prior to coring for direct pull-out tensile testing, scan substrate to ensure existing reinforcing will not be severed by the testing procedure.

.1 Contractor will be responsible for the following where existing reinforcing is severed by the test procedure at no additional cost to the City:

.1 Design repair and re-establishment of reinforcing procedure by a professional engineer licenced in the Province of Manitoba.

.2 Repair and re-establishment of reinforcing in accordance with the repair procedure.

.3 Submit repair procedure to the Contract Administrator for review prior to repair work proceeding.

.6 Infilling of the core hole will be the responsibility of the Contractor. Unless otherwise directed by the Contract Administrator, repair in accordance with this Section.

3.7 DEFECTIVE CONCRETE

.1 Defective concrete: bond strengths below minimum specified value, cracking, spalling, scaling and concrete not conforming to required lines, details, dimensions, tolerances, finishes or specified requirements.

.2 Repair or replacement of defective concrete will be determined by the Contract Administrator, based on the specifications and the above guidelines.

.3 Do not patch, fill, touch up, repair or replace exposed concrete except upon express direction of the Contract Administrator for each individual use.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Slab soffit areas, beams, columns and walls exhibiting extensive spalling and/or delamination in which patching would be uneconomical are to be repaired by mechanical removal of the deteriorated concrete and replacement with a pumpable grout.

.2 All spalling and/or delaminated concrete must be removed down to sound concrete in accordance with Section 03 91 10.

1.2 RELATED SECTIONS

.1 Section 03 10 00 – Concrete Forming and Accessories.

.2 Section 03 20 00 – Concrete Reinforcing.

.3 Section 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.4 Section 03 93 10 – Hand Patching.

.5 Section 03 98 10 – Embedded Galvanic Anodes.

.6 Section 09 30 13 – Ceramic Tiling.

.7 Section 22 05 00 – Common Work Results for Plumbing.

.8 Section 26 05 26 – Grounding and Bonding.

1.3 MEASUREMENT PROCEDURES

.1 No measurements will be conducted for pressure grouting concrete repairs shown on Drawings as Stipulated Price work. Include concrete restoration costs in the lump sum price component of the work to which they correspond.

.2 Pressure grouting repairs identified as a unit price, will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.3 Concrete testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.4 Concrete direct pull-out tensile testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.5 Scanning of concrete for reinforcing steel to accommodate concrete testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

1.4 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C109/C109M-23, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. (50-mm) Cube Specimens).

.2 ASTM C157/C157M-17, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.

.3 ASTM C309-19, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.4 ASTM C496-17, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.

.5 ASTM C531-18 (2023), Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.

.6 ASTM C666-15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

.7 ASTM C882/C882M-23, Standard Test Method for Bond Strength of Bonding Systems Used With Concrete By Slant Shear.

.8 ASTM C1202-22e1, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.

.2 Canadian Standards Association (CSA)

.1 CSA- A23.2-19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

1.5 QUALITY ASSURANCE

.1 Qualifications: In accordance with Section 03 91 10 – Surface Preparation of Concrete Delamination Repair.

.2 Field Mock-up:

.1 Install field mock-up at Project site or pre-selected area of building or location approved by the Contract Administrator. Install material in accordance with this Section.

.2 Field mock-up will be standard for judging workmanship on remainder of Project.

.3 Manufacturer's representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.6 PRE-INSTALLATION CONFERENCE

.1 In accordance with Section 01 31 19 – Project Meetings.

.2 Convene pre-installation conference for concrete restoration as specified by the following sections:

.1 Section 03 91 10 – Surface Preparation for Concrete Delamination Repair.

.2 Section 03 10 00 - Concrete Forming and Accessories.

.3 Section 03 20 00 – Concrete Reinforcing.

.4 Section 03 98 10 – Embedded Galvanic Anodes.

.5 Section 09 30 13 – Ceramic Tiling.

.6 Section 22 05 00 – Common Work Results for Plumbing.

.7 Section 26 05 26 – Grounding and Bonding.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Comply with Section 01 61 00.

.2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

.4 Keep materials in manufacturer's original, unopened containers and packaging until installation.

.5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.8 PROJECT CONDITIONS

.1 Environmental Requirements:

.1 Ensure that substrate surface and ambient air temperature are minimum of 4°C and rising at application time and remain above 4°C for at least 24 hours after application. Ensure that frost or frozen surfaces are thawed and dry.

.2 Ensure that substrate surface and ambient air temperature are below of 32°C and remain below 32°C for at least 8 hours after application.

.3 Do not apply material if snow, rain, fog, and mist are anticipated within 12 hours after application. Allow surfaces to attain temperature and conditions specified before proceeding with application.

Part 2 Products

2.1 MATERIALS

.1 One-component, shrinkage-compensated, micro concrete consisting of cement, graded aggregate, shrinkage-compensating agents, and additives complying with the following performance requirements:

.1 Compressive Strength, ASTM C109:
- .1 1 day: minimum 17.0 MPa.
- .2 7 days: minimum 34.5 MPa.
- .3 28 days: minimum 41.0 MPa.

.2 Slant Sheer Bond Strength, ASTM C 882:
- .1 1 Day: minimum 5.0 MPa.
- .2 7 Days: minimum 10.0 MPa.
- .3 28 days: minimum 16.0 MPa.

.3 Drying Shrinkage, ASTM C157, Unmodified, 1-inch (25-mm) prisms:
- .1 28 Days: less than 350 µstrain.

.4 Drying Shrinkage, ASTM C157, Modified, 3-inch (76-mm) prisms, air cured at 73 degrees F (23 degrees C), 50 percent relative humidity:
- .1 7 Days: less than 225 µstrain.
- .2 28 Days: lest than 500 µstrain.

.5 Coefficient of Thermal Expansion, ASTM C531:
- .1 28 days: $10 \pm 0.1 \times 10^{-6}$ cm/cm per degree C.

.6 Freeze/Thaw Resistance, ASTM C666 at 300 cycles:
- .1 minimum 96% relative dynamic modulus.

.7 Splitting Tensile Strength, ASTM C496:
- .1 28 days: minimum 4.0 MPa.

.8 Rapid Chloride Permeability, ASTM C1202:
- .1 Less than 1,000 Coulombs

.2 Acceptable product is:

.1 SikaEmaco S 440 MC, by Sika Canada.

.2 Sikacrete-211 Flow Plus by Sika Canada.

.3 Sikacrete 08-SCC by Sika Canada.

2.2 EQUIPMENT

.1 Pumping equipment: Mono-type, piston/ball valve, or hydraulic/swing valve pumps capable of pumping specified grout. Pumping equipment must have adequate controls to regulate flow rates and pressures

2.3 ACCESSORIES

.1 Cure and sealing compound: to ASTM C309, Type 1.

.1 Acceptable product(s):

.1 Florseal WB by Sika Canada Inc. at an application rate in accordance with manufacturer's written directions.

Part 3 Execution

3.1 PREPARATION

.1 Protection: Protect adjacent Work areas and finish surfaces from damage during repair mortar application.

.2 Coordinate with the following sections for incorporating surface mounted fixtures and anchors, waterproofing, plumbing, grounding, and galvanic anode installation into the repair as shown on Drawings:

.1 Section 03 98 10 – Embedded Galvanic Anodes.

.2 Section 09 30 13 – Ceramic Tiling.

.3 Section 22 05 00 – Common Work Results for Plumbing.

.4 Section 26 05 26 – Grounding and Bonding.

.3 Surface Preparation:

.1 Complete concrete delamination repairs to 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.4 The repair area must be thoroughly cleaned and well soaked prior to infilling. The surface should be thoroughly wetted for a period of not less than two (2) hours. The repair areas shall be kept continuously wet until just before infilling. Any standing water must be removed prior to grouting.

.5 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.6 Forming:

.1 Unless otherwise indicated provide plywood formwork to match existing profiles.

.2 Install chamfers at outside corners and filets at inside corners in accordance with Section 03 10 00 or to match existing profiles.

.3 Design formwork to accommodate the mass and pressure of the repair material but not less than 100 kPa.

.4 Securely anchor formwork to substrate. Anchors to be sized and space to prevent deflection of the forms during pressure grouting.

.5 Construct forms to fit tightly against existing concrete surfaces. Seal around edge of formwork with sealant to prevent leakage during grouting.

.6 Anchors shall be completely removable. All anchor holes shall be patched with same grout utilized for the repairs but mixed to dry pack consistency. Completely fill all anchor holes.

.7 A minimum of 20 mm concrete cover over the primary reinforcing steel will be required, thus, an adjustment of the formwork such as a notch may be required to ensure sufficient cover.

.8 Provide drainage outlets in formwork for presoaking and, if beneath a soffit, provide air venting. Provide suitable access points to pump mixed repair mortar into place.

.9 Space ports for pump line attached in a grid pattern.

.10 Use form-release agent to facilitate removal of forms from cast material.

.11 Within two (2) hours immediately prior to grouting, pressure test formwork to determine watertightness. Completely fill formwork with clean water and let stand for not less than 15 minutes. Any areas of leakage are to be sealed prior to grouting. Re-test as required.

3.2 INFILLING PROCEDURES

.1 Obtain the Contract Administrator's approval before placing repair material. Provide minimum 24 hours notice.

.2 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.3 Mixing:

.1 Mix materials in accordance with manufacturer's instructions.

.2 Ensure repair mortar is thoroughly mixed.

.3 Do not use free-fall mixers.

.4 Never mix partial bags.

.4 Within 15 minutes of mixing, pump the grout into the prepared form. Work in a manner to avoid air entrapment with a variable pressure pump.

.5 Start pumping at one corner for horizontal surfaces, or at the lowest point for vertical surfaces, continue filling in a manner that prevents air entrapment.

.6 Continue pumping until material flows from adjacent ports and all air is expelled. After all air is expelled, temporarily stop pumping, close off port, and begin pumping from next port that has seen material flow. Repeat sequence until the cavity is completely filled.

.7 Monitor pump-line pressure to prevent excessive back-pressure when pumping long distances.

.8 Vibrate the form while pumping, as required, to achieve flow and compaction. Flowable grout must be confined in either the horizontal or vertical direction, leaving a minimum of exposed surface.

3.3 CURING

.1 Concrete repairs to be cured for a minimum of 3 days at 10°C. Provide supplemental heat and hoarding as required throughout curing period.

.2 Leave formwork in place until repair mortar reaches compressive strength of 20 MPa.

.3 Upon removal of forms, apply two coats curing compound in accordance with manufacturer's specifications. Apply the first coat immediately upon removal of forms. Apply the second coat about 24 hours later.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Contract Administrator in accordance with CSA-A23.1 and Section 01 40 00 - Quality Requirements and as described herein.

.2 The Contractor will pay for costs of tests as a unit price in accordance with Section 01 22 00 – Unit Prices.

.3 Inspection or testing by the Contract Administrator will not augment or replace Contractor quality control nor relieve contractual responsibility.

.4 Flowable Grout Properties Testing:

.1 In accordance with CSA-A23.2-1B.

.2 Costs for tests as a unit price in accordance with Section 01 22 00 – Unit Prices and Form B – Prices.

.3 Testing agency conducting tests:

.1 To be certified for CSA A23.2-1B by the Canadian Council of Independent Laboratories (CCIL).

.2 To prepare test samples in accordance with ASTM C109.

.4 Frequency of tests:

.1 Not less than one test per 4m^2 of patching material placed and not less than one test for each day of placement.

.5 Direct pull-out tensile tests:

.1 Direct pull-out tensile (bond) tests of the substrate will be completed in accordance with CSA-A23.2-6B, Procedure A.

.2 Costs for direct pull-out tensile tests as a unit price in accordance with Section 01 22 00 – Unit Prices and Form B – Prices.

.3 Testing agency conducting direct pull-out tensile tests to be certified for CSA A23.2-6B (Procedure A) by the Canadian Council of Independent Laboratories (CCIL).

.4 Frequency of tests:

.1 Divide extent of work area into three equally sized areas and label as Phase 1, 2 and 3.

.2 Minimum three (3) tests within the first phase of repairs.

.3 Not less than one (1) bond test for each subsequent phase.

.4 The Contract Administrator reserves the right to direct additional bond tests to be conducted if concrete or bonding system is suspect.

.5 Prior to coring for direct pull-out tensile testing, scan substrate to ensure existing reinforcing will not be severed by the testing procedure.

.1 Scanning will be measured and paid as a Unit Price.

.2 Contractor will be responsible for the following where existing reinforcing is severed by the test procedure at no additional cost to the City:

.1 Design repair and re-establishment of reinforcing procedure by a professional engineer licenced in the Province of Manitoba.

.2 Repair and re-establishment of reinforcing in accordance with the repair procedure.

.3 Submit repair procedure to the Contract Administrator for review prior to repair work proceeding.

.6 Infilling of the core hole will be the responsibility of the Contractor. Unless otherwise directed by the Contract Administrator, repair in accordance with this Section or Section 03 93 10.

3.5 DEFECTIVE CONCRETE

.1 Defective concrete: bond strengths below minimum specified value, cracking, spalling, scaling and concrete not conforming to required lines, details, dimensions, tolerances, finishes or specified requirements.

.2 Repair or replacement of defective concrete will be determined by the Contract Administrator, based on the specifications and the above guidelines.

.3 Do not patch, fill, touch up, repair or replace exposed concrete except upon express direction of the Contract Administrator for each individual use.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Slab soffit areas, beams, columns and walls exhibiting extensive spalling and/or delamination in which patching would be uneconomical are to be repaired by mechanical removal of the deteriorated concrete and replacement using the form and pour method.

.2 All spalling and/or delaminated concrete must be removed down to sound concrete in accordance with Section 03 91 10.

1.2 RELATED SECTIONS

.1 Section 03 10 00 – Concrete Forming and Accessories.

.2 Section 03 20 00 – Concrete Reinforcing.

.3 Section 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.4 Section 03 93 10 – Hand Patching.

.5 Section 03 98 10 – Embedded Galvanic Anodes.

.6 Section 09 30 13 – Ceramic Tiling.

.7 Section 22 05 00 – Common Work Results for Plumbing.

.8 Section 26 05 26 – Grounding and Bonding.

1.3 MEASUREMENT PROCEDURES

.1 No measurements will be conducted for form and pour concrete repairs shown on Drawings as Stipulated Price work. Include concrete restoration costs in the lump sum price component of the work to which they correspond.

.2 Form and pour repairs identified as a unit price, will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.3 Concrete testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.4 Concrete direct pull-out tensile testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.5 Scanning of concrete for reinforcing steel to accommodate concrete testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

1.4 REFERENCES

.1 American Concrete Institute (ACI)

.1 ACI 546-04, Concrete Repair Guide.

.2 ACI RAP-4, Surface Repair Using Form-and-Pour Techniques.

.2 American Society for Testing and Materials (ASTM)

.1 C109/C109M-23, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. (50-mm) Cube Specimens).

.2 ASTM C157/C157M-17, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.

.3 ASTM C309-19, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.4 ASTM C531-18 (2023), Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.

.5 ASTM C666-15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

.3 Canadian Standards Association (CSA)

.1 CSA- A23.2-19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

1.5 QUALITY ASSURANCE

.1 Qualifications: In accordance with Section 03 91 10 – Surface Preparation of Concrete Delamination Repair.

.2 Field Mock-up:

.1 Install field mock-up at Project site or pre-selected area of building or location approved by the Contract Administrator. Install material in accordance with this Section.

.2 Field mock-up will be standard for judging workmanship on remainder of Project.

.3 Manufacturer’s representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.6 PRE-INSTALLATION CONFERENCE

.1 In accordance with Section 01 31 19 – Project Meetings.

.2 Convene pre-installation conference for concrete restoration as specified by the following sections:

.1 Section 03 91 10 – Surface Preparation for Concrete Delamination Repair.

.2 Section 03 10 00 - Concrete Forming and Accessories.

.3 Section 03 20 00 – Concrete Reinforcing.

.4 Section 03 98 10 – Embedded Galvanic Anodes.

.5 Section 09 30 13 – Ceramic Tiling.

.6 Section 22 05 00 – Common Work Results for Plumbing.

.7 Section 26 05 26 – Grounding and Bonding.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Comply with Section 01 61 00.

.2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

.4 Keep materials in manufacturer’s original, unopened containers and packaging until installation.

.5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.8 PROJECT CONDITIONS

.1 Environmental Requirements:

.1 Ensure that substrate surface and ambient air temperature are minimum of 4°C and rising at application time and remain above 4°C for at least 24 hours after application. Ensure that frost or frozen surfaces are thawed and dry.

.2 Ensure that substrate surface and ambient air temperature are below of 32°C and remain below 32°C for at least 8 hours after application.

.3 Do not apply material if snow, rain, fog, and mist are anticipated within 12 hours after application. Allow surfaces to attain temperature and conditions specified before proceeding with application.

Part 2 Products

2.1 MATERIALS

.1 The repair mortar shall cement-based, one-component, self-consolidating with the following properties:

.1 Drying shrinkage to ASTM C157:

.1 less than 0.10% at 28 days.

.2 Compressive Strength, ASTM C109:

.1 1 day: minimum 10.0 MPa.

.2 7 days: minimum 28.0 MPa.

.3 28 days: minimum 35.0 MPa.

.3 Freeze/Thaw Resistance, ASTM C666 at 300 cycles:

.1 minimum 98% relative dynamic modulus.

.4 Coefficient of Thermal Expansion, ASTM C531:

.1 28 days: $10 \pm 1.0 \times 10^{-6}$ cm/cm per degree C.

.2 Acceptable product is:

.1 SikaEmaco S 440 by Sika Canada.

.2 Sikacrete-08 SCC by Sika Canada.

2.2 ACCESSORIES

.1 Cure and sealing compound: to ASTM C309, Type 1.

.1 Acceptable product(s):

.1 Florseal WB by Sika Canada Inc. at an application rate in accordance with manufacturer's written directions.

Part 3 Execution

3.1 PREPARATION

.1 Protection: Protect adjacent Work areas and finish surfaces from damage during repair mortar application.

.2 Coordinate with the following sections for incorporating surface mounted fixtures and anchors, waterproofing, plumbing, grounding, and galvanic anode installation into the repair as shown on Drawings:

.1 Section 03 98 10 – Embedded Galvanic Anodes.

.2 Section 09 30 13 – Ceramic Tiling.

.3 Section 22 05 00 – Common Work Results for Plumbing.

.4 Section 26 05 26 – Grounding and Bonding.

.3 Surface Preparation:

.1 Complete concrete delamination repairs to 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.4 The repair area must be thoroughly cleaned and well soaked prior to infilling. The surface should be thoroughly wetted for a period of not less than two (2) hours. The repair areas shall be kept continuously wet until just before infilling. Any standing water must be removed prior to grouting.

.5 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.6 Forming:

.1 Unless otherwise indicated provide plywood formwork to match existing profiles.

.2 Install chamfers at outside corners and filets at inside corners in accordance with Section 03 10 00 or to match existing profiles.

.3 Design formwork to accommodate the mass and pressure of the repair material.

.4 Securely anchor formwork to substrate. Anchors to be sized and space to prevent deflection of the forms placement and curing.

.5 Construct forms to fit tightly against existing concrete surfaces. Seal around edge of formwork with sealant to prevent leakage during grouting.

.6 Anchors shall be completely removable. All anchor holes shall be patched with grout mixed to dry pack consistency. Completely fill all anchor holes.

.7 Placement openings or chutes are required to place the repair material behind vertical forms. Chutes should be constructed to permit development of a hydraulic head above the prepared upper edges of the concrete surface. This will provide for repair material supply into these upper horizontal zones after concrete is consolidated.

.8 For large, vertical surfaces exceeding 3 m in height, multiple lifts should be considered to reduce free-fall segregation and excessive formwork pressures.

.9 Formwork for overhead surfaces does not require openings for placement of repair materials. Place repair materials through openings in the slab from above. Size and location of openings to be approved by the Contract Administrator. Do not remove or cause damage to existing reinforcing steel in order to install placement openings.

.10 A minimum of 20 mm concrete cover over the primary reinforcing steel will be required, thus, an adjustment of the formwork such as a notch may be required to ensure sufficient cover.

.11 Provide drainage outlets in formwork for presoaking and, if beneath a soffit, provide air venting. Provide suitable access points to pour mixed repair mortar into place.

.12 Use form-release agent to facilitate removal of forms from cast material.

.13 Within two (2) hours immediately prior to placement of repair material, test formwork to determine watertightness. Completely fill formwork with clean water and let stand for not less than 15 minutes. Any areas of leakage are to be sealed prior to placement of repair material. Re-test as required.

3.2 INFILLING PROCEDURES

.1 Obtain the Contract Administrator's approval before placing repair material. Provide minimum 24 hours notice.

.2 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.3 Mixing:

- .1 Mix materials in accordance with manufacturer's instructions.
- .2 Ensure repair mortar is thoroughly mixed.
- .3 Do not use free-fall mixers.
- .4 Never mix partial bags.

.4 Within 15 minutes of mixing, pour repair material into the prepared form. Work in a manner to avoid air entrapment with a variable pressure pump.

.5 Vibrate the form while pumping, as required, to achieve flow and compaction.

.6 Ensure that the uppermost surfaces are filled adjacent to the chute or opening where placement occurs. Rod or tamp material to ensure proper filling.

3.3 CURING

.1 Concrete repairs to be cured for a minimum of 3 days at 10°C. Provide supplemental heat and hoarding as required throughout curing period.

.2 Leave formwork in place until repair mortar reaches compressive strength of 20 MPa.

.3 Upon removal of forms, apply two coats curing compound in accordance with manufacturer's specifications. Apply the first coat immediately upon removal of forms. Apply the second coat about 24 hours later.

3.4 FINISHING

.1 After stripping of formwork, any spaces not filled should be trimmed, cleaned, and dry-packed with grout to the desired profile. Do not proceed with repairs without the Contract Administrator's written approval.

3.5 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Contract Administrator in accordance with CSA-A23.1 and Section 01 40 00 - Quality Requirements and as described herein.

.2 The Contractor will pay for costs of tests as a unit price in accordance with Section 01 22 00 – Unit Prices.

.3 Inspection or testing by the Contract Administrator will not augment or replace Contractor quality control nor relieve contractual responsibility.

.4 Flowable Grout Properties Testing:

- .1 In accordance with CSA-A23.2-1B.
- .2 Costs for tests as a unit price in accordance with Section 01 22 00 – Unit Prices and Form B – Prices.
- .3 Testing agency conducting tests:

.1 To be certified for CSA A23.2-1B by the Canadian Council of Independent Laboratories (CCIL).

.2 To prepare test samples in accordance with ASTM C109.

.4 Frequency of tests:

.1 Not less than one test per 4m^2 of patching material placed and not less than one test for each day of placement.

.5 Direct pull-out tensile tests:

.1 Direct pull-out tensile (bond) tests of the substrate will be completed in accordance with CSA-A23.2-6B, Procedure A.

.2 Costs for direct pull-out tensile tests as a unit price in accordance with Section 01 22 00 – Unit Prices and Form B – Prices.

.3 Testing agency conducting direct pull-out tensile tests to be certified for CSA A23.2-6B (Procedure A) by the Canadian Council of Independent Laboratories (CCIL).

.4 Frequency of tests:

.1 Divide extent of work area into three equally sized areas and label as Phase 1, 2 and 3.

.2 Minimum three (3) tests within the first phase of repairs.

.3 Not less than one (1) bond test for each subsequent phase.

.4 The Contract Administrator reserves the right to direct additional bond tests to be conducted if concrete or bonding system is suspect.

.5 Prior to coring for direct pull-out tensile testing, scan substrate to ensure existing reinforcing will not be severed by the testing procedure.

.1 Scanning will be measured and paid as a Unit Price.

.2 Contractor will be responsible for the following where existing reinforcing is severed by the test procedure at no additional cost to the City:

.1 Design repair and re-establishment of reinforcing procedure by a professional engineer licenced in the Province of Manitoba.

.2 Repair and re-establishment of reinforcing in accordance with the repair procedure.

.3 Submit repair procedure to the Contract Administrator for review prior to repair work proceeding.

.6 Infilling of the core hole will be the responsibility of the Contractor. Unless otherwise directed by the Contract Administrator, repair in accordance with this Section or Section 03 93 10.

3.6 DEFECTIVE CONCRETE

.1 Defective concrete: bond strengths below minimum specified value, cracking, spalling, scaling and concrete not conforming to required lines, details, dimensions, tolerances, finishes or specified requirements.

.2 Repair or replacement of defective concrete will be determined by the Contract Administrator, based on the specifications and the above guidelines.

.3 Do not patch, fill, touch up, repair or replace exposed concrete except upon express direction of the Contract Administrator for each individual use.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This Section includes furnishing all labor, tools, materials, equipment and services necessary to properly install embedded galvanic anodes.

.2 Embedded galvanic anodes are designed to provide localized corrosion protection. When placed at the appropriate spacing along the perimeter of concrete patches or along the interface between new/existing concrete, the anodes mitigate active corrosion and the formation of new corrosion sites in the existing concrete in adjacent areas.

1.2 RELATED SECTIONS

.1 Section 03 91 10 – Surface Preparation for Concrete Delamination Repair.

.2 Section 03 10 00 - Concrete Forming and Accessories.

.3 Section 03 20 00 – Concrete Reinforcing.

.4 Section 03 92 12 – Top Surface Concrete Repairs with Rapid Setting Mortar.

.5 Section 03 92 20 – Scaling Repairs.

.6 Section 03 93 10 – Hand Patching.

.7 Section 03 93 20 – Pressure Grouting.

.8 Section 03 93 30 – Form and Pour with Repair Mortar.

1.3 MEASUREMENT PROCEDURES

.1 Embedded galvanic anodes will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

1.4 REFERENCES

.1 American Concrete Institute (ACI)

.1 ACI 546-04, Concrete Repair Guide.

.2 ACI 562-12, Code Requirements for Evaluation, Repair and Rehabilitation of Concrete Buildings

.3 ACI RAP-8, Installation of Embedded Galvanic Anodes.

.2 Canadian Standards Association (CSA)

.1 CSA- S448.1-10, Repair of Reinforced Concrete in Buildings.

.3 International Concrete Repair Institute (ICRI)

.1 ICRI concrete Repair Terminology (2010 Edition).

.2 ICRI Guideline No. 120.1–2009, Guidelines and Recommendations for Safety in the Concrete Repair Industry.

.3 ICRI Guideline No. 130.1R–2009, Guide for Methods of Measurement and Contract Types for Concrete Repair Work (formerly No. 03735).

.4 ICRI Guideline No. 310.1R–2008, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion (formerly No. 03730).

.5 ICRI Guideline No. 310.2–1997, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays (formerly No. 03732).

1.5 QUALITY ASSURANCE

.1 Qualifications: In accordance with Section 03 91 10 – Surface Preparation of Concrete Delamination Repair.

.2 Field Mock-up:

.1 Install field mock-up at Project site or pre-selected area of building or location approved by the Contract Administrator. Install material in accordance with this Section.

.2 Field mock-up will be standard for judging workmanship on remainder of Project.

.3 Manufacturer's representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.6 PRE-INSTALLATION CONFERENCE

.1 In accordance with Section 01 31 19 – Project Meetings.

.2 Convene and coordinate pre-installation conference for concrete restoration including attendance by the following sections:

.1 Section 03 91 10 – Surface Preparation for Concrete Delamination Repair.

.2 Section 03 10 00 - Concrete Forming and Accessories.

.3 Section 03 20 00 – Concrete Reinforcing.

.4 Section 03 92 12 – Top Surface Concrete Repairs with Rapid Setting Mortar.

.5 Section 03 92 20 – Scaling Repairs.

.6 Section 03 93 10 – Hand Patching.

.7 Section 03 93 20 – Pressure Grouting.

.8 Section 03 93 30 – Form and Pour with Repair Mortar.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Comply with Section 01 61 00.

.2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

.4 Keep materials in manufacturer's original, unopened containers and packaging until installation.

.5 Protect materials during storage, handling, and application to prevent contamination or damage.

