## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 This Specification shall revise, amend, and supplement the requirements of CW1110.

### 1.2 REFERENCE STANDARDS

.1 City of Winnipeg General Conditions for Construction, Revision 2020-01-31.

.2 City of Winnipeg Specification CW1110.

### 1.3 ADMINISTRATIVE

.1 Submit to the Contract Administrator submittals required by Specifications for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

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

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

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

.5 Review submittals prior to submission to 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. Submittals not stamped, signed, dated, and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify the Contract Administrator, in writing at time of submission, identifying deviations from requirements of Contract stating reasons for deviations.

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

.8 Contractor's responsibility for errors and omissions in submission is not relieved by the Contract Administrator’s review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract documents is not relieved by the Contract Administrator’s review.

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

### 1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" as defined in the City’s General Conditions for Construction (Revision 2020-01-31) means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada if requested.

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

.4 Allow seven (7) Business Days for review of each submission by the Contract Administrator.

.5 The review by the Contract Administrator of the Shop Drawings is for the sole purpose of ascertaining conformance with the design concept.

.6 Adjustments made on Shop Drawings by the Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Contract Administrator prior to proceeding with Work.

.7 Make changes in Shop Drawings as the Contract Administrator may require, consistent with Contract. When resubmitting, notify the Contract Administrator in writing of revisions other than those requested.

.8 Accompany submissions with transmittal containing:

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

.9 Submissions include:

- .1 Date and revision dates.
- .2 Project title and number.
- .3 Section name and clause number equipment is specified under.
- .4 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .5 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .6 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.

.7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationship to adjacent work.

.10 After the Contract Administrator’s review, distribute copies as required.

.11 Submit electronic copy of Shop Drawings for each requirement requested in Specification sections and as the Contract Administrator may reasonably request.

.12 Submit electronic copies of product data sheets or brochures for requirements requested in Specification sections and as requested by the Contract Administrator where Shop Drawings will not be prepared due to standardized manufacture of product.

.13 Submit electronic copies of test reports for requirements requested in Specification sections and as requested by the Contract Administrator.

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

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

.14 Submit electronic copies of certificates for requirements requested in Specification sections and as requested by the Contract Administrator.

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

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

.15 Submit electronic copies of manufacturer’s instructions for requirements requested in Specification sections and as requested by the Contract Administrator.

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

.16 Submit electronic copies of manufacturer's field reports for requirements requested in Specification sections and as requested by the Contract Administrator.

.17 Submit documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.18 Submit electronic copies of operation and maintenance data for requirements requested in Specification sections and as requested by the Contract Administrator.

.19 Delete information not applicable to project.

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

.21 If upon review by the Contract Administrator, no errors or omissions are discovered or if only minor corrections are made, a copy will be returned and fabrication and installation of Work may proceed. If Shop Drawings are rejected, noted copy will be returned and resubmission of corrected Shop Drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

**1.5 SAMPLES**

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

.2 Deliver samples prepaid to Contract Administrator's.

.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 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.

.6 Make changes in samples which Contract Administrator may require, consistent with Contract Documents.

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

**1.6 MOCK-UPS**

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

**1.7 PHOTOGRAPHIC DOCUMENTATION**

.1 Submit electronic progress photographs to the Contract Administrator.

.2 Frequency of photographic documentation: weekly & as directed by Contract Administrator.

.1 Upon completion of: reinforcing steel prior to concrete casting, framing and other works prior to concealment.

**1.8 CERTIFICATES AND TRANSCRIPTS**

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

.2 Submit transcription of insurance immediately after award of Contract.

**1.9 DESCRIPTION OF CONSTRUCTION METHODS**

.1 The Contractor shall, if required by the Contract Administrator, submit for the review of the Contract Administrator method statements which describe in detail, supplemented with drawings where necessary, the methods to be adopted for executing any portion of Work.

.2 These method statements shall also include details of constructional plan and labour to be employed. Acceptance by the Contract Administrator shall not relieve the Contractor of any of his responsibilities, nor shall reasonable refusal to approve entitle the Contractor to extra payment or an extension of time.

**1.10 REQUESTS FOR INFORMATION**

.1 In the event that the Contractor, or any Subcontractor involved in the Work, determines that some portion of the Drawings, Specifications, or other Contract Documents requires

clarification or interpretation by the Contract Administrator, the Contractor shall submit a Request for Information (RFI) in writing to the Contract Administrator.

.2 Submission Procedure:

.1 Submit RFI's to the Contract Administrator on the "Request for Information" form appended to this section. The Contract Administrator shall not respond to a RFI except as submitted on this form.

.2 Number RFI's consecutively in one sequence in order submitted, in a numbering system established by the Contract Administrator.

.3 Submit one distinct subject per RFI request. Do not combine unrelated items on one form.

.4 Where RFI form does not have sufficient space, attach additional sheets as required.

.5 Submit with RFI form all necessary supporting documentation.

.3 In the RFI, the Contractor shall clearly and concisely set forth:

.1 the issue for which clarification or interpretation is sought and why a response is needed from the Contract Administrator; and

.2 an interpretation or understanding of the requirement along with reasons why such an understanding was reached.

.4 The Contract Administrator will review all RFIs to determine whether they are valid RFIs. If it is determined that the document is not a valid RFI, it will be returned to the Contractor not having been reviewed with an explanation why it was deemed not valid.

.5 A RFI response shall be issued within 14 Calendar Days of receipt of the request from the Contractor unless the Contract Administrator determines that a longer time is necessary to provide an adequate response. When the RFI submission is received by the Contract Administrator before noon, the review period commences on that Calendar Day. When the RFI submission is received by the Contract Administrator after noon, the review period commences on the subsequent Calendar Day.

.6 If, at any time, the Contractor submits a large number of RFIs or the Contract Administrator considers the RFI to be of such complexity that the Contract Administrator cannot process the RFIs within 14 Calendar Days, the Contract Administrator shall confer with the Contractor within five (5) Calendar Days of receipt of such RFIs and the Contract Administrator and the Contractor will jointly prepare an estimate of the time necessary for processing same as well as an order of priority among the RFIs submitted. The Contractor shall accommodate such necessary time at no impact to the schedule and at no additional cost to the Contract.

.7 If the Contractor submits a RFI on an activity with 14 Calendar Days or less of available time to the impacted activity on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the Contractor Administrator to respond to the request provided that the Contract Administrator responds within the 14 Calendar Days set forth above.

.8 A RFI response from the Contract Administrator will not change any requirement of the Contract. In the event the Contractor believes that the RFI response from the Contract Administrator will cause a change to the requirements of the Contract, the Contractor shall within 14 Calendar Days give written notice to the Contract Administrator stating

that the Contractor believes the RFI response will result in a change in requirements to the Contract and the Contractor intends to submit a change request. Failure to give such written notice of 14 Calendar Days shall waive the Contractor's right to seek additional time or cost under the requirements of the Contract.

**1.11 CLOSEOUT SUBMITTALS**

.1 Refer to Section 01 78 00 – Closeout Submittals for closeout submittal requirements.

**1.12 MISCELLANEOUS SUBMITTALS**

.1 Prepare and submit submittals required by individual Specification sections.

.2 Copies: Submit one electronic copy to Contract Administrator. Method of electronic submission to be coordinated with Contract Administrator after execution of the Contract. Submit hard copies only where specifically required under individual Specification sections.

.3 Contract Administrator will review submittals for general conformance with design concept and intent, and general compliance with Contract.

.4 Contract Administrator's review does not relieve Contractor from compliance with requirements of Contract nor from errors in submittals or Contractor's design.

.5 Contractor is responsible for confirmation of dimensions at jobsite; fabrication processes; means, methods, techniques, sequences. and procedures of construction; coordination of work of all trades; and performance of Work in safe and satisfactory manner.

.6 At Contract Administrator's option, Contract Administrator's review comments and review stamp will be placed either directly on submitted copies of submittals or on separate submittal review comment form.

.7 Where work is to be designed by Contractor, comply with applicable codes and furnish submittals signed and sealed by professional engineer licensed in Province of Manitoba, as required by Specifications. If requested, calculations shall be submitted for review. Calculations shall also be signed and sealed by a professional engineer registered in the Province of Manitoba.

**Part 2 Products**

**2.1 NOT USED**

.1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 This specification is to supplement the health and safety requirements contained in the Section D of the Tender Documents, and the City of Winnipeg's "General Conditions for Construction".

### 1.2 REFERENCE STANDARDS

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

.2 Province of Manitoba

.1 The Workers Compensation Act RSM 1987. - Updated 2013.

.3 General Conditions for Construction, City of Winnipeg, Revision 2020-01-31.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit copies of reports or directions issued by federal, provincial, and territorial health and safety inspectors.

.3 Submit copies of incident and accident reports.

.4 Submit WHMIS SDS - Safety Data Sheets where indicated in individual sections..

.5 The Contract Administrator will review Contractor's site-specific Health and Safety Work Plan and provide comments to Contractor within three (3) business days.

.6 The Contract Administrator's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

### 1.4 SAFETY ASSESSMENT

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

### 1.5 MEETINGS

.1 Schedule and administer Health and Safety meeting with the Contract Administrator prior to commencement of Work.

### 1.6 REGULATORY REQUIREMENTS

.1 Do work in accordance with all applicable regulatory requirements.

### 1.7 GENERAL REQUIREMENTS

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

.2 The Contract Administrator and the City may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

**1.8 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 Contractor will be responsible and assume the role prime contractor as described in the Manitoba Workplace Safety and Health Act.

.3 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.

**1.9 COMPLIANCE REQUIREMENTS**

.1 Comply with the Workers Compensation Act, Workplace Safety Regulation, Manitoba.

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

**1.10 UNFORSEEN HAZARDS**

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

.2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise the Health and Safety Co-ordinator and follow procedures in accordance with Acts and Regulations of Province of Manitoba and advise the Contract Administrator verbally and in writing.

**1.11 HEALTH AND SAFETY CO-ORDINATOR**

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

.1 Have site-related working experience.

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

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

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

.5 The Health and Safety Co-ordinator’s contact information should be prominently displayed in the construction site office.

**1.12 POSTING OF DOCUMENTS**

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of the Province of Manitoba and in consultation with the Contract Administrator.

**1.13 CORRECTION OF NON-COMPLIANCE**

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

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

.3 The Contract Administrator may issue a stop Work Order if non-compliance of health and safety regulations is not corrected.

**1.14 POWDER ACTUATED DEVICES**

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

**1.15 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**

.1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

## Part 1 General

### 1.1 INSPECTION

.1 Allow the Contract Administrator access to Work. If part of the Work is in preparation at locations other than the Site, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections, or approvals by the Contract Administrator or inspection authorities.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections, or approvals before such is made, uncover such Work at no additional cost and have inspections or tests satisfactorily completed and make good such Work.

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

### 1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by the Contract Administrator for purpose of inspecting and/or testing portions of Work. The Contract Administrator will be copy furnished of all inspection and/or testing results and correspondence from the inspection/testing agency. Additional tests required due to defective Work shall be paid by the Contractor at no additional cost to the Contract.

.2 The maximum allowed markup by the Contractor is 10% of the inspection/testing subcontractor cost. If additional inspection and/or tests are required due to defective Work by the Contractor, the additional costs will be borne by the Contractor.

.3 All equipment required for executing inspection and testing will be provided by the respective agencies.

.4 Employment of inspection/testing agencies does not relax the Contractor’s responsibility to perform Work in accordance with Contract Documents.

.5 If defects are revealed during inspection and/or testing, the appointed agency will request additional inspection and/or testing to ascertain the full degree of defect. Correct the defect and irregularities as advised by the Contract Administrator at no cost to the City. The Contractor shall be responsible for the costs of the subsequent testing and inspection of the corrected Work. The City shall deduct such costs from the Contract, amount of which will be determined by the Contract Administrator.

### 1.3 ACCESS TO WORK

.1 The City, the Contract Administrator, and other inspection authorities shall have access to the Work.

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

**1.4 REJECTED WORK**

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

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

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

**1.5 REPORTS**

.1 Submit four [4] copies of inspection and test reports to the Contract Administrator, prior to inclusion with the operation and maintenance manuals, and in accordance with Section 01 33 00 – Submittal Procedures.

.2 Provide copies to subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

**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 SUBMITTALS

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

.2 Submittals to include but are not limited to:

.1 Site plan as described in Part 1.2.

.2 Shop Drawings, including scaffolding and/or platforms as described in Part 1.3.

### 1.2 INSTALLATION AND REMOVAL

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

.1 Identify areas which have to be gravelled to prevent tracking of mud.

.2 Indicate use of supplemental or other staging area.

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

.3 Remove from site all such work after use.

.4 Restore grassed areas damaged from construction activities.

### 1.3 SCAFFOLDING AND TEMPORARY PLATFORMS

.1 Scaffolding in accordance with:

.1 CAN/CSA-S269.2 – Access Scaffolding for Construction Purposes

.2 C.C.S.M.c W210 – Manitoba, The Workplace Safety and Health Act

.2 Provide and maintain scaffolding and/or platforms in accordance with Section 01 33 00 – Submittal Procedures were requested on the Drawings.

### 1.4 SITE STORAGE/LOADING

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

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

.3 All construction materials shall be stored at designated storage areas. Stored combustible materials shall be separated by clear space to prevent fire spread and allow access for manual fire fighting equipment, including fire hoses, extinguishers, hydrants, etc.

.4 Pressurized dry chemical fire extinguishers of suitable capacity or equally effective extinguishers as per NFPA 10 shall be provided where:

.1 Flammable liquids are stored or handled.

.2 Welding or flame cutting is performed.

**1.5 CONSTRUCTION PARKING**

.1 Parking will be permitted on the Site provided it does not disrupt performance of the Work or access by the City.

.2 Provide and maintain adequate access to project site including fire route access.

**1.6 OFFICES**

.1 E2.1 The SEWPCC and WEWPCC Boardrooms may be used for construction meetings, providing that the rooms are properly booked with the plants.

.1 Maintain in clean condition

.2 Contractor or subcontractors to provide their own require separate site/field office space as required. The location(s) of these facilities must be made clear on site layout plan for approval.

.3 The Contractor shall be responsible for installation, maintenance, removal, operating costs, and service installation costs for the office facilities as described herein.

**1.7 EQUIPMENT, TOOL, AND MATERIALS STORAGE**

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

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

**1.8 SANITARY FACILITIES**

.1 The Contractor shall provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.1 The Contractor shall post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

**1.9 PROTECTION AND MAINTENANCE OF TRAFFIC**

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

.2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by the Contract Administrator.

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

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

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

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

.7 Construct access and haul roads necessary.

.8 Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.

.9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.

.10 Dust control should be adequate to ensure safe operation at all times.

**1.10 DISPOSAL OF WASTE MATERIALS**

.1 Spoiled and waste materials shall not be dumped, under any circumstances, in any locations other than those approved by the local authorities. Any cost for permits and fees for disposing of waste materials shall be at the Contractor's expense.

.2 Disposal of all excavated and waste materials shall be in accordance with the requirements of the appropriate provincial regulatory agencies.

.3 When working anywhere within the Works, the Contractor shall at the end of each day remove the rubbish and leave the Site in a clean and tidy state, to the satisfaction of the Contract Administrator. If this is not done, the City may clean the Site and deduct such costs from the Contract, amount of which will be determined by the Contract Administrator.

**1.11 FACILITY ELECTRICAL SUPPLY AND DISTRIBUTION**

.1 If service interruptions are necessary, such interruptions shall be made only at times approved by the Contract Administrator.

**1.12 WARNINGS AND TRAFFIC SIGNS**

.1 All Work affecting Site access must be authorized by the Contract Administrator. Provide a minimum of one week notice to the Contract Administrator when Work will affect Site access.

.2 When Work is performed within public areas, provide and erect adequate warning signs as necessary to give proper warning. Place signs sufficiently in advance to enable public to respond to directions.

.3 Provide and maintain signs and other devices required to indicate construction activities or other temporary or unusual conditions resulting from the Work.

**1.13 Temporary Construction Facility Utilities**

.1 Water

.1 Water for the purposes of hydrovac operations can be provided by the City. If the City deems the Contractor water use to be excessive the City reserves the right to meter the water usage and bill the Contractor at a fair rate.

.2 Washrooms

.1 Contractor is not permitted to use facility washrooms. Contractor must supply their own portable washroom facilities. Contractor responsible for delivery, maintenance, and removal of temporary washroom facilities as well as disposal costs of the waste.

.3 Electricity

.1 Contractor is permitted to connect their trailer and equipment to facility power sources however they must notify City prior to any power draws.

**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 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CSA-O121-M1978(R2003), Douglas Fir Plywood.

### 1.2 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

### 1.3 HOARDING

.1 Erect temporary site enclosures using construction grade lumber framing and exterior grade fir plywood to CSA O121.

.2 Provide hoarding and ventilation for the building as required to maintain operation of the plant.

### 1.4 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs, and any other fall hazards.

.2 Provide as required by governing authorities.

### 1.5 WEATHER ENCLOSURES

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

.2 Design enclosures to withstand wind pressure and snow loading, if applicable.

### 1.6 DUST TIGHT SCREENS

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

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

### 1.7 ACCESS TO SITE

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

### 1.8 PUBLIC TRAFFIC FLOW

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

**1.9 FIRE ROUTES**

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

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

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

.2 Be responsible for damage incurred.

**1.11 PROTECTION OF BUILDING FINISHES**

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

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with the Contract Administrator locations and installation schedule three (3) Business Days prior to installation.

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

**Part 2 Products**

**2.1 NOT USED**

.1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

## 1. GENERAL

### 1.1 SURVEY REFERENCE POINTS

.1 Primary horizontal and vertical survey reference points have been established by the Contract Administrator as specified in the Contract Documents. The Contract Administrator is responsible for the accuracy of the primary survey reference points.

.2 Locate, confirm, and protect primary reference points prior to starting Work on the Site. Preserve permanent reference points during construction.

.3 Make no changes to or relocations of the primary survey reference points without prior written authorization of the Contract Administrator.

.4 Report to the Contract Administrator when a reference point is lost or damaged or requires relocation because of the Work.

.5 Replace damaged reference points in accordance with the original survey control.

### 1.2 CONTRACTOR SURVEY WORK

.1 Employ qualified construction surveyors to perform survey work.

.2 Record survey data in accordance with standard survey methods in a form acceptable to the Contract Administrator.

.3 Establish secondary survey reference points required for laying out and staking the Work and for checking tolerances. Be solely responsible for the accuracy of the secondary survey reference points and the layout, staking, and checking of the Work.

.4 Establish lines, grades, and elevations, and locate and lay out the Work.

.5 Provide final grade staking of each line, grade or elevation required for the Contract Administrator’s checking of the work and for measurement for payment purposes. Maintain final grade stakes in place until the Contract Administrator has authorized their removal.

.6 Provide such assistance as may be required by the Contract Administrator for carrying out surveys in Article 1.4.

.7 Establish and maintain survey reference points in all work areas, including elevations and locations relative to established stationing and offset systems or otherwise required by the Contract Administrator. Provide reference points within 50 m horizontal distance and 2 m vertical distance of all locations where testing, observations of conditions, or other similar activities are undertaken by the Contract Administrator, such that the Contract Administrator can establish the location and elevations at those locations.

### 1.3 GLOBAL POSITIONING SYSTEMS (GPS)

.1 If GPS controlled excavation and trimming equipment is utilized in conjunction with GPS final grade checking, the Contract Administrator may waive the requirement for final grade stakes if the accuracy and consistency of the final grade check can be demonstrated.

.2 If the final grade stake requirement is waived, provide a surface grade sheet in electronic and hard copy of the electronic survey data in a format acceptable to the Contract Administrator.

.3 The surface grade sheet to include the following minimum information:

.1 Station.

.2 Offset left or right of the centerline.

.3 Design elevation at the grade line break point.

.4 Actual elevation at the grade line break point.

.5 Deviation of the actual elevation from the design elevation.

.6 Indication if deviation is within specified tolerances.

**1.4 CONTRACT ADMINISTRATOR'S SURVEY REQUIREMENTS**

.1 The Contract Administrator may carry out surveys, as the Contract Administrator deems necessary, to check the accuracy of the Contractor's layout and stakes.

.2 The Contract Administrator will carry out surveys for the purpose of measuring the Work for payment.

**1.5 SUBMITTALS**

.1 Provide the following submittals.

.2 The name and address of the Contractor's surveyor to the Contract Administrator prior to commencing the Work at the Site.

.3 When requested, submit a copy of reduced notes for surveys or portions of surveys to the Contract Administrator.

.4 A certificate signed by the Contractor's surveyor confirming that the lines, grades, elevations, and dimensions of the completed Work are in conformance or not in conformance with the Contract Documents. Provide details of all non-conformances.

.5 Electronic survey data files in a format acceptable to the Contract Administrator.

**1.6 MEASUREMENT AND PAYMENT**

.1 Works described herein shall be considered incidental to the work. No additional payment will be made for Site Surveying.

**2. PRODUCTS – NOT USED**
**3. EXECUTION – NOT USED**

**END OF SECTION**

Approved: 2006-03-31

## Part 1 General

### 1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

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

- .1 Structural integrity of elements of Project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of operational elements.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of the City or separate Contractor.

.3 Include in request:

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

### 1.2 MATERIALS

.1 Required for original installation.

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

### 1.3 PREPARATION

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

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

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

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

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

### 1.4 EXECUTION

.1 Execute cutting, fitting, and patching including excavation and fill to complete Work.

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

.3 Uncover Work to install ill-timed Work.

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

.5 Remove samples of installed Work for testing.

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

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

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

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

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

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

.12 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material with approved fire stopping assembly.

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

.14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

**Part 2 Products**

**2.1 NOT USED**

**Part 3 Execution**

**3.1 NOT USED**

**END OF SECTION**

Approved: 2017-10-27

## Part 1 General

### 1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by the Contract Administrator. Do not burn waste materials on Site.

.3 Clear snow and ice from access to building, bank/pile snow in designated areas only and remove from Site.

.4 Make arrangements with and obtain permits from Authorities having jurisdiction for disposal of waste and debris.

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

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

.7 Dispose of waste materials and debris off site.

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

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

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

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

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

### 1.2 FINAL CLEANING

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

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

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

.4 Remove waste products and debris.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed the Contract Administrator. Do not burn waste materials on site.

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

.7 Vacuum clean and dust building interiors, behind grilles, louvres, and screens.

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

.9 Clean roofs, downspouts, and drainage systems.

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

.11 Remove snow and ice from access to building.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

.1 Separate waste materials for recycling or reuse in accordance with Section 01 74 19-Waste Management and Disposal.

**Part 2 Products**

**2.1 NOT USED**

.1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

## Part 1 General

### 1.1 SECTION INCLUDES

.1 Text, schedules, and procedures for systematic Waste Management Program for construction, deconstruction, demolition, and renovation projects that may include:

.1 Diversion of Materials;

.2 Materials Source Separation Program (MSSP); and

.3 Canadian Governmental Responsibility for the Environment Resources.

### 1.2 DEFINITIONS

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

.2 Construction Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction.

.3 Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

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

.5 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

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

.7 Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for the purpose of reuse or recycling.

.8 Source Separation: Acts of keeping different types of waste materials separate beginning from the first time they become waste.

### 1.3 SUBMITTALS

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

### 1.4 MATERIALS SOURCE SEPARATION PROGRAM

.1 Prepare Material Source Separation Program and have ready for use prior to Project start up.