Part 2 Products

2.1 MATERIALS

.1 Embedded galvanic anodes shall meet the following requirements:

.1 Embedded galvanic anodes shall be Anode Type 1A with the following nominal dimensions: 33 x 35 x 130 mm (1.3 x 1.38 x 5.12 in.). The anodes shall be pre-manufactured with zinc in compliance with ASTM B418 Type II cast around an integral, unspliced, uncoated, non-galvanized double loop steel tie wire and encased in a highly alkaline cementitious shell with a pH of 14 or greater.

.2 The galvanic anodes shall be alkali-activated and shall contain no intentionally added chloride, bromide or other constituents that are corrosive to reinforcing steel as per ACI 562. The anode size and spacing shall deliver a minimum current density to the steel adjacent to the repair of 0.8mA/m2 (0.07mA/ft2) for the 20-year design life taking into account an anode aging factor calculated from previous field installations and the in-service environment.

.2 Repair materials:

.1 Concrete and bonding agents shall be Portland cement-based materials. Non-conductive repair materials such as epoxy, urethane, or magnesium phosphate shall not be permitted. Insulating materials such as epoxy bonding agents shall not be used unless otherwise noted.

.2 Anodes used with repair materials having saturated bulk resistivity of 50,000 ohm-cm or greater, shall be embedded in manufacturer approved mortar to create a conductive bridge to the substrate prior to repair material installation.

.3 Acceptable Product: Galvashield XP4 by Vector Corrosion Technologies.

Part 3 Execution

3.1 PREPARATION

.1 Complete concrete delamination repairs and surface preparation to Section 03 91 10.

.2 Coordinate installation of galvanic anodes with concrete repairs as specified in the following sections:

.1 Section 03 20 00 – Concrete Reinforcing.
.2 Section 03 92 12 – Top Surface Concrete Repairs with Rapid Setting Mortar.
.3 Section 03 92 20 – Scaling Repairs.
.4 Section 03 93 10 – Hand Patching.
.5 Section 03 93 20 – Pressure Grouting.
.6 Section 03 93 30 – Form and Pour with Repair Mortar.

3.2 INSTALLATION

.1 Install anode units and repair material immediately following preparation and cleaning of the steel reinforcement.

.2 Install galvanic anodes in patch repair locations identified by the Consultant. Install along the perimeter of the repair or interface as follows:

.1 For typical pool slab: Galvanic anodes shall be installed along the perimeter of the repair in a grid pattern throughout the entire repair at a maximum spacing of 300mm.

.2 Anode spacing will vary with changes in the reinforcing steel density, the level of chloride in the structure and the corrosively of the local environment, etc.

.3 Provide sufficient clearance between anodes and substrate to allow repair material to encase anode.

.4 Secure the galvanic anodes as close as possible to the patch edge using the anode tie wires.

.5 The tie wires shall be wrapped around the cleaned reinforcing steel and twisted tight to allow little or no free movement.

.1 If less than 1 inch (25 mm) of concrete cover is expected, place anode beside or beneath the bar and secure to clean reinforcing steel.

.2 If sufficient concrete cover exists, the anode may be placed along a single bar or at the intersection between two bars and secured to each clean bar.

.6 If repair materials with resistivity greater than 50,000 ohm-cm are to be used or the resistivity is unknown, create a conductive grout bridge between the anode and the substrate. Pack manufacturer approved mortar to cover minimum area of 4 in (100mm) in diameter between the anode and the substrate concrete ensuring no voids exist.

.7 Electrical Continuity

.1 Confirm electrical connection between anode tie wire and reinforcing steel by measuring DC resistance (ohm,Ω) or potential (mV) with a multi-meter.

.2 Electrical connection is acceptable if the DC resistance measured with multi-meter is less than 1 Ω or the DC potential is less than 1 mV.

.3 Confirm electrical continuity of the exposed reinforcing steel within the repair area. If necessary, electrical continuity shall be established with steel tie wire.

.4 Electrical continuity between test areas is acceptable if the DC resistance measured with multi-meter is less than 1 Ω or the potential is less than 1 mV.

3.3 CONCRETE OR MORTAR REPLACEMENT

.1 Pre-wet the concrete surface and the anode units to achieve a saturated surface dry condition, and then complete the repair according to the appropriate Section.

.2 Do not soak the anode units for greater than 20 minutes.

.3 Repair materials with significant polymer modification and/or silica fume content may have high resistivity. Similarly, if bonding agents are used, they shall have suitable conductivity. Do not use insulating materials such as epoxy bonding agents.

.4 Following normal concrete repair procedures complete the repair with the repair material, taking care not to create any air voids around the anode.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM).
- .1 ASTM A153/A153M-16a, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .2 ASTM A653/A653M-20, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM D5456-121e1, Standard Specification for Evaluation of Structural Composite Lumber Products.

.2 American Wood Protection Association (AWPA).
- .1 AWPA Book of Standards, 2013.
- .2 AWPA M2-11, Standard for Inspection of Treated Wood Products.

.3 Canadian Standards Association (CSA).
- .1 CAN/CSA O80 SERIES-21, Wood Preservation.
- .2 CSA O86-19, Engineering Design in Wood.
- .3 CSA O121-17, Douglas Fir Plywood.
- .4 CSA O141-05(R2019), Softwood Lumber.
- .5 CSA O151-17, Canadian Softwood Plywood.
- .6 CSA O153-19, Poplar Plywood.
- .7 CSA O325-21, Construction Sheathing.

.4 National Building Code of Canada, 2020 (NBCC), complete with current Manitoba Building Code amendments (MBC).

.5 National Lumber Grades Authority (NLGA)
- .1 NLGA SPS 1 Special Products Standard for Fingerjoined Structural Lumber, 2017.
- .2 NLGA Standard Grading Rules for Canadian Lumber, 2017.

.6 Underwriters Laboratories of Canada (ULC).
- .1 CAN/ULC S102-18-Rev1, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 QUALITY ASSURANCE

.1 Lumber identification: by grade stamp of agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: by grade mark in accordance with applicable CSA standards.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Deliver all material to site in manufacturer’s original unopened packaging with labels clearly identifying product name and manufacturer.

.2 Store materials in a dry, enclosed area protected from exposure to moisture, construction activity, and direct sunlight in strict accordance with manufacturer's recommendations.

.3 Handle all products with appropriate precautions and care as stated manufacturer's instructions.

.4 Cleaning and Waste Management in accordance with Section 01 74 00.

Part 2 Products

2.1 LUMBER MATERIAL

.1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with CSA O141 and NLGA Standard Grading Rules for Canadian Lumber.

.2 Machine stress-rated lumber: acceptable for all purposes.

.3 Glued end-jointed (finger-jointed) lumber is not acceptable.

.4 Structural Composite Lumber (SCL) in accordance with ASTM D5456.

.5 Framing and board lumber: in accordance with NBCC.

.6 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, panel and soffit backing:

- .1 Use S2S or S4S material.
- .2 Board sizes: “Standard” or better grade.
- .3 Dimension sizes: “Standard” light framing or better grade.
- .4 Post and timber sizes: “Standard” or better grade.

.7 Pressure Treated Dimension Lumber: vacuum pressure impregnated Alkaline Copper Quaternary (ACQ) treated lumber to CSA O80. Minimum moisture content at treatment in accordance with CAN/CSA O80. Minimum retention for above ground use 4.0 kg/m3 and for ground contact 6.4 kg/m3. All wood to be free of defects. Any warped, checked or bent materials will be rejected.

2.2 PANEL MATERIAL

.1 Construction Sheathing: to CSA O325.

.2 Plywood Standards: type, grade and thickness as indicated and in accordance with following standards:

- .1 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .3 Poplar plywood (PP): to CSA O153, standard construction.

.3 Fire Retardant Treated Plywood: type, grade and thickness as indicated and in accordance with following standards:

- .1 Douglas Fir Plywood: pressure-treated with fire retardant chemicals to meet CAN/ULC S102, Class A Fire Retardant, made with binder containing no added urea-formaldehyde, moisture content 15% or less.

2.3 ACCESSORIES

.1 Fasteners for Exterior Work and Pressure Treated Wood: hot-dipped galvanized steel to ASTM A153/A153M (for hot-dip fastener products) and ASTM A653/A653M (G-185 coating designation for hot-dip connector and sheet products).

.2 Fasteners for Fire Retardant Treated Lumber and Plywood: hot-dipped galvanized steel to ASTM A153/A153M (for hot-dip fastener products) and ASTM A653/A653M (G-185 coating designation for hot-dip connector and sheet products).

.3 Bolts: 12.5 mm diameter unless indicated otherwise, galvanized, complete with nuts and washers.

.4 Proprietary Fasteners: galvanized toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

.5 Surface-applied Wood Preservative: as recommended by pressure impregnated material manufacturer in accordance with CAN/CSA O80.

Part 3 Execution

3.1 INSTALLATION

.1 Install members true to line, levels and elevations, square and plumb.

.2 Construct continuous members from pieces of longest practical length.

.3 Install spanning members with "crown-edge" up.

.4 Install furring and blocking as required to space-out and support door frames, casework, cabinets, wall and ceiling finishes, washroom accessories, and other work as required.

.5 Treat surfaces of ACQ treated lumber exposed by field cutting, trimming or boring with liberal application of wood preservative before installation. Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3-minute soak on lumber and one-minute soak on plywood.

.6 Use only hot-dipped galvanized steel fasteners with all ACQ pressure treated lumber.

.7 Install fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.

.8 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.9 Provide wood blocking where required to provide support for wall or ceiling mounted items specified or detailed including wall mounted door stops. Fasten wood blocking securely to steel studs on each side with minimum of two (2) screws on each stud.

.10 Provide backboards for mounting electrical equipment as required. Use 19 mm thick DFP or CSP on 19 x 38 mm furring around perimeter and at maximum 300 mm intermediate spacing. Paint both sides of backboards in accordance with Section 09 90 00 before installation.

.11 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.12 Countersink bolts where necessary to provide clearance for other work.

3.2 SITE APPLIED WOOD TREATMENT

.1 Apply preservative treatment in accordance with manufacturer's instructions.

.2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface and site-sawn cuts for minimum 3-minute soak on lumber and one-minute soak on plywood.

.3 Allow preservative to dry prior to erecting members.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00.
  .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.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Mechanical Specifications.

.2 Electrical Specifications.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM).
- .1 ASTM C679-15(2022), Standard Test Method for Tack-Free Time of Elastomeric Sealants.
- .2 ASTM D6904-03(2022), Standard Practice for Resistance to Wind Driven Rain for Exterior Coatings Applied on Masonry.
- .3 ASTM E84-21a, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .4 ASTM E119-20, Standard Test Methods for Fire Tests of Building Construction and Materials.
- .5 ASTM E595-15(2021), Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment.
- .6 ASTM E814-13a(2017), Standard Test Method for Fire Tests of Penetration Firestop Systems.
- .7 ASTM E1966-15(2019), Standard Test Method for Fire-Resistive Joint Systems.
- .8 ASTM E2174-20a, Standard Practice for On-Site Inspection of Installed Fire Stops.
- .9 ASTM E2307-20, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus.
- .10 ASTM E2393-20a, Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
- .11 ASTM G21-15(2021)e1, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

.2 Firestop Contractors International Association (FCIA).
- .1 FCIA Manual of Practice (MOP) 7th Edition, 2018.

.3 International Firestop Council (IFC).
- .1 IFC 401 Inspection Manual for Firestopped through Penetrations, Joints, Perimeter Fire Barrier Systems, and Fire Rated Duct Enclosures Systems, 5th Edition, 2016.
- .2 Recommended IFC Guidelines for Evaluating Firestop Systems Engineering Judgments, 2018.

.4 National Building Code of Canada, 2020 (NBCC), complete with current Manitoba Building Code amendments (MBC).

.5 National Fire Protection Association (NFPA).
- .1 NFPA 101: Life Safety Code, 2021 Edition.

.6 National Research Council Canada.
- .1 Best Practice Guide on Fire Stops and Fire Blocks and their impact on Sound Transmission, June 2007.

.7 Underwriter's Laboratories (UL).
- .1 UL 1479-14, Standard for Fire Tests of Through-Penetration Firestops.
- .2 UL 2079-04 (R2014), Standard for Tests for Fire Resistance of Building Joint Systems.

.8 Underwriter's Laboratories of Canada (ULC).
- .1 CAN/ULC S101-14-Rev3, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
- .2 CAN/ULC S102-18-Rev1, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .3 CAN/ULC S115-18, Standard Method of Fire Tests of Fire Stop Systems.
- .4 ULC List of Equipment and Materials Firestop Systems and Components 2010 Edition.

1.3 DEFINITIONS

.1 Firestopping: material or combination of materials used to retain integrity of fire-rated construction by maintaining effective barrier against spread of flame, smoke, and hot gases through penetrations in joints between fire-rated wall and floor assemblies.

.2 Through-penetration: opening or foreign material, pipes, conduits, ducts, cable trays, cable, wire, structural components or any other element passing completely through opening in fire-rated barrier/assembly such that full thickness of rated material(s) is breached either in total or in part.

.3 Membrane penetration: any penetration of fire-rated barrier that breaches one side but does not pass completely through to other side, including recessed electrical devices.

.4 System: combination of specific materials and/or devices, including penetrating item(s) required to complete firestop, as tested by independent third party test facility.

.5 Barrier/Assembly: wall, floor, ceiling or roof assembly or other partition with fire-smoke rating of 0,1,2,3 or up to 4-hours.

.6 Fire Resistive Joint: any joint or opening, whether static or dynamic, within or between adjacent sections of fire rated interior or exterior walls, floors, ceilings or roof decks.

.7 Fireblocking: building materials installed to resist the free passage of flame, smoke and toxic gases to other areas of building through concealed spaces.

.8 Perimeter Fire Barrier System: perimeter joint protection that provides fire resistance to prevent passage of fire from floor to floor within building at opening between exterior wall assembly and floor assembly.

.9 Intumescent: materials that expand with that to seal around objects threatened by fire.

.10 F-Rating: time firestop, penetration item, building, material, firestop material, can withstand direct flame without burn through as tested to CAN/ULC S115.

.11 T-Rating: amount of time through-penetration firestop limits temperature rise on cold side-outside test furnace - as tested to CAN/ULC S115.

.12 W-Rating Water Leakage Test: systems tested and listed in accordance with UL 1479.

.13 L-Rating: the amount of air that moves through an opening in cubic feet per minute per square foot of opening area or per lineal foot of joint, at ambient temperatures and 400F - as tested to CAN/ULC S115.

1.4 SYSTEM DESCRIPTION

.1 Provide firestopping as indicated and in accordance with NBCC and NFPA 101, composed of components that are compatible with each other, substrates forming openings, and items, if any, penetrating firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

.2 Provide components for each firestopping system that are needed to install fill material. Use only components specified by firestopping manufacturer and approved by qualified testing agency for designated fire-resistance-rated systems.

.3 Firestopping Materials are either “cast-in-place” (integral with concrete placement) or “post installed.” Provide cast-in-place firestop devices prior to concrete placement.

.4 Provide firestopping with mould and mildew resistance rating of ZERO in accordance with ASTM G21.

.5 Provide firestopping of smoke barrier penetrations with L-Rating not exceeding 5.0 cfm/sq. ft. or 5.0 cfm/ln. ft. of penetration or joint opening at both ambient and elevated temperatures in accordance with CAN/ULC S115.

.6 Use only firestop systems that have been ULC or cUL tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance and as follows:

- .1 New and existing service penetrations for passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through new and existing fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
- .2 Openings between structurally separate sections of wall or floors.
- .3 New and existing joints (gaps) between top of walls and ceilings or roof assemblies.
- .4 New and existing wall-to-wall joints (gypsum board to concrete or concrete block walls or control/expansion joints for masonry, concrete or gypsum board).
- .5 New and existing joints between the bottom of walls (gypsum board to floor system).
- .6 Control or expansion joints in walls and floors.
- .7 Openings and penetrations in fire-rated partitions or walls containing fire doors.
- .8 Openings around structural members which penetrate floors or walls.
- .9 Systems installed to allow and be designed to accommodate movement (expansion) in all joints as indicated on architectural / structural drawings/specifications and plumbing pipes and sprinkler pipes that require movement during the activation of these systems.
- .10 Openings around structural members, which penetrate horizontal and vertical fire separations and their fire-resistant membranes.
- .11 Fire-rated cable pathway devices.
- .12 Marriage joints between fire rated duct wrap to fire rated floor and wall assemblies.

1.5 ACTION AND INFORMATION SUBMITTALS

.1 Submit Product Data: Manufacturer's specifications and technical data for each material including composition and limitations, documentation of ULC or cUL firestop systems to be used and manufacturer's installation instructions to comply with Section 01 33 00 – Submittals Procedures.

.2 Manufacturer's engineering judgment identification number and drawing details when no ULC or cUL system is available for application. Engineered judgment must include both project name and contractor’s name who will install firestop system as described in drawing.

.3 Submit material safety data sheets (MSDS) provided with product delivered to jobsite. MSDS to include following:

- .1 Technical data on out-gassing; off-gassing and age testing.
- .2 Curing time.

.3 Chemical compatibility to other construction materials.

.4 Provide certification by manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's), are non-toxic to building occupants, and comply with following:
- .1 ASTM E595.
- .2 EPA Method 24.
- .3 Volatile Content: below 250 g/l.
- .4 Silicone firestop not permitted.

.5 Design system listings to show proposed material, including technical data, reinforcement, anchorage, fastenings and method of installation. Construction details to accurately reflect actual job conditions.

1.6 QUALITY ASSURANCE

.1 Installer Qualifications.
- .1 Manufacturer to employ fire protection engineers having minimum five (5) years' experience with manufacturers' design systems. Provide proof of experience upon Contract Administrator's request.
- .2 Fire protection engineer to oversee project, and provide engineered judgments as required to suit building conditions and Authorities Having Jurisdiction. All Engineered Judgments shall conform to IFC 401 and manufacturer shall be member in good standing with the IFC or FCIA. Provide proof of membership upon Contract Administrator's request.
- .3 Work is to be undertaken by experienced Site Supervisor in their trade of material or system being used with a minimum of five (5) working years of experience utilizing that material/system, and shall provide a list of not less than five (5) successfully completed projects of similar scale and type.
- .4 Firestop Contractor shall be a member in good standings with FCIA for a minimum of two years, and who is certified, licensed, or otherwise qualified by firestop manufacturer as having necessary experience, staff, and training to install manufacture's products per specified requirements. Provide proof of membership and certification upon Contract Administrator's request.
- .5 Manufacturer/supplier's willingness to sell its firestopping products to Contractor or to installer engaged by Contractor does not in itself confer qualification on buyer.
- .6 Installation Responsibility: assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.
- .7 When installing non-preformed devices, the work is to be installed by a contractor with at least one of the following qualifications:
  - .1 FM 4991 Approved Contractor.
  - .2 UL Approved Contractor.
  - .3 Hilti Accredited Fire Stop Specialty Contractor

.2 Regulatory Requirements.
- .1 Firestop System installation must meet requirements of CAN/ULC S115 tested assemblies that provide fire rating as shown.
- .2 Proposed firestop materials and methods to conform to applicable governing codes having local jurisdiction.
- .3 For those firestop applications that exist for which no ULC or cUL tested system is available through manufacturer, manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by IFC 401.

.4 A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

.3 Firestopping systems are not intended to reestablish structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Consult Contract Administrator prior to penetrating any load bearing assembly.

.4 Firestopping material to be free of asbestos, PCB and lead, and cannot incorporate nor require the use of hazardous solvents.

.5 Firestopping material must have visibly labeled expiration or packaging date and **must be within the manufacturer specified shelf life at time of installation**. Installation of firestopping material past its specified shelf life is strictly prohibited and will be rejected. Contractor to verify shelf life with Contract Administrator prior to installation.

.6 Verify on-site to Contract Administrator prior to firestopping installation on all phases of construction that firestopping material is not damaged or frozen or has not exceeded manufacturer’s expiry date identified on product or packaging. All firestopping materials must be installed prior to expiration of shelf life.

.7 Mock-up a minimum of 25% of the proposed ULC or cUL system in accordance with Section 01 40 00.

.1 If required, include work by other trades to provide required finish work, such as steel stud / gypsum board trade framing out multi-penetrations openings.

.2 Reviewed mock-ups become standard of workmanship and material against which installed work will be checked. Reviewed and approved mock-ups may be used in final construction.

.3 Once mock-ups have been completed and materials have had adequate time to properly cure, notify Contract Administrator to perform their review. Minimum 48 hours’ notice is required.

.8 Hold pre-installation meeting prior to commencement of firestop systems. Subcontractors that are affected, such as masonry, gypsum board/steel stud, mechanical and electrical subcontractors to attend. Review standard installation procedures, scheduling / sequencing of other work around or that affects outcome of installation, precautions, annular opening sizes, wall/floor service single and multi - preparations, joints and perimeter joints to ensure that all Subcontractors and Contractor understand full complexity of firestop installation, based on reviewed shop drawings.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and ULC or cUL label where applicable.

.2 Co-ordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

.3 Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

.4 Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

.5 Do not use damaged or expired materials.

.6 Cleaning and Waste Management in accordance with Section 01 74 00.

1.8 SITE CONDITIONS

.1 Do not use materials that contain flammable solvents.

.2 Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

.3 Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

.4 Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed manufacturer's recommended limitations for installation printed on product label and product data sheet.

.5 Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

.6 Schedule installation of Drop-In firestop devices after placement of concrete but before installation of the pipe penetration. Diameter of sleeved or cored hole to match the listed system for the device

.7 During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

1.9 WARRANTY

.1 Manufacturer’s Product Warranty: provide an extended warranty for Work of this Section for a period of two (2) years from date of Substantial Performance of the Work. Manufacturer hereby warrants firestopping products to be free of manufacturing defects, and these or other observed defects and deficiencies will be repaired or replaced to the satisfaction of the Contract Administrator and the City, and at no expense to the City.

.2 Installation Contractor’s Warranty: provide an extended warranty for Work of this Section for a period of two (2) years from date of Substantial Performance of the Work. Contractor hereby warrants that firestopping will remain as installed, free from any defects and deficiencies, and these or other observed defects and deficiencies will be repaired or replaced to the satisfaction of the Contract Administrator and the City, and at no expense to the City.

Part 2 Products

2.1 PERFORMANCE REQUIREMENTS

.1 Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

.2 Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

.3 Firestopping Materials are either “cast-in-place” (integral with concrete placement) or “post installed.” Provide cast-in-place firestop devices prior to concrete placement.

.4 Provide a round fire-rated cable management device whenever cables penetrate fire rated walls, where frequent cable changes and additions may occur. The fire-rated cable management device shall consist of a corrugated steel tube with zinc coating, contain and inner plastic housing, intumescent material rings, and inner fabric smoke seal membrane. The length of the sleeve shall be 12.4". The fire-rated cable management device shall contain integrated intumescent firestop wrap strip materials sufficient to maintain the hourly rating of the barrier being penetrated. The fire-rated cable management device shall contain a smoke seal fabric membrane or intumescent firestop plugs sufficient to achieve the L-Rating requirements of the barrier type. Install device per the manufacturer's published installation instructions.

.5 Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with CAN/ULC-S115-11

.1 F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.

.6 Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with CAN/ULC-S115-11.

.1 F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

.2 T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

.3 W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.

.7 Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E814.

.1 L-Rating: Not exceeding 5.0 cfm/sq. ft. or 5.0 cfm/ln. ft.of penetration or joint opening at both ambient and elevated temperatures.

.8 Mould Resistance: Provide penetration firestopping with mould and mildew resistance rating of 0 as determined by ASTM G21.

.9 Rain and water resistance: provide perimeter joint sealant tested in accordance with ASTM D6904 with less than 1-hour tack free time as tested in accordance with ASTM C679.

2.2 MANUFACTURERS

.1 Basis of Design Products: subject to compliance with through penetration firestop systems and joint systems listed in ULC Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory.

2.3 MATERIALS

.1 Cast-in place and pre-installed firestop devices for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors.

.2 Sealants or caulking materials for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT).

.3 Sealants or caulking materials for use with sheet metal ducts.

.4 Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps.

.5 Pre-formed mineral wool designed to fit flutes of metal profile deck (as backer for spray material).

.6 Intumescent sealants or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe.

.7 Foams, intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles.

.8 Non curing, re-penetrable intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles.

.9 Wall opening protective materials for use with cUL/ULC listed metallic and specified nonmetallic outlet boxes.

.10 Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems) tested to 50 Pa. differential.

.11 Materials used for large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways.

.12 Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways.

.13 Sealants or caulking materials used for openings between structurally separate sections of wall and floors.

.14 For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected.

.15 Re-penetrable, round cable management devices for use with new or existing cable bundles penetrating gypsum or masonry walls.

.16 Cable discs for single or cable bundles up to 1” diameter penetrating gypsum, masonry, concrete walls or wood floor assemblies.

.17 Fire Barrier Insulation Block for expansion joints in fire-rated wall assemblies.

.18 For penetrations through Fire Wall or horizontal Fire Separation provide firestop system with “FT” Rating as determined by ULC or cUL which is equal to fire resistance rating of construction being penetrated.

.19 For joints provide firestop system with Assembly Rating as determined by CAN/ULC S115 or UL 2079 which is equal to fire resistance rating of construction being penetrated.

Part 3 Execution

3.1 PREPARATION

.1 Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
- .1 Verify penetrations are properly sized and in suitable condition for application of materials.
- .2 Surfaces to which firestop materials will be applied to be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
- .3 Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
- .4 Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
- .5 Do not proceed until unsatisfactory conditions have been corrected.

3.2 CO-ORDINATION

.1 Co-ordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for work. Ensure device is installed before placement of concrete.

.2 Responsible trade is to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interference.

.3 Co-ordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Co-ordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

.4 Co-ordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.

3.3 INSTALLATION

.1 Regulatory Requirements: Install firestop materials in accordance with ULC Fire Resistance Directory or UL Products Certified for Canada (cUL) Directory or Omega Point Laboratories Directory, and FCIA MOP.

.2 Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.

- .1 Seal all holes or voids made by penetrations to ensure air and water-resistant seal.
- .2 Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of ULC or cUL firestop systems that might hamper performance of fire dampers as it pertains to duct work.
- .3 Protect materials from damage on surfaces subjected to traffic.

.3 Firestopping of New Fire Separations.

- .1 Install firestopping to maintain the integrity of all new fire separations in new fire rated floors and walls whenever affected by the demolition and new construction including:
  - .1 Penetrations through and top of masonry, and gypsum board fire separation walls.
  - .2 Penetrations through floor assembly fire separations.
  - .3 Intersections of fire-resistance rated masonry and gypsum board walls.
  - .4 Control joints in fire-resistance rated floor assemblies, and masonry and gypsum board walls.
  - .5 Openings and sleeves installed for future use through fire separations.
  - .6 Around mechanical and electrical assemblies penetrating fire separations.
  - .7 Rigid ducts greater than 129 cm^2 (20 in^2): firestopping to consist of bead of firestopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

.4 Firestopping of Existing Fire Separations.

- .1 Install firestopping and/or restore integrity of existing fire separations in existing fire rated floor assemblies and walls whenever affected by the demolition and new construction.
- .2 Patch and restore integrity of existing fire separations at openings in existing fire rated walls resulting from the demolition of doors, windows, ceilings, abutting walls, etc.
- .3 Install firestopping and/or restore openings (i.e. abandoned and not required for future services, or replaced with services of a smaller size) in existing fire rated floor assemblies and walls remaining after the demolition and removal of mechanical pipes and or ducts and electrical services.

.4 Install firestopping at all new penetrations in existing fire separations.

3.4 FIELD QUALITY CONTROL

.1 Do not conceal firestopping installations until Contract Administrator's inspection agency or Authorities Having Jurisdiction have examined each installation.

.2 Perform under this Section, patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

.3 Inspection of through-penetration firestopping shall be performed in accordance with ASTM E2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.

.4 Identify firestopping with pressure sensitive, self-adhesive preprinted vinyl warning labels. Attach labels permanently to surfaces of penetrated construction on both sides of all firestopping installations where the labels will be visible to anyone seeking to add to or remove penetrating items or firestopping at a future date. Photograph all installations for record purposes. Include the following information on all warning labels:
- .1 The words: "WARNING FIRESTOPPING DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE"
- .2 Contractor's name, address and phone number.
- .3 Firestopping system designation of applicable testing and inspecting agency (ULC or cUL).
- .4 Date of installation.
- .5 Firestopping product used and manufacturer's name.
- .6 Installer's name.