.2 Implement Material Source Separation Program for waste generated on Project in compliance with approved methods and as reviewed by Contract Administrator. Provide

on Site facilities for collection, handling and storage of anticipated quantities of reusable and recyclable materials.

.3 Provide containers to deposit reusable and recyclable materials.

.4 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

.5 Locate separated material(s) in area(s) which minimize material damage.

.6 Collect, handle, store on Site and transport off site, salvaged materials in separate condition.

.7 Transport to approved and authorized recycling facility.

.8 Collect, handle, store on Site and transport off site, salvaged materials in combined condition.

.9 Ship material(s) to Site operating under Certificate of Approval or as directed by the City of Winnipeg.

.10 Materials must be immediately separated into required categories for reuse or recycling.

## 1.5 WASTE PROCESSING SITES

.1 Identify appropriate waste processing sites, based on municipal requirements, as required.

## 1.6 STORAGE, HANDLING AND PROTECTION

.1 Store materials to be reused, recycled, and salvaged in locations as directed by Contract Administrator.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect, stockpile, store, and catalogue salvaged items.

.4 Separate non salvageable materials from salvaged items. Transport and deliver non salvageable items to licensed disposal facility.

.5 Protect structural components not removed for demolition from movement or damage.

.6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Contract Administrator.

.7 Protect surface drainage, mechanical and electrical from damage and blockage.

.8 Separate and store materials produced during dismantling of structures in designated areas.

.9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

.10 On Site source separation is recommended.

.11 Remove co-mingled materials to offsite processing facility for separation.

.12 Provide waybills for separated materials.

## 1.7 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner or excavation material into waterways, storm or sanitary sewers.

.3 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.4 Prepare project summary to verify destination and quantities on a material by material basis as identified in pre demolition material audit.

.5 Dispose of waste in accordance with Municipal and Provincial regulations.

.6 Hydrovac waste is only permitted to be discharged at facility dump locations if the waste is free from concrete debris. Should concrete debris be found in the waste it must be removed prior to dumping and disposed of properly. Should the Contractor fail to adequately remove concrete from waste and the Contractor proceed with dumping regardless they must clean dump location sewer at their own cost at the discretion of the Contract Administrator.

.7 All waste disposal costs are considered incidental to the project.

**1.8 USE OF SITE AND FACILITIES**

.1 Execute Work with least possible interference or disturbance to normal use of premises.

.2 Maintain security measures established by existing facility and provide temporary security measures approved by Contract Administrator as required.

**1.9 SCHEDULING**

.1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.

## Part 2 Products

**2.1 NOT USED**

## Part 3 Execution

**3.1 APPLICATION**

.1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

**3.2 CLEANING**

.1 Remove tools and waste materials on completion of Work and leave Work area in clean and orderly condition.

.2 Clean-up Work area as Work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

**END OF SECTION**

## Part 1 General

### 1.1 OPERATION AND MAINTENANCE MANUALS

.1 General

.1 Provide operation and maintenance manuals in accordance with Section 01 33 00 – Submittal Procedures.

.2 An electronic draft copy of the operation and maintenance manuals shall be submitted (word version, if available) two (2) weeks prior to Substantial Performance of the Work for review and comments. Submission of individual data will not be accepted unless directed by the City. Make changes and incorporate the Contract Administrator's review comments as required and re-submit as directed by the Contract Administrator

.3 After review and acceptance by the City, five (5) hard copies and one electronic (PDF) copy of the final operation and maintenance manuals shall be submitted. The final electronic copy shall be provided on a flash memory drive.

.4 Prepare operation and maintenance manuals using personnel experienced in maintenance and operation of described products.

.5 Operation and maintenance instructions and technical data to be sufficiently detailed with respect to design elements, construction features, component function, correct installation procedure, and maintenance requirements to permit effective start-up, operation, maintenance, repair, modification, extension, and expansion of any portion or feature of installation. Technical data to be in the form of approved Shop Drawings, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists.

.6 For the guidance of the City's operation and maintenance personnel, the Contractor shall prepare operation and maintenance manuals for the Work, describing in detail the construction of each part of the Work and the recommended procedure for operation, servicing, and maintenance.

.7 All instructions in these operation and maintenance manuals shall be in simple language to guide the City in the proper operation and maintenance of this installation.

.2 Format

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf, 8.5" by 11" with spine and face pockets.

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

.1 Identify contents of each binder on spine and face.

.4 Cover: identify each binder with title sheet labelled "Operation and Maintenance Instructions", and containing project name and date, facilities covered in the manual, City's Contract number, the name and address of the Contractor, and the issue date.

.5 Arrange content by Division and Section numbers and sequence of Table of Contents.

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

.7 Text: manufacturer's printed data or type written data.

.8 Drawings: provide with reinforced punched binder tab.

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

.3 Contents

.1 For each operation and maintenance manual volume, provide an overall title sheet that includes:

.1 The title "Operation and Maintenance Instructions";

.2 Project name and date;

.3 Facilities covered in the manual;

.4 City’s Contract number;

.5 Addresses and telephone numbers of the Contract Administrator and Contractor with name of responsible parties; and

.6 Schedule of products and systems, indexed to content of volume;

.2 For each operation and maintenance manual volume, provide an overall list of contents which includes the contents for all the operation and maintenance manual volumes.

.3 In addition to operation and maintenance information required in the individual Specification sections, include:

.1 Brochures/catalogue excerpts of all components of the Work.

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

.3 Documentation of all test results.

.4 Complete set of equipment and assembly drawings.

.5 Installation, start-up, individual equipment operation and maintenance manuals.

.6 Shop Drawings and cutsheets of all equipment and materials.

.1 Do not utilize the cutsheet and Shop Drawing submittals that were sent to the Contract Administrator for review as these may contain inaccurate information and markups. Only provide cutsheets and Shop Drawings representing the final materials and equipment supplied, without any markups from the Contract Administrator.

.2 For generic cutsheets and Shop Drawings that list multiple model numbers or configurations, place a rectangle around the specific model that was supplied and cross out other models.

.7 Sections for the record Drawings and as-built Drawings of all installations. Drafted record Drawings and as-built Drawings of size 432x279 mm (11 x 17”) will be inserted by the Contract Administrator, based on the as-built Drawings marked up by the Contractor.

.8 Names, addresses, and telephone numbers of all major Subcontractors and suppliers.

.9 Certificate of Inspection from the inspection authority.

.10 Testing and commissioning documentation.

.11 Warranty certificate, signed and dated.

.12 Written process narratives outlining the programming of the PLC systems for individual processes or systems.

.13 Final instrumentation set points including but not limited to:

.1 Unit

.2 Scale

.3 Alarm points (low-low, low, high, high-high)

.4 4-20 mA settings

.14 Logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 – Quality Control.

.4 General catalog data for the operations and maintenance manual is unacceptable. If manufacturer’s specification sheets are generalized in any way, they shall be clearly marked to show exactly which item has been supplied, and the project designation for that item (e.g., SF-Y601) is to be noted on manufacturer’s specification sheet which includes all details for this unit, including complete model number, serial number, and construction and performance data.

.4 Equipment and System

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

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

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

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

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

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

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

.5 Maintenance Requirements: include routine procedures and guide for troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions

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

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

.8 Include sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

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

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

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

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

.5 Materials and Finishes

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

.1 Provide information for re-ordering custom manufactured products if applicable

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

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

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

**1.2 AS -BUILT / RECORD DRAWINGS**

.1 Accurately mark-up deviations from the Contract caused by the Site conditions and changes ordered by the Contract Administrator. Update daily.

.2 The Contractor shall keep one complete set of white prints at the Site during the Work, including all addenda, change orders, Site instructions, clarifications, and revisions for the purpose of the as-built and record Drawings. As the Work on-site proceeds, the Contractor shall clearly mark up the white prints in red pencil all the Work which deviated from the original Contract. Identify Drawings as "Project Record Copy". Maintain in good condition and make available for inspection on-site by the Contract Administrator at all times.

**1.3 WARRANTIES AND BONDS**

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

.2 Submit warranty management plan, 30 days before planned pre-warranty meeting, to the Contract Administrator for approval.

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

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

.5 Submit warranty information, made available during construction phase, to the Contract Administrator for approval prior to each monthly pay estimate.

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

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within [ten] days after completion of applicable item of work.

.4 Verify that documents are in proper form, contain full information, and are notarized.

.5 Co-execute submittals when required.

.6 Retain warranties and bonds until time specified for submittal.

.7 Except for items put into use with the City's permission, leave date of beginning of time of warranty until date of Total Performance is determined.

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

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

.2 Listing and status of delivery of certificates of warranty for warranty items, to include roofs, HVAC balancing, pumps, and commissioned systems. Provide list for each warranted equipment, item, feature of construction, or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

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

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

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

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

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

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

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

.3 Contractor's plans for attendance at four (4) and nine (9) month post-construction warranty inspections.

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

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

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

.10 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Contract Administrator to proceed with action against the Contractor.

**1.4 WARRANTY TAGS**

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water-resistant tag approved by the Contract Administrator.

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

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

.4 Indicate following information on tag:

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

**Part 2 Products**

**2.1 NOT USED**

**Part 3 Execution**

**3.1 NOT USED**

**END OF SECTION**

## Part 1 General

### 1.1 SUMMARY

.1 This Section includes the following:

.1 Demolition and removal of selected portions of interior building components and finishes.

.2 Repair procedures for selective demolition operations.

.2 This section does not include the following:

.1 Removal of hazardous materials or asbestos abatement.

.2 Demolition of exterior building components or structural elements.

.3 Mechanical or electrical equipment, except as required to make minor modifications to allow the work to be completed.

.3 Drawings contain details that suggest directions for solving some of the major demolition and removal requirements for this project; Contractor is required to develop these details further by submitting a demolition plan prepared by a professional engineer employed by the Contractor.

### 1.2 RELATED REQUIREMENTS

.1 Section 02 81 00 - Hazardous Materials

.2 Section 02 56 13 - Waste Containment

.3 Section 03 01 37 - Concrete Restoration

.4 Section 09 85 00 - Concrete Resurfacing Lining and Coating Specifications

### 1.3 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.

.2 Remove and Salvage: Detach items from existing construction and deliver them to the City.

.3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.4 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.

.5 Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

.6 Draft Construction Waste Management Plan (Draft CWM Plan): Detailed inventory of materials in building indicating estimated quantities of reuse, recycling and landfill, prepared in accordance with Section 01 74 19 - Waste Management and Disposal and as follows:

.1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.

.7 Construction Waste Management Plan (CWM Plan): Written plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - Waste Management and Disposal

.8 Construction Waste Management Report (CWM Report): Written report identifying actual materials that formed CWM Plan for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - Waste Management and Disposal

.9 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

## 1.4 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)

.1 ANSI A10.8 2011, Safety Requirements for Scaffolding

.2 ASTM International (ASTM)

.1 ASTM C 475/C 475M-15, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board

.3 CSA Group (CSA)

.1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures

.4 Department of Justice Canada (Jus)

.1 Canadian Environmental Assessment Act (CEAA), 2012

.2 Canadian Environmental Protection Act (CEPA), 2012

.1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations

.2 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations

.3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34

.4 Motor Vehicle Safety Act (MVSA), 1995

.5 Hazardous Materials Information Review Act, 1985

.5 National Fire Protection Association (NFPA)

.1 NFPA 241 13, Standard for Safeguarding Construction, Alteration, and Demolition Operations

## 1.5 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate with Contract Administrator for the material ownership as follows:

.1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain The City's property, demolished materials shall become Contractor's property and shall be removed from Project site.

.2 Coordinate selective demolition work so that work of this Section adheres to aesthetic criteria established by the Drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.

.3 Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to The City that may be encountered during selective demolition remain The City's property:

.1 Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to The City.

.2 Coordinate with Contract Administrator, who will establish special procedures for removal and salvage.

.2 Pre Demolition Meeting: Convene pre-installation meeting 1 week prior to beginning work of this Section and on-site installation, with Contractor and Contract Administrator to:

.1 Confirm extent of salvaged and demolished materials

.2 Review Contractor's demolition plan

.1 Verify existing site conditions adjacent to demolition work

.2 Coordination with other construction sub trades

.3 Hold project meetings weekly.

.4 Ensure key personnel, site supervisor, project manager, subcontractor representatives and WMC attend.

.5 WMC must provide written report on status of waste diversion activity at each meeting.

.6 Contract Administrator will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

## 1.6 ACTION AND INFORMATION SUBMITTALS

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

.1 Schedule of Selective Demolition Activities: Indicate the following:

.1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.

.2 Coordinate with Contract Administrator and The City's user group ongoing site operations and limit the number of interruptions during regular business hours.

.3 Interruption of utility services.

.4 Coordination for shutoff, capping, and continuation of utility services.

.5 Use of elevator and stairs.

.6 Locations of temporary partitions and means of egress, including for others affected by selective demolition operations.

.7 Coordination with The City's continuing occupancy of portions of existing building The City's partial occupancy of completed Work.

.2 Demolition Plan: Submit a plan of demolition area indicating extent of temporary facilities and supports, methods of removal and demolition prepared by a professional engineer in accordance with requirements of Authority Having Jurisdiction, and as follows:

.1 Proposed Dust Control and Noise Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Contract Administrator reserves the right to make modifications where proposed methods interfere with the Contract Administrator ongoing operation.

.2 Inventory: Submit a list of items that have been removed and salvaged after selective demolition is complete.

.3 Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

.4 Pre demolition Photographs or Videotape: Submit photographs or videotape indicating existing conditions of adjoining construction and site improvements prior to starting Work. Include finish surfaces that may be misconstrued as damage caused by selective demolition operations.

.2 Informational Submittals: Provide the following submittals when requested by the Contract Administrator:

.1 Qualification Data: Submit information for companies and personnel indicating their capabilities and experience to perform work of this Section including but not limited to, lists of completed projects with project names and addresses, names and addresses of architects and owners, for work of similar complexity and extent.

## 1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: Perform work as follows; use most restrictive requirements where differences occur between the municipal, provincial and federal jurisdictions:

.1 Provincial and Federal Requirements: Perform work in accordance with governing environmental notification requirements and regulations of the Authority Having Jurisdiction.

.2 Municipal Requirements: Perform hauling and disposal operations in accordance with regulations of Authority Having Jurisdiction.

.2 Qualifications: Provide proof of qualifications when requested by the Contract Administrator:

.1 Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project:

.1 Conform to the provincial Occupational Health and Safety Act and Regulation.

.2 Conform to Workers' Compensation Board Regulations.

.3 Conform to City of local municipal bylaws and regulations governing this type of work.

## 1.8 SITE CONDITIONS

.1 The City will occupy portions of building immediately adjacent to selective demolition area:

.1 Conduct selective demolition so that The City's operations will not be disrupted.

.2 Provide not less than 72 hours notice to The City of activities that will affect The City's operations.

.2 Maintain access to existing means of egress, walkways, corridors, exits, and other adjacent occupied or used facilities:

.1 Do not close or obstruct means of egress, walkways, corridors, exits, or other occupied or used facilities without written acceptance from authorities having jurisdiction.

.3 The City assumes no responsibility for condition of areas to be selectively demolished:

.1 Conditions existing at time of Pre-Bid Site Review will be maintained by the Contract Administrator as far as practical.

.4 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in the Work; immediately notify the Contract Administrator if materials suspected of containing hazardous substances are encountered and perform the following activities:

.1 Hazardous materials will be as defined in the Hazardous Materials Act.

.2 Hazardous materials will be removed by the Contract Administrator before start of the Work.

.3 If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify the Contract Administrator. Hazardous materials will be removed by the Contract Administrator under a separate contract or as a change to the Work.

.5 Hazardous Substances: Hazardous Substances are present in building to be selectively demolished. A report on the presence of Hazardous Substances is available at the Contract Administrator's offices attached as an information document to this Section for review and use:

.1 Examine report to become aware of locations where hazardous materials are present.

.2 Coordinate with Section 02 81 00 - Hazardous Materials

## Part 2 Products

### 2.1 TEMPORARY SUPPORT STRUCTURES

.1 Design temporary support structures required for demolition work and underpinning and other foundation supports necessary for the project using a qualified professional engineer registered or licensed in province of the Work.

### 2.2 DESCRIPTION

.1 This section of the Work includes, but is not necessarily limited to, the following:

.1 Demolition, removal completely from site, and disposal of all identified components, materials, equipment and debris

.2 Selective demolition to allow new walls, bulkheads, ceilings and other materials to meet existing construction as indicated

.3 All material from demolition shall be removed from site immediately with no salvage, selling, sorting or burning permitted on site

.4 Retain items indicated on drawings for re use in new construction

### 2.3 DEBRIS

.1 Make all arrangements for transport and disposal of all demolished materials from the site.

### 2.4 EQUIPMENT

.1 Provide all equipment required for safe and proper demolition of the building interiors indicated.

**2.5 REPAIR MATERIALS**

.1 Use repair materials identical to existing materials:

.1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

.2 Use a material whose installed performance equals or surpasses that of existing material.

.3 Comply with material and installation requirements specified in individual Specification Sections.

.2 Floor Patching and Levelling Compounds: Cement based, trowelable, self levelling compounds compatible with specified floor finishes; gypsum-based products are not acceptable for work of this Section.

.3 Concrete Unit Masonry: Lightweight concrete masonry units, and mortar, cut and trimmed to fit existing opening to be filled. Provide standard hollow core units, square end units and bond beam units as indicated on drawings.

**2.6 EXISTING MATERIALS**

.1 Items to be retained for re use in new construction include, but are not limited to the following:

.1 All equipment on currently on or above SEWPCC tank top slab. Items to be stored in a suitable location approved by the Contract Administrator for the duration of construction. Contractor responsible for documenting condition of equipment before beginning construction and replacing any equipment damaged as a result of the construction.

.2 Confirm with Contract Administrator any materials that appear to be in re usable condition prior to disposal.

.3 Confirm with Contract Administrator any materials scheduled for re use that are not in re usable condition prior to installation.

**Part 3 Execution**

**3.1 EXAMINATION**

.1 Verify that utilities have been disconnected and capped.

.2 Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

.3 Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

.4 Notify the Contract Administrator where existing mechanical, electrical, or structural elements conflict with intended function or design:

.1 Investigate and measure the nature and extent of conflict and submit a written report to Contract Administrator.

.2 Contract Administrator will issue additional instructions or revise drawings as required to correct conflict.

.5 Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

## 3.2 UTILITY SERVICES

.1 Coordinate existing services indicated to remain and protect them against damage during selective demolition operations.

.2 Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.

- .1 Arrange to shut off affected utilities with utility companies.
- .2 If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
- .3 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
- .4 Cut off pipe or conduit to a minimum of 25 mm below slab and remove concrete mound. Patch concrete using cementitious grout.

.3 Coordinate with Mechanical and Electrical Divisions for shutting off, disconnecting, removing, and sealing or capping utilities.

.4 Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

## 3.3 PREPARATION

.1 Identify and mark all equipment and materials identified to be retained by The City or to be re used in subsequent construction. Separate and store items to be retained in an area away from area of demolition and protect from accidental disposal.

.2 Post warning signs on electrical lines and equipment that must remain energized to serve other areas during period of demolition.

.3 Confirm that all electrical and telephone service lines entering buildings are not disconnected.

.4 Do not disrupt active or energized utilities crossing the demolition site.

.5 Provide and maintain barricades, warning signs, protection for workmen and the public during the full extent of the Work. Read drawings carefully to ascertain extent of protection required.

.6 Mark all materials required to be re used, store in a safe place until ready for re installation.

.7 Adjust all junction boxes, receptacles and switch boxes flush with new wall construction where additional layers to existing construction are indicated.

.8 Remove permanent marker lines used or found on exposed surfaces and at surfaces indicated for subsequent finish materials. Mechanically remove permanent marker lines and associated substrates where permanent marker lines occur and patch surface. Sealing or priming over permanent marker lines is not acceptable.

## 3.4 CONCRETE SLAB REINFORCING

.1 Locate location of reinforcing steel in concrete slabs prior to cutting or coring using non destructive, nonionizing radio frequency locators.

.2 Core concrete slabs to avoid reinforcing steel, electrical conduit or water pipes; adjust core location and coordinate with Engineer where slab features interfere with core drilling.

.3 Notify the Engineer immediately for further instructions where coring or cutting will damage existing slab features.

**3.5 SELECTIVE DEMOLITION**

.1 Demolish and dismantle work in a neat and orderly manner and in strict accordance with all regulations.

.2 At end of each day's work, leave Work in safe condition so that no part is in danger of toppling or falling.

.3 Demolish in a manner to minimize dusting and to prevent migration of dust.

.4 Selling or burning of materials on the site is not permitted.

.5 Remove concrete bases by cutting and chipping, take precautions against slab cracking and degradation. Grind edges smooth, fill and make level with self levelling grout.

.6 Fill all openings in concrete block walls with concrete masonry units, coursing to match existing, prepare ready to receive new finishes to match existing.

.1 Provide bond beams in new openings cut into existing concrete masonry unit walls.

.2 Provide finished end masonry units to patch and repair for new jamb sections in existing concrete masonry unit walls.

.7 Fill all openings in gypsum board walls with gypsum board and steel framing to match existing, skim coat to make wall smooth and even.

.8 Demolish completely all ceiling panels and grid as indicated.

.9 Remove all wall coverings scheduled for demolition. Patch and repair wall surfaces with skim coat of gypsum board joint compound leaving wall surfaces smooth and even ready for new wall finishes.

.10 Patch and repair all walls, floor and ceilings damaged during demolition with material matching adjacent walls, prepare ready for new finishes.

.11 Patch and repair all radiation cabinets, mechanical equipment and electrical fixtures damaged or exposed during demolition to match adjacent finished surfaces.

**3.6 PATCHING AND REPAIRING**

.1 Repair of concrete tank walls covered in its own respective specifications.

**3.7 PROTECTION**

.1 Prevent debris from blocking drainage inlets and systems and ground draining and protect material and electrical systems and services that must remain in operation.

.2 Arrange demolition and shoring work so that interference with the use of adjoining areas by the Contract Administrator and users is minimized.

.3 Maintain safe access to and egress from occupied areas adjoining.

.4 Provide and maintain fire prevention equipment and alarms accessible during demolition.

**3.8 CLEANING**

.1 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal, and as follows:

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

.3 Divert excess materials from landfill to site approved by the Contract Administrator.

.4 Promptly as the Work progresses, and on completion, clean up and remove from the site all rubbish and surplus material. Remove rubbish resulting from demolition work daily.

.5 Maintain access to exits clean and free of obstruction during removal of debris.

.6 Keep surrounding and adjoining roads, lanes, sidewalks, municipal rights of way clean and free of dirt, soil or debris that may be a hazard to vehicles or persons.

.7 Transport material designated for alternate disposal using approved facilities listed in CWM Plan and in accordance with applicable regulations.

.1 Written authorization from Contract Administrator is required to deviate from facilities listed in CWM Plan.

.8 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

.1 Disposal facilities must be those approved of and listed in CWM Plan.

.2 Written authorization from Contract Administrator is required to deviate from disposal facilities listed in CWM Plan.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 02 41 19.16 - Selective Interior Demolition

.2 02 81 00 - Hazardous Materials

### 1.2 DEFINITIONS

.1 Toxic: substance is considered toxic if it is listed on Toxic Substances List found in Schedule 1 of CEPA.