.5 Cut and remove systems for visual review by Contract Administrator and manufacturer's representative. Once review is completed and accepted, replace firestop system with new. For such exploratory reviews per approved design system listings, allow:
- .1 Minimum of 2% of each service penetration design listing for each area of 900 m^2;
- .2 Cut test perimeter joints every 15 meters;
- .3 Cut test bottom- and top-of-wall joints, wall-to-wall joints and building expansion joints every 15 meters minimum.
- .4 All Exploratory Reviews (cut tests) must meet the Firestop Systems minimum thickness, depth and/or widths of the annular requirements. These reviews will be performed 28 days after the installation to allow for curing of the product as a minimum. The Contract Administrator will not accept the installed system to be below the system's minimum requirements (depth and width). Shrinkage of the product installation must be factored into all installations on this Project.

3.5 IDENTIFICATION AND DOCUMENTATION

.1 The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration and joint location on the entire project.

.2 The Documentation Form for through penetrations is to include:
- .1 A Sequential Location Number.
- .2 The Project Name.
- .3 Date of Installation.
- .4 Detailed description of the penetrations location.
- .5 Tested System or Engineered Judgment Number.
- .6 Type of assembly penetrated.
- .7 A detailed description of the size and type of penetrating item.
- .8 Size of opening.
- .9 Number of sides of assemblies addressed.

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM).
- .1 ASTM C509-06(2021), Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
- .2 ASTM C510-16(2022), Standard Test Method for Staining and Colour Change of Single- or Multi-component Joint Sealants.
- .3 ASTM C717-19, Standard Terminology of Building Seals and Sealants.
- .4 ASTM C834-17, Standard Specification for Latex Sealants.
- .5 ASTM C919-22, Standard Practice for Use of Sealants in Acoustical Applications.
- .6 ASTM C920-18, Standard Specification for Elastomeric Joint Sealant.
- .7 ASTM C1193-16, Standard Guide for Use of Joint Sealants.
- .8 ASTM C1248-18, Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- .9 ASTM C1253-14(2019), Standard Test Method for Determining Outgassing Potential of Sealant Backing.
- .10 ASTM C1330-18, Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- .11 ASTM C1518-16, Standard Specification for Precured Elastomeric Silicone Joint Sealants.
- .12 ASTM C1520-20, Standard Guide for Paintability of Latex Sealants.
- .13 ASTM D412-16(2021), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
- .14 ASTM D624-00(2020), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- .15 ASTM E90-09(2016), Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.2 Workplace Hazardous Materials Information System (WHMIS).

1.2 QUALITY ASSURANCE

.1 Regulatory Requirements.
- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and provision of material safety data sheets acceptable to Labour Canada.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make all submittals in accordance with Section 01 33 00.

.2 Product Data.
- .1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Manufacturer's product to describe:
  - .1 Caulking compound.
  - .2 Primers.
  - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Submit two (2) copies of WHMIS MSDS.

.3 Samples.
- .1 Submit two (2) samples of each type of material and colour.

.2 Cured samples of exposed sealants for each colour where required to match adjacent material.

.4 Manufacturer's Instructions.
.1 Submit instructions to include installation instructions for each product used.

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

1.4 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect joint sealants from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Cleaning and Waste Management in accordance with Section 01 74 00.

1.5 SITE CONDITIONS

.1 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.2 Clean porous materials such as concrete by brushing, grinding, blast cleaning, mechanical abrading or combinations of these methods to provide a clean, sound substrate for optimum sealant adhesion. Remove loose particles that are present from grinding, abrading, or blast cleaning by blowing out joint with oil-free compressed air prior to application of a primer and/or sealant.

.3 Use only non-staining sealants on existing exterior building components.

Part 2 Products

2.1 MATERIALS

.1 Joint Sealants and Sealant Primers: as recommended by sealant manufacturer for use with their product on applicable substrates.
.1 Silicone Sealant: to ASTM C1518 at all locations unless otherwise indicated.
.2 Interior Latex Acrylic Sealant: to ASTM C834 and C1520 for interior joints in surfaces to be painted.
.3 Acoustical Sealant to ASTM C919.
.4 Expanding Joint Sealant to ASTM D3574.

.2 Preformed Compressible Joint Filler Material.
.1 Closed-cell foam backing rod to ASTM C1330.
.2 Polyethylene, Urethane, Neoprene or Vinyl Foam.
.1 Extruded open cell foam backer rod.
.2 Size: oversize 30% to 50%.

.3 Neoprene or Butyl Rubber.
.1 Round solid rod, Shore A hardness 70.
.4 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.
.5 Bond Breaker Tape.
.1 Self-adhesive, pressure sensitive tape mad from TFE-fluorocarbon (Teflon) or polyethylene which sealant will not adhere to.

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

2.2 SEALANT MATERIALS

.1 Do not use caulking that emits strong odours, contains toxic chemicals, or is not certified as mould resistant in air handling units.

.2 When low toxicity caulks are not possible, confine usage to areas which off-gas to the exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off-gas time.

Part 3 Execution

3.1 PREPARATION OF JOINT SURFACES

.1 Prior to commencement of work, verify that site joints and surfaces have been provided as specified under work of other sections, and that joint conditions will not adversely affect execution, performance or quality of completed work, and that they can be put into acceptable condition by means of preparation specified in this section.

.2 Examine joint sizes and conditions to establish correct depth to width relationship for installation of joint filler materials and sealants.

.3 Ascertain that sealers and coatings applied to sealant substrates are compatible with sealant used and that full bond between sealant and substrate is attained. Request samples of sealed or coated substrate from their fabricators for testing of compatibility and bond, if necessary, or test on site to Contract Administrator’s acceptance.

.4 Clean bonding joint surfaces of harmful matter substances including dust, oil grease, loose mortar and other matter which may impair work. Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sandblasting.

.5 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.

.6 Ensure that releasing agents, coatings or other treatments have either not been applied to joint surfaces or that they are entirely removed.

.7 Ensure joint surfaces are dry and frost free.

.8 Verify that specified environmental conditions are ensured before commencing work.

.9 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.10 Defective work resulting from application to unsatisfactory joint conditions will be considered the responsibility of those performing the work of this section.

3.2 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.3 JOINT FILLER MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Pack joints continuously with closed cell backer rod joint backing material allowing a recess to receive sealant. Installation of backer rod with a sharp tool such as putty knife is not permitted. Ensure surface skin of the backer rod is not punctured or cut during installation. A puncture in the backer rod may result in outgassing into the uncured sealant resulting in voids or other defects in the cured sealant.

.3 Backer rod to be installed under adequate compression to hold it in-place in the joint opening and to resist the pressure applied when tooling a non-sag sealant into place. Backer rod diameter to be 25% greater than the joint width. Install backer rod without stretching. Under no circumstances should backer rod that is too small for the joint be doubled up or braided together to fit the opening.

.4 Where joint configuration and/or size does not permit the use of a backer rod, install bond breaker tape. The tape shall be installed continuously with no skips or voids in the tape application.

.5 Install joint filler to achieve correct joint depth and shape (ratio 1:2) with approximately 30% compression.

3.4 APPLICATION

.1 Sealant.
- .1 Apply sealants to manufacturer's printed instructions.
- .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
- .3 Apply sealant in continuous beads.
- .4 Apply sealant using gun with proper size nozzle.
- .5 Use sufficient pressure to fill voids and joints solid. Superficial pointing with skin bead is not acceptable.
- .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
- .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
- .8 Remove excess compound promptly as work progresses and upon completion.
- .9 Install continuous bead or joint sealant along all gypsum board control joints.

.2 Curing.
- .1 Cure sealants in accordance with sealant manufacturer's instructions.
- .2 Do not cover up sealants until proper curing has taken place.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00.
- .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.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00.

.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 joint sealants installation.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Ceramic tile, backing and installation at locations shown on Drawings.

1.2 RELATED SECTIONS

.1 Section 03 91 10 – Surface Preparation for Concrete Delamination Repair.

.2 Section 22 05 00 – Common Work Results for Plumbing.

.3 Section 26 05 26 – Grounding and Bonding.

1.3 MEASUREMENT PROCEDURES

.1 No measurement will be made under this section for preparation and installation tiles and associated items.

.2 Repair of cracks in concrete substrate exposed by removal of existing ceramic tiles and mortar bed will be a Unit Price in accordance with Section 01 22 00 – Unit Prices.

.3 Direct pull-out tensile testing of mortar bed will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

.4 Scanning of concrete for reinforcing steel to accommodate concrete testing will be measured and handled in accordance with Section 01 22 00 – Unit Prices.

1.4 REFERENCES

.1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI).

.1 ANSI A108/A118/A136.1:2024, Specification for the Installation of Ceramic Tile.

.2 American Society for Testing and Materials International (ASTM):

.1 ASTM D1056-20, Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.

.2 ASTM F1869-23, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

.3 Canadian Standards Association (CSA)

.1 CSA- A23.2-19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA A283-19, Qualification Code for Concrete Testing Laboratories.

.4 Terrazzo Tile and Marble Association of Canada (TTMAC)

.1 Tile Specification Guide 09 30 00 2019/2021, Tile Installation Manual.

1.5 SUBMITTALS

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

.1 Product data:

.1 Each tile type, size, and shape required, including slip resistance and frost resistance where applicable.

.2 Tile chemical resistance to mortar and grout.

.3 Bonding agent characteristics

.4 Repair mortar and mortar bed

.5 Accessories specified including waterproofing membrane and reinforcing fabric.

.6 High performance, marine-grade sealants
.7 Tile setting mortar characteristics
.8 Each grout type, colour, and characteristics
.9 Grout sealer
.10 Cleaning compounds

.2 Submit manufacturer's technical information and colour charts for each product specified.

.3 Samples:

.1 Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each tile colour, texture, size and pattern, including related trims and profiles at edges, corners, transition. Make samples at least 300mm square. Use grout of type and in colour or colours approved for completed Work. Adhere tile samples to 11mm thick plywood.

.2 Full-size units of each type of trim and accessory for each colour and finish required.

.4 Shop Drawings:

.1 Tiling Plans: Submit tiling plans illustrating the follows:

.1 Tile layout in plan, tank elevation and detail views.

.2 Indicating location and extent of:

.1 Each tile type.
.2 Each specialty fitting.
.3 Text markers.
.4 Expansion and control joints.

.3 Submit in sufficient time to allow for review and ordering of tiles so as not to cause a delay in the Work.

.5 Qualification Statements:

.1 General:

.1 Submit the following information for each qualification statement project example:

.1 Name and location of project.
.2 Name and contact information for the:

.1 Building owner.
.2 Prime consultant.

.3 Name of prime contractor and site superintendent.
.4 Total contract value.
.5 Name of concrete restoration contractor and superintendent.
.6 Concrete restoration contract value.
.7 Date of construction.
.8 Description of prime project.
.9 Description of types of concrete restoration.

.2 Upon request by the Contract Administrator submit the following:

.1 Prime Contractor:

.1 Prime Contractor Qualification Statements:

.1 Minimum three project examples as prime contractor completed in the past five years demonstrating successful performance of the specified qualifications.

.2 Superintendent Qualification Statements:

.1 Minimum three project examples as a prime contractor site superintendent completed in the past five years demonstrating successful performance of the specified qualifications.

.2 Ceramic Tiling Subcontractor:

.1 Ceramic Tiling Subcontractor Qualification Statements:

.1 Minimum three examples of local projects as a ceramic tiling subcontractor completed in the past ten years demonstrating successful performance of the specified qualifications.

.2 Ceramic Tiling Subcontractor Superintendent Qualification Statements:

.1 Minimum three examples of local projects as a ceramic tiling subcontractor superintendent completed in the past ten years demonstrating successful performance of the specified qualifications.

.3 Ceramic Tiling Manufacturer:

.1 Ceramic Tiling Manufacturer Qualification Statements:

.1 Minimum three examples of local projects as a ceramic tiling manufacturer completed in the past ten years demonstrating successful performance of the specified qualifications.

.4 Testing Agency:

.1 Certification confirming member in good standing with the Canadian Council of Independent Laboratories for the specified testing procedure(s).

1.6 CLOSEOUT SUBMITTALS

.1 Provide in accordance with Section 01 78 00 - Closeout Submittals.

.2 Maintenance data: submit maintenance data for incorporation into Operations and Maintenance Manual. Include:

.1 Cleaning and maintenance recommendations for The City's use.

.2 TTMAC Maintenance Guide. Provide specific warning of any maintenance practice or materials that may damage or disfigure finished work.

.3 Warranty: Submit final executed warranty.

.4 Extra materials:

.1 Provide minimum 5% of each type and colour of tile required for project for maintenance use. Store where directed.

.2 Maintenance material same production run as installed material.

1.7 QUALITY ASSURANCE

.1 Conform to TTMAC Manual, latest edition.

.2 Maintain one (1) copy of each document on site.

.3 Prime Contractor Qualifications:

.1 Prime Contractor:

.1 Engaged full time as a prime contractor with knowledge and experience in the risks, safety and environmental impacts involved in managing a ceramic tiling subcontractor completing ceramic tiling removal, preparation and installation as required by these Contract Documents.

.2 Prime Contractor Superintendent:

.1 Experienced as a prime contractor site superintendent with knowledge and experience in the risks, safety and environmental impacts involved in supervising and coordinating a ceramic tiling subcontractor completing ceramic tiling removal, preparation and installation as specified by these Contract Documents.

.4 Ceramic Tiling Subcontractor Qualifications:

.1 Ceramic Tiling Subcontractor:

.1 Engaged full time as a ceramic tiling subcontractor with knowledge and experience in the risks, technical, safety and environmental impacts involved in ceramic tiling removal, preparation and installation as required by these Contract Documents.

.2 Ceramic Tiling Superintendent:

.1 Experienced as a ceramic tiling subcontractor site superintendent with knowledge and experience in the risks, technical, safety and environmental impacts involved in supervising and coordinating ceramic tiling removal, preparation and installation as specified by these Contract Documents.

.3 Ensure all personnel involved with ceramic tiling are adequately trained and familiar with the requirements of this and related ceramic tiling sections.

.5 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten (10) years documented experience.

.6 Testing agency Qualifications:

.1 Independent third party testing agency certified:

.1 In accordance with CSA A283, and

.2 By the Canadian Council of Independent Laboratories (CCIL) for the testing procedures specified in related concrete sections.

1.8 MOCK-UP

.1 General:

.1 Locate where directed by the Contract Administrator and The City.

.2 Approved mock-up may remain as part of the Work.

.3 Approved mock-up will form standard of acceptance for remaining work.

.2 Field tile installation:

.1 Provide 3,000mm long by 6,000mm wide mock-up, with finish grout, and specified accessories.

.2 Mock-up to include control joints.

.3 Conduct minimum three direct pull-out tensile (bond) tests of mock-up.

.1 Measurement and payment of bond tests in accordance with Section 01 22 00 – Unit Prices.

.3 Tank deck lettering:

.1 Provide minimum 300mm wide by 3,000mm long mock-up of minimum two types of lettering.

.4 Tank deck/wall contrasting band:

.1 Provide minimum 1,500mm wide by 3,000mm long by 1,000mm high mock-up of ceramic tile installation with contrasting colour bands.

1.9 POOL TANK EMPTYING AND FILLING CONFERENCE

.1 In accordance with Section 01 31 19 – Project Meetings.

1.10 PRE-INSTALLATION CONFERENCE

.1 In accordance with Section 01 31 19 – Project Meetings.

.2 Convene and coordinate pre-installation conference for concrete restoration including the following sections:

.1 Section 03 91 10 – Surface Preparation for Concrete Delamination Repair.

.2 Section 22 05 00 – Common Work Results for Plumbing.

.3 Section 26 05 26 – Grounding and Bonding.

1.11 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

1.12 AMBIENT CONDITIONS

.1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C for 48 hours before, during, and after, installation.

.2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.

.3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

1.13 WARRANTY

.1 Provide setting material Manufacturer’s superior 25-year materials and labour warranty against breakdown or deterioration of the waterproof membrane and setting materials.

Part 2 Products

2.1 TILES

.1 Ceramic Tile (CT-1):

.1 Acceptable product: “Keystones Series”, by Daltile.

.1 Mosaic pattern, matte finish, colour through body.

.2 Size: 23mm x 23mm Square (300 x 600 sheets).

.3 Colour: Castlerock.

.4 Code: D618.

.5 Location: Refer to Architectural Drawings.

.6 Trims and Profiles: Include all required trims & profiles such as cove base, nosing, inside corner, outside corner, cove base corner, universal trims, etc.

.2 Ceramic Tile (CT-2):

.1 Acceptable product: “Keystones Series”, by Daltile.

.1 Mosaic pattern, matte finish, colour through body.

.2 Size: 23mm x 23mm Square (300 x 600 sheets).

.3 Colour: Black.

.4 Code: D311.

.5 Location: Refer to Architectural Drawings.

.6 Trims and Profiles: Include all required trims & profiles such as cove base, nosing, inside corner, outside corner, cove base corner, universal trims, etc.

.3 Ceramic Tile (CT-3):

.1 Acceptable product: “Keystones Series”, by Daltile.

.1 Mosaic pattern, matte finish, colour through body.

.2 Size: 23mm x 23mm Square (300 x 600 sheets).

.3 Colour: Biscuit.

.4 Code: D317

.5 Location: Refer to Architectural Drawings.

.6 Trims and Profiles: Include all required trims & profiles such as cove base, nosing, inside corner, outside corner, cove base corner, universal trims, etc.

.4 Ceramic Tile (CT-4):

.1 Acceptable product: Elan Tile, Porcelain tactile walking surface indicator (TWSI) with truncated domes.

.2 Size: 300mm x 300mm.

.3 Code: ELAN-D-1212.

.4 Colour: Sand Stone.

.1 Code: ST.

.5 Location: Refer to Architectural Drawings.

.5 Ceramic Tile (CT-5):

.1 No Diving Symbol. Custom graphic with text as shown on Architectural Drawings.

.1 No diving symbol: Minimum 100mm diameter.

.2 English and French text. Refer to Architectural Drawings.

.2 Acceptable product: MG Series Skid resistant – C82, by Daltile.

.3 Size: Custom size: 175mm x 175mm Square.

.4 Location: Refer to Architectural Drawings.

.6 Ceramic Tile (CT-6):

.1 Acceptable product: “Keystones Series”, by Daltile.

.1 Mosaic pattern, matte finish, colour through body.

.2 Size: 50mm x 50mm Square (300 x 600 sheets).

.3 Colour: Biscuit.

.4 Code: D317.

.5 Location: Refer to Architectural Drawings.

.6 Trims and Profiles: Include all required trims & profiles such as cove base, nosing, inside corner, outside corner, cove base corner, universal trims, etc.

.7 Ceramic Tile – Splash Pad:

.1 Hexagon tile to match existing.

.2 Colour: Grey and white to match existing.

.3 Location: Splash pad North knee wall and adjacent floor as shown on Drawings.

.4 Trims and Profiles: Include all required trims & profiles such as cove base, nosing, inside corner, outside corner, cove base corner, universal trims, etc.

2.2 CRACK SEALER

.1 Epoxy crack sealer: Sikadur 52 SLV by Sika.

2.3 MORTAR BED – POOL DECK FLOOR AND TANK FLOOR

.1 Accelerated-cure mortar bed.

.2 Application thickness:

.1 As required to achieve finished tile thickness to match existing tile finished thickness.

.2 6mm to 100mm: Standard mix.

.3 Extended mix up to 4": Add up to 20 per cent by weight of washed, clean, non-reactive saturated surface dry 0.375" pea gravel.

.3 Acceptable Product:

.1 Topcem Premix by Mapei mixed with Planicrete AC by Mapei.

2.4 MORTAR BED – TANK WALLS:

.1 Two component, fats setting, thixotropic, fibre reinforced repair mortar with corrosion-inhibitor.

.2 Application thickness:

.1 As required to achieve finished tile thickness to match existing tile finished thickness.

.2 6mm to 50mm per lift.

.3 Maximum two lifts to total thickness of 100mm.

.3 Acceptable Product:

.1 Planitop 12 SR by Mapei.

2.5 BONDING AGENT

.1 Single component, polymer-modified premium thin-set mortar, complying with ANSI A118.4.

.2 Acceptable Product:

.1 Ultraflex 3 by Mapei.

2.6 WATERPROOFING MEMBRANE

.1 Membrane: Fast setting, flexible, thin, load bearing, premium latex-based waterproofing and crack isolation membrane complying with ANSI A118.10 and ANSI A118.12.

.2 Reinforcing fabric: Flexible, alkali-resistant, nonwoven polyester fabric.

.3 Acceptable Products:

.1 Membrane: Aquadefense by Mapei.

.2 Reinforcing fabric: Reinforcing fabric by Mapei.

2.7 TILE SETTING MORTAR

.1 Single component, polymer-modified premium thin-set mortar, complying with ANSI A118.4.

.2 Acceptable Product:

.1 Ultraflex 3 by Mapei.

2.8 GROUT MATERIALS

.1 Fine-aggregate, fast-setting, polymer-modified, colour-resistant, non-shrinking, efflorescence-free grout.

.2 Acceptable Products:

.1 Ultracolor Plus FA by Mapei.

.2 Colour: By The City based on manufacturer standard colour range.

2.9 JOINT SEALANT/JOINT BACKING

.1 Joint Sealant: Latasil by Latacrete.

.2 Joint Backing (ASTM D1056): round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.

.3 Teflon tape bond breaker tape for control joints.

2.10 ACCESSORIES

.1 Anchors:

.1 For installation of deck fixtures removed and salvaged for re-installation.

.1 Anchor: Hilti-HS-RN 316 SS.

.1 Diameter: to match existing.

.2 Adhesive: Hilti HIT RE 500 V3.

.2 Wedge, stanchion, and railing anchors:

.1 Material: Bronze.

.2 Size and shape: to match existing, intended use and as shown on Drawings.

.3 In accordance with Public Health Act, Regulations and guidelines.

.4 Including grounding and bonding connections.

.2 Tile Closure: Extruded, anodized clear aluminum.

.1 Profile as shown on Drawings.

2.11 TRIM SHAPES

.1 Conform to applicable requirements of adjoining floor and wall tile.

.2 Use trim shapes sizes conforming to size of adjoining field wall tile, including existing spaces, unless specified otherwise.

.3 Internal and External Corners: provide trim shapes as follows where indicated.

.1 Bullnose shapes for external corners including edges.

.2 Coved shapes for internal corners.

2.12 SCHEDULES

.1 Deck floors:

.1 Ceramic tile.

.1 Grout joints with grout materials.

.2 Tile setting mortar.

.3 Waterproofing membrane.

.4 Mortar bed – Pool deck floor and tank floor.

.5 Bonding agent.

.6 Existing concrete substrate.

.2 Deck walls:

.1 Ceramic tile.

.1 Grout joints with grout materials.

.2 Tile setting mortar.

.3 Waterproofing membrane.

.4 Existing concrete substrate.

.3 Tank floors:

.1 Ceramic tile.

.1 Grout joints with grout materials.

.2 Tile setting mortar.

.3 Waterproofing membrane.

.4 Mortar bed – Pool deck floor and tank floor.

.5 Bonding agent.

.6 Existing concrete substrate.

.4 Tank walls:

.1 Ceramic tile.

.1 Grout joints with grout materials.

.2 Tile setting mortar.

.3 Waterproofing membrane.

.4 Mortar bed – Tank walls.

.5 Existing concrete substrate.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance:

.1 Comply with manufacturer's written recommendations, instructions and specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

.2 Proportion and mix materials in accordance with manufacturer’s most current written instructions and applicable ANSI standards.

3.2 DEMOLITION

.1 Demolish existing materials as shown on Drawings to allow preparation of surfaces for ceramic tiling installation.

3.3 EXAMINATION

.1 Verify that surfaces are ready to receive work.

.2 Tile installation contractor to inspect substrate.

.1 Commencement of installation shall be considered acceptance of substrate.

.3 General Contractor shall be responsible for ensuring that the substrate, the overlay and underlayment meet the specification requirements or surface flatness tolerances.

.4 Contractor to verify surface conditions in structural slab comply with TTMAC.

.5 Conduct Calcium Chloride moisture emission testing of concrete substrate:

.1 In accordance with ASTM F1869.

.2 Frequency: minimum three independent floor test locations at each tank.

.3 Acceptable conditions: moisture emission not to exceed 2,26 kg/92m^2 per 24 hours (5 lbs per 1000 S.F. per 24 hours).

3.4 PREPARATION

.1 Protect surrounding work from damage or disfiguration.

.2 Ensure that any contaminants, including but not limited to oils and solvents which may impact the bond of the thin-set are removed. The removal of such stains shall be included in the fixed price of the tile installation.

.3 Vacuum clean surfaces and damp clean.

3.5 CRACK SEALING WITH EPOXYCRACK SEALER

.1 At locations of cracks requiring repair identified by the Contract Administrator:

.1 Sawcut with 3mm blade along length of crack identified.

.2 Do not cut reinforcing steel.

.3 Clean crack with vacuum.

.4 Infill crack with epoxy crack sealer.

.5 Top crack repair with silica sand to saturation.

.6 Remove loose sand.

3.6 INSTALLATION: MORTAR BED – POOL DECK FLOOR AND TANK FLOOR

.1 Examination:

.1 Once existing tiles and mortar bed have been removed to expose existing concrete substrate, surfaces will be reviewed by the Contract Administrator in the presence of and with the assistance of the Contractor to identify concrete repairs.

.2 Concrete repairs to be completed in accordance with applicable concrete repair specifications.

.3 Once concrete repairs are complete, ensure concrete repairs have acceptable cured.

.2 Preparation:

.1 Treat existing cracks in concrete with crack sealer as shown on Drawings.

.2 Shotblast and sandblast surface of concrete and repair areas prior to installation of mortar bed.

.1 Surface preparation to ICRI CSP-3 to 5.

.3 Vacuum clean surfaces and damp clean.

.4 Thoroughly wet surfaces for a period of not less than two (2) hours.

.5 Remove standing water prior to installation of mortar bed.

.6 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.3 Installation:

.1 Bonding Agent:

.1 After the concrete surface has been prepared and cleaned, mix and apply bonding agent in accordance with manufacturer’s directions and application rates.

.2 Apply one coat of bonding agent:

.1 Brush scrub into surface.

.2 If scrub coat dries prior to application of mortar bed, re-coat bonding agent.

.2 Mortar Bed:

.3 Mix and apply mortar bed materials in accordance with manufacturer’s directions and application rates.

.4 While bonding agent is still wet, spread thin layer of mortar bed materials onto the floor surface with a flat trowel.

.1 Work mortar bed materials into bonding agent with wood or magnesium float.

.5 Immediately follow with more mortar bed material to desired height.

.1 Compact and close surface.

.6 Provide slopes and contours as shown on Drawings.

.7 Allow mortar bed to cure for at least 48 hours per 12mm thickness based at 21° C and 50% relative humidity, plus or minus 10% prior to application of waterproofing.

3.7 INSTALLATION: MORTAR BED – TANK WALLS

.1 Examination:

.1 Once existing tiles and mortar bed have been removed to expose the existing concrete substrate, surfaces will be reviewed by the Contract Administrator in the presence of and with the assistance of the Contractor for concrete repairs.

.2 Preparation:

.1 Shotblast and sandblast surface of concrete prior to installation of mortar bed.

.1 Surface preparation to ICRI CSP-7.

.2 Vacuum clean surfaces and damp clean.

.3 Thoroughly wet surfaces for a period of not less than two (2) hours.

.4 Remove standing water prior to installation of mortar bed.

.5 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.3 Application

.1 Mix and apply repair mortar material in accordance with manufacturer's directions and application rates.

.2 Apply scrub coat of repair mortar with pressure into prepared surface.

.3 Prior to scrub coat drying, quickly apply repair mortar by trowel or spray.

.4 Allow repair mortar to cure for at least 24 hours based at 23° C and 50% relative humidity prior to application of waterproofing.