.2 List of Toxic Substances: found in Schedule 1 of CEPA, lists substances that have been assessed as toxic. Federal Government can make regulations with respect to a substance specified on List of Toxic Substances. Column II of this list identifies type of regulation applicable to each substance.

.3 PCBs: includes chlorobiphenyls referred to in Column I of item 1 of the List of Toxic Substances in Schedule I of Canadian Environmental Protection Act.

### 1.3 REFERENCE STANDARDS

.1 Canadian Environmental Protection Act,1999 (CEPA 1999).

.1 Controlling Pollution and Managing Wastes

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 WHMIS Safety Data Sheets (SDS).

.3 National Research Council Canada (NRC)

.1 National Fire Code of Canada 2015 (NFC).

### 1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit WHMIS Safety Data Sheets (SDS) in accordance with Section 02 81 00 - Hazardous Materials.

.2 Submit photocopy of shipping documents to Contract Administrator when shipping toxic wastes off site.

.3 Maintain 1 copy of product data in readily accessible file on site.

### 1.5 DELIVERY, STORAGE, AND HANDLING

.1 Store and handle toxic wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.

.2 Store and handle flammable and combustible wastes in accordance with current National Fire Code of Canada (NFC) requirements.

.3 Co-ordinate storage of toxic wastes with Contract Administrator and follow internal requirements for labelling and storage of wastes.

.4 Observe smoking regulations, smoking is prohibited in area where toxic wastes are stored, used, or handled.

.5 Only certified persons who have successfully completed Environment Canada Environmental Awareness Course for Environmentally Safe Handling of Refrigerants are permitted to work on refrigeration and air conditioning systems.

.6 Report spills or accidents involving toxic wastes immediately to Contract Administrator and to appropriate regulatory authorities. Take reasonable measures to contain the release while ensuring health and safety is protected.

.7 Transport toxic wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.

.8 Use authorized/licensed carrier to transport toxic waste.

.9 Co-ordinate transportation and disposal of toxic wastes with Contract Administrator.

.10 Notify appropriate regulatory authorities and obtain required permits and approvals prior to exporting toxic waste.

.11 Dispose of toxic wastes generated on site in accordance with applicable federal and provincial acts, regulations, and guidelines.

.12 Ensure toxic waste is shipped to authorized/licensed treatment or disposal facility and that liability insurance requirements are met.

.13 Minimize generation of toxic waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.

## Part 2 Products

### 2.1 NOT USED

.1 Not Used.

## Part 3 Execution

### 3.1 NOT USED

.1 Not Used.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 02 41 19.16 - Selective Interior Demolition.

.2 07 92 00 - Joint Sealants

### 1.2 DEFINITIONS

.1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.

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

.3 Hazardous Waste: hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.

### 1.3 REFERENCE STANDARDS

.1 Canadian Environmental Protection Act,1999 (CEPA 1999)

.1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).

.2 Department of Justice Canada (Jus)

.1 Transportation of Dangerous Goods Act, 1992 (TDG Act) 1992, (c. 34).

.2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001-286).

.3 Green Seal Environmental Standards (GS)

.1 GS-11-2008, 2nd Edition, Paints and Coatings.

.2 GS-36-00, Commercial Adhesives.

.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 WHMIS Safety Data Sheets (SDS).

.5 National Research Council Canada (NRC)

.1 National Fire Code of Canada 2015 (NFC).

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113-A2007, Architectural Coatings.

.2 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

### 1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for hazardous materials and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit two copies of WHMIS Safety Data Sheets (SDS) in accordance with Section 01 35 29.06 - Health and Safety Requirements to Contract Administrator for each hazardous material required prior to bringing hazardous material on site.

.3 Submit hazardous materials management plan to Contract Administrator that identifies hazardous materials, usage, location, personal protective equipment requirements, and disposal arrangements.

.4 Hazardous waste classification: identify waste codes applicable to each hazardous waste material based on applicable federal and provincial acts, regulations, and guidelines. Waste profiles, analyses, and classification submitted to contract offices for review and approval.

.3 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan, Waste Reduction Workplan highlighting recycling and salvage requirements.

.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged

.2 Low-Emitting Materials: submit listing of adhesives and sealants and paints and coatings used in building, comply with VOC and chemical component limits or restrictions requirements.

.3 Spill response: establish spill response procedures. Comply with applicable requirements according to classification of waste material. Designate an emergency coordinator and emergency contacts for comprehensive emergency response and incident mitigation.

.4 Record keeping contractor is responsible for maintaining adequate records of handling, storing, and shipping of hazardous materials.

## 1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Transport hazardous materials and wastes in accordance with Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.

.1 When exporting hazardous waste to another country, ensure compliance with Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulations.

.4 Storage and Handling Requirements:

.1 Co-ordinate storage of hazardous materials with Contract Administrator and abide by internal requirements for labelling and storage of materials and wastes.

.2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.

.3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada (NFC) requirements.

.4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.

.1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.

.2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Contract Administrator.

.5 Transfer of flammable and combustible liquids is prohibited within buildings.

.6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.

.7 Solvents or cleaning agents: non-flammable or have flash point above 38 degrees C.

.8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.

.9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.

.10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:

.1 Store hazardous materials and wastes in closed and sealed containers.

.2 Label containers of hazardous materials and wastes in accordance with WHMIS.

.3 Store hazardous materials and wastes in containers compatible with that material or waste.

.4 Segregate incompatible materials and wastes.

.5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.

.6 Store hazardous materials and wastes in secure storage area with controlled access.

.7 Maintain clear egress from storage area.

.8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.

.9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.

.10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.

.11 When hazardous waste is generated on site:

.1 Co-ordinate transportation and disposal with Contract Administrator.

.2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.

.3 Use licensed carrier authorized by provincial authorities to accept subject material.

.4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material, and it is licensed to accept this material.

.5 Label container with legible, visible safety marks as prescribed by federal and provincial regulations.

.6 Only trained personnel handle, offer for transport, or transport dangerous goods.

.7 Provide photocopy of shipping documents and waste manifests to Contract Administrator.

.8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to Contract Administrator.

.9 Report discharge, emission, or escape of hazardous materials immediately to Contract Administrator and appropriate provincial authority. Take reasonable measures to control release.

.12 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.

.13 Report spills or accidents immediately to Contract Administrator. Submit a written spill report to Contract Administrator within 24 hours of incident.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

## Part 2 Products

### 2.1 MATERIALS

.1 Description:

.1 Bring on site only quantities hazardous material required to perform Work.

.2 Maintain WHMIS Safety Data Sheets (SDS) in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

.3 Sustainability Characteristics:

.1 Adhesives and Sealants in accordance with Section 07 92 00 - Joint Sealants].

.1 Adhesives and Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168 to GS-36.

.4 Spill Response Materials: provide spill response materials which can be used for absorbing/shoveling and containing hazardous materials.

.5 Provide personal protective equipment.

## Part 3 Execution

### 3.1 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.

.2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.

.3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.

.4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.

.5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.

.6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.

.7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.

.8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:

.1 Hazardous wastes recycled in manner constituting disposal.

.2 Hazardous waste burned for energy recovery.

.3 Lead-acid battery recycling.

.4 Hazardous wastes with economically recoverable precious metals.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 02 81 00 - Hazardous Materials

.2 09 85 00 – Concrete Resurfacing Lining and Coating

### 1.2 DEFINITIONS

.1 Application Specialist: An individual who performs surface preparation and application of protective coatings and linings to steel and concrete surfaces of complex industrial structures.

### 1.3 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 ASTM International (ASTM)

.1 ASTM C109/C109M, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. (50-mm) Cube Specimens)

.2 ASTM C157/C157M, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete

.3 ASTM C348, Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars

.4 ASTM C469/C469M, Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression

.5 ASTM C496/C496M, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens

.6 ASTM C596, Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement

.7 ASTM C779/C779M, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces

.8 ASTM C1202, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration

.3 International Concrete Repair Institute (ICRI)

.1 ICRI Concrete Repair Terminology

.4 NACE International (NACE)

.1 ANSI/NACE No. 13/SSPC-ACS-1, Industrial Coating and Lining Application Specialist Qualification and Certification

### 1.4 SECTION INCLUDES

.1 Work requirements for concrete restoration and waterproofing in accordance with Section 01 11 00 - Summary of Work including the following:

.1 Chipping and breaking out all deteriorated, spalled and delaminated concrete, defective cold joints, and the subsequent filling of voids, cracks and rebuilding of surface profiles.

.2 General surface preparation of all interior concrete wall and ceiling surfaces of tank structures.

.3 Water jetting of metal hatchway and ladder rungs clean of buildup including rust to sound substrate.

.4 Coating of interior wall and ceiling surfaces.

.5 Liner application.

.6 Quality control and assurance testing.

## 1.5 MEASUREMENTS AND PAYMENTS

.1 Measurement Procedures: in accordance with Section 01 29 00 - Payment Procedures

.1 Concrete restoration and coating will be measured in square metres.

## 1.6 ADMINISTRATIVE REQUIREMENTS

.1 Site Visit: Schedule a site visit with Contract Administrator to examine existing site conditions

## 1.7 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature, and data sheets and include product characteristics, performance criteria, physical properties, finish and limitations.

.3 Submit WHMIS Safety Data Sheet (SDS).

.1 Submit digital copies of WHMIS SDS.

.4 Submit a proposed work plan for approval by Contract Administrator. Work plan to include a list of materials and proposed plan to be implemented to perform the work.

.5 Submit a list of (5) jobs of a similar nature that the Contractor has completed within the previous 60 months, before signing of contract, for review by Contract Administrator.

.6 Certificates:

.1 Submit certifications for Application Specialists to demonstrate compliance to the requirements of ANSI/NACE No.13.

## 1.8 CLOSEOUT SUBMITTALS

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

## 1.9 QUALITY ASSURANCE

.1 Manufacturer's Instructions: submit manufacturer's application instructions, special handling criteria, and cleaning procedures.

.2 Provide testing results, inspection results, and reports for review by Contract Administrator and do not proceed without written approval when deviations from mix design or parameters are found.

.1 Submit in accordance with Section 01 43 00 - Quality Assurance.

.3 Qualifications:

.1 Ensure that 100% of lining application specialists, who perform concrete and steel surfaces preparation and coating applications, are certified by a recognized Applicator Certification Agency, in accordance with NACE 13/SSPC ACS-I, Applicator Certification Standard (ACS).

.2 Maintain a current and valid ACS certification during project period.

.1 Application specialists who perform surface preparation and coating application work on this project must have a current ACS.

.3 Notify Contract Administrator of any change in application specialist certification status.

.1 Any delays to the completion of the Project due to invalid certifications will not be considered.

**1.10 EXISTING CONDITIONS**

.1 Examine Site conditions and existing surfaces to be restored.

.2 Ensure tanks are isolated, drained, and mechanically locked out.

.3 Ensure all contaminants and debris are removed, and the tank walls, floor, and ceiling are clean and surfaces prepared according to Section 09 85 00 – Concrete Resurfacing Lining and Coating.

## Part 2 Products

**2.1 MATERIALS**

.1 Patching compound: as per approved products listed in Section 09 85 00 – Concrete Resurfacing Lining and Coating.

.2 Water: potable.

.3 Joint filler: extruded polyethylene, closed cell, Shore A hardness 20, tensile strength, 140 to 200 kPa, outsized 30 to 50%, CFC free.

.4 Abrasive materials: Not permitted.

**2.2 EQUIPMENT**

.1 Mobile, high performance HEPA Vacuum/Drumming System as follows:

.1 Two-stage positive filtration of hazardous particles.

.1 First Stage: Automatic self-cleaning by reverse-flow pulses of high-pressure air. Efficiency of 95% at 1 micron.

.2 Second Stage: HEPA efficiency of 99.7% at 0.3 microns.