3.8 WATERPROOFING INSTALLATION

.1 Preparation:

.1 Shotblast surface of concrete and repair areas prior to installation of mortar bed.

.1 Surface preparation to ICRI CSP-2.

.2 Vacuum clean surfaces and damp clean.

.3 Pre-treat cracks, floor-to-wall interfaces, inside corners and drains as shown on Drawings and in accordance with manufacturer directions.

.4 Maintain surface temperature of concrete slab at least 3°C above the dew point.

.2 Installation:

.1 Mix and apply waterproofing membrane material accordance with manufacturer's directions and application rates.

.2 Apply membrane into corners, coves, drains and penetrations.

.1 Immediately embed reinforcing fabric into membrane to 100% and remove excess membrane material.

.2 Immediately re-cover fabric with another coat of membrane.

.3 Ensure reinforcing fabric is installed at 90° angle in corners.

.4 Overlap reinforcing fabric minimum 2".

.3 Apply membrane material on areas to be waterproofed using 3/8" nap roller.

.4 Allow membrane to cure for minimum 24 hours.

.5 Apply second coat of membrane over entire application area.

3.9 CERAMIC TILE INSTALLATION

.1 Install in accordance with TTMAC and manufacturer's written instructions.

.2 Tile setting Mortar

- .1 Mix and apply tile setting mortar in accordance with manufacturer’s directions and application rates.
- .2 Apply mortar with a notched trowel of sufficient depth to achieve more than 95% mortar contact to both the tile and substrate.
- .3 Backbutter tiles.
- .4 With pressure, apply a coat using the trowel’s flat side to key mortar into substrate.
- .5 Apply additional mortar, combing in single direction with trowel’s notched side.
- .6 Spread only as much mortar as can be tiled before mortar skins over.
- .7 Place tiles firmly into wet mortar.
- .8 Remove excess mortar from joint so that at least 2/3 of the tile depth is available for grouting.

.3 Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

.4 Place thresholds, edge strips at exposed tile edges at locations indicated.

.5 Cut and fit tile tight to penetrations through tile. Form corners, bases neatly. Align floor, base and wall joints.

.6 Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

.7 Lippage: To TTMAC tolerances; 2 mm maximum.

.8 Sound tile after setting. Replace hollow sounding units.

.9 Grouting:

- .1 Remove tile spacers, pegs, ropes and strings.
- .2 Grout joints to be clean and free of standing water, dust, dirt, and foreign matter.
- .3 Remove excess mortar from joints to maintain 2/3 of the depth of tile is available for grouting.
- .4 Mix and apply grout in accordance with manufacturer’s directions.
- .5 Use hard-rubber floats with sharp edge to force grout into joints in continuous manner. Leave flush with tile edge.
- .6 Compact grout in joints and maintain free of voids and gaps.
  - .1 Fill joints with maximum amount of grout.
- .7 Remove excess grout from the face of tile.
- .8 Clean tiles immediately following application of grout.
- .9 Grout and clean in small areas.

.10 Grout joint width:

- .1 In accordance with manufacturer’s direction to suit tile size.
- .2 All grout widths to be uniform throughout installation.

.11 Control joints:

- .1 Spacing:
  - .1 Minimum: 4 875 mm (16’-0”).
  - .2 Maximum: 6 100 mm (20’-0”).
- .2 Width: Minimum 6 mm.
- .3 Show locations on tiling plans to be submitted.

.4 Keep control joints free of adhesive or grout.

.5 Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.

.6 Apply sealant to joints.

.12 Allow tile to set for a minimum of 48 hours prior to grouting.

.13 Grout tile joints.

.14 Tile installation not to impede operation of swing of doors. Check all thresholds prior to installation.

.15 Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.10 POOL TANK EMPTYING AND FILLING

.1 As specified in Part D – Supplementary Conditions, D2.1(b).

3.11 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Co-ordinate with mortar bed, waterproofing and tile setting material Manufacturer's representative to inspect prepared conditions and installations as required to satisfy warranty requirements.

.2 Do not take instructions directly from the manufacturer’s representative unless approved by the Contract Administrator.

.2 Mortar Bed Direct Pull-out Tensile (Bond) Tests:

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Contract Administrator in accordance with CSA-A23.1 and Section 01 40 00 - Quality Requirements and as described herein.

.2 Inspection or testing by the Contract Administrator will not augment or replace Contractor quality control nor relieve contractual responsibility.

.3 Direct pull-out tensile (bond) tests of the mortar bed will be completed to determine bond strength of mortar bed to the concrete substrate in accordance with CSA-A23.2-6B, Procedure A.

.1 Schedule testing following minimum 72-hour cure of mortar bed, but prior to installation of waterproofing membrane.

.4 Costs for direct pull-out tensile tests as a unit price in accordance with Section 01 22 00 – Unit Prices and Form B – Prices.

.5 Testing agency conducting direct pull-out tensile tests to be certified for CSA A23.2-6B (Procedure A) by the Canadian Council of Independent Laboratories (CCIL).

.6 Frequency of tests:

.1 Pool deck floors: Minimum three locations.

.2 Tank floors: Minimum three locations.

.3 Tank walls: Minimum three locations.

.4 The Contract Administrator reserves the right to direct additional bond tests to be conducted if concrete or bonding system is suspect.

.7 Prior to coring for direct pull-out tensile testing, scan substrate to ensure existing reinforcing will not be severed by the testing procedure.

.1 Scanning will be measured and paid as a Unit Price.

.2 Contractor will be responsible for the following where existing reinforcing is severed by the test procedure at no additional cost to the City:

.1 Design repair and re-establishment of reinforcing procedure by a professional engineer licenced in the Province of Manitoba.

.2 Repair and re-establishment of reinforcing in accordance with the repair procedure.

.3 Submit repair procedure to the Contract Administrator for review prior to repair work proceeding.

.8 Infilling of the core hole will be the responsibility of the Contractor. Unless otherwise directed by the Contract Administrator, repair in accordance with this Section or Section 03 93 10.

.9 Submit test results in accordance with Section 01 33 00 – Submittal Procedures.

.3 Post waterproofing application flood test:

.1 Following application of waterproofing membrane, conduct flood testing of membrane as follows:

.1 Erect scaffolding and platform in middle of tank.

.1 Provide protection of membrane at locations of scaffolding supports in contact with membrane.

.2 Elevation of scaffold platform to be 150mm below pool water elevation.

.2 Place plastic 18L pail on top of scaffold platform.

.3 Sequentially fill pool in accordance with waterproofing membrane manufacturer directions.

.4 Fill 18L pail with water. Elevation of water in pail to match elevation of pool tank water level.

.5 Over next 72 hours:

.1 Observe pool and pail water levels.

.2 Observe leaks in tank walls and floor from underside of tank.

.6 Record difference in pool and pail water levels.

.2 Where no difference in pool to pail water levels observed and no leaks observed at underside of tank, membrane is acceptable.

.1 Empty pool water at rate in accordance with manufacturer's directions and proceed with ceramic tiling.

.3 Where a difference in pool to pail water levels are observed or where leaks are observed at underside of tank:

.1 Empty pool water at rate in accordance with manufacturer's directions.

.2 Visually review waterproofing application with Contract Administrator and manufacturer representative.

.3 Repair defects observed in waterproofing membrane in accordance with manufacturer's directions.

.4 Apply another coat of waterproofing membrane.

.5 Re-test.

3.12 CLEANING

.1 Clean tile and grout surfaces.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Related Sections

.2 Words and Terms

.3 Complimentary Documents

.4 Description of the work

.5 Contract Method

.6 Permits, inspection and testing

.7 Examination

.8 Closeout submittals

.9 Operation and maintenance manual

.10 Recording actual site conditions.

.11 Record documents.

.12 Warranties and bonds.

.13 Fabrication and workmanship

.14 Quality Assurance.

.15 Demonstration and Training

.16 Conditions for Demonstrations

.17 Shop drawings – Administrative requirements

.18 Shop drawings and product data submissions

.19 Product changes and substitutions.

.20 Samples.

.21 Mock-ups

.22 Progress Payment Submissions

.23 Certificates and transcripts.

.24 Products Supplied: Quality, Availability, Storage, Handling, Protection, and Transportation.

.25 Sustainable and low impact requirements

.26 Special Cleaning

.27 Existing Utilities

.28 Manufacturer's instructions.

.29 Quality of Work, Accessibility, Coordination and Fastenings.

.30 Work for other trades

.31 Electrical requirements

.32 Concealment

.33 Access panels

.34 Remedial work

.35 Alteration work

.36 Location of fixtures

.37 Temporary use of equipment

.38 Protection of work in progress

.39 Equipment start up and verification reports

1.2 WORDS AND TERMS

.1 Conform to definitions and their defined meanings as in Section .

.2 Refer to Section for Specification Grammar.

.3 Conform to the following definitions and their defined meanings in addition to those referenced in Section]:

.1 **Install:** To remove from site storage, move or transport to intended location, install in position, connect to utilities, repair site caused damage, and make ready for use.

.2 **Supply:** To acquire or purchase, ship or transport to the site, unload, remove packaging to permit inspection for damage, re-package, replace damaged items, and safely store on-site.

.3 **Provide:** Wherever the term "provide" is used in relationship to equipment, piping and other materials specified for the work, it means "supply, install and connect". Wherever the terms “provide” is used in connection with services such as testing, balancing, start-up, preparation of drawings for any part of the work, it means procure, prepare, supervise, take responsibility for, and pay for these services.

.4 **Typical:** A representative characteristic that is standard for all installations whether individually noted or not throughout the documents. “Typical” applies to each individual or combined installation except where specifically noted or otherwise indicated that the application is non-typical.

.5 **Exposed:** Any work not concealed in wall, shaft, or ceiling cavities or spaces. Work behind doors, in closets or cupboards or under counters is considered exposed.

.6 **New:** Produced from new materials.

.7 **Renewed:** Produced or rejuvenated from an existing material to like-new condition to serve a new or existing service.

.8 **Defective:** A condition determined exclusively by the Contract Administrator.

1.3 COMPLEMENTARY DOCUMENTS

.1 Drawings, specifications, and schedules are complementary to each other and what is called for by one will be binding as if called for by all.

.2 Should any discrepancy appear between the drawings and specifications, which leaves the Contractor in doubt as to the true intent and meaning of the plans, and specifications, the Contractor shall obtain a ruling in writing from the Contract Administrator in writing before submitting the bid. If this is not done it will be assumed that the most expensive alternative has been included in the bid price.

.3 The drawings for mechanical work are performance drawings. They are generally diagrammatic and are not to scale unless detailed otherwise. They establish scope, material and installation quality and are not detailed installation instructions showing every offset, fitting, valve or every difficulty encountered during execution of work and will not be used as an excuse for deficiencies or omissions. Where required installations are not shown on plans or are only shown diagrammatically, install in such a way as to conserve headroom and interfere as little as possible with free use or space through which they pass, while adequate space is allowed for service, maintenance, repair, or replacement for all equipment.

.4 The drawings indicate general location and route of new and existing mechanical systems. The review of exact location and routing of systems prior to bidding is the responsibility of the Contractor. Install piping and duct systems not exactly shown in plan or indicated by note, by graphic, or diagrammatically in schematic or riser diagrams to provide an operational assembly or system.

.5 Install components to physically conserve headroom, to minimize furring spaces, to accommodate installed Work, or other obstructions.

.6 Install ceiling mounted or exposed mechanical components such as diffusers, sprinkler heads and grilles in accordance with reflected ceiling drawings or floor plans.

.7 Locate devices with primary regard for convenience of operation and usage.

.8 Examine the drawings, specifications, and schedules and related Work for all other Sections to ensure that Work can be satisfactorily executed. Conflicts or additional Work beyond the Work described shall be brought to the attention of the .

.9 All specification sections of the Project Manual and Drawings are affected by requirements of Division 01 sections.

1.4 DESCRIPTION OF THE WORK

.1 Division of the Work among other Contractors, Subcontractors, suppliers or vendors is solely the Contractor's responsibility. Neither The City of Winnipeg nor Contract Administrator assumes any responsibility to act as an arbiter to establish Subcontract terms or disagreements between sectors or disciplines of the Work.

1.5 CONTRACT METHOD

.1 Construct Work under the Contract requirements in the Applicable Part C – General Conditions, Part D – Supplementary Conditions, and Division 01 Sections.Contract Documents were prepared by the Contract Administrator for The City of Winnipeg. Any use which a third party makes of the Contract Documents, or any reliance on or decisions to be made based on them, are the responsibility of such third parties. The Contract Administrator accepts no responsibility for any damages suffered by any third party as a result of decisions made or actions based on the Contract Documents.

1.6 PERMITS, INSPECTION AND TESTING

.1 File all necessary notices and approved layouts, obtain and pay for all Local Authority and Fire Underwriters Inspections, approvals and permits applicable to each Mechanical Section. Make changes required to secure Local Authorities approval, without extra cost. Where conflicting requirements occur, comply with most stringent regulation. Note that requirements shown or specified may exceed minimum standards set by Local Authorities.

.2 The Regulations of the A.S.M.E. Code and the Provincial Labour Department shall cover the design, manufacture, installation, welding and tests of piping and other equipment as specified hereafter.

.3 Obtain Registration Certificates for all pressure vessels, with suitable metal-framed glass covers installed where directed. Furnish all certificates required by Local Authorities before acceptance of building by The City of Winnipeg.

.4 The City may request the Mechanical Section to operate device or material installed for such time as may require, as a thorough test, before final acceptance. Such tests shall not be construed as evidence of acceptance, and no claim for cost of such operation for test, or damage due to inadequacy or defect will be recognized.

.5 Note that site reviews by are for the purpose of determining in general if the work is proceeding in accordance with the Contract Documents, and to endeavour to guard The City of Winnipeg against defects and deficiencies and not to superintend the execution of the work, which is the Mechanical Contractor's and their Subcontractors' responsibility.

1.7 EXAMINATION

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

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

.3 Examine all Contract documents to ensure work can be performed without changes to the Work as shown on plans. No allowance will be made later for necessary changes, unless notification of interferences have been brought to Contract Administrator's attention in writing, prior to bid closing.

.4 Verify that materials and equipment can be delivered to the place of the work and that sufficient space and access is available to permit installation as shown on the drawings.

.5 Verify the locations and inverts of service lines leaving and entering building to ensure their proper function prior to commencing work.

1.8 CLOSEOUT SUBMITTALS

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.2 Four (4) weeks prior to Substantial Performance of the Work, submit to the Contract Administratordigital copies of operating and maintenance manuals and record drawings in Canadian English.

.3 Copy will be returned with Contract Administrator's comments.

.4 Revise content of documents as required prior to final submittal.

.5 Two (2) weeks prior to Substantial Performance of the Work, submit to the Contract Administrator final digital copies of operating and maintenance manuals and record drawings, revised as per Contract Administrator's comments.

.6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.7 Provide complete list of parts and supplies included location of where parts and supplies were stored in the building. List to include parts and supplies recommended, but not specified, for use within the first two years of operation. Listed parts and supplies to be reviewed with The City of Winnipeg's Representative and marked by The City of Winnipeg's Representative as reviewed and accepted.

.8 If requested, furnish evidence as to type, source and quality of products provided.

.9 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.10 On Contract Administrator's acceptance of the operating and maintenance manuals and record drawings, produce 2 hard copies (or quantity as required by Section) of the closeout documents and ship to The City of Winnipeg. Pay costs of transportation. Provide digital copy to The City of Winnipeg by electronic file transfer or physical media.

1.9 OPERATION AND MAINTENANCE MANUAL

.1 Format – Hard Copy

.1 Refer also to Section for formats for manuals. Where there is a discrepancy with this section, follow the requirements of .

.2 Organize data in the form of an instructional manual.
.3 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 8.5 x 11 inch (219 x 279 mm) with spine and face pockets.
.4 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
.5 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
.6 Arrange content by systems under Section numbers and sequence of Table of Contents.
.7 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
.8 Text: Manufacturer's printed data, or typewritten data.
.9 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.2 CONTENTS - EACH VOLUME
.1 Refer also to Section for formats for contents. Where there is a discrepancy with this section, follow the requirements of .
.2 Table of Contents: Provide:
.1 Title of project.
.2 Date of submission.
.3 Names, addresses, and telephone numbers of Contract Administrator and Contractor with name of responsible parties.
.4 Schedule of products and systems, indexed to content of volume.
.3 For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
.4 Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section .
.5 Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
.6 Certificate of Acceptance: Relevant certificates issued by authorities having jurisdiction, including code compliance certificate, life safety systems performance certificate. pressure vessel acceptance.
.7 Training: Refer to Demonstration and Training in this Section.

1.10 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on a full-sized set of drawings, and within the Project Manual.

.2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.

.3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately recorded.

.4 Contract drawings and shop drawings: legibly mark each item to record actual construction, including:
.1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
.2 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
.3 Field changes of dimension and detail.
.4 Changes made by change orders.
.5 Details not on original Contract Drawings.
.6 References to related shop drawings and modifications.

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

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
.2 Changes made by Addenda and change orders.

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

1.11 RECORD DOCUMENTS

.1 Prior to Substantial Performance of the Work, electronically transfer the marked-up information from the as-built documents, as follows:
.1 Drawings: Transfer the final marked-up information to AutoCAD and produce an electronic record set in Adobe Acrobat (PDF) format, as well as the AutoCAD file. AutoCAD base drawing files will be available from the Contract Administrator for a charge.
.2 Specifications: Adobe Acrobat (PDF).

.2 Mark revised documents as "RECORD DOCUMENTS". Include all revisions.

.3 Submit completed record documents to Contract Administrator on physical electronic media or by electronic transfer.

1.12 WARRANTIES AND BONDS

.1 Refer also to.

.2 Provide written guarantee that complete installation including materials, work and operation of all equipment provide under Mechanical Sections are first class in every respect, subject only to improper usage by The City of Winnipeg, and make good forthwith when reported all defects which develop within one year from date of acceptance of building by The City of Winnipeg at no additional cost to The City of Winnipeg.

.3 In addition, guarantee heating and cooling systems through one complete heating or cooling season, as applicable.

.4 Deliver to The City of Winnipeg all equipment manufacturer's guarantees specified in excess of one year.

1.13 FABRICATION AND WORKMANSHIP

.1 Employ skilled mechanics in their respective trades, under competent supervision, and where required by Provincial or Local regulations holder of acceptable qualification certificates.

1.14 QUALITY ASSURANCE

.1 Provide testing organization services as specified in subsequent Sections.

.2 Testing organization: Current member in good standing of their respective professional or industry organization and certified to perform specified services.

.3 Comply with applicable procedures and standards of the certification sponsoring association.

.4 Perform services under direction of supervisor qualified under certification requirements of sponsoring association.

1.15 DEMONSTRATION AND TRAINING

.1 Refer also to Section - Demonstration and Training. Where there is a discrepancy with this section, follow the requirements of .

.2 Instruct The City of Winnipeg's designated employees in proper care, operation, use and maintenance of all systems and equipment, and provide general explanatory literature required and start up supervision and instructions.

.3 Provide two (2) weeks prior notice to The City of Winnipeg to schedule the training.

.4 The City of Winnipegwill provide list of personnel to receive instructions and will coordinate their attendance at agreed-upon times.

.5 Upon completion of instructions, forward to Contract Administratorwith a copy to The City of Winnipeg a letter indicating person instructed and dates that the instruction took place. If in Contract Administrator's opinion, this is not done satisfactorily, Contract Administrator may direct such instruction, and charge all costs involved to relevant section.

1.16 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation in accordance with related sections.

.2 Testing, adjusting, and balancing have been performed and equipment and systems are fully operational.

.3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.17 SHOP DRAWINGS - ADMINISTRATIVE REQUIREMENTS

.1 Shop drawings shall be submitted electronically in PDF format documents to shopdrawings@eppsiepman.com.

.2 Shop drawing documents **shall be grouped by specification section**. Clearly list the specification section on the front page or cover sheet of the submittal. Shop drawings related to **multiple sections may not be grouped together** into a single document. Documents that are groups incorrectly will be returned without being examined and shall be considered rejected.

.3 Each drawing shall include the name of project as found on the drawings or specifications, the equipment supplier and the specification section that the equipment is specified under.

.4 Submit to Contract Administrator submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 Work affected by submittal shall not proceed until review is complete.

.6 Present Shop Drawings, product data, samples and mock-ups in SI Metric and/or Imperial inch-pound units, to match the units used in the schedules.

.7 Review submittals prior to submission to Contract Administrator. 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.

.8 Submittals not stamped, signed, dated, identified as to specific project, and attesting to their being reviewed will be returned without being examined and shall be considered rejected.

.9 Notify Contract Administrator, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.10 Verify field measurements and affected adjacent Work are coordinated.

.11 Contractor's responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.

.12 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administratorreview.

.13 Keep one (1) reviewed copy of each submission on site.

1.18 SHOP DRAWINGS AND PRODUCT DATA SUBMISSIONS

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

.2 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 coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications. Indicate layouts, quantity, details of equipment, control wiring diagrams, sizes, capacities and roughing in and exact requirements for concrete pits, bases and other supporting members.

.3 Each shop drawing must be certified by manufacturer and as such shall indicate that all product engineering has been performed to ensure the product will meet the requirements of the intended installation.

.4 Shop drawings for grilles, registers and diffusers shall be accompanied by an itemized list indicating the unit locations by room number and the unit size.

.5 Allow fifteen (15) working days for Contract Administrator's review of each submission.

.6 Adjustments made on Shop Drawings by Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.

.7 Make changes in Shop Drawings as Contract Administratormay require, consistent with Contract Documents. When resubmitting, notify Contract Administrator in writing of any revisions other than those requested.

.8 Accompany submissions with transmittal letter, containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.9 Submissions shall 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 other parts of the Work.

.10 After Contract Administrator's review, distribute copies.

.11 Submit one (1) copy of Shop Drawings as a pdf document by email attachment for each requirement requested in specification Sections and as Contract Administrator may reasonably request. Any electronic copy of shop drawings shall bear all the required marks of certification and approval by the manufacturer and Contractor(s) as indicated above. The Contract Administrator will review and mark up one copy of the shop drawing, and return to the Contractor by email attachment. The Contractor shall then make copies as required for ordering and documentation purposes. Multiple copies of shop drawings will not be returned.

.12 Submit one electronic copy of product data sheets or brochures for requirements requested in specification sections and as requested by Contract Administratorwhere Shop Drawings will not be prepared due to standardized manufacture of product. Submittals shall be submitted as a pdf document by email attachment, or delivered as a hard copy. Any electronic copy of shop drawings shall bear all the required marks of certification and approval by the manufacturer and Contractor(s) as indicated above.

.13 Delete information not applicable to project.

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

.15 If upon review by Contract Administrator, no errors or omissions are discovered or if only minor corrections are made, one electronic copy will be returned and fabrication and installation of Work may proceed. If Shop Drawings are rejected, noted copy will be returned and re-submission of corrected Shop Drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed. The Contractor shall then make copies as required for ordering and documentation purposes. Multiple copies of shop drawings will not be returned.

.16 Checking of shop drawings by the Contract Administratordoes not constitute acceptance of responsibility. Such checking constitutes assistance only to the Mechanical Division in the proper execution of their work.

1.19 PRODUCT CHANGES & SUBSTITUTIONS

.1 Change in Product/Products: Submit request for substitution or alternative in accordance with this section, Part B – Bidding Procedures, B7, and Section 01 61 00. In case of a discrepancy between this section and Part B and Division 01, the more stringent shall apply.

.2 Part B – Bidding Procedures, B7 specify time restrictions for submitting requests for Substitutions during the bidding period to requirements specified in this section.

.3 Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

.4 Any substituted item submitted for consideration must not exceed the available space and weight limitations, and all additional costs for mechanical, electrical, structural and architectural revisions including Contract Administrator fees required to incorporate the substituted material shall be the responsibility of the Mechanical Division. Review the maximum dimensions and weights when provided in the specification and schedules, and where not specified review the drawings for space limitations. The Bidder may be required to submit to the Contract Administratordrawings in plan and sections to prove that the substituted item will fit in the allowable space.

.5 A request constitutes a representation that the Bidder:

.1 Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
.2 Will provide the same warranty for the Substitution as for the specified Product.
.3 Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to The City of Winnipeg.
.4 Waives claims for additional costs or time extension which may subsequently become apparent.
.5 Will reimburse The City of Winnipeg and Contract Administratorfor review or redesign services associated with re-approval by authorities.

.6 Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

1.20 SAMPLES

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

.2 Deliver samples prepaid to Contract Administrator's business address unless otherwise instructed.

.3 Notify Contract Administrator 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 Contract Administratorare not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administratorprior to proceeding with Work.

.6 Make changes in samples which Contract Administratormay require, consistent with Contract Documents.

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

1.21 MOCK-UPS

.1 Erect mock-ups to the requirements of Division 01.

1.22 PROGRESS PAYMENT SUBMISSIONS

.1 Submit progress payment breakdowns for review by the Contract Administrator to the requirements of Division 01.

.2 Prior to the first application for payment, submit for review a draft progress application template.

.3 Progress Application shall contain separate line items for the following systems:
.1 Fire Protection
.2 Plumbing
.3 Hydronic
.4 HVAC
.5 Controls
.6 Insulation
.7 Air Balancing
.8 Commissioning, Start Up and Training
.9 Close out documents – Record drawings, Operation and Maintenance documents.

.4 Progress for each system shall break out labor and materials separately.

.5 Equipment and materials must be located on site or in bonded storage with proof of storage for payment request to be accepted.

1.23 PRODUCT SUPPLIED

.1 QUALITY

.1 Products, materials, equipment, parts or assemblies (referred to as Products) incorporated in Work: New, not damaged or defective, of best quality (compatible with specification requirements) for purpose intended. If requested, provide evidence as to type, source and quality of Products provided.

.2 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.

.3 Should any dispute arise as to quality or fitness of Products, decision rests strictly with Contract Administrator.

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

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

.2 AVAILABILITY

.1 Immediately upon signing Contract, review Product delivery requirements and anticipate foreseeable supply delays for any items.

.2 If delays in supply of Products are foreseeable, notify Contract Administratorof such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

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

.3 STORAGE AND PROTECTION

.1 Store and protect Products in accordance with manufacturers' written instructions.

.2 Store with seals and labels intact and legible.

.3 Store sensitive Products in weather tight, climate controlled, enclosures in an environment favourable to Product.

.4 For exterior storage of fabricated Products, place on sloped supports above ground.

.5 Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.

.6 Cover open ends of pipes, fixtures, ductwork, etc. to prevent entry of building rubbish.

.7 Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

.8 Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

.9 Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

.4 TRANSPORTATION AND HANDLING

.1 Transport and handle Products in accordance with manufacturer's written instructions.

.2 Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.

.3 Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

.4 Protect all finished and unfinished work from soiling or damage, cover floors with tarpaulins or plywood as necessary, and repair any damage resulting from work of Mechanical Section.

.5 Protect finished surfaces to remain exposed, by paper, polyethylene or other satisfactory removable protective covering using paste acceptable to fixture manufacturer to prevent possible damage to finishes, until all reason for construction damage has passed and until acceptance by The City of Winnipeg, and make good any such damage.

1.24 SPECIAL CLEANING

.1 Maintain tidiness within work of Mechanical Sections and at completion remove protective paper, labels, etc. and tools and waste materials. Leave clean and in perfect operating condition.

.2 Remove dirt, rubbish, grease, and dust for which this section is responsible from all exposed surfaces and fixtures.

.3 Operate, drain and flush out bearings and refill with new charge of lubricant, before final acceptance.

.4 Thoroughly clean piping, ducts and equipment of dirt, cuttings and other foreign substances within the scope of work area. Disconnect, clean and reconnect whenever necessary for purpose of locating and removing obstructions. Repair work damaged in course of removing obstructions. Refer to 23 31 00 for any additional duct cleaning requirements.

.5 Clean exposed surfaces of mechanical equipment, ductwork, piping, etc., and polish plated work.

.6 Protect bearings and shafts during installation. Grease shafts and sheaves to prevent corrosion. Supply and install extended nipples to outside of bearing enclosures for lubrication purposes.