.2 Controlled-seal drum fill system to allow filling, sealing, removal and waste drum replacement under controlled vacuum system.

.3 Automatic, full-drum level alarm.

.4 Vacuum system to be capable of completely removing waste slurry, refuse, and washdown water.

.2 Mobile evaporator system complete with oil separation system for dewatering waste slurry.

.3 One, or a combination of, the following:

.1 Corded electrically operated handheld SDS rotary hammer drill with carbide tipped bushing bit to pulverize protective coatings, laitance, and concrete substrate in a single process, leaving surface clean with uniformly keyed surface profile, ready to receive new concrete and protective coatings.

.2 Ultra-high pressure water jet system capable of producing:

.1 145 MPa (21,000 psi) water jet pressure.

.2 550 MPa (80,000 psi) washdown pressure.

.3 Water filtration system for water recycling.

to pulverize protective coatings, laitance, and concrete substrate in a single process, leaving surface clean with uniformly keyed surface profile, ready to receive new concrete and protective coatings.

## Part 3 Execution

### 3.1 SURFACE PREPARATION

.1 Remove protective coatings using equipment listed above and HEPA vacuum/drumming system.

.1 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.2 Remove drums from site and dispose of in accordance with the Federal, Provincial, and municipal regulations.

.2 Remove loose, spalled, cracked, eroded and disintegrated concrete to solid surface using equipment listed above.

.1 Removal to minimum 9 mm depth.

.2 If reinforcement is to be replaced increase minimum removal depth to 100mm.

.3 Concrete to reach a minimum pH of 9.0, with testing procedures as per Section 09 85 00 – Concrete Resurfacing Lining and Coating.

.4 If removal depth reached 127mm, stop work and notify Contract Administrator.

.3 Chisel under perimeter of areas to be patched.

.4 Waterjet loose rust and scale from exposed steel surfaces.

.5 Utilize dustless decontamination and surface preparation system for bush hammering concrete.

.6 Clean area of loose material, dirt, oil and scale.

.7 Clean cracks 6 mm thick or wider with pressurized water jet.

.8 Chip and break out all deteriorated concrete, existing delamination and defective cold joints to sound concrete.

.9 Chip concrete away from exposed rusted surfaces of reinforcing bars, chipping to extend for a distance as shown in drawings, or about 300 mm along the bars beyond evident rusting.

.1 If chipping operation results in a bar becoming debonded from the concrete, the concrete behind the debonded bar shall be cut out to a depth of at least 50 mm.

.2 If chipping operation extends into the sloped portion of the tank walls beyond what is called for in the drawings, stop and notify Contract Administrator.

.10 Rout out wall cracks wider than 1 mm to a minimum width and depth of 6 mm and clean free of dust and debris, for subsequent filling (after water jetting).

.11 Profile sound concrete surface to CSP 6 for improved repair bond adhesion.

.12 Beginning at the ceiling of the tank, washdown ceiling, walls, and floor in succession with a smooth pass with water pressure set to 550 MPa (80,000 psi).

.13 Evacuate water, slurry, and waste to mobile evaporator. Clean and prepare surface for repairs performing a re-washdown as required.

.14 Reference Section 09 85 00 – Concrete Resurfacing Lining and Coating for additional criteria.

## 3.2 WATER JETTING

.1 Provide temporary enclosure as required to limit contamination to within the boundaries of the work site.

.2 Use suitable equipment for heavy duty type with proper nozzles to provide adequate pressure and volume to efficiently and effectively prepare the surface.

.3 Protect main doors and other appurtenances either inserted in or adjoining the concrete being water jetted all times. Contractor is responsible for making good any damage at their own expense.

.4 Collect and remove all contaminated water and slurry from the site and process through mobile evaporator. Dispose of dry waste to an appropriate off-site facility identified by Contractor and approved by Contract Administrator.

## 3.3 MIXING

.1 Repair Compound:

.1 Mix components in accordance with manufacturer's written instructions.

.2 Mix quantities able to be applied within the specified timeframe to limit wastage and ensure mix does not exceed pot life.

.3 Use drill mixer to mechanically mix components. Ensure components are thoroughly mixed.

.4 Apply mix immediately.

.5 Dispose of unused mix immediately, do not retemper.

## 3.4 SURFACE REPAIRS

.1 Rebuild surface profile following surface preparation previously described, and repair as indicated in drawings.

.2 Apply repair compound in accordance with manufacturer's written instructions.

.3 Apply mix in successive 12 mm to 25 mm layers unless otherwise specified by the manufacturer.

.1 Ensure lifts are profiled to accept successive lifts. Do not profile final surface unless indicated.

.2 All previously embedded steel should be first thoroughly covered and slushed with brush coat before application of heavier trowel coat.

.4 Repair scaled or spalled concrete and missing corners deeper or greater than 6 mm with patching compound and bonding agent to render a regular flush surface.

.1 When rebuilding projecting concrete, such as cracked caps, key into existing concrete by means of edge cutting at a minimum depth of 20 mm.

.5 During rebuilding procedures, all surfaces to have a 3mm – 6mm microsilica mortar parge coat. Build out a minimum 25mm radius or 45° cant cove at all wall-to-wall, wall-to-floor, and wall-to roof transitions.

.6 Obtain third party quality control testing to perform adhesion tests to ASTM C1583 as specified in Section 09 85 00 – Concrete Resurfacing Lining and Coating. Report all findings to Contract Administrator.

.7 Protect other trades work and/or other prepared surfaces from patching material spills.

## 3.5 FINISH COATING INTERIOR APPLICATION

.1 Ensure surface is prepared to receive liner.

.2 Apply liner according to manufacturer recommendations and Section 09 85 00 – Concrete Resurfacing Lining and Coating.

.3 Obtain third party quality control testing to perform adhesion tests to ASTM DS7234 as specified in Section 09 85 00 – Concrete Resurfacing Lining and Coating. Report all findings to Contract Administrator.

## 3.6 SEALANT INSTALLATION

.1 Clean and dry joints before work starts.

.2 Insert joint filler where applicable to a depth of 1/2 joint width, minimum of 6 mm.

.3 Prime joints when recommended by sealant manufacturer.

.4 Apply sealant in accordance with manufacturer's instructions.

.5 Make surfaces smooth and concave.

## 3.7 INSPECTION

.1 Contract Administrator will inspect work for:

.1 Adherence to specific procedures and materials as listed in Section 09 85 00 – Concrete Resurfacing Lining and Coating.

.2 Final cleanliness and completion.

.3 Review of adhesion testing results.

.4 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

**3.8 CLEANING**

.1 Progress cleaning in accordance with Section 01 74 00 - Cleaning.

.2 Leave work area clean at end of each working day.

.3 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

.4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.5 Waste Management: separate waste materials 01 74 19 - Waste Management and Disposal.

**3.9 PROTECTION OF COMPLETED WORK**

.1 Protect adjacent finished work against damage which may be caused by on-going work.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 07 92 00 - Joint Sealants

### 1.2 DEFINITIONS

.1 Environmental Product Declaration (EPD): Third-party verified documentation with the supporting Product Category Rule (PCR) and Life cycle assessment information. Prepared in accordance with ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

.1 Industry-wide (generic) EPD with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator.

.2 Product-specific Type III EPD - Products with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator.

### 1.3 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 CSA Group (CSA)

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

.2 CAN/CSA O86, Engineering Design in Wood

.3 CSA O121, Douglas Fir Plywood

.4 CSA O141, Softwood Lumber

.5 CSA O151, Canadian Softwood Plywood

.6 CSA O153, Poplar Plywood.

.7 CSA S269.1, Falsework and Formwork

### 1.4 ADMINISTRATIVE REQUIREMENTS

.1 Preinstallation Meetings: in accordance with Section 01 31 19 - Project Meetings, convene preinstallation meeting one week before beginning concrete works.

.1 Ensure key personnel, site supervisor, testing laboratories, Contract Administrator, speciality contractor - finishing, forming attend.

.1 Verify Project requirements.

### 1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in formwork and coatings and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Submit digital copies of WHMIS SDS.

.3 Submit shop drawings for formwork.

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.

.2 Prepare Shop Drawings in accordance with CSA S269.1 for formwork.

.3 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.

.4 Indicate sequence of erection and removal of formwork as directed by Contract Administrator.

.5 When slip forming and flying forms are used, submit details of equipment and procedures for review by Contract Administrator.

.6 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts.

.7 Indicate sequence of erection and removal of formwork.

## 1.6 QUALITY ASSURANCE

.1 Quality Assurance: In accordance with Section 01 43 00 - Quality Assurance.

.2 Retain a professional engineer registered or licensed in Manitoba, Canada, with experience in formwork design of comparable complexity and scope, to perform following services as part of Work of this Section:

.1 Design of formwork.

.2 Review, stamp, and sign fabrication and erection Shop Drawings, design calculations and amendments.

.3 Conduct on-site inspections and prepare and submit inspection reports verifying this part of Work is in accordance with Contract Documents and reviewed Shop Drawings. Perform inspections a minimum of once per month.

## 1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect formwork from damages.

.4 Packaging Waste Management: Remove for reuse by manufacturer and return of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan

and Waste Reduction Workplan in accordance with Section 01 74 19 - Waste Management and Disposal.

## Part 2 Products

### 2.1 MATERIALS

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

.2 Do verification requirements in accordance with Section 01 33 29 - Sustainable Design Reporting.

.3 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA O121, CAN/CSA O86, CSA O437Series, CSA O153.

.4 Form ties:

.1 Removable, fixed or adjustable length, free of devices, leaving holes minimum 25 mm diameter in concrete surface.

.2 Plywood: high density overlay, medium density overlay, Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151, Poplar to CSA O153 or intended by the manufacturer.

.5 Form release agent: Proprietary, non-volatile material not to stain concrete or impair subsequent application of finishes or coatings to surface of concrete, derived from agricultural sources, non-petroleum containing, non-toxic, biodegradable, low VOC.

.6 Sealant: to Section 07 92 00 - Joint Sealants.

## Part 3 Execution

### 3.1 FABRICATION AND ERECTION

.1 Verify lines, levels, and centres before proceeding with formwork and ensure dimensions agree with drawings.

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

.3 Align form joints and make watertight.

.1 Keep form joints to minimum.

.4 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.

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

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

.7 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.

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

.9 When slip forming or flying forms are used, submit details as indicated in PART 1 - SUBMITTALS.

## 3.2 REMOVAL AND RESHORING

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

.1 2 days for walls and sides of beams.

.2 14 days for beam soffits, slabs, decks and other structural members, or 3 days when replaced immediately with adequate shoring to standard specified.

.2 Remove formwork when concrete has reached 70 % of its 28-day 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 subject to requirements of CSA A23.1/A23.2.

## 3.3 CLEANING

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

.2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 03 01 37 - Concrete Restoration.

.2 03 30 00 - Cast-In-Place Concrete

### 1.2 PRICE AND PAYMENT PROCEDURES

.1 Measurement and Payment:

.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 Contract Administrator.

.2 No measurement made under this Section.

.1 Include reinforcement costs in items of concrete work in Section 03 30 00 - Cast-In-Place Concrete.

### 1.3 DEFINITIONS

.1 Environmental Product Declaration (EPD): Third-party verified documentation with the supporting Product Category Rule (PCR) and Life cycle assessment information. Prepared in accordance with ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

.1 Industry-wide (generic) EPD with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator.

.2 Product-specific Type III EPD - Products with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator.

### 1.4 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 American Concrete Institute (ACI)

.1 SP-66-04, ACI Detailing Manual

.3 ASTM International (ASTM)

.1 ASTM A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished

.2 ASTM A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

.3 ASTM A143/A143M, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement

.4 ASTM A641/A641M, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

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

.6 ASTM A884/A884M, Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement

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

.4 CSA Group (CSA):

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

.2 CSA A283, Qualification code for concrete testing laboratories

.3 CAN/CSA A23.3, Design of Concrete Structures

.4 CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.