.7 Remove tools, surplus, and waste material from the building site upon completion of work. Clean grease, dirt, and excess material from walls, floors, ceilings, surfaces, and fixtures for which this Contractor was responsible, and leave the premises suitable for immediate use.

.8 Schedule cleaning operations so that resulting dust and other contaminants will not fall on wet, newly painted surfaces, infiltrate into occupied areas, or trigger fire alarm smoke or dust detectors.

.9 Replace heating, ventilating and air conditioning filters if units were operated during construction.

.10 Do not start air-handling systems unless the systems and associated ductwork are clean. Failure to properly clean the equipment and ductwork shall make the Contractor responsible to clean, repair or replace equipment and ductwork rendered deficient.

.11 At the end of construction all systems shall be left ready for operation.

.12 This Section shall be responsible for repair work as may be necessary to remove dents and touch-up of factory finishes.

1.25 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to the Work, building occupants, or pedestrian or vehicular traffic.

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

1.26 MANUFACTURER'S WRITTEN INSTRUCTIONS

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

.2 Notify Contract Administrator in writing, of conflicts between specifications and manufacturer's instructions, so that Contract Administrator may establish course of action.

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

1.27 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 Contract Administrator if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Contract Administrator reserves right to require dismissal from site any workers deemed incompetent or careless.

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

.4 Assume full responsibility for layout of own work and for any damage caused to property of others through improper location or poor workmanship.

.5 ACCESSIBILITY OF EQUIPMENT

.1 The Contract Administrator places a high priority on being able to safely and efficiently gain access to systems and equipment for replacement and repair. All equipment must be accessible, as defined as follows:

.1 Ceiling mounted equipment shall only be considered accessible if a tradesman can place both hands on the equipment components which requires services (ie: fan motor, belt, pulley, bearing, fire damper linkages, valve/control valve, strainer or any other equipment component which requires periodic maintenance). The component must be in clear view, and access must be gained from an 8 or 10 foot step ladder. Access panels provided in drywall shall be sized and placed in such a manner that trades personnel can place two hands on the equipment components as stated above. Equipment located above acoustic tile ceiling shall be positioned in such a manner that equipment and its components can be accessed through a full tile which does not contain any devices such as light fixtures, speakers, smoke detectors or sprinkler heads. If this is not possible, it should be reviewed by the Contract Administrator before deemed acceptable.

.2 Conduit, pipe, ducting and support racking or any other obstruction to accessibility shall be relocated at the Contractor’s expense by the Contractor’s forces.

.6 COORDINATION

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

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

.3 Check levels shown before commencement to ensure adequate falls for sewers and pipes and report discrepancies immediately. Failure to so check and report does not relieve this section from responsibility for consequent extra expenditures.

.4 Where space is indicated as reserve for future equipment, leave clear and install piping and other work so that connections can be made to future equipment.

.5 Secure approval where necessary to cut holes in either finished or unfinished work, employ section whose work is involved, cut openings no larger than necessary and without damage to adjoining work and carefully repair all damage to match adjacent work. Note the Mechanical Division is responsible for all required cutting and patching relating to this Contract, except as specifically noted otherwise.

.6 Provide and set bolts, templates, sleeves and fixing materials for fixing work under this section securely to work provided under other sections, in advance of other work, where required.

.7 Locate all openings in walls, partitions, beams, etc. required for installation of ducts, pipes and equipment, etc. specified in this section of the specifications and frame all openings as required.

.8 Installation of all equipment shall allow sufficient space to facilitate ease of maintenance. Clearance space shall allow for the removal of all components of equipment without hindrance. Where clearance requirements are not shown on the mechanical plans, manufacturer clearances must be maintained at a minimum.

.7 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.

.8 FASTENINGS - EQUIPMENT

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

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use Type 304 or 316 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.

1.28 WORK FOR OTHER TRADES

.1 The Mechanical Contractor shall install rough-ins and/or connections for all equipment requiring mechanical services, as shown on drawings or mentioned elsewhere in the specifications.

.2 Supply other trades with all necessary details, rough-in drawings, wiring diagrams, etc. as required.

1.29 ELECTRICAL REQUIREMENTS

.1 Motors and electrical equipment supplied under Mechanical Division shall comply with Electrical Section and electrical characteristics scheduled or shown.

.2 See "Installation and Wiring Controls" in Electrical Section for equipment supplied under Electrical Section.

.3 The Electrical section shall provide starters for all motors and wire from starters to motors, unless otherwise indicated.

.4 The Electrical section shall wire between starters and switching components such as relays, float switches, and pressure switches.

.5 Supply to Electrical Section within four (4) weeks after Contract award, fully detailed diagrams of power and control wiring required for equipment supplied by Sections 21 – 25.

.6 Motors shall be squirrel cage induction type 1800 RPM unless otherwise noted. Where dampness occurs, all motors and electrical apparatus such as float switches, etc. supplied integrally with any piece of apparatus, shall be totally enclosed.

.7 All motors 1 hp and larger shall be high efficiency as defined in CSA C390.

1.30 CONCEALMENT

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

.2 Before installation, inform Contract Administrator if there is interference. Install as directed by Contract Administrator.

1.31 ACCESS PANELS

.1 Provide in ample time for installation under relevant sections all necessary access panels in walls and ceilings to allow access to dampers, valves, etc., size 300 mm x 300 mm (12" x 12") min. or as required for proper maintenance with steel panel and frame, similar to Acudor, type to suit application. Instruct relevant section for proper location of access panels. Final locations subject to Contract Administrator's approval. ULC approved access panels must be provided where access is through or into a fire partition or assembly. If access doors have been specified by architectural sections the architectural specification shall supersede this section.

1.32 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

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

1.33 ALTERATION WORK

.1 Where work is to be done in existing buildings, accurately survey, provide for avoidance of damage and interference to existing work and rectify any such damage due to work under Mechanical Sections. Accept existing work as it exists at time of Bid Submission.

.2 Carefully dismantle existing mechanical equipment to be removed or relocated. Temporarily disconnect, remove, and reinstall existing equipment, piping, ductwork, conduit, light fixtures, and similar items, which interfere with the new installation after completion of new work or of existing installations to be demolished. Store equipment and materials on the premises as directed by The City of Winnipeg.

.3 All usable salvaged equipment and materials shall remain the property of The City of Winnipeg unless specifically noted otherwise. Such material shall be removed from the building and be safely and neatly stored on the site for removal by The City of Winnipeg. The Contractor shall remove all rejected salvage from the site and legally dispose of it off site.

.4 Reuse existing equipment in new work after first repairing and reconditioning any defective items where noted. Safely cap and seal disconnected mechanical services within finished surfaces.

.5 The abandonment of existing equipment and material in place is not acceptable. All redundant services are to be removed back to active mains, which shall then be capped at existing point of connection.

.6 All mechanical equipment conflicting with new equipment being installed shall be moved or disconnected, without damage, by Contractor and shall remain property of The City of Winnipeg. Remove ducts and piping not required in revised systems and interfering with new installation. This material shall become property of Contractor.

.7 Disconnect existing equipment indicated, intended to be reused, rough-in in new position, and after replacement connect fully, ready for use.

.8 Removal and relocation of mechanical equipment by relevant Mechanical Sections.

.9 Operation of HVAC equipment serving occupied areas during renovation

.1 Protect HVAC air handling equipment from collecting odours and pollutants during demolition & construction by implementing the following measures:

.1 Shut-down HVAC equipment in coordination with The City of Winnipeg's representative during heavy construction or demolition.

.2 Isolate the functional HVAC system from the renovation to prevent intake of pollutants.

.3 Seal all return system openings in and immediately adjacent to the construction area where isolation of the renovation area is possible.

.4 Install and maintain temporary filters on return air openings from the renovation space when system is in operation and connection to the renovation space is necessary. Replace these filters at the end of the project.

.5 Avoid storage of waste and construction materials in the mechanical room.

.6 Use high-efficiency filters (MERV 13) for central filtration when operating the system during construction. Inspect filters daily and replace as required over the duration of the project.

.7 Protect diffusers, VAV boxes, ducts and other HVAC system components.

.8 Final cleaning of existing ducts, diffusers, and window units is required upon completion of work if evidence of contamination is found.

1.34 LOCATION OF FIXTURES

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

.2 Inform Contract Administrator of conflicting installation. Install as directed.

1.35 TEMPORARY USE OF EQUIPMENT

.1 No portion of any mechanical system or equipment provided under Mechanical Sections may be used for temporary heating without Contract Administrator's written permission and observance of the following procedure:

.1 Oil and grease motor, fan and pump bearings, etc. check on a regular basis and maintain as recommended by manufacturer.

.2 Maintain and clean when necessary cleanable type filters and clean and oil just prior to Total Performance and take-over of building.

.3 Ensure that mechanical air handling equipment is not operated during painting.

.4 Employ equipment manufacturers and subtrades to ensure and certify that all systems and equipment are in proper condition, and guarantee all work used prior to take-over as for new work, from date of acceptance of building by Contract Administrator.

.5 If permission for temporary use of mechanical equipment is granted, use Canadian Plumbing and Mechanical Contractors Association standard form of agreement as basis of responsibilities. Guarantee on complete installation shall not start until acceptance of building by Contract Administrator.

.2 Where air handling systems are permitted to be operated before turnover to The City of Winnipeg, all return air grilles/openings shall be equipped with MERV 8 filters to keep return air system clean of dust and dirt. Monitor all filters for dust loading and replace heating, ventilating and air conditioning filters. Replace non-LED lamps if used for more than one month.

1.36 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of any part of the Project.

.2 Do not cut, drill or sleeve any load bearing structural member unless specifically indicated without written approval of Contract Administrator.

1.37 EQUIPMENT START UP AND VERIFICATION REPORTS

.1 The Contractor shall supply the equipment start-up reports for the mechanical equipment being installed.
- .1 Forms shall be filled out in full, with all required and suggested fields.
- .2 Forms shall include tester's signature and the signature by the project manager for the mechanical Contractor.

.2 The controls Contractor shall supply a completed sequence verification checklist confirming all points of the system are functioning, reporting, and properly executing the sequence operation.
- .1 Forms shall be developed and filled out by the Contractor
- .2 Forms shall include tester's signature and the signature by the project manager for the mechanical Contractor.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

Part 1 General

1.1 DESCRIPTION OF THE WORK

.1 Disconnect building from all utilities and services related to mechanical sections (Fire Protection, Plumbing, HVAC, Hydronic and Controls).

.2 Demolish all mechanical systems and related components within and associated with the building being demolished.

.3 Remove all demolished materials from site and leave in conditions suitable for construction of a new building with new site services. The abandonment of existing equipment, material and services in place is not acceptable.

.4 Division of the Work among other contractors or subcontractors is solely the Contractor's responsibility. Neither The City of Winnipeg nor Contract Administrator assumes any responsibility to act as an arbiter to establish subcontract terms or disagreements between sectors or disciplines of the Work.

1.2 CONTRACT METHOD

.1 Construct Work under the Contract requirements in the Applicable Part C – General Conditions, Part D – Supplementary Conditions, and Division 01 and 02 Sections.

1.3 PERMITS, INSPECTION AND TESTING

.1 File all necessary notices, obtain and pay for all approvals and permits applicable to each Mechanical Section.

.2 Make changes required to secure Local Authorities approval, without extra cost. Where conflicting requirements occur, comply with most stringent regulation.

1.4 EXAMINATION

.1 Inspect existing conditions, including elements or adjacent buildings subject to irregularities, damage, movement, or other that could result from demolition Work.

.2 Hazardous containing materials may be present within existing buildings. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials. Coordinate all abatement requirements with the Contract Administrator.

.3 Buried conditions

.1 Refer to drawings for extent of buried system removal in coordination with Site and Civil drawings.

.4 Coordinate full extent of demolition work with all disciplines. Coordinate on site with all trades prior to commencement of demolition.

.5 Beginning of demolition means installer accepts existing conditions.

1.5 Existing Utilities AND SERVICES

.1 Coordinate disconnection of existing natural gas, sanitary and domestic water service with utility providers. When disconnecting existing services or utilities, execute Work at times directed by local governing authorities.

.2 Disconnect fuel oil piping and equipment to requirements of applicable laws and bylaws.

.3 Disconnect propane service and piping from building back to service provider’s equipment. Coordinate termination point with propane service provider. Coordinate removal of propane service with service provider. Where propane service equipment is the property of The City of Winnipeg, remove full extent of propane service.

.4 Disconnect district hydronic piping in coordination with district hydronic system representative.

1.6 Electrical Requirements

.1 Division 26 shall disconnect power from all mechanical equipment and components prior to mechanical section beginning demolition. Coordinate with Division 26 to confirm power disconnection requirements.

1.7 Waste Management

.1 In accordance with Section 01 74 00 - Cleaning and Waste Management.
- .1 Recycle all materials where facilities exist.
- .2 Refer to Section 01 74 00 for ownership of demolished materials.
- .3 Refer to Division 02 for requirements of handling hazardous materials. Where requirements are not addressed, refer to applicable laws and bylaws.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Provide as required for the installation of mechanical systems.
- .1 Paint
- .2 Concrete – Equipment Pads
- .3 Firestopping

1.2 REFERENCE STANDARDS

1.3 SUBMITTALS

.1 Submittals in accordance with Section .

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.

Part 2 PRODUCTS

2.1 PAINT

.1 Refer to Division 09 for painting requirements

OR

.2 Paint: Conform to Canadian General Standards Board (CGSB) standards.
- .1 Prime coat material shall conform to Canadian General Standards Board Standard No. 1GP-48.

.3 Provide materials identical to those tested and third-party certified to UL 2818 GREENGUARD Gold or equivalent when tested to CDPH Standard Method v1.2 for VOC emissions compliance.

2.2 CONCRETE – EQUIPMENT PADS

.1 Provision of concrete work by Division 03.

.2 Provide all concrete work required for mechanical work (bases, curbs, anchors, thrust blocks, manholes, catch basins, etc.) to industry standard.
- .1 Roughen concrete surface prior to pouring slab.
- .2 Rebar: 10M rebar 300 mm (12") centre to centre each way, middle of full pad. Drill in and epoxy grout 10M rebar into concrete at least 3" below existing surface. Tie to dowl or bend to cross though centre of equipment pad thickness. Minimum spacing of 600mm (24") on centre around perimeter of pad.
- .3 Concrete: 25 MPa, exposure class N
- .4 Chamfer or round pad corners.

.3 Provide other concrete work and material required for Mechanical Division work including but not limited to inserts, anchors, frames and any related components.

2.3 FIRESTOPPING

.1 Firestopping by Division 07.

Part 3 EXECUTION

3.1 PAINTING

.1 Paint all ferrous metal work except piping, galvanized and stainless steel ductwork with one prime coat, coating may be manufacturer or site applied.

.2 Clean and steel brush surfaces with exposed welds. Prime coat all steel supports, brackets, piping and ductwork welds.

.3 Touchup or repaint surfaces damaged during shipment or installation and leave ready for finish painting.

.4 Finish painting will be provided by Division 09 90 00.

3.2 FIRESTOPPING

.1 Ensure that fire ratings of floors and walls are maintained.

.2 Fill spaces between openings, pipes and ducts passing through fire separations and install firestopping systems in accordance with the appropriate ULC system number for the products, type of penetration and manufacturer's instructions.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Pipe and Pipe Fittings, Valves, Strainers.

1.2 RELATED SECTIONS

.1 Section 20 05 00 – Common Work for Mechanical

.2 Section 22 11 16 – Domestic Water Piping.

.3 Section 26 05 80 - Equipment Wiring

1.3 REFERENCES

.1 American Society of Mechanical Engineers
- .1 ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
- .2 ASME SEC VIIID - Boiler and Pressure Vessel Code - Rules for Construction of Pressure Vessels.

.2 ASTM
- .1 ASTM A36/A36M - Carbon Structural Steel.
- .2 ASTM B32 - Solder Metal.
- .3 ASTM B88/M - Seamless Copper Water Tube.
- .4 ASTM D1785 - Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- .5 ASTM D2467 - Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- .6 ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

.3 American Welding Society
- .1 AWS A5.8 - Filler Metals for Brazing and Braze Welding.

.4 Canadian Standards Association
- .1 CSA B149.1 – Natural Gas and Propane Installation Code
- .2 CSA C22.1 – Canadian Electrical Code
- .3 CSA 4.7/ ANSI Z21.56 - Gas-fired pool heaters

.5 National Pool and Spa Institute (NPSI)
- .1 Minimum Standards for Public Swimming Pools.

.6 NSF
- .1 NSF 50 - Circulation System Components and Related Materials for Swimming Pools, Spas/Hot Tubs.

.7 Underwriters Limited
- .1 UL 174 - Standard for Household Electric Storage Tank Water Heaters.
- .2 UL 1081 - Swimming Pool Pumps, Filters, and Chlorinators.
- .3 UL 1261 - Standard for Electric Water Heaters for Pools and Tubs.
- .4 UL 1453 - Standard for Electric Booster and Commercial Storage Tank Water Heaters.

1.4 SUBMITTALS FOR REVIEW

.1 Refer to 20 05 00 – Common Work for Mechanical

.2 Product Data:
- .1 Include data on pipe materials, pipe fittings, valves and accessories.
- .2 Include component sizes, rough-in requirements, service sizes, and finishes.
- .3 Include product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.

.4 Include dimension drawings of water heaters indicating components and connections to other equipment and piping.
.5 Include heat exchanger dimensions, size of trappings, and performance data.
.6 Include dimensions of tanks, tank lining methods, anchors, attachments, lifting points, trappings, and drains.
.7 Indicate pump type, capacity, power requirements, and affected adjacent construction. Submit certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
.8 Provide electrical characteristics and connection requirements.

.3 Shop Drawings: Indicate detailed assembly of components of each system or sub-system.

1.5 SUBMITTALS FOR INFORMATION

.1 Submission procedures: Refer to 20 05 00 – Common Work for Mechanical

.2 Manufacturer's Instructions: Indicate installation details, components assembly, and start-up procedures.

.3 Manufacturer's Field Reports: Indicate results of water treatment system set-up and testing.

1.6 CLOSEOUT SUBMITTALS

.1 Refer to 20 05 00 – Common Work for Mechanical

.2 Operation Data: Include installation instructions, lubrication instructions, and assembly views.

.3 Maintenance Data: Include maintenance and inspection data, replacement part numbers and availability, and service depot location and telephone number.

.4 Record Documentation: Record actual locations of controlling devices and underfloor piping.

.5 Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in The City's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Perform Work to NSF.

.3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

.4 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience.

1.8 REGULATORY REQUIREMENTS

.1 Conform to applicable code for installation of swimming pool systems.

.2 Perform work to local health department regulations.

.3 Provide certificate of compliance from authority having jurisdiction indicating approval of installation.

.4 Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.9 DELIVERY, STORAGE, AND PROTECTION

.1 Section 20 05 00 – Common Work for Mechanical: Transport, handle, store, and protect products.

.2 Accept equipment on site in shipping containers with labelling in place. Inspect for damage.

.3 Protect equipment from damage and elements by maintaining shipping packaging in place until installation. Maintain temporary inlet and outlet caps in place until installation.

Part 2 Products

2.1 WATER PIPING AND PIPE FITTINGS

.1 PVC Pipe: ASTM D1785, Schedule 80.
- .1 Fittings: ASTM D2467, PVC.
- .2 Joints: ASTM D2855, solvent weld.

.2 Unions for Pipe Sizes 50 mm (2 inch) and Under: PVC for plastic piping; bronze unions for copper pipe, soldered joints.

.3 Flanges for Pipe Sizes over 50 mm (2 inch): PVC for plastic piping; bronze for copper piping.

.4 Valves: PVC plastic body and ball, double lever handle, double union with socket ends, EPDM seals, teflon seats.

.5 Butterfly Valves: Iron body, bronze disc, resilient replaceable seat for service to 82 degrees C (180 degrees F) wafer style, 10 position lever handle.

2.2 POOL FITTINGS AND EQUIPMENT

.1 Main Drain:
- .1 Manufacturers:
  - .1 Lawson Aquatics Superflow Main Drain System Model 18x18.
  - .2 As per Drawings
  - .3 Substitutions: Refer to Section 20 05 00 – Common Work for Mechanical
- .2 Molded sump, frame and cover, 450 x 450mm (18 x 18 inch) square frame and cover, 1181 sq cm (183 sq in) open area, side outlet, .

.2 Floor Inlets:
- .1 Manufacturers:
  - .1 Atlantis Heavy Duty Adjustable Bottom Inlets Model 6765-2.
  - .2
  - .3 Substitutions: Refer to Section 20 05 00 – Common Work for Mechanical Not permitted.
- .2 Nominal 125 mm (5 inch) diameter, with internal spinner valve disc.

.3 Vacuum Ports:
- .1 Manufacturers:
  - .1 Atlantis Model 2” FPT Vacuum Inlet for Institutional Pool.
  - .2
  - .3 Substitutions: Refer to Section 20 05 00 – Common Work for Mechanical Not permitted.
- .2 Nominal 100 mm (4 inch) diameter, with plug.

.4 Gutter Drain Grates:
- .1 Manufacturers:
  - .1 Commercial Pool Model Custom bent Stainless Steel.
  - .2 Substitutions: Refer to Section 20 05 00 – Common Work for Mechanical

.5 Skimmers:

.1 Manufacturers:
  .1 Commercial Pool Model Floating Weir Skimmer with Custom Bent Stainless Steel grate.
  .2 Substitutions: Refer to Section 20 05 00 – Common Work for Mechanical
.2 New floating weir skimmer fittings to match existing. Provide shop drawing for new product. Work with Commercial Pool to provide appropriate product to suit existing condition.
.3 Custom bent grate shall match new gutter profile, coordinate with structural.

Part 3 Execution

3.1 INSTALLATION

.1 Install equipment to manufacturer's instructions.

.2 Install Work to Province of Manitoba and City of Winnipeg standards.

.3 Install piping to conserve building space, not interfere with use of space and other work. Route piping in orderly manner, and maintain gradient. Group whenever practical at common elevations.

.4 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Provide access to valves and fittings.

.5 Pipe relief valve outlet and backwash to nearest floor drain.

.6 Install unions downstream of valves and at equipment or apparatus connections.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Duct and HVAC equipment cleaning of HVAC systems serving the pool area.

1.2 QUALITY ASSURANCE

.1 Contractor Qualifications:

.1 Duct cleaning contractor to be member of National Air Duct Cleaners Association (NADCA).

Part 2 Products

2.1 AIR DUCT CLEANING EQUIPMENT

.1 Manually propelled full contact brushes:Ensure brushes are specifically manufactured and shaped to fit individual ducts, equipment and components of HVAC system.Ensure brushes are sized to fit various duct sizes in HVAC system.Ensure brushes make scrubbing motion and full contact with HVAC system interior surfaces to be cleaned.

.2 Brushes: manually propelled with integrally-mounted drive and nylon, polypropylene, or other non-metallic material bristles.

.3 Ensure drive has capacity to continue to push brush after bristles are distorted.

.4 Replace worn and ineffective brushes when required.

2.2 HEPA FILTER EVACUATION FAN

.1 Evacuation Fan: includes fan, HEPA filter, flexible hose and motor capable of maintaining debris and particulates airborne in airstream until they reach evacuation fan and maintaining system under negative pressure. Ensure HEPA filters are clean and maintain evacuation fan and HEPA filter to run efficiently.

2.3 HEPA VACUUM UNIT

.1 Vacuum Unit: includes vacuum fan, integral HEPA filter, suction hose and vacuum head, capable of maintaining HVAC System debris and particulates airborne in air stream until they reach vacuum unit and maintaining system under negative pressure. Ensure HEPA filters are clean and maintain vacuum unit and HEPA filter to run efficiently.

2.4 MATERIALS

.1 Access Panel: Fabricated sheet metal closure.

.1 Minimum of same gauge as ductwork.
.2 Minimum 19mm larger than opening on all sides.
.3 Attached with sheet metal screws.
.4 Sealed with duct sealant.

Part 3 Execution

3.1 PREPARATION

3.2 PREPARATION

.1 Close down HVAC system.

.2 Locate and identify externally visible HVAC system features which may affect cleaning process including:

- .1 Control devices;
- .2 Fire and smoke control dampers;
- .3 Balancing dampers: indicate and record positions for resetting;
- .4 Air volume control boxes: indicate and record positions for resetting;
- .5 Fire alarm devices;
- .6 Monitoring devices and controls;

.3 Cut openings in equipment panels and ductwork for access to system interior.

- .1 Square or rectangular opening sizes: 200 mm minimum each side.
- .2 Circular opening sizes: 200 mm minimum diameter.

.4 Installation of Access Doors and Panels: install access doors and panels for equipment where required to facilitate system inspection and cleaning.

- .1 Install access doors and panels for inspection and cleaning of equipment as follows:
  - .1 Heating and cooling coils;
  - .2 Fan units;
  - .3 Filters;
  - .4 Dampers;
  - .5 Sensors

.5 Installation of Access Doors in Ductwork: install access doors in ductwork where required to facilitate system inspection and cleaning.

- .1 Access door installation is not permitted in flexible ductwork.
  - .1 Inspect flexible ductwork only by disconnecting from main duct and inspecting from open end.

.6 When acoustically lined duct is cut for access, repair cut edges of acoustic lining using self-adhesive fibre glass tape and water based duct sealer.

- .1 Adhere new acoustic lining to match existing to inside of access panel or door to ensure continuity of acoustic properties of system.

.7 Remove and reinstall ceiling to gain access to HVAC system as required.

- .1 Replace ceiling damaged or soiled by air duct cleaning procedures.

3.3 EXAMINATION / PRE-CLEANING INSPECTION

.1 Verification of Conditions:

- .1 Make visual inspection of interior of HVAC system using remote controlled robotic camera.
- .2 Insert camera at pre-established strategic locations to evaluate condition and cleanliness of HVAC systems and components.

.2 Evaluation and Assessment:

.1 Identify location and type of internal components.

.2 Identify extent of potential problems.

.3 If toxic or hazardous materials or deposits are suspected after inspection, immediately stop work and notify the Contract Administrator.

.1 Do not proceed further with inspection operations until written approval from the Contract Administrator.

3.4 DUCT CLEANING

.1 Do duct cleaning in accordance with NADCAACR Standard.

.2 Isolate and clean sections in zones to ensure that dirt deposits and debris from zone being cleaned does not pass through another zones which has already been cleaned.

.1 Isolate zone of duct using air inflated zone bag before cleaning.

.3 Ensure vacuum units and evacuation fans are securely in place before starting cleaning operation of isolated section of HVAC air duct system.

.4 Install HEPA filter evacuation fan at one end of zone section and insert full contact brushes at other end.

.5 Clean HVAC supply air duct system and components.

.6 Clean exhaust, return, transfer ductwork and plenums, equipment and components.

.7 Energize brushes to travel from insertion point to HEPA filter evacuation fan.

.1 Pass brushes through sections as often as necessary to achieve required cleanliness.

.2 Change brush sizes as required to ensure positive contact with duct and component interiors.

.3 Clean corners and pockets where dirt and debris can accumulate.

.8 Clean equipment, components and other features in isolated zone before moving to next zone of HVAC air duct system.

.9 Clean diffusers, registers, louvers, and other terminal units.

.10 Remove perforated supply diffusers from suspended tee-bar ceiling.

.1 Dismantle and clean perforated plates and supply diffuser duct collars.

.2 Re-assemble perforated plate diffusers and reconnect to HVAC system using supply diffuser duct collar after cleaning.

.11 Advise Contract Administrator 24 hours minimum before deactivation of fire alarm and smoke detectors duct cleaning operations.

3.5 COMPONENTS AND EQUIPMENT CLEANING

.1 Brush and vacuum coils, humidifiers, air handling unit enclosures, and heat exchanger surfaces to achieve required cleanliness.

.2 When cleaning equipment and components by brushing and vacuuming is inappropriate or insufficient, dismantle and remove equipment or component and move to area designated by the Contract Administrator for cleaning.

.1 Pressure wash with water and cleaning solution until required cleanliness is achieved.

.2 Clean equipment and components in place only if there is no hazard to adjacent materials.