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

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

.5 Reinforcing Steel Institute of Canada (RSIC):

.1 RSIC, Reinforcing Steel Manual of Standard Practice

## 1.5 ADMINISTRATIVE REQUIREMENTS

.1 Preinstallation Meetings: In accordance with Section 01 31 19 - Project Meetings, convene preinstallation meeting one week before beginning concrete works.

.1 Ensure key personnel, site supervisor, Contract Administrator, concrete producer, speciality contractor - finishing, forming attend.

.1 Verify Project requirements.

## 1.6 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 When Chromate solution used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by Contract Administrator before its use.

.3 Submit digital copies of WHMIS Safety Data Sheet (SDS).

.3 Shop Drawings:

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

.1 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and SP-66.

.2 Indicate placing of reinforcement and:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

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

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

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

.4 Indicate position and size of openings in slabs and walls. Coordinate with trades requiring openings.

.4 Quality Assurance Submittals:

.1 Submit in accordance with Section 01 43 00 - Quality Assurance.

.2 Mill Test Report: Upon request, submit to Contract Administrator certified copy of mill test report of reinforcing steel, minimum 4 weeks before beginning reinforcing work.

.3 Upon request submit in writing to Contract Administrator proposed source of reinforcement material.

.4 Upon request submit to Contract Administrator epoxy coating applicator certificates identified in Quality Assurance.

## 1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.4 Handle, transport, store, and install epoxy coated reinforcing steel bars to prevent damage to coating. Prevent bar-to-bar abrasion and excessive sagging. Do not drop or drag bars. Store on suitable non-metallic supports. For lifting use nylon lifting slings, padded slings, separators or other means recommended by epoxy coated reinforcing steel supplier.

## Part 2 Products

### 2.1 PERFORMANCE CRITERIA

.1 Recycled Content: Provide reinforcing steel containing 80% post consumer recycled content.

### 2.2 MATERIALS

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

.2 Reinforcing Steel: Billet steel, grade 400, deformed bars to CSA G30.18 , unless indicated otherwise.

.3 Cold-drawn annealed steel wire ties: To ASTM A1064/A1064M.

.4 Deformed steel wire for concrete reinforcement: To ASTM A1064/A1064M.

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

.6 Chairs, bolsters, bar supports, spacers: to CSA A23.1/A23.2.

.7 Tie wire: 1.5 mm diameter annealed wire, epoxy coated.

.8 Mechanical splices: subject to approval of Contract Administrator.

.9 Plain Round Bars: To CSA G40.20/G40.21.

### 2.3 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2, SP-66 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.1 SP-66 unless indicated otherwise.

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

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

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

.1 Ship epoxy coated bars in accordance with ASTM A 775A/A 775M.

### 2.4 SOURCE QUALITY CONTROL

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

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

## Part 3 Execution

### 3.1 SITE BENDING

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

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

.3 Replace bars, which develop cracks or splits.

### 3.2 PLACING REINFORCEMENT

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

.2 Use plain round bars as slip dowels in concrete.

.1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.

.2 Apply thick even film of mineral lubricating grease when paint is dry.

.3 Before placing concrete, obtain Contract Administrator's approval of reinforcing material and placement.

.4 Maintain cover to reinforcement during concrete pour.

.5 Protect epoxy and paint coated portions of bars with covering during transportation and handling.

### 3.3 SITE TOUCH-UP

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

### 3.4 SITE QUALITY CONTROL

.1 Site tests: Conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.1 Epoxy coating.

.2 Reinforcing steel and welded wire fabric.

.2 Inspection and testing of reinforcing and reinforcing materials carried out by testing laboratory designated by Contract Administrator for review to CSA A23.1/A23.2.

.1 Ensure testing laboratory certified to CSA A283.

.3 Ensure test results distributed for discussion at pre-pouring concrete meeting between testing laboratory and Contract Administrator.

.4 The City will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.

.5 Inspection or testing by Contract Administrator not to augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.

## 3.5 CLEANING

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

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

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

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 03 01 37 - Concrete Restoration

.2 03 10 00 - Concrete Forming and Accessories

.3 03 20 00 - Concrete Reinforcing

.4 04 05 00 - Common Work Results for Masonry

### 1.2 PRICE AND PAYMENT PROCEDURES

.1 Measurement and Payment:

.1 Measurement Procedures: in accordance with Section 01 29 00 - Payment Procedures.

.2 Measure cast-in-place concrete in sub-structure in cubic metres calculated from neat dimensions as indicated and authorized in writing by Contract Administrator.

.1 Concrete placed beyond dimensions indicated not measured.

.3 No deductions made for volume of concrete displaced by reinforcing steel, structural steel, or piles.

.4 No deductions made for volume of concrete less than 0.1 $m^3$ in volume displaced by individual drainage openings.

.5 Cast-in-place concrete in superstructure not measured but paid for as fixed price item.

.6 Supply and installation of anchor bolts, nuts and washers and bolt grouting not measured but considered incidental to work.

### 1.3 ABBREVIATIONS AND ACRONYMS

.1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement types:

.1 GU, GUb, GUL and GULb - General use cement.

.2 MS, MSb and MSLB - Moderate sulphate-resistant cement.

.3 MH, MHb, MHL and MSLB - Moderate heat of hydration cement.

.4 HE, HEb, HEL and HELb- High early-strength cement.

.5 LH, LHb, LHL LHLb - Low heat of hydration cement.

.6 HS, HSb and HSLb - High sulphate-resistant cement.

.2 Fly ash types:

.1 F - with CaO content maximum 8%.

.2 CI - with CaO content 15 and 20%.

.3 CH - with minimum CaO content of 20%.

.3 Other Supplementary Cementitious Materials (SCM) types:

.1 S-GGBFS - Ground, granulated blast-furnace slag.

.2 N - Natural pozzolan.

.3 SF - Silica fume with minimum silicon dioxide (SiO ¨ ) content of 85%.

.4 SFI - Silica fume with silicon dioxide (SiO ¨ ) content between 75% and 85%.

.5 GL - Ground glass with maximum total alkali (NaEq) content of 4%.

.6 GH - Ground glass with total alkali (NaEq) content between 4% and 13%.

## 1.4 DEFINITIONS

.1 Environmental Product Declaration (EPD): Third-party verified documentation with the supporting Product Category Rule (PCR) and Life cycle assessment information. Prepared in accordance with ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

.1 Industry-wide (generic) EPD with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator.

.2 Product-specific Type III EPD - Products with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator.

.2 Supplementary Cementitious Materials (SCM)s: Materials added to concrete which contribute to the properties of hardened concrete through hydraulic or pozzolanic activity.

.3 Workability: The term Workability broadly describes the total properties and expectations for concrete delivered to site as follows:

.1 Individual tested properties of concrete that account for confined or free flow slump, penetration, compaction, or relative plasticity of various concrete mix designs used for the project.

.2 Overall properties involved with mixing, handling, transportation, and placement using vibratory compaction methods without loss of homogeneity of in-place concrete.

## 1.5 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 ASTM International (ASTM)

.1 ASTM C260/C260M, Standard Specification for Air-Entraining Admixtures for Concrete.

.2 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.3 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.

.4 ASTM C881/C881M, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

.5 ASTM C1017/C1017M, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.4 CSA Group (CSA)

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

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

.3 CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005),

## 1.6 ADMINISTRATIVE REQUIREMENTS

.1 Preinstallation Meetings: in accordance with Section 01 31 19 - Project Meetings, convene preinstallation meeting one week before beginning concrete works.

.1 Ensure key personnel, site supervisor, Contract Administrator, speciality contractor - finishing, forming attend.

.1 Verify project requirements.

## 1.7 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Samples:

.1 Not used

.4 Site Quality Control Submittals:

.1 Provide testing, inspection results and reports for review by Contract Administrator and do not proceed without written approval when deviations from mix design or parameters found.

.2 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - SITE QUALITY CONTROL.

.3 Concrete hauling time: provide for review by Contract Administrator deviations exceeding maximum allowable time of 120 minutes for concrete delivered to site of Work and discharged after batching.

## 1.8 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 43 00 - Quality Assurance.

.2 Provide Contract Administrator, minimum 4 weeks before starting concrete work, with valid and recognized certificate from plant delivering concrete.

.1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture meet specified requirements.

.3 At least 4 weeks before beginning Work, inform Contract Administrator of source of fly ash.

.1 Changing source of fly ash without written approval of Contract Administrator is prohibited.

.4 Minimum 4 weeks before starting concrete work, provide proposed quality control procedures for review by Contract Administrator on following items:

.1 Hot weather concrete.

.2 Cold weather concrete.

.3 Curing.

.4 Finishes.

.5 Formwork removal.

.6 Joints.

.5 Quality Control Plan: provide written report to Contract Administrator verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

## 1.9 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.2 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.

.1 Modifying maximum time limit without receipt of before written agreement from Contract Administrator, laboratory representative and concrete producer as described in CSA A23.1/A23.2 is prohibited.

.2 Deviations submitted for review by Contract Administrator.

.3 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2 .

.3 Packaging Waste Management: remove for reuse by manufacturer and return of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

## 1.10 SITE CONDITIONS

.1 Placing concrete during rain or weather events that could damage concrete is prohibited.

.2 Protect newly placed concrete from rain or weather events in accordance with CSA A23.1/A23.2 .

.3 Cold weather protection:

.1 Maintain protection equipment, in readiness on Site.

.2 Use such equipment when ambient temperature below 5°C, or when temperature may fall below 5°C before concrete cured.

.3 Placing concrete upon or against surface at temperature below 5°C is prohibited.

.4 Hot weather protection:

.1 Protect concrete from direct sunlight when ambient temperature above 27°C.

.2 Prevent forms of getting too hot before concrete placed. Apply accepted methods of cooling not to affect concrete adversely.

.5 Protect concrete from drying.

## Part 2 Products

### 2.1 DESIGN CRITERIA

.1 Alternative 1 - Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

### 2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Contract Administrator and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

.2 Provide supplementary cementitious materials and products that contribute to a 10 % reduction in the Global Warming Potential (GWP) against the listed GWP identified in the industry-wide EPD and a reduction in the environmental impact categories as measured through a cradle to gate scope.

.3 Provide supplementary cementitious materials and products that contribute to a maximum Global Warming Potential (GWP) of 200 kg CO ¨ per m ³ against the listed GWP identified in the industry-wide EPD and a reduction in the environmental impact categories as measured through a cradle to gate scope.

.4 Recycled Content: Use of supplementary cementitious materials that contribute to a ten 10 % reduction in the quantity of Portland cement by as part of a concrete mix design.

.1 Provide Supplementary Cementitious Materials (SCM) and products that contain or are sourced from processes that use post-consumer and pre-consumer recycled content.

### 2.3 MATERIALS

.1 Portland Cement: HS

.2 Water: potable to CSA A23.1.

.3 Aggregates: to CSA A23.1/A23.2 Non-reactive.

.4 Admixtures:

.1 Chemical admixture: to ASTM C 494, ASTM C 1017. Contract Administrator to approve accelerating or set retarding admixtures during cold and hot weather placing.

.5 Grout: Non premixed dry pack grout composition of non-metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 50 MPa at 28 days.

**2.4 MIXES**

.1 Alternative 1 - Performance Method for specifying concrete: to meet Contract Administrator performance criteria to CSA A23.1/A23.2 .

.1 Concrete supplier to meet performance criteria as established in drawings, and section E-13 of the Tender Documents. Provide verification of compliance as in Quality Control Plan.

**Part 3 Execution**

**3.1 PREPARATION**

.1 Obtain Contract Administrator's written approval before placing concrete.

.1 Provide 24 hours minimum notice before placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitate placing with minimum of re-handling, and without damage to existing structure or Work.