.3 Compressed air and manual cleaning is acceptable only for cleaning individual components and small areas as follows and only after written approval from the Contract Administrator:

.1 Fan blades;
.2 Dampers;
.3 Turning vanes;
.4 Controls;
.5 Sensor bulbs;
.6 Fire alarms;
.7 Smoke detectors.

3.6 SYSTEM STARTUP

.1 Install new system filters after cleaning operations are completed.

.2 Cover each inspection opening with access door or panel and secure in place after inspection and cleaning are completed.

.3 Restart each HVAC system.

3.7 CLEANING

.1 Clean in accordance with Section 01 74 00 – Cleaning and Waste Management.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 0 – Bidding & Contract Requirements

.2 General Requirements

.3 All Electrical Drawings and Division 25, 26, 27, 28 Series Specification Sections.

1.2 REFERENCES

.1 CSA-C22.1-21 - Canadian Electrical Code, Part I (25th Edition), Safety Standard for Electrical Installations.

.2 CAN3-C235-83 (R2015) - Preferred Voltage Levels for AC Systems, 0 to 50 000 V.

.3 CSA (Canadian Standards Association).

.4 ULC (Underwriters' Laboratories of Canada).

.5 ASTM E-814, - Fire Tests of Penetration Fire Stops.

.6 ANSI/ UL1479 - Fire Tests of Through Penetration Firestops

1.3 REGULATORY REQUIREMENTS

.1 Conform to CSA-C22.1-21.

.2 Comply with all CSA Electrical Bulletins in force at time of tender submission.

.3 Comply with all provincial by-laws, ordinances, codes, rulings, and other requirements.

.4 Comply with requirements of the electrical supply authority and the local inspection authority.

.5 Products: Listed and classified by CSA, or ULC and as suitable for the purpose specified and indicated. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from the appropriate Inspection Departments.

1.4 DEFINITIONS

.1 The following are definitions of terms and expressions used in the specification:

- .1 Contract Administrator: Electrical Engineering Consultant: Epp Siepman Engineering Inc.
- .2 Defective: A condition determined exclusively by the Contract Administrator.
- .3 Demolish: The complete removal of the existing item identified complete with associated infrastructure back to last remaining device or source as required to accommodate the overall scope of work. Demolished items shall be legally disposed of off site.
- .4 Electrical Code: Canadian Electrical Code or Local Code in effect at project location.
- .5 Exposed: Any work not concealed in wall, shaft, or ceiling cavities or spaces. Work behind doors, in closets or cupboards or under counters is considered exposed.
- .6 Indicated: as shown on Contract drawings or noted in Contract Documents.
- .7 Inspection Authority: agent of any authority having jurisdiction over construction standards associated with any part of electrical work on site.
- .8 Install: To remove from site storage, move or transport to intended location, install in position, connect to utilities, repair site caused damage, and make ready for use.
- .9 New: Produced from new materials.

.10 Provide**:** Wherever the term "provide" is used in relationship to equipment, conduit and other materials specified for the work, it means "supply, install, connect and leave in working order all materials and necessary wiring, supports, access panels, etc., as necessary for equipment indicated." Wherever the terms "provide" is used in connection with services such as testing, load balancing, start-up, preparation of drawings for any part of the work, it means procure, prepare, supervise, take responsibility for, and pay for these services.

.11 Relocate: The complete relocation of the existing item identified to the new location as indicated, modifying the existing infrastructure as required to accommodate the relocation and overall scope of work.

.12 Remove and Reinstall: The temporary removal of the existing item identified complete with associated infrastructure to accommodate the overall scope of work, the temporary storage of the item, preparing the item for reuse, and reinstallation of the item as indicated.

.13 Remove and Replace: The complete removal and replacement of the item identified in its current location, with a new item, modifying the existing infrastructure as required to accommodate the overall scope of work.

.14 Renewed: Produced or rejuvenated from an existing material to like-new condition to serve a new or existing service.

.15 Supply: To acquire or purchase, ship or transport to the site, unload, remove packaging to permit inspection for damage, re-package, replace damaged items, and safely store on-site.

.16 Supply Authority: electrical power utility company responsible for delivery of electrical power to project.

.17 Typical: A representative characteristic that is standard for all installations whether individually noted or not throughout the documents. “Typical” applies to each individual or combined installation except where specifically noted or otherwise indicated that the application is non-typical.

1.5 ABBREVIATIONS

.1 The following are common abbreviations used in the specification:

.1 **AFF:** Above finished floor.

.2 **AFG:** Above finished grade.

1.6 PERMITS & FEES

.1 Submit all quantities of drawings and specifications necessary for examination and approval to Electrical Permit Department and Electrical Supply Authority prior to commencement of work.

.2 Obtain and pay for all permits necessary for the electrical installation.

1.7 INSPECTION

.1 Furnish a Certificate of Acceptance from the Inspection Authorities on completion of work. Copies of Certificate shall be included in Maintenance Manuals.

.2 Certificate of Inspection and Approval shall be submitted before final payment may be considered to be due.

.3 During the course of the project construction, the Contract Administrator will carry out periodic site reviews and prepare a deficiency list for remedial action by the Electrical Subcontractor. When requested, the Electrical Subcontractor shall respond in writing to the Contract Administrator, stating corrective action and completion date for each item listed as deficient. This response shall be in the hands of the Contract Administrator within three working days of receipt of the Site Review Report.

1.8 PRODUCT CHANGES & SUBSTITUTIONS

.1 Change in Product/Products: Submit request for substitution or alternative in accordance with this section, Part B – Bidding Procedures, B7, and Section 01 61 00. In case of a discrepancy between this section and Part B and Division 01, the more stringent shall apply.

.2 Part B – Bidding Procedures, B7 specify time restrictions for submitting requests for Substitutions during the bidding period to requirements specified in this section.

.3 Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

.4 Any substituted item submitted for consideration must not exceed the available space limitations, and all additional costs for mechanical, electrical, structural and architectural revisions required to incorporate the substituted material shall be the responsibility of the Electrical Division. Review maximum dimensions and weights when provided in the specification and schedules, and where not specified review the drawings for space limitations.

.5 A request constitutes a representation that the Bidder:
- .1 Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
- .2 Will provide the same warranty for the Substitution as for the specified Product.
- .3 Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to the City of Winnipeg.
- .4 Waives claims for additional costs or time extension which may subsequently become apparent.
- .5 Will reimburse City of Winnipeg and Contract Administrator for review or redesign services associated with re-approval by authorities.

.6 Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

1.9 SUBMITTALS FOR REVIEW

.1 Refer to Division 01.

.2 Progress Payment Application Template
- .1 Prior to the first application for payment, submit for review a draft progress application template.
- .2 Progress Application shall contain separate line items for the following systems:
  - .1 Distribution Equipment including Panels, Distribution Panels, Transformers, etc.
  - .2 Branch Wiring, Conduit, Raceway, Boxes
  - .3 Exit & Emergency Lighting
  - .4 Voice/Data
  - .5 Fire Alarm
  - .6 Pool Grounding
  - .7 Close Out (As-Builts, O&Ms)
- .3 Progress for each system shall break out labor and materials separately.

.3 Shop Drawings Administrative Requirements
- .1 **Shop drawings shall be submitted electronically in PDF format documents to** shopdrawings@eppsiepman.com.

.2 Shop drawing documents **shall be grouped by specification section**. Clearly list the specification section on the front page or cover sheet of the submittal. Shop drawings related to **multiple sections may not be grouped together** into a single document. Documents that are groups incorrectly will be returned without being examined and shall be considered rejected.

.1 Each drawing shall include the name of project as found on the drawings or specifications, the equipment supplier and the specification section that the equipment is specified under.

.3 Submit to Contract Administrator submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.4 Work affected by submittal shall not proceed until review is complete.

.5 Present Shop Drawings, product data, samples and mock-ups in SI Metric and/or Imperial inch-pound units, to match the units used in the schedules.

.4 Shop Drawings and Product Data

.1 Submit shop drawings and product data for review by the Contract Administrator. All drawings shall be in English and metric dimensions or in imperial where indicated. Manufacture of equipment shall not commence until shop drawings have been reviewed.

.2 Material submitted for review shall be marked up bear the Contractor's and where applicable the Utility's reviewed stamp.

.3 Shop drawings shall be reviewed by the Electrical Subcontractor, Contractor, and where applicable the Utility prior to submittal to Contract Administrator, confirming that they meet all the design requirements. 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.

.4 Submittals not stamped, signed, dated, identified as to specific project, and attesting to their being reviewed will be returned without being examined and shall be considered rejected.

.5 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.

.6 Where applicable, include wiring, single line and schematic diagrams.

.7 Include wiring drawings or diagrams showing inter-connection with work of other sections.

.5 Provide scaled drawings showing layout of all electrical equipment and coordination of same with mechanical equipment in all electrical, electrical/mechanical and voice data rooms.

.6 Submit samples in accordance with General Conditions. Samples shall be forwarded to the Contract Administrator's office and returned. Approved samples will be retained until after tender closing, then all samples will be returned except for the sample submitted by the Manufacturer who has been listed by the successful Contractor in the tender documents. This sample will be used for comparison with the actual production run of successful manufacturer.

.7 Submit shop drawings of service entrance equipment to utilities.

1.10 CLOSEOUT SUBMITTALS

.1 Refer to Division 01.

.2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.3 Four (4) weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, one (1) draft copy of operating and maintenance manuals in Canadian English.

.4 Copy will be returned with Contract Administrator's comments.

.5 Revise content of documents as required prior to final submittal.

.6 Two (2) weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, three (3) final copies of operating and maintenance manuals in Canadian English.

.7 Summary audit documents associated with requirements for LEED classification documentation.

.8 Maintenance Data:

.1 Provide operation and maintenance data for incorporation into Maintenance Manuals.

.2 Include details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

.3 Include technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature not acceptable.

.4 Include all warranty information.

.5 Submit Maintenance Manuals to the Contract Administrator for review. Manuals that are incomplete shall be returned to the Electrical Subcontractor for completion. Completed manuals shall be submitted, to the satisfaction of the Contract Administrator, before final payment may be considered to be due.

.6 Format

.1 Refer also to Section 01 78 00 - Closeout Submittals for formats for manuals. Where there is a discrepancy with this section, follow the requirements of 01 78 00.

.2 Organize data in the form of an instructional manual.

.3 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 8.5 x 11 inch (219 x 279 mm) with spine and face pockets.

.4 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

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

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

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

.8 Text: Manufacturer's printed data, or typewritten data.

.9 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.7 Contents

.1 Refer also to Section 01 78 00 for formats for contents. Where there is a discrepancy with this section, follow the requirements of 01 78 00.

.2 Table of Contents: Provide:

.1 Title of project.

.2 Date of submission.

.3 Names, addresses, and telephone numbers of Contract Administrator and Contractor with name of responsible parties.

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

.3 For each product or system, list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.4 Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 40 00.

.5 Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control, wiring, and schematic diagrams and performance curves.

.6 Include Systems Certifications where applicable.

.7 Include manufacturer specific warranties where applicable.

.8 Include a list of maintenance materials provided in each related section.

.9 Certificate of Acceptance: Relevant certificates issued by authorities having jurisdiction, including code compliance certificate, life safety systems performance certificate.

.10 Training: Record of the City of Winnipeg's representative training as specified.

.9 Maintenance Materials:

.1 Provide maintenance materials as specified. Include a list of the maintenance materials in each related section of the operation and maintenance data.

.2 Turn materials over to the City of Winnipeg in an orderly fashion upon completion of installation.

1.11 EXAMINATION

.1 Prior to submitting a tender, examine the site and local conditions which will affect the work. Refer to the Architectural, Mechanical and Structural drawings, schedules and specifications for construction details to be certain that the electrical work can be satisfactorily carried out as specified. Claims for extra payments resulting from conditions which could reasonably be foreseen during an examination of the documents and/or site, will not be recognized.

.2 Ensure that all equipment designated as "Existing to Remain" or "Existing to be Relocated" is suitable for its intended re-use, including panelboards and circuits. Report any discrepancies to the Contract Administrator before tender close.

.3 Refer to General Conditions for instructions regarding a prearranged site visit during the tender period.

.4 Notify Contract Administrator of any discrepancies, omissions, etc., prior to the awarding of the Contract, otherwise the Electrical Subcontractor shall perform the work as directed at no additional cost to the City of Winnipeg.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Provide labour, materials, transportation, equipment and facilities, etc., required for the complete electrical installation as indicated or implied on the drawings and specifications.

.2 Electrical equipment shall be new and of type and quality specified.

.3 Request for approval of material, as equal, shall conform to the specification.

.4 Equivalent materials and equipment

.1 Bidders shall submit a tender based on the specified materials and equipment only.

.2 Bidders may submit a tender based on equivalent materials and equipment only if such items have been approved as equals by the Contract Administrator.

.3 Bidders may submit, with their tender, an alternate price based on alternate materials and equipment only if such items have been approved as alternates by the Contract Administrator.

.4 Submissions for equals or alternates shall be received by the Contract Administrator, ten (10) working days prior to tender closing. Submissions shall include sufficient manufacturer's data to clearly show equivalency, as well as an itemized list of equal or alternate items, the items for which they were submitted and a space for the Contract Administrator to indicate "approved equal in accordance with B6", "approved alternate in accordance with B6", or "not approved". Submittal list will be returned or may be picked up at the Contract Administrator's office. Where submissions are not returned by the Contract Administrator before tender closing or are not received by the Contract Administrator ten (10) working days before close of tender, they are considered not approved.

.5 All submissions shall include the following phrase "We have reviewed all Contract documents, Contract drawings and specifications relating to the equipment presented herein" and shall bear the name and signature of the manufacturer or their agent.

2.2 VOLTAGE RATINGS

.1 Operating voltages: to CAN3-C235-83(R2015).

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment shall operate in extreme operating conditions established in above standard without damage to equipment.

2.3 FINISHES

.1 Finish outdoor electrical equipment such as parking lot panels, to match light standards.

.2 Paint indoor switchgear light grey to EEMAC-2Y-1.

.3 Paint indoor distribution enclosure trims light grey to EEMAC-2Y-1. Distribution tub shall be galvanized.

.4 Paint outdoor electrical equipment enclosures with two (2) coats of U.V. resistant Urethane Enamel to minimum 1.5 mil dry coat thickness. Colour shall be "equipment green" to EEMAC 2Y-1.

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

.6 Clean, prime and paint exposed wiring, conduit, junction and pull boxes, hangers, racking, and fasteners to prevent rusting and to match surrounding finishes where applicable.

2.4 LABELS AND WARNING SIGNS

.1 Manufacturer's nameplates and CSA labels shall be visible and legible after equipment is installed.

.2 Provide warning signs on equipment, as required, to meet the requirements of the Inspection Authorities, including indication of multiple power sources.

.3 Provide quantity as required of buried cable signs reading "Buried Cable" and "Buried High Voltage Cable". Signs shall be installed at building structure/equipment, at locations as directed on site and as per Canadian Electrical Code.

2.5 PROTECTION

.1 Guards
- .1 Provide guards for all electrical equipment and devices in gymnasium and other areas subject to damage.

.2 Sprinkler Proof Equipment
- .1 All surface mounted electrical equipment located in sprinklered areas shall be sprinkler proof and shall be provided with suitable hoods and shields.
- .2 Entrance of conduits into the top of surface mount electrical panels/cabinets/distributions and motor control centers shall utilize O-rings and watertight connectors.
- .3 All recessed mounted branch circuit panels and distribution panels shall be provided with a Type 2 enclosure.

.3 Construction
- .1 Protect exposed live equipment during construction for personnel safety.
- .2 Shield and mark live part “LIVE ( ) VOLTS”, with appropriate voltage.
- .3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision.

2.6 SPARE PARTS AND MAINTENANCE MATERIALS

.1 Assemble spare parts as specified.

.2 Include the following:
- .1 Part number.
- .2 Identification of equipment or system for which parts are applicable.
- .3 Installation instructions as applicable.

.3 Provide a written list complete with the City of Winnipeg’s signature assuring that spare parts have been received by the City of Winnipeg.

Part 3 Execution

3.1 COORDINATION WITH OTHER TRADES

.1 Refer to Mechanical, Structural, Architectural and Interior Design drawings and specifications for additional electrical work in connection with other Divisions. Where such work is included in other sections of the specifications, provide equipment, conduit, wiring, etc. (in accordance with the approved manufacturer’s shop drawings), as required, for operation of the specified equipment.

.2 Schedule execution of electrical work with associated work specified in other Divisions.

.3 Coordinate electrical work with work of other trades to avoid conflicts with pipes, air ducts or other equipment. Provide additional supports, wiring, etc., to relocate electrical equipment, as required, where structural members, air ducts, piping or other equipment interferes with the electrical installation.

.4 Prior to installation provide scaled drawings of all mechanical/electrical rooms and communication rooms showing layout of all equipment (mechanical and electrical) for Contract Administrator review.

3.2 QUALITY ASSURANCE

.1 Do complete installations in accordance with CSA C22.1-21.

.2 While not identified and specified by number in this Division, comply with CSA Electrical bulletins in force at time of tender submission. Comply with the requirements of all Provincial and local laws, rules, ordinances and codes.

.3 Electrical installations shall comply with all requirements of the electrical supply authority and the inspection authority.

.4 Electrical installation shall be in accordance with the applicable versions of the Canadian Electrical Code, Provincial and other codes, rules and regulations. Supply material and labour required to meet the requirements of these codes, rules and regulations even though the work in not shown on the drawings or mentioned in the specifications. Where the electrical installation calls for better quality materials or construction than the minimum requirements of these codes, rules and regulations, the electrical installation shall be as shown on the drawings and as specified.

3.3 WORKMANSHIP

.1 Install equipment, conduit and cables in a workmanlike manner to present a neat appearance to the satisfaction of the Contract Administrator. Install conduit and cable runs parallel and perpendicular to building lines in chases, behind furring or above ceilings, where such concealment is possible. In areas where systems are to be exposed, install neatly and group in a tidy appearance.

.2 Install equipment/junction boxes and apparatus requiring maintenance, adjustment or eventual replacement, with adequate clearances and accessibility for same.

.3 Provide for all requirements shown on shop drawings or manufacturer's installation instructions.

.4 Work deemed by the Contract Administrator to be unsatisfactory shall be replaced at no additional cost.

3.4 DELIVERY STORAGE AND HANDLING

.1 Deliver all materials to site in an orderly fashion.

.2 Store all materials in a clean and dry place, secure from vandalism or theft. All materials shall be left in shipping containers until required for use.

.3 Provide additional protection such as tarps, padding, wood skids, etc., as required to ensure protection of equipment and as directed by the Architect.

3.5 EXCAVATION AND BACKFILLING

.1 Excavate and backfill as required for underground electrical services as indicated. Provide protective materials around and over services and be present at all times during excavation and backfilling to supervise work. Backfilling shall restore the excavated area to the original condition and shall include sodding where required.

.2 Work shall be in accordance with the current CSA Bulletin.

.3 Include all costs for excavation and backfilling, for any underground electrical installation, unless otherwise indicated.

.4 Work shall be arranged in such a manner that will not interfere with regular pedestrian or vehicular traffic patterns.

.5 Provide trenching, cable installations and backfill promptly. Open trenches shall be barricaded in an appropriate manner.

.6 Cables required to cross under roadways, paved areas, sidewalks, etc. shall be installed in PVC conduits pushed under such areas.

.7 Six _ (6") of sand shall be provided surrounding installed cables and _ x _ 2" x 4" treated plank installed _ 6" above the cables. Install cable marker tape in all trenches, minimum _ 12" above cables. The remainder of the trench shall be backfilled with granular base course. All backfill material shall be thoroughly tamped and compacted to at least 90% of maximum density at optimum moisture. The ground shall be left free from ruts and rough spots. In any asphalt areas, backfill shall be granular material only.

.8 All sodded areas disturbed or damaged during trenching and backfilling shall be repaired with manured soil mix and resodded. Make all repairs to damaged asphalt and/or concrete surfaces to match existing.

.9 Care shall be taken when excavating near existing services. Existing trees and shrubbery in work area shall be protected from damage.

.10 Install buried cable signs as per CEC and Manitoba Electrical addendums.

3.6 CONDUIT SLEEVES AND HOLES

.1 Install conduit, and sleeves, prior to pouring of concrete. Sleeves through concrete shall be sized for free passage of conduit.

.2 Holes through exterior walls and roof shall be flashed and made weatherproof.

.3 Make necessary arrangements for cutting of chases, drilling of holes and other structural work required to install electrical conduits, cables, pullboxes and outlet boxes.

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

.5 Provide a minimum of two (2) separate conduit sleeves embedded in each concrete lighting fixture base. At least one (1) unused conduit shall be for possible future extension of wiring.

.6 All conduits and cables shall be entered into the building above grade unless otherwise noted.

.7 All coring in buildings with electrical in the slab shall be scanned at Contractor's expense to prevent damage.

3.7 CUTTING AND PATCHING

.1 Pay the costs of all cutting and patching required for the installation of electrical work. Payment for cutting and patching shall be made through the Contractor.

.2 Cutting and patching required for the installation of electrical work shall be done by the particular trade whose work is involved. No cutting or patching shall be carried out by the tradesman employed on the electrical work.

.3 Obtain the approval of the Architect before arranging for any cutting. Patching shall restore the affected area to the original condition; materials and methods used for patching shall be in accordance with the requirements of the corresponding Divisions of the specification.

3.8 DEVICE/EQUIPMENT INSTALLATION

.1 Device/equipment location and mounting:
- .1 Locate devices as indicated.
- .2 Do not install devices back-to-back in wall.
- .3 Drawings are schematic only and do not indicate all architectural or structural elements.

.4 Outlets or equipment shall be moved to any point within a 3 m (10'-0") radius when the Contract Administrator requests relocation prior to closing of wall framing, without additional cost.

.5 Locate manual lighting controls on latch side of doors.

.6 Vertically align devices of different systems when shown near each other and occurring at different mounting heights.

.7 Coordinate mounting heights and location of all devices/equipment with all discipline Contract documents prior to installation of rough-in boxes.

.8 Panelboards and similar equipment including control panels intended to be surface mounted shall be installed on minimum 19 mm (3/4") good one side, fir plywood mounting backboards. Treat backboards with wood preservative prior to installation and paint with primer and two (2) coats gray enamel before any equipment is mounted. Provide plywood mounted boards unless specified otherwise in other sections.

.9 Panelboards and similar equipment including control panels mounted on exterior concrete/block walls shall have minimum 19 mm (3/4") air gap behind enclosure (to minimize condensation).

.10 All transformers, motor control centers and floor-mounted distribution panels shall be mounted on 100 mm (4") concrete housekeeping pads. The Electrical Contractors shall be responsible for provision of these pads.

.2 Mounting heights

.1 Mounting height of equipment is from finished floor to centre line of equipment unless indicated otherwise.

.2 If mounting height of equipment is not indicated, verify before installation.

.3 Coordinate all mounting heights with Architectural elevations.

.4 Where installed in block or brick, mounting heights shall be as above or at bottom of nearest course.

.5 Install devices/equipment at the following heights unless indicated otherwise:

.1 Receptacles and similar devices:

.1 General height (accessible height): 450 mm (18")

.2 Above continuous baseboard heater: 200 mm (8")

.3 Above counters: 150 mm (6"); Note-4

.4 Service and utility spaces: 1000 mm (39")

.5 Exterior: 1000 mm (39") AFG

.2 Communications outlets and similar devices:

.1 General height (accessible height): 450 mm (18")

.2 Above continuous baseboard heater: 200 mm (8")

.3 Above counters: 150 mm (6"); Note-4

.4 Service and utility spaces: 1000 mm (39")

.3 Luminaires:

.1 Suspended: Unless indicated otherwise, refer to architectural.

.2 Wall mounted: Unless indicated otherwise, refer to architectural.

.4 Lighting controls:

.1 General (accessible height): 1150 mm (45")

.2 Occupancy sensors (switch based, manual): 1150 mm (45")

.3 Barrier free (accessible) suites: 900 mm (36")

.5 Emergency lighting:

.1 Exit signage: 25 mm (1"); Note-5

.2 Battery units:

.1 2350 mm (92"); Note-1 or

.2 150 mm (6"); Note-2

.3 Remote heads:
.1 2350 mm (92”); Note-1 or
.2 150 mm (6”); Note-2

.6 Fire alarm:
.1 Control panels, annunciators: 2000 mm (78”); Note-1
.2 Manual stations: 1150 mm (45”)
.3 Signal devices (visual and audible):
.1 2350 mm (92”); Note-1 or
.2 150 mm (6”); Note-2
.4 Telephone handsets: 1500 mm (59”)

.7 Automatic door operators:
.1 Controller box: Refer to architectural.
.2 Pushbutton control (button type): 900 mm (36”)
.3 Pushbutton control (bar type): Refer to architectural.
.4 Key switch (line voltage): 1550 mm (61”)
.5 Key switch (low voltage): 1150 mm (45”)
.6 Push-to-lock (PTL) pushbutton: 900 mm (36”)
.7 Occupied-when-lit (OWL) indicator: 25 mm (1”); Note-5

.8 Access control:
.1 Keypads: 1150 mm (45”)
.2 Proximity readers: 900 mm (36”)
.3 Exit pushbuttons: 1150 mm (45”)
.4 Exit motion detectors: 25 mm (1”); Note-5
.5 Control panels: 2000 mm (79”); Note-1

.9 Intrusion detection:
.1 Keypads: 1150 mm (45”)
.2 Keypads with integrated proximity readers: 900 mm (36”)
.3 Motion detectors:
.1 2350 mm (92”); Note-1 OR
.2 150 mm (6”); Note-2
.4 Glass break sensors:
.5 Control panels: 2000 mm (79”); Note-1

.10 Clocks:
.1 2150 mm (84”) OR
.2 150 mm (6”); Note-2

.11 Electrical distribution and branch circuit panels:
.1 General: 2000 mm (79”); Note-1
.2 Where panels taller than 1800 mm (72”): No more than 100 mm (4”) AFF.
.3 Enclosed circuit breakers: 1600 mm (63”); Note-3

.12 Electric heat and controls:
.1 Thermostats:
.1 General (accessible height): 1150 mm (45”)
.2 Barrier free (accessible) suites: 900 mm (36”)

.13 Hand dryers: 1150 mm (45”)

.14 Intercom and paging:

.1 Intercom stations: 1150 mm (45”)

.2 Wall mounted speakers:

.1 2150 mm (84”) OR

.2 150 mm (6”); Note-2

.6 Notes (Note-X):

.1 Measured to top of device/equipment.

.2 Measured from ceiling to top edge of device/equipment where mounting height would be lower than required specification.

.3 Measured to operating handle of device/equipment.

.4 Coordinate counter backsplash heights with architectural drawings prior to rough-in. Maintain minimum 1” clearance above backsplash height.

.5 Measured above door trim to underside of device/equipment.

.6 Measured to bottom of device/equipment.

3.9 FIREPROOFING

.1 Where cables or conduits pass through block or concrete walls and floors and any fire-rated assembly, seal openings with firestopping systems that have been tested for specific fire-resistance-rated construction conditions conforming to the construction assembly type, penetrating item type, annular space requirements, and fire-rating involved in each instance.

.2 Provide products that upon curing, do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.

.3 Openings within walls and floors designed to accommodate cabling systems subjected to frequent cable changes shall be provided with re-enterable products.

.4 Fire proofing of electrical cables, conduits, trays, etc, passing through fire barriers shall conform to local codes and inspection authorities.

.5 Fire stop materials shall be asbestos free and have been tested in accordance with ASTM E-814, and ULC 1479.

.6 Fire stop and smoke seals shall be done in accordance with Section 07 84 13.

.7 Approved manufacturers:

.1 Nelson Firestop Products

.2 Specified Technologies

.3 Hilti Firestop

3.10 CIRCUITING

.1 Circuiting is representational only within a panel only. Circuit all electrical equipment and devices to their individually respective, intended panels.

3.11 LOAD BALANCE

.1 Measure phase current to panelboards with normal loads operating at time of measurement. 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 Submit, at completion of work, a report listing phase and neutral currents on panelboards, transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

.4 Include load balance test results in maintenance manuals.

3.12 TESTING

.1 Conduct and pay for tests including, but not limited to, the following systems:
- .1 Circuits originating from branch distribution panels.
- .2 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
- .3 Grounding systems.

.2 Insulation Resistance Testing
- .1 Megger circuits, feeders and equipment up to 350V with a 500V instrument.
- .2 Megger 350-600V circuits, feeders and equipment with a 1000V instrument.
- .3 Check resistance to ground before energizing.

.3 Furnish Manufacturer's Certificate or letter confirming that entire installation, as it pertains to each system, has been installed to manufacturer's instructions. Submit letter in accordance with this section.

.4 Carry out tests in presence of Contract Administrator where directed.

.5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.6 Submit test results in Maintenance Manuals.

3.13 CARE, OPERATION AND START-UP

.1 Instruct the City of Winnipeg's operating personnel in the operation, care and maintenance of equipment. Arrangement of such instructional sessions shall be done at a time convenient to the City of Winnipeg.

.2 Arrange and pay for services of Manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components.

.3 Provide these services for such a period, and for as many visits as necessary to put equipment into operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

3.14 CLEANING

.1 Final cleaning shall be done in accordance with the specification.

.2 Final cleaning shall include, but not be limited to, all lighting reflectors, lenses, and other lighting surfaces that have been exposed to dust and dirt throughout the course of construction.

.3 Clean surfaces that have been exposed to dust and debris throughout construction.

.4 Remove dirt and debris from enclosures.

.5 Clean electrical parts to remove conductive and deleterious materials.

.6 Clean finishes and touch-up damage.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Electrical demolition.

1.2 RELATED SECTIONS

.1 Section 02 41 19 - Selective Demolition.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Materials and equipment for patching and extending work: As specified in individual Sections.

Part 3 Execution

3.1 EXAMINATION

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Verify field measurements and circuiting arrangements are as shown on Drawings.

.3 Verify that abandoned wiring and equipment serve only abandoned facilities.

.4 Electrical drawings are based on existing record documents and/or casual field observations. Coordinate full extent of demolition work with all disciplines. Coordinate on site with all trades prior to commencement of demolition.

.5 Report discrepancies to the Contract Administrator, and The City of Winnipeg before disturbing the existing installation.

.6 Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

.1 Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

.2 Reroute/extend/re-feed existing electrical as required to maintain existing systems not indicated to be removed.

.3 Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

.1 Demolish and extend existing electrical work to this Section and as indicated.

.2 The construction documents indicate major items of equipment, fixtures and devices, that exist and may not indicate every item or supporting wiring and conduit to be removed and/or relocated.

.3 Carefully examine the site and construction documents to verify the extent of work defined in the construction documents. Be responsible for determining which existing equipment and/or devices are to be removed and/or relocated.

.4 Remove, relocate, and extend existing installations to accommodate new construction including all existing equipment and/or devices indicated within the construction documents.

.5 Where existing equipment and/or devices are to be temporarily relocated, coordinate the required structure to support the equipment.

.6 Remove abandoned wiring to source of supply.

.7 Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

.8 Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

.9 Disconnect and remove abandoned panelboards and distribution equipment.

.10 Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

.11 Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

.12 Repair adjacent construction and finishes damaged during demolition and extension work.

.13 Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

.14 Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.4 PANELBOARDS

.1 Existing panelboards shall be retrofitted to accommodate new sprinklers. Provide mechanically fastened manufacturer approved drip hoods for all surface mounted panelboards. Seal existing conduit and wiring penetrations for all surface mounted panelboards with weatherproof connectors. All work shall be conducted in accordance to approved methods by the authority having jurisdiction.

3.5 CLEANING AND REPAIR

.1 Clean and repair existing materials and equipment which remain or are to be reused.

.2 Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts, broken electrical parts and lenses.

3.6 FINISHES

.1 Clean, prime and paint exposed wiring, conduit, junction and pull boxes, hangers, racking, and fasteners to prevent rusting and to match existing finishes where applicable.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Building wire and cable.

.2 Armoured cable.

.3 Armoured cable wet underground (ACWU)

.4 Metal clad cable (TECK)

.5 Wiring connectors and connections.

1.2 RELATED SECTIONS

.1 Section 26 05 53 - Electrical Identification.

.2 Section 31 23 18 - Trenching: Trenching and backfilling for direct burial cable installation.

1.3 REFERENCES

.1 CSA-C22.1-21 - Canadian Electrical Code, Part I (25th Edition), Safety Standard for Electrical Installations.

.2 C22.2 No. 0.3-09 (R2014) - Test Methods for Electrical Wires and Cables.

.3 CSA C22.2 No. 51-14 - Armoured Cables.

.4 CSA C22.2 No. 52-15 - Underground Secondary and Service Entrance Cables.

.5 CAN/CSA-C22.2 No. 65-18 - Wire Connectors.

.6 CSA C22.2 No. 75-17 - Thermoplastic-Insulated Wires and Cables.

.7 CSA C22.2 No. 123-16 - Metal Sheathed Cables.

.8 CAN C22.2 No.131-17 - Type TECK 90 Cable.

.9 NECA (National Electrical Contractors Association) - National Electrical Installation Standards (NEIS).

.10 NETA (InterNational Electrical Testing Association) - ANSI/NETA ATS-2017 - Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems.

.11 CSA (Canadian Standards Association).

.12 ULC (Underwriters' Laboratories of Canada).

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Coordination:

- .1 Coordinate with other work having a direct bearing on work of this section.
- .2 Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

1.5 SUBMITTALS FOR REVIEW

.1 Refer to 26 05 00 Common Work Results for Electrical.

1.6 SUBMITTALS FOR INFORMATION

.1 Refer to 26 05 00 Common Work Results for Electrical.

1.7 STORAGE, AND HANDLING

.1 Cables shall be stored and handled in accordance with manufacturer's recommendations.

1.8 CLOSEOUT SUBMITTALS

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Record Documentation:
- .1 Record actual locations of components and circuits.
- .2 Record routing of all equipment and panelboard feeders.

1.9 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five (5) years documented experience.

1.10 REGULATORY REQUIREMENTS

.1 Conform to CSA-C22.1.

.2 Provide products listed and classified by CSA or ULC and as suitable for the purpose specified and indicated.

1.11 PROJECT CONDITIONS

.1 Conductor sizes are based on copper unless indicated as aluminum or "AL".

Part 2 Products

2.1 BUILDING WIRE AND CABLE

.1 Description: Single conductor insulated wire RW90.

.2 Conductor: Copper unless otherwise noted.

.3 Insulation Voltage Rating: 600 volts.

.4 Insulation: Cross-Linked Polyethylene material rated 90 degrees C.

2.2 ARMOURED CABLE (AC90)

.1 Description: Type AC90.

.2 Conductor: Copper unless otherwise noted.

.3 Insulation Voltage Rating: 600 volts.

.4 Insulation Temperature Rating: 90 degrees C (_ degress F).

.5 Insulation Material: Cross-Linked Polyethylene.

.6 Rating: CSA FT4

2.3 ARMOURED CABLE WET UNDERGROUND (ACWU90)

.1 Description: Type ACWU90

.2 Conductor: Aluminum, conductor quantities as indicated complete with bond

.3 Insulation: Cross-linked polyethylene (XLPE), type RW90, 600 volts

.4 Armour: Interlocking aluminum

.5 Outer jacket: Flame-retardant, moisture and sunlight resistant black PVC

.6 Temperature rating: 90 degrees C (_ degress F).

.7 Listings: CSA FT4, CSA C22.2 No. 51, CSA C22.2 No. 174

.8 Options: Outer jacket color coding as indicated

2.4 METAL CLAD CABLE (TECK90)

.1 Description: Type TECK90.

.2 Conductor: Copper, conductor quantities as indicated complete with bond

.3 Insulation: Cross-linked polyethylene (XLPE), type RW90, 600 or 1,000 volts

.4 Inner jacket: Flame-retardant, moisture and sunlight resistant black PVC

.5 Armour: Interlocking aluminum

.6 Armour: Interlocking galvanized steel

.7 Outer jacket: Low-temperature, moisture and sunlight resistant black PVC

.8 Listings: CSA FT1, CSA FT4, CSA C22.2 No. 131, CSA C22.2 No. 174

2.5 CONNECTORS

.1 Pressure type connectors, fixture type splicing connectors, cable clamps and lugs, as required.

Part 3 Execution

3.1 EXAMINATION

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Verify that field measurements are as indicated.

.3 Verify that interior of building has been protected from weather.

.4 Verify that mechanical work likely to damage wire and cable has been completed.

.5 Verify that raceway installation is complete and supported.

3.2 PREPARATION

.1 Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

.1 Concealed Dry Interior Locations: Use only armoured cable, armoured cable wet underground, metal clad cable, or building wire in raceway.

.2 Exposed Dry Interior Locations: Use only building wire in raceway.

.3 Above Accessible Ceilings: Use only armoured cable, armoured cable wet underground, metal clad cable, or building wire in raceway.

.4 Wet or Damp Interior Locations: Use only armoured cable wet underground, metal clad cable, or building wire in PVC raceway.

.5 Exterior Locations: Use only armoured cable wet underground, metal clad cable, or building wire in raceway.

.6 Underground Installations: Use only armoured cable, armoured cable wet underground, or building wire in raceway.

3.4 INSTALLATION

.1 Route wire and cable as required to meet project conditions.

.2 Install cable to the CSA-C22.1.

.3 Use solid conductor for feeders and branch circuits 10 AWG and smaller.

.4 Use stranded conductors for control circuits.

.5 Use conductor not smaller than 12 AWG for power and lighting circuits and sized for maximum 3% voltage drop as per the following Table:

Maximum Conductor Length for 120V Branch Circuits

Breaker SizeA	Conductor	
	Size AWG	Max Length m
15A	#12	20
	#10	35
	#8	55
	#6	90
20A	#12	15
	#10	25
	#8	40
	#6	65
	#4	110
30A	#10	15
	#8	25
	#6	45
	#4	70

.1 Where conductors are required to meet voltage drop requirements that are too large for proper termination at breakers or end devices, a transition to a suitable sized conductor may be made within 3m (10') of the termination with a minimum smaller conductor size of #10AWG.

.6 Use conductor not smaller than 16 AWG for control circuits.

.7 Pull all conductors into raceway at same time.

.8 Use suitable wire pulling lubricant for building wire 4 AWG and larger.

.9 Protect exposed cable from damage.

.10 All cable routed below grade shall enter/exit the building below grade unless noted otherwise.

.11 Where cabling is installed on building exterior, or direct buried, make provision for differential settling of exterior grade, buildings, and other structures and supports. Provide slack within cabling systems as required.

.12 Support cables above accessible ceiling, using spring metal clips to support cables from structure. Do not rest cable on ceiling panels.

.13 Single conductor cables shall be installed one cable diameter apart on suspended cable tray or channel supports and shall be clamped with aluminum cable clamps. Cables shall be terminated using non-magnetic connectors and shall be watertight for top entry. Cable armour shall be grounded via an aluminum plate at the supply end and isolated via an insulating plate, at the load end of the cable. A #3/0 AWG insulated (unless otherwise noted) copper ground wire shall be installed with each set of feeder cables. Cable bending radius shall be at least twelve times the overall cable diameter and bend shall not damage or distort the outer sheath.

.14 Armoured cable shall be used for connections from conduit systems to recessed luminaires in accessible ceilings. Cable shall be of sufficient length to allow the lighting fixture to be relocated to any location within an 1800mm (6') radius. Cable shall be clamped before entering the lighting fixture and shall be clipped before entering the conduit system junction box. (Minimum requirements).

.15 Use suitable cable fittings and connectors.

.16 Use bonding bushings at both ends of armoured cables.

.17 Neatly train and lace wiring inside boxes, equipment, and panelboards.

.18 Clean conductor surfaces before installing lugs and connectors.

.19 Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

.20 Aluminum Conductors

.1 Terminate aluminum conductors with tin-plated aluminum- bodied compression connectors only. Fill with anti- oxidant compound before installing conductor.

.2 Use suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.

.21 Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

.22 Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

.23 Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

.24 Identify wire and cable to Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Grounding electrodes and conductors.

.2 Equipment grounding conductors.

.3 Bonding.

1.2 REFERENCES

.1 CSA-C22.1-21 - Canadian Electrical Code, Part I (25th Edition), Safety Standard for Electrical Installations.

.2 IEEE 81-2012 IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.

1.3 SYSTEM DESCRIPTION

.1 Metal and underground water pipe.

.2 Metal frame of the building.

.3 Metal and underground gas piping system.

1.4 PERFORMANCE REQUIREMENTS

.1 Maximum Grounding System Resistance: 5 ohms.

1.5 SUBMITTALS FOR REVIEW

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Product Data: Provide for grounding electrodes and connections.

.3 Shop Drawings: Submit shop drawing showing floor plan layout of all bonding conductor routing and connections.

1.6 SUBMITTALS FOR INFORMATION

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Test Reports: Indicate overall resistance to ground.

.3 Photographs: Submit photographs of installation connections and routing.

1.7 CLOSEOUT SUBMITTALS

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Record Documentation: Record drawings identifying:
- .1 Locations of bonded equipment.
- .2 Routing of bonding conductors.
- .3 Details of connections.
- .4 Photographs showing connection details.

.3 Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

1.8 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years experience.

1.9 REGULATORY REQUIREMENTS

.1 Products: Listed and classified by ULC and/or CSA as suitable for the purpose specified and indicated.

Part 2 Products

2.1 MECHANICAL CONNECTORS

.1 Material: Bronze.

2.2 CONDUCTORS

.1 Material: Stranded copper

.2 Sized to CSA-C22.1 requirements minimum, or larger where indicated.

Part 3 Execution

3.1 EXAMINATION

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

.1 Provide grounding and bonding to meet regulatory requirements.

.2 Exposed conductors shall be protected from mechanical injury.

.3 Mechanical connections shall be used for bonding connections to equipment. Soldered joints shall not be permitted.

.4 Buried connections of grounding and bonding conductors shall be made using exothermic welding process.

.5 Provide bonding wire connected to both ends of flexible conduit. Neatly attach to exterior of flexible conduit.

.6 Bonding connections shall be made using a star configuration. Loop connections shall be avoided.

.7 Provide separate bonding conductor in all non-metallic raceways.

.8 Swimming pools or hot tubs:
- .1 Bond together reinforcing steel and metal accessories
- .2 Bond as required by regulatory requirements and as indicated.

.9 Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

.10 Schedule a review of the installation by the The City of Winniepg, Contract Administrator, and Electrical Designer prior to covering the installation. Do not proceed without written instruction by the Contract Administrator.

3.3 SYSTEM GROUNDING

.1 Install system and circuit grounding connection to neutral points of 600V and 208V systems.

.2 Grounding conductors shall be routed in or adjacent to primary conduits or cables.

3.4 EQUIPMENT BONDING

.1 Install bonding connections to typical equipment included in, but not necessarily limited to:

.1 Service equipment
.2 Distribution Panels
.3 Building Steel Work

3.5 FIELD QUALITY CONTROL

.1 Perform ground continuity and resistance tests using fall-of-potential measurement system method per IEEE 81-2012 standards. A report shall be submitted to the Contract Administrator from the testing agency.

.2 Perform tests before energizing electrical system.

.3 Disconnect ground fault indicator, if provided, during tests.

.4 A ground electrode with an unsatisfactory resistance test result shall be altered as necessary until the required resistance reading is achieved.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Conduit and equipment supports.

.2 Anchors and fasteners.

1.2 REFERENCES

.1 CSA-C22.1-21 - Canadian Electrical Code, Part I (25th Edition), Safety Standard for Electrical Installations.

.2 CECA - Canadian Electrical Contractors Association.

.3 CSA (Canadian Standards Association).

.4 ULC (Underwriters' Laboratories of Canada).

1.3 SUBMITTALS FOR REVIEW

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Product Data: Provide manufacturer's catalogue data for fastening systems.

1.4 REGULATORY REQUIREMENTS

.1 Provide products listed and classified by CSA and as suitable for purpose specified and shown.

Part 2 Products

2.1 PRODUCT REQUIREMENTS

.1 Materials and Finishes: Provide adequate corrosion resistance.

.2 Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

.3 Anchors and Fasteners:

.1 Concrete Structural Elements: Use expansion anchors.
.2 Steel Structural Elements: Use beam clamps and spring steel clips.
.3 Concrete Surfaces: Use expansion anchors.
.4 Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
.5 Solid Masonry Walls: Use expansion anchors.
.6 Sheet Metal: Use sheet metal screws.
.7 Wood Elements: Use wood screws.

2.2 STEEL CHANNEL

.1 U-shape, galvanized steel or stainless steel as indicated, sized to suit installation, surface-mounted, suspended or set in poured concrete walls and ceilings as required.

.2 Provide appropriate anchors, fasteners, fittings and supports for a complete supporting system.

2.3 INSTALLATION

.1 Install products to manufacturer's written instructions.

.2 Provide anchors, fasteners, and supports to CSA-C22.1.

.3 Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

.4 Do not use powder-actuated anchors.

.5 Do not drill or cut structural members.

.6 Do not use plastic cable ties.

.7 Use stainless steel channel for exterior or wet applications.

.8 Use galvanized steel channel for interior dry location applications.

.9 Fabricate supports primarily from steel channel systems. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

.10 Where the structural system is open web steel joists, supporting device shall be by means of structural steel angles or channel system spanning the top chords of adjacent joists. The number of joists to be spanned in this way shall be determined by the incident load of the system or equipment being supported.

.11 In no case shall the hanging of the electrical supporting devices be directly from roof or ceiling decking, be allowed, unless special permission is obtained from the Contract Administrator.

.12 Install surface-mounted cabinets and panelboards with minimum of four anchors.

.13 In wet and damp locations use steel channel supports to stand cabinets and panelboards 25 mm (1 inch) off wall.

.14 Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Metal conduit.

.2 PVC coated metal conduit.

.3 Flexible metal conduit.

.4 Electrical metallic tubing.

.5 Non-metallic conduit.

1.2 RELATED SECTIONS

.1 Section 07 84 00 - Firestopping.

.2 Section 26 05 34 - Boxes.

.3 Section 26 05 37 - Duct Bank.

.4 Section 26 05 26 - Grounding And Bonding.

.5 Section 26 05 29 - Electrical Supporting Devices.

.6 Section 26 05 53 - Electrical Identification.

1.3 REFERENCES

.1 CSA-C22.1-21 - Canadian Electrical Code, Part I (25th Edition), Safety Standard for Electrical Installations.

.2 CSA C22.2 No. 18.1-13 (R2018) - Metallic Outlet Boxes.

.3 CSA-C22.2 No. 83.1-07 (R2017) - Electrical Metallic Tubing - Steel.

.4 CSA C22.2 No. 211.2-06 (R2016) - Rigid PVC (Unplasticized) Conduit.

.5 CSA C22.2 No. 227.2.1-14 - Liquid-Tight Flexible Nonmetallic Conduit.

.6 CSA (Canadian Standards Association).

.7 ULC (Underwriters' Laboratories of Canada).

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Coordination:
- .1 Coordinate with other work having a direct bearing on work of this section.

1.5 CLOSEOUT SUBMITTALS

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Record Documentation:
- .1 Accurately record actual routing of conduits equal to or larger than 35mm (1-1/4").
- .2 Accurately record actual routing of backbone conduit runs.
- .3 Accurately record actual routing of all conduit in slab.

1.6 REGULATORY REQUIREMENTS

.1 Design conduit size to CSA-C22.1.

.2 Provide products listed and classified by CSA or ULC as suitable for purpose specified and shown.

1.7 DELIVERY, STORAGE, AND PROTECTION

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Accept conduit on site. Inspect for damage.

.3 Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

.4 Protect PVC conduit from sunlight.

Part 2 Products

2.1 CONDUIT REQUIREMENTS

.1 Minimum Size: 21 mm (3/4 inch) unless otherwise specified.

.2 In Slab:
.1 Use electrical non-metallic tubing.

.3 Wet and Damp Locations: Use non-metallic conduit.

.4 Dry Locations:
.1 Concealed: Use electrical metallic tubing.
.2 Exposed: Use electrical metallic tubing.

2.2 ELECTRICAL METALLIC TUBING (EMT)

.1 Description: CSA C22.2 N0. 83.1; galvanized tubing.

.2 Fittings and Conduit Bodies: CSA C22.2 No. 83.1; steel, set screw type in dry locations, watertight connectors in sprinklered areas

.3 Refer to Section 26 05 53 for colour requirements.

2.3 NON-METALLIC CONDUIT

.1 Description:
.1 CSA C22.2 No. 211.2; PVC.
.2 CSA C22.2 No. 327-18; HDPE

.2 Fittings and Conduit Bodies:
.1 CSA C22.2 No. 211.2.
.2 CSA C22.2 No. 327-18

.3 Provide a separate ground wire in all non-metallic conduit

2.4 FITTINGS

.1 Fittings shall be manufactured for use with conduit specified.

.2 Insulated throat liners on connectors.

.3 Steel raintight connector fittings complete with O-rings, for use on weatherproof or sprinklerproof enclosures. Steel raintight couplings shall be used for surface conduit installation exposed to moisture or sprinkler heads. Steel raintight connectors shall be used for all top entries to panels, contactors and motor control centres.

.4 Expansion fittings
.1 Outdoor locations - Weatherproof expansion fittings with internal bonding assembly, suitable for 100 mm (4") or 200 mm (8") linear expansion.

.2 Wet and Damp Locations - Watertight expansion fittings with integral bonding jumper suitable for linear expansion, and 21 mm (3/4") deflection in all directions, as required.
.3 Panel Entry - Weatherproof expansion fittings for linear expansion as required.
.4 PVC Conduit - O-ring type expansion fittings.
.5 Flexible watertight conduit between junction boxes with integral bonding jumper suitable for linear and lateral movement greater than 19 mm (3/4”).

Part 3 Execution

3.1 EXAMINATION

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Verify that field measurements are as indicated on drawings.

.3 Verify routing and termination locations of conduit prior to rough-in.

.4 Conduit routing is indicated on drawings in approximate locations unless specifically dimensioned. Coordinate routing on site.

.5 Drawings do not indicate all conduit. Provide all conduit as required for a complete system.

.6 All conduit sizes indicated on drawings are minimum sizes unless noted otherwise. Where larger conduit sizes are required to meet the requirements of the Canadian Electrical Code, contractor shall provide larger conduit size at no additional cost to the The City of Winnipeg.

.7 Increase conduit size at no additional cost to the The City of Winnipeg where required to accommodate length of run and voltage drop requirements.

3.2 INSTALLATION

.1 General:
.1 Install conduit to CSA C22.1.
.2 Install conduit to manufacturer's written instructions.
.3 Minimum conduit size shall be 21mm (3/4”) unless specifically noted otherwise.
.4 All conduit shall generally be concealed except in mechanical and electrical rooms or as otherwise noted.
.5 Group related conduits where appropriate.
.6 Arrange conduit to maintain headroom and present neat appearance.
.7 Arrange supports to prevent misalignment during wiring installation.
.8 Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, split hangers or steel channel conduit rack.
.9 Where steel channel conduit rack is used, provide space to support an additional 25% additional conduit.
.10 Fasten conduit supports to building structure and surfaces to Section 26 05 29.
.11 Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
.12 Do not attach conduit to ceiling support wires.
.13 Locate more than 2000 mm (78 inches) from infrared or gas-fired heaters.
.14 Route conduit parallel and perpendicular to walls.
.15 Route conduit installed above accessible ceilings parallel and perpendicular to walls.
.16 Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket.
.17 Route conduit in and under slab from point-to-point.
.18 Do not route conduits through structural members unless otherwise indicated.
.19 Do not route conduit through terrazzo or concrete toppings unless otherwise indicated.

.20 Do not route conduit horizontally in masonry walls unless otherwise indicated.
.21 Maintain adequate clearance between conduit and piping.
.22 Maintain 300 mm (12 inch) clearance between conduit and surfaces with temperatures exceeding 40 degrees C (104 degrees F).
.23 Cut conduit square using saw or pipe cutter; de-burr cut ends.
.24 Bring conduit to shoulder of fittings; fasten securely.
.25 Where threaded connections are used, threads shall be of sufficient length to ensure a tight connection.
.26 Where conduit becomes blocked, remove and replaced blocked sections.
.27 Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
.28 Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
.29 Ensure conduit systems are dry prior to installation of wiring.
.30 Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic and control expansion joints
.31 Use suitable caps to protect installed conduit against entrance of dirt and moisture.
.32 Conduit raceway systems shall not be longer than 27m (90'-0") or have more than two 90˚ bends without the use of a pull box or junction box. Pull box shall be standard square or octagonal box for conduit 41mm (1-1/2") and smaller.
.33 Ground and bond conduit to Section 26 05 26.
.34 Identify conduit to Section 26 05 53.

.2 Conduit bends:
.1 Use conduit bodies only as required or necessary for applications requiring sharp changes in direction.
.2 Use factory elbows, or bend conduit on site using hydraulic or manual bender.
.3 Install no more than equivalent of two 90-degree bends in a single conduit run, or between junction or pullboxes.
.4 Conduit shall be bent cold.
.5 Replace conduit sections where kinked or flattened.

.1 Flexible conduit:
.1 Provide flexible metal conduit for the following connections:
.1 Motors.
.2 Lighting fixtures.
.3 Transformers.
.4 Equipment subject to movement or vibration.

.3 Conduit in poured concrete slab:
.1 Submit sketch of proposed conduit routing complete with conduit sizes to Contract Administrator for approval prior to installation.
.2 Coordinate installation of conduit to suit reinforcing steel.
.3 Locate in centre third of slab.
.4 Provide minimum separation of 150 mm (6") between parallel conduit runs.
.5 Do not install conduit in drop panels, beams, or columns unless approved by the Contract Administrator.
.6 Where conduit are grouped, or do not follow perpendicular or parallel to building lines, provide photos in electronic format (minimum resolution 1920x1080) of conduit installation prior to concrete pour.
.7 Record drawings shall indicate location of all conduit embedded in concrete, complete with dimensions to building lines.
.8 For slab-on-grade, conduit larger than 27 mm (1") shall be routed below slab and encased in minimum 75 mm (3") of concrete.

.4 Conduit below slab:

.1 Record drawings shall indicate location of all conduit run below slab complete with dimensions to building lines.

.5 Conduit below-grade:

.1 Conduit below grade shall be sloped to provide drainage away from the building.

.2 Where conduit transitions from below grade to above grade, provide suitable fittings to accommodate expansion and deflection due to differential settling of exterior grade, buildings, and other structures and supports.

.6 Non-metallic conduit:

.1 Join non-metallic conduit using cement as recommended by manufacturer.

.2 Wipe non-metallic conduit dry and clean before joining.

.3 Apply full even coat of cement to entire area inserted in fitting.

.4 Allow joint to cure for 20 minutes, minimum.

.7 Empty conduit:

.1 Provide polypropylene pull string in each empty conduit except sleeves and nipples.

.2 Provide conduit bushings at each conduit end.

.3 Empty conduit shall be temporarily capped to prevent debris and moisture from entering the conduit system.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Wall and ceiling outlet boxes.

.2 Pull and junction boxes.

1.2 RELATED SECTIONS

.1 Section 07 84 00 - Firestopping.

.2 Section 26 27 26 - Wiring Devices.

1.3 REFERENCES

.1 CSA-C22.1-21 - Canadian Electrical Code, Part I (25th Edition), Safety Standard for Electrical Installations.

.2 CSA C22.2 No. 18.1-13 (R2018) - Metallic Outlet Boxes.

.3 CSA C22.2 No. 40-17 - Junction and Pull Boxes.

.4 CSA C22.2 No. 85-14 - Rigid PVC Boxes and Fittings.

.5 CSA (Canadian Standards Association).

.6 ULC (Underwriters' Laboratories of Canada).

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Coordination:

.1 Coordinate with other work having a direct bearing on work of this section.

.2 Coordinate installation of outlet box for equipment connected under Section 26 05 80.

1.5 CLOSEOUT SUBMITTALS

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Record Documentation: Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.6 REGULATORY REQUIREMENTS

.1 Products: Listed and classified by CSA or ULC, and as suitable for the purpose specified and indicated.

Part 2 Products

2.1 OUTLET BOXES

.1 Sheet Metal Outlet Boxes: CSA-C22.2 No. 18, galvanized steel.

.1 Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 13 mm (1/2 inch) male fixture studs where required.

.2 Concrete Ceiling Boxes: Concrete type.

.2 Non-metallic Outlet Boxes: CSA-C22.2 No. 18.

.3 Cast Boxes: CSA-C22.2 No. 18, Type FS or FD as indicated or as required, cast ferric alloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

.4 Wall Plates for Finished Areas: As specified in Section 26 27 26.

2.2 PULL AND JUNCTION BOXES

.1 Sheet Metal Boxes: CSA-C22.2 No. 18, galvanized steel.

.2 Hinged Enclosures: As specified in Section 26 27 16.

.3 Surface Mounted Cast Metal Box: CSA-C22.2 No. 18, Type 4 or Type 6 as required or as indicated; flat-flanged, surface mounted junction box:
- .1 Material: Galvanized steel.
- .2 Cover: Provide with ground flange, neoprene gasket, and stainless steel cover screws.

Part 3 Execution

3.1 EXAMINATION

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Verify locations of floor boxes and outlets throughout prior to rough-in.

3.2 INSTALLATION

.1 Install boxes to CSA-C22.1.

.2 Install in locations as shown on drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

.3 Set wall mounted boxes at elevations to accommodate mounting heights specified in section for outlet device and as indicated. Coordinate locations with architectural drawings.

.4 Electrical boxes are shown on drawings in approximate locations unless dimensioned. Adjust box location up to 3 m (10 ft) if required to accommodate intended purpose.

.5 Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.

.6 Maintain headroom and present neat mechanical appearance.

.7 Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

.8 Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

.9 Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

.10 Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

.11 Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

.12 Use flush mounting outlet box in finished areas.

.13 Use adjustable steel channel fasteners for hung ceiling outlet box.

.14 Do not fasten boxes to ceiling support wires.

.15 Support boxes independently of adjacent or connecting conduit systems.

.16 Use gang box where more than one device is mounted together.

.17 Use cast outlet box in exterior locations where exposed to the weather and wet locations.

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

.19 Vacuum clean interior of outlet boxes before installation of wiring devices.

3.3 ADJUSTING

.1 Adjust floor box flush with finish flooring material.

.2 Adjust flush-mounting outlets to make front flush with finished wall material.

.3 Install knockout closures in unused box openings.

3.4 CLEANING

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Clean interior of boxes to remove dust, debris, and other material.

.3 Clean exposed surfaces and restore finish.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Nameplates and labels.

.2 Wire markers.

.3 Conduit markers.

1.2 RELATED SECTIONS

.1 Section 09 91 10 - Painting.

1.3 REFERENCES

.1 CSA (Canadian Standards Association).

.2 ULC (Underwriters' Laboratories of Canada).

1.4 SUBMITTALS FOR REVIEW

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Product Data: Provide catalogue data for nameplates, labels, and markers.

.3 Installation Data: Provide list of all equipment requiring nameplates complete with associated nameplate configuration for review.

1.5 REGULATORY REQUIREMENTS

.1 Provide products listed and classified by CSA or ULC and as suitable for purpose specified and shown.

1.6 LANGUAGE

.1 All identification shall be in English.

Part 2 Products

2.1 NAMEPLATES AND LABELS

.1 Nameplates:

.1 Interior - Engraved three-layer laminated plastic, white letters on blue background for normal power and systems, white letters on red background for life safety power and systems, and white letters on orange background for standby power and systems.

.2 Locations:

.1 Emergency Lighting Units.

.1 Nameplate shall include:

.1 Unit #

.2 Manufacturer & Model # of unit equipment

.3 AC circuit supplying unit

.4 AC lighting circuits monitored (zone sensing)

.5 Date installed

.3 Letter Size:

.1 Use 6 mm (1/4 inch) letters for identifying equipment mark designations and system types.

.2 Use 3 mm (1/8 inch) letters for identifying supporting information.

.3 Use 6 mm (1/4 inch) letters for identifying grouped equipment and loads.

.4 Wording on nameplates shall be approved prior to manufacture. Submit schedule of nameplates and wording.

.2 Labels: Plastic self-adhesive non-smear labels with 5 mm (3/16 inch) black letters on white background.
.1 Locations:
.1 Wiring devices, including lighting control devices and receptacles.
.1 Label shall include:
.1 Indicate associated panel and circuit number.
.2 E.g. “A-32” (A is for Panel-A, and 32 is the circuit number)
.3 Lighting controls to include brief description of lighting being controlled.
.4 E.g. “Pendants”

2.2 WIRE MARKERS

.1 Wire Markers: Permanent tape type wire markers not susceptible to thermal or mechanical influence.

.2 Locations:
.1 Each conductor at panelboard gutters, pull boxes, outlet and junction boxes and each load connection.
.1 Legend:
.1 Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
.2 Control Circuits: Control wire number indicated on Shop Drawings.

2.3 CONDUIT MARKERS

.1 Manufacturers:
.1 Brady; Product: BMP71 Indoor/Outdoor Vinyl Labels.
.2 Substitutions: Refer to Section 26 05 00.

.2 Description: Vinyl label.

.3 Location: Provide markers for each conduit longer than 4.7 m (10 ft).

.4 Spacing: 6 m (20 ft) on centre.

.5 Colour:
.1 Normal Power System: Blue
.2 Fire Alarm System: Red.
.3 Communication System: Yellow
.4 Security Systems: Black
.5 Controls System: White

.6 Legend:
.1 600 Volt System: 600V.
.2 120/208 Volt System: 120/208V.
.3 Fire Alarm System: FIRE ALARM.
.4 Communication System:
.1 VOICE
.2 DATA
.3 VOICE/DATA
.5 CCTV System: CCTV
.6 Access Control System: ACCESS CONTROL

.7 Controls System: CONTROLS

Part 3 Execution

3.1 PREPARATION

.1 Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

.1 Install nameplate and label parallel to equipment lines.

.2 Secure nameplate to equipment front using rivets or screws.

.3 Identify conduit using field painting to Section 09 91 10.

.4 Paint coloured band on each conduit longer than 2 m (6 ft).

.5 Paint bands 6 m (20 ft) on centre.

.6 Colour:
- .1 600 Volt System: Orange
- .2 208 Volt System: Blue
- .3 Fire Alarm System: Red.
- .4 Communication System: Yellow
- .5 Security Systems: Black
- .6 Controls System: White

.7 Provide identification on all junction box covers indicating associated system, panel and circuit numbering using permanent marker.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Wall switches.

.2 Receptacles.

.3 Device plates and decorative box covers.

1.2 RELATED SECTIONS

.1 Section 09 69 00 - Access Flooring: and Access floor boxes.

.2 Section 26 05 39 - Underfloor Ducts.

.3 Section 26 05 34 - Boxes.

1.3 REFERENCES

.1 CSA-C22.1-21 - Canadian Electrical Code, Part I (25th Edition), Safety Standard for Electrical Installations.

.2 CSA C22.2 No. 42-10 (R2015) - General Use Receptacles, Attachment Plugs, and Similar Wiring Devices

.3 CSA C22.2 No. 42.1-13 (R2017) - Cover Plates for Flush-Mounted Wiring Devices.

.4 CSA C22.2 No. 55-15 - Special use switches.

.5 CAN/CSA C22.2 No. 111-18 - General-Use Snap Switches.

.6 CSA C22.2 No. 184-15 - Solid-State Lighting Controls.

.7 CSA (Canadian Standards Association).

.8 ULC (Underwriters' Laboratories of Canada).

1.4 SUBMITTALS FOR REVIEW

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Product Data: Provide manufacturer's catalogue information showing dimensions, colours, and configurations.

1.5 SUBMITTALS FOR INFORMATION

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Installation Data: Submit manufacturer's installation instructions.

1.6 MAINTENANCE MATERIAL SUBMITTALS

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Extra Stock Materials:
.1 Provide two (2) of each style, size, and finish wall plate.

1.7 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five (5) years documented experience.

1.8 REGULATORY REQUIREMENTS

.1 Provide products listed and classified by CSA and as suitable for the purpose specified and indicated.

Part 2 Products

2.1 WALL SWITCHES

.1 Manufacturers:
- .1 Leviton
- .2 Hubbell
- .3 Cooper
- .4 Legrand
- .5 Substitutions: Refer to Section 26 05 00.

.2 General-use snap switch:
- .1 Grade: Commercial Specification Grade CSA-C22.2 No. 111
- .2 Style: Standard toggle
- .3 Device Body: White nylon toggle.
- .4 Ratings: Match branch circuit and load characteristics. Amperage rating shall be marked on body of switch.

.3 Body and Handle: White with nylon toggle.

2.2 RECEPTACLES

.1 Manufacturer:
- .1 Leviton.

.2 Description: CSA-C22.2 No.42, industrial specification grade.

.3 Device Body: Brown and plastic.

.4 Configuration: Type as specified and indicated.
- .1 General Use Receptacles: Classrooms and other general areas.
  - .1 15A - CAT#5262.
  - .2 20A - CAT#5362.
- .2 High Abuse Receptacles: Labs, shop areas and gymnasiums, corridors.
  - .1 15A - CAT#5262
  - .2 20A – CAT#5362
- .3 GFCI Receptacles
  - .1 15A - CAT#7599
  - .2 20A – CAT#7899
- .4 Exterior GFCI
  - .1 20A - CAT#X7891-PL

.5 Suitable for No. 10 AWG for back and side wiring.

.6 Break-off links for use as split receptacles.

.7 Double wipe contacts and riveted grounding contacts.

.8 Receptacles shall be of one manufacturer throughout the project.

.9 Manufacturers:
- .1 Leviton
- .2 Hubbell
- .3 Cooper
- .4 Legrand
- .5 Substitutions: Refer to Section 26 05 00.

.10 General-duty duplex convenience receptacle:

.1 Grade: Commercial Specification Grade, Industrial Specification Grade Nema WD-6 Compliant, CSA-C22.2 No.42.
.2 Style: Standard
.3 Device Body: Smooth white nylon face and base.
.4 CSA Configuration: Type as specified and indicated.
.5 Tamper resistant as indicated or as per Electrical Code.

.11 GFCI Receptacle: Duplex receptacle with integral ground fault circuit interrupter to meet regulatory requirements complete with steady-on “Green-Power-On” and steady-on “Red-Power-Tripped Off” LED indicator lights. Washroom GFCI shall be complete with integral photo sensor controlled night light.

.12 Exterior Use Receptacle: Extra Heavy Duty Industrial grade duplex receptacle with integral ground fault circuit interrupter to meet regulatory requirements complete with steady-on “Green-Power-On” and steady-on “Red-Power-Tripped Off” LED indicator lights complete with UV and corrosion resistant device body complete with CSA 5-20R configuration only.

.13 USB Charger Receptacle: General-duty tamper resistant decorator style duplex receptacle with dual USB type C chargers with smart chips optimized for USB power delivery meeting specification of USB-PD 3.0 and Quick Charge 4. Type C port shall be rated 6A @20V (auto sensing) at 60W for single port charging and 30W per port for dual port charging. Standard of acceptance Leviton T5636 for 5-15R and T5836 for 5-20R. Color white.

.14 USB Charger Receptacle: General-duty tamper resistant decorator style duplex receptacle with USB type A and type C chargers with smart chips optimized for USB power delivery. Type A port to be rated 2.4A @5V and type C to be rated 3A @5V. Standard of acceptance Leviton T5633 for 5-15R and T5833 for 5-20R. Color white.

.15 Controlled Receptacle: General-duty dual-controlled duplex receptacle with integral relay, wireless RF communication, and manual override button. Control system shall be complete with wireless RF signal packs to control all receptacles in individual rooms as indicated on drawings. RF signal packs shall be integrated with room lighting control occupancy sensor to turn off controlled receptacle within 20 minutes of unoccupied state.

.16 Surge Protection Receptacle: General-duty duplex receptacle with integral surge protection device, power-on indicator light and damage-alert alarm with silencing screw. Surge suppression shall be 240 joules/15000A per mode. Device body shall be decorator style, smooth blue nylon face and base.

.17 Isolated Ground Receptacle: General-duty duplex receptacle with insulation barrier between green grounding screw and metal box mounting strap. Device body shall be smooth orange nylon face with “IG triangle”.

.18 Receptacle on Emergency Circuit: Heavy Duty Specification grade duplex receptacle with smooth red nylon face. CSA configuration as indicated. Type as indicated.

.19 Range Receptacle: CSA configuration 14-50R commercial specification grade complete with stainless steel faceplate.
.1 Flush Mounted: Leviton CAT#1279-W-50
.2 Surface Mounted: Leviton CAT#55050

.20 Dryer Receptacle: CSA configuration 14-30R commercial specification grade complete with stainless steel faceplate.
.1 Flush Mounted: Leviton CAT#1278-W-30A
.2 Surface Mounted: Leviton CAT#55054

.21 Suitable for No. 10 AWG for back and side wiring.

.22 Break-off links for use as split receptacles.

.23 Double wipe contacts and riveted grounding contacts.

.24 Receptacles shall be of one manufacturer throughout the project.

2.3 WALL PLATES

.1 Nylon Cover Plate: Impact resistant unbreakable nylon with reinforcing ribs. Style and color shall match wiring device. Combination or multi-gang covers as required or indicated. Jumbo or standard size as indicated or specified.

.2 Standard Stainless Steel Cover Plate: 430 type stainless steel cover plate complete with protective plastic film. Combination or multi-gang covers as required or indicated. Jumbo or standard size as indicated or specified.

.3 Heavy Duty Stainless Steel Cover Plate: 302/304 type stainless steel cover plate complete with protective plastic film. Combination or multi-gang covers as required or indicated.

.4 Thermoplastic While-in-Use covers: Nema 3R rated, thermoplastic construction, suitable for horizontal mounting on device box only, and padlock provision.

.5 Weatherproof Cover Plate: Gasketed cast metal with gasketed double hinged device covers suitable for horizontal mounting on device box only. Provide single hinged device cover for GFI type receptacle only.

Part 3 Execution

3.1 EXAMINATION

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Verify that outlet boxes are installed at proper height.

.3 Verify that wall openings are neatly cut and will be completely covered by wall plates.

.4 Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

.1 Provide extension rings to bring outlet boxes flush with finished surface.

.2 Clean debris from outlet boxes.

3.3 INSTALLATION

.1 Install to CSA-C22.1 and to manufacturer's written instructions.

.2 Install devices plumb and level.

.3 Install switches with OFF position down.

.4 Provide neutral conductor in box for all line voltage lighting control devices.

.5 Install wall dimmers to achieve full rating specified and indicated after de-rating for ganging as instructed by manufacturer.

.6 Do not share neutral conductor on load side of dimmers.

.7 Install receptacles with grounding pole on bottom.

.8 Connect wiring device grounding terminal to branch circuit equipment grounding conductor and outlet box.

.9 Install locator pilot light for lighting controls located in crawlspace.

.10 Install indicator pilot light for all lighting controlled from a remote switch location. Switch and light shall be clearly labelled identifying the controlled lighting.

.11 Install decorative plates on switch, receptacle, and blank outlets in finished areas.

.12 Connect wiring devices by wrapping conductor around screw terminal.

.13 Use jumbo size plates for outlets installed in masonry walls.

.14 Stainless steel protective coverings shall be maintained until project completion and turn-over to The City of Winnipeg.

.15 Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

.16 Install metallic While-In-Use covers on exterior receptacles.

.17 Install protective rings on active flush cover service fittings.

3.4 INTERFACE WITH OTHER PRODUCTS

.1 Coordinate locations of outlet boxes provided under Section 26 05 34 to obtain mounting heights specified and as indicated on drawings.

.2 Coordinate installation of access floor boxes with access floor system.

.3 Coordinate the installation of wiring devices with underfloor duct service fittings provided under Section 26 05 39.

3.5 FIELD QUALITY CONTROL

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Inspect each wiring device for defects.

.3 Operate each wall switch with circuit energized and verify proper operation.

.4 Verify that each receptacle device is energized.

.5 Test each receptacle device for proper polarity.

.6 Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

.1 Adjust devices and wall plates to be flush and level.

3.7 CLEANING

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 General use battery unit

.2 Nema4X battery unit

.3 Nema4X vandal resistant remote fixture

.4 Accessories

1.2 RELATED SECTIONS

.1 Section 26 05 00 Common Work Results for Electrical

.2 Section 26 05 19 Building Wire and Cable

.3 Section 26 05 53 Electrical Identification

.4 Section 26 27 26 Wiring Devices

1.3 REFERENCES

.1 CSA-C22.2 No. 141-15 - Emergency lighting equipment.

1.4 REGULATORY REQUIREMENTS

.1 Conform to CSA-C22.2 No. 141-15

.2 Refer to 26 05 00 Common Work Results for Electrical

1.5 DEFINITIONS

.1 The following are definitions of terms and expressions used in the specification:

.1 **Zone sensing:** A method to monitor AC circuits for loss of voltage, using voltage sensing relays. Refer to sequence of operations for further requirements.

.2 **Voltage sensing:** Refer to Zone sensing.

1.6 SUBMITTALS FOR REVIEW

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Shop Drawings:

.1 Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

.2 Product Data: Provide dimensions, ratings, and performance data.

1.7 SUBMITTALS FOR INFORMATION

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Installation Data: Submit data indicating application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.8 CLOSEOUT SUBMITTALS

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Operation and Maintenance Data:

.1 Submit manufacturer's operation and maintenance instructions for each product.

.3 Record documentation:

.1 Record actual locations of emergency lighting equipment.
.2 Record routing of all AC and DC emergency lighting circuits.

1.9 MAINTENANCE MATERIAL SUBMITTALS

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Extra Stock Materials:
.1 Provide one (1) replacement head for every two (2) battery units supplied.
.2 Provide one (1) replacement head for every six (6) remote fixtures supplied

1.10 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five (5) years documented experience.

.2 Conform to requirements of CSA C22.1, and to the Efficiency Manitoba Commercial Lighting Program.

.3 Products: Listed and classified by CSA, and as suitable for the purpose specified and indicated.

1.11 WARRANTY

.1 Batteries used for emergency lighting:
.1 Provide extended warranty period of 10 years.
.2 Provide no-charge replacement for the first 5-years.
.3 Provide pro-rated charge for replacement on the remaining 5-years.

Part 2 Products

2.1 BATTERY UNIT – GENERAL USE (BUX)

.1 Description: Self-contained AC/DC emergency lighting unit.

.2 Manufacturers:
.1 Lumacell: RGS series
.2 Emergi-Lite: ESL series
.3 Ready-Lite: LDX series
.4 Beluce: Nova NV series
.5 Aimlite: EBST series
.6 Substitutions: Refer to Section 26 05 00

.3 Battery: 12-volt DC, lead acid type. capacity as indicated

.4 Battery charger: Solid state pulse charger, current limited, temperature compensated, short circuit proof, and reverse polarity protected.

.5 Heads: Quantity of two (2), MR16 LED
.1 Lumacell, Emergi-Lite, Ready-Lite: 6-watts
.2 Beluce, Aimlite: 7-watts

.6 Housing: Factory white, corrosion resistant steel cabinet.

.7 Status LED's for:
.1 Battery failure
.2 Battery disconnected
.3 Charger failure
.4 Lamp failure
.5 Service alarm
.6 AC-ON
.7 Charger high-rate

.8 Test switch: Transfers unit from external power supply to integral battery supply.

.9 Electrical connection: Line cord with non-locking 5-15R CSA configuration.

.10 Input Voltage: Universal 120/347-volt AC.

.11 Accessories:
- .1 AC/DC terminal blocks for incoming and outgoing AC and DC circuits
- .2 Auto test function
- .3 Mounting shelf

2.2 ZONE SENSING

.1 Zone sensing (voltage sensing) relays either internal, or external to the battery unit.

.2 Quantity of relays shall be as required or as indicated. Allow for a minimum of two (2) zone sensing relays per battery unit to pick up external AC monitored circuits.

.3 Provide a push to test button for each zone either on the side of the battery unit, or on the cover of the external zone sensing panel.

2.3 NEMA-4X VANDAL-RESISTANT REMOTE FIXTURE (RH-X)

.1 Description: Fully enclosed, Nema-4X certified, NSF certified, vandal resistant emergency lighting remote fixture.

.2 Manufacturers:
- .1 Lumacell: MQM-NX series
- .2 Emergi-Lite: EF39P series
- .3 Ready-Lite: TUF-NM series
- .4 Beluce: BOL series
- .5 Aimlite: RMN series
- .6 Substitutions: Refer to Section 26 05 00

.3 Voltage: To match supplying battery unit output DC voltage

.4 Heads:
- .1 Two (2) MR16 LED, 12-volt DC
- .2 Lumacell, Emergi-Lite, Ready-Lite: 6-watts
- .3 Beluce, Aimlite: 7-watts

.5 Housing: White, UV resistant, polycarbonate backplate, clear polycarbonate lens, gasketed, Nema-4X certified, NSF certified, tamperproof screws.

2.4 NEMA-4X SELF-CONTAINED REMOTE HEADS

.1 Description: Fully enclosed, Nema-4X certified, NSF certified, vandal resistant emergency lighting remote fixture.

.2 Manufacturers:
- .1 Lumacell: MQM-NX series
- .2 Emergi-Lite: EF39P series
- .3 Ready-Lite: TUF-NM series
- .4 Beluce: BOL series
- .5 Aimlite: RMN series
- .6 Substitutions: Refer to Section 26 05 00

.3 Voltage: To match supplying battery unit output DC voltage

.4 Heads:
- .1 Two (2) MR16 LED, 12-volt DC
- .2 Lumacell, Emergi-Lite, Ready-Lite: 6-watts
- .3 Beluce, Aimlite: 7-watts

.5 Housing: White, UV resistant, polycarbonate backplate, clear polycarbonate lens, gasketed, Nema-4X certified, NSF certified, tamperproof screws.

.6

2.5 ACCESSORIES

.1 Wireguard:
- .1 As required or as indicated
- .2 Wireguard to be listed by manufacturer for use with the equipment being protected
- .3 Color: White, unless noted otherwise

2.6 AC SUPPLY CIRCUITS

.1 Building wire and cable to section 26 05 19 building wire and cable, installed with conduit raceway system for main runs.

.2 Armored cable (AC90) to section 26 05 19 building wire and cable for drops to emergency lighting equipment.

2.7 DC EMERGENCY OUTPUT CIRCUITS

.1 Building wire and cable to section 26 05 19 building wire and cable, installed with conduit raceway system for main runs.

.2 Armored cable (AC90) to section 26 05 19 building wire and cable for drops to emergency lighting equipment.

2.8 SEQUENCE OF OPERATIONS

.1 Minimum run-time:
- .1 Thirty (30) minutes
- .2 One (1) hour
- .3 Two (2) hours

.2 Loss of power to the AC supply circuit to the battery unit will trigger the DC emergency output circuit(s) of the battery unit.

.3 Loss of power to the AC circuit(s) monitored by the zone sensing relays will trigger the DC emergency output circuit(s) of the associated battery unit.

.4 Emergency lighting circuit(s) shall operate for the minimum run-time identified.

2.9 SOURCE QUALITY CONTROL

.1 Refer to 26 05 00 Common Work Results for Electrical.

Part 3 Execution

3.1 INSTALLATION

.1 Install emergency lighting to CSA-C22.1.

.2 Install emergency lighting to manufacturers recommendations.

.3 Install accessories as supplied by the manufacturer.

.4 Install emergency lighting square and plumb and adjust to align with building lines and with each other.

.5 Secure emergency lighting to prevent movement.

.6 Install specified lamps in emergency lighting equipment.

.7 Orient emergency lighting to maximize light distribution.

.8 Adjust emergency lighting heads for wide optics and to suit egress path.

.9 Install wall mounted emergency lighting at heights indicated.

.10 Suspended ceilings: Install clips or bar hangars to secure grid-supported emergency lighting in place.

.11 Exposed grid ceilings: Fasten surface mounted emergency lighting to ceiling grid members using bolts, screws, or suitable clips.

.12 Battery units:
- .1 Install battery unit on shelf.
- .2 Provide 5-15R duplex receptacle for battery unit cord connection.
- .3 Bundle cord connection neatly to reduce surplus.
- .4 Wire and connect AC and DC circuits to battery unit using AC and DC terminal blocks.
- .5 Where applicable, DC emergency output circuits shall be load balanced. Adjust field wiring to emergency lighting DC remote fixtures as required.
- .6 Perform voltage drop calculations on DC output circuits, and adjust conductor sizes as required wi
- .7
- .8 Provide nameplate to section 26 05 53 electrical identification. Nameplate shall include:
  - .1 Battery unit # as it relates to the record documents
  - .2 Manufacturer and model number of the unit. Model number shall be complete with all associated components and options.
  - .3 AC supply circuit
  - .4 AC lighting circuits monitored (zone sensing)
  - .5 Date installed or commissioned.

.13 Zone sensing:
- .1 Wire and connect monitored AC exit sign circuit to zone sensing relays.
- .2 Wire and connect monitored AC lighting circuits to zone sensing relays as indicated.
- .3 Where zone sensing is external, interface zone sensing relay panel with associated battery units.
- .4 Provide nameplate to section 26 05 53 electrical identification. Nameplate shall include:
  - .1 Associated battery unit # as it relates to the record documents
  - .2 Manufacturer and model number of the unit. Model number shall be complete with all associated components and options.
  - .3 AC supply circuit
  - .4 AC lighting circuits monitored (zone sensing)
  - .5 Date installed or commissioned.

.14 Remote heads:
- .1 Wire and connect remote heads to associated battery unit DC output circuits.
- .2 Provide nameplate to section 26 05 53 electrical identification. Nameplate shall include:
  - .1 Associated battery unit # as it relates to the record documents
  - .2 Associated remote head # as it relates to the record documents
  - .3 Manufacturer and model number of the unit. Model number shall be complete with all associated components and options.
  - .4 Date installed or commissioned.

.15 DC emergency output circuits:
- .1 Perform voltage drop calculations on DC output circuits and adjust conductor sizes as required.

3.2 INTERFACE WITH OTHER PRODUCTS

.1 Interface zone sensing relay panels where required with associated battery unit.

.2 Interface exit signage AC supply circuits with zone sensing relays.

.3 Interface exit signage DC supply circuit with battery unit DC emergency output circuits.

3.3 FIELD QUALITY CONTROL

.1 Prior to the life-safety system review by the Contract Administrator or by the inspection authority for the intended purpose of occupancy, perform the following:
- .1 Ensure battery unit(s) are fully charged.
- .2 Ensure all AC supply circuits associated with the emergency lighting system are clearly identified at the associated branch circuit panel, either by temporary or permanent means.
- .3 Ensure all AC supply circuits monitored by the emergency lighting system are clearly identified at the associated branch circuit panel, and at the associated zone sensing equipment, either by temporary or permanent means.
- .4 Ensure all DC emergency output circuits are load balanced.
- .5 Ensure all lamps are seated correctly within their respective lamp holders and lamps operate as intended.
- .6 Ensure emergency lighting coverage is optimized to maximize light distribution.
- .7 Pre-test the emergency lighting system under the following conditions:
  - .1 Disconnect the AC supply circuit to the battery unit by turning off the associated branch circuit breaker.
  - .2 Disconnect the AC supply circuits that are monitored by the zone sensing relays, by turning off the associated branch circuit breaker for each of the monitored circuits. Test each circuit individually.
  - .3 Verify emergency lighting sequence of operations for each battery unit.
- .8 Submit the pre-test results indicating successful operation of each of the battery units specified.

3.4 ADJUSTING

.1 Adjust emergency lighting as directed by the Contract Administrator.

.2 Adjust emergency lighting as directed by the inspection authority.

3.5 CLEANING

.1 Clean to 26 05 00 Common Work Results for Electrical.

.2 Clean photometric control surfaces as recommended by manufacturer.

3.6 CLOSEOUT ACTIVITIES

.1 Demonstration: Demonstrate emergency lighting operation.

3.7 PROTECTION OF FINISHED WORK

.1 Refer to 26 05 00 Common Work Results for Electrical.

.2 Re-lamp emergency lighting equipment that have failed lamps at Substantial Completion.

END OF SECTION