.4 Pumping of concrete permitted only after approval of equipment and mix.

.5 Disturbing reinforcement and inserts during concrete placement are prohibited.

.6 Before placing of concrete obtain Contract Administrator's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, workability, air content, temperature and test samples taken.

.8 In locations where new concrete dowelled to existing work, drill holes in existing concrete.

.1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.

.9 Do not place load upon new concrete until authorized by Contract Administrator.

**3.2 INSTALLATION/ APPLICATION**

.1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2 .

.2 Sleeves and inserts:

.1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Contract Administrator.

.2 Where approved by Contract Administrator, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.

.3 Sleeves and openings greater than 100 x 100 mm not indicated reviewed by Contract Administrator.

.4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Contract Administrator before placing concrete.

.5 Confirm locations and sizes of sleeves and openings shown on drawings.

.6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Finishing and curing:

.1 Finish concrete to CSA A23.1/A23.2 .

.2 As indicated in drawings.

## 3.3 SITE QUALITY CONTROL

.1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.1 Concrete pours.

.2 Slump.

.3 Air content.

.4 Compressive strength at 7, 28, and 56 days.

.5 Air and concrete temperature.

.2 Inspection and testing of concrete and concrete materials carried out by testing laboratory designated by Contract Administrator for review to CSA A23.1/A23.2.

.1 Ensure testing laboratory certified to CSA A283.

.3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Contract Administrator.

.4 The City will pay for costs of tests or as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.

.5 Contract Administrator will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2 .

.7 Inspection or testing by Contract Administrator not to augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.

## 3.4 CLEANING

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

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.1 Construction and Demolition Waste Management: prepare Construction Waste Management plan in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Divert unused concrete materials from landfill to local quarry facility after receipt of written approval from Contract Administrator.

.3 Provide appropriate area on job site where concrete trucks and be safely washed.

.4 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Contract Administrator.

.5 Disposal of unused admixtures and additive materials, concrete, concrete wash water, or cleaning materials and residues into sewer systems, into lakes, streams, onto ground or in other location to pose health or environmental hazard is prohibited. Provide mobile evaporator or centrifuge for wastewater and slurry.

.6 Prevent admixtures and additive materials from entering drinking water supplies or streams.

.7 Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal.

.8 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 03 01 37 - Concrete Restoration

.2 03 30 00 - Cast-in-place Concrete

.3 07 92 00 - Joint Sealants

.4 09 85 00 - Concrete Resurfacing Lining and Coating Specifications

### 1.2 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 ASTM International (ASTM)

.1 ASTM C309, Liquid Membrane-Forming Compounds for Curing Concrete

.2 ASTM D7234, Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Adhesion Testers.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-25.20, Surface Sealer for Floors

.4 CSA Group (CSA)

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

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit digital WHMIS Safety Data Sheet (SDS) in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

.3 Include application instructions for concrete floor treatment.

.3 Samples:

.1 Not used

### 1.4 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 43 00 - Quality Assurance.

.2 Minimum 4 weeks prior to starting concrete finishing work, provide proposed quality control procedures for review by Contract Administrator on following items:

.1 Hardening.
.2 Sealing.
.3 Curing.
.4 Finishes.

**1.5 DELIVERY, STORAGE, AND HANDLING**

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

.2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name, and address.

.3 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

**1.6 SITE CONDITIONS**

.1 Temporary lighting: Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40m $^2$ of floor being treated.

.2 Electrical power: Provide sufficient electrical power to operate equipment normally used during construction.

.3 Work area: Make work area watertight protected against rain and detrimental weather conditions.

.4 Temperature: Maintain minimum 10 degrees C ambient temperature for 7 days before installation and minimum 48 hours after completion of work and maintain relative humidity maximum 40 % during same period.

.5 Moisture: Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.

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

.7 Ventilation:

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

**Part 2 Products**

**2.1 PERFORMANCE REQUIREMENTS**

.1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.

.2 Submit written declaration that all components used are compatible as a system and will not adversely affect finished flooring products and their installation adhesives.

.3 Products to be selected from approved list in 09 85 00 - Concrete Resurfacing Lining and Coating Specifications

**2.2 CURING COMPOUNDS**

.1 Waterborne membrane forming curing membrane to ASTM C 309 , Type 1 Class B.

.1 Verify compatibility with subsequent finishes.

**2.3 MIXES**

.1 Mixing ratios in accordance with manufacturer's written instructions.

**Part 3 Execution**

**3.1 EXAMINATION**

.1 Verify slab/substrate surfaces, and site conditions are ready to receive work as indicated on shop drawings and recommended by manufacturer's written instructions.

**3.2 APPLICATION**

.1 Apply floor treatment in accordance with manufacturer's written instructions and Section 09 85 00 - Concrete Resurfacing Lining and Coating.

.2 Test flooring adhesion to ASTM D7234 as specified in Section 09 85 00 – Concrete Resurfacing Lining and Coating.

**3.3 CLEANING**

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

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

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

**3.4 PROTECTION**

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

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 03 20 00 - Concrete Reinforcing

.2 03 30 00 - Cast-in-Place Concrete

.3 09 85 00 – Concrete Resurfacing Lining and Coating

### 1.2 DEFINITIONS

.1 Two basic shotcreting processes are:

.1 Dry mix process where mix water is added at nozzle.

.2 Wet mix process where mix water is added before concrete enters delivery hose, and compressed air is added at nozzle.

.2 Overspray: shotcrete material deposited away from intended receiving surface.

.3 Application Specialist: An individual who performs surface preparation and application of protective coatings and linings to steel and concrete surfaces of complex industrial structures.

### 1.3 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 American Concrete Institute (ACI)

.1 ACI 506R, Guide to Shotcrete.

.2 ACI 506.2, Specification for Shotcrete.

.3 ACI Certified Shotcrete Nozzleman.

.3 ASTM International (ASTM)

.1 ASTM C42/C42M, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

.2 ASTM C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

.3 ASTM C642, Standard Test Method for Density, Absorption, and Voids in Hardened Concrete.

.4 ASTM C1116, Standard Specification for Fibre-Reinforced Concrete.

.5 ASTM C1202, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-3.3, Kerosene.

.5 CSA Group (CSA)

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

.6 Ontario Provincial Standard Specifications (OPSS)

.1 OPSS 1312, Material Specification for Latex Modifiers for use in Concrete.

.7 NACE International

.1 ANSI/NACE No. 13/SSPC-ACS-1, Industrial Coating and Lining Application Specialist Qualification and Certification.

## 1.4 MEASUREMENT AND PAYMENT

.1 Method 1: measure shotcrete in place, in cubic metres of shotcrete incorporated into work.

.2 Following items will not be measured for payment:

.1 Testing procedures.
.2 Surface preparation.
.3 Removal, disposal and replacement of defective concrete.
.4 Provision of reinforcement.
.5 Anchor bolts.
.6 Clean-up procedures.
.7 Scaffolding.
.8 Protective coating.

## 1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for shotcrete and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.

.4 Certificates:

.1 Submit certifications for Application Specialists to demonstrate compliance to the requirements of ANSI/NACE No.13 .

## 1.6 QUALIFICATIONS

.1 Use operators of equipment for mixing and application of shotcrete experienced in process to be used.

.2 Operators: qualified to perform work to ACI 506R.

.3 Foremen: minimum 5 years experience as ACI Certified Shotcrete Nozzleman.

.4 ACI Certified Shotcrete Nozzleman: minimum 2 years experience on similar applications.

.5 Ensure that 100 % of industrial coating specialists persons, who perform concrete and steel surfaces preparation and coating applications, are certified by a recognized Applicator Certification Agency, in accordance with NACE 13 /SSPC ACS-I , Applicator Certification Standard (ACS).

.6 Maintain a current and valid ACS certification during project period.

.1 Application specialists who perform surface preparation and coating application work on this project must have a current ACS.

.7 Notify Contract Administrator of any change in application specialist certification status.

.1 Any delays to the completion of the Project due to invalid certifications will not be considered, and liquidated damages shall not be waived for any non-performance by Contractor.

**1.7 DELIVERY, STORAGE AND HANDLING**

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

## Part 2 Products

**2.1 MATERIALS**

.1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

**2.2 EQUIPMENT**

.1 Shotcrete equipment for wet mix process to ACI 506R.

.2 Batching equipment to proportion aggregate and cement mixtures on mass basis or by integral cement bag count and sand measured on volume basis.

.3 Use air supply system that delivers air uncontaminated by oil and capable of maintaining constant air pressure.

.4 Provide separate air hose and blow pipe, capable of simultaneous operation with shotcreting operation, for removal of rebound and dust.

.5 Equipment subject to approval of Contract Administrator.

.1 Maintain equipment in proper working order.

.2 Provide additional test panels and test cores as required by Contract Administrator to demonstrate that equipment is functioning properly during shotcreting operation.

**2.3 MIXES**

.1 Proportion concrete for wet process shotcrete to: CSA A23.1/A23.2, and performance as indicated in drawings.

**2.4 SOURCE QUALITY CONTROL**

.1 Pre-construction testing procedures to ACI 506.2.

.2 Make one test panel for each shooting position for each mix being considered for use on Project. Repeat for each nozzleman to be employed on Project.

.3 Provide (4) cores from each test panel to testing laboratory designated by Contract Administrator.

**Part 3 Execution**

**3.1 PREPARATION**

.1 Prepare surfaces for shotcreting to ACI 506R.

.2 Remove unsound concrete with equipment approved by Contract Administrator. Remove only in areas and to depths as directed by Contract Administrator and as indicated.

.3 After acceptance of surface by Contract Administrator, water jet surfaces including existing reinforcing steel. Remove dirt, grease, oil or other substances which would interfere with bond of newly placed shotcrete.

.4 Install reinforcement as indicated on drawings.

.5 Clean, wet and damp dry surfaces just before application of shotcrete.

**3.2 APPLICATION**

.1 Apply shotcrete to prepared surfaces to ACI 506R.

.2 Do not apply shotcrete to surface having running or free standing water.

.3 Apply shotcrete to build concrete surface to finished lines. Acceptable minus tolerance of finished surfaces is 3 mm. Provide minimum cover over steel reinforcement as indicated in the drawings.

.4 Use depth gauges or depth probes in accordance with ACI 506R as guide to obtain correct thickness of shotcrete.

.5 Screed or finish surface of shotcrete.

.6 Protect adjacent surfaces from shotcrete and rebound during operations and clean up material deposited.

.7 During application continuously remove rebound from surfaces.

.8 Do not reuse rebound or overspray material.

## 3.3 SITE QUALITY CONTROL

.1 Construction testing and acceptance of results to ACI 506.2 and as indicated.

.2 Test panels to ACI 506.2.

.3 Site cure panels in same manner as Work to ACI 506.2.

.4 Remove and replace shotcrete in areas where hollow spots, segregation, honeycombing, laminations, dry patches, slugs, voids or sand pockets occur, as directed by Contract Administrator.

## 3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

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

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

.2 Divert unused plasticizers, water-reducing agents and air-entraining agent materials from landfill to an official hazardous material collections site as approved by Contract Administrator.

.3 Unused plasticizers, water-reducing agents and air-entraining agents materials must not be disposed of into the sewer systems, into lakes, streams, onto the ground or in any other location where it will pose a health or environmental hazard.

## 3.5 PROTECTION

.1 Cure and protect finished surfaces to ACI 506.2.

.2 Apply 2 coats of protective coating consisting of mixture containing 50% boiled linseed oil and 50% kerosene by volume. Ensure protective coating is compatible with subsequent finishes. Notify Contract Administrator if incompatibility exists for further direction.

.3 First application: 135 mL/$m^2$ ; second application: 90 mL/$m^2$ .

.4 Apply to clean dry surface when air temperature is above 10 degrees C.

.1 Apply second coat only when previous coat is thoroughly dried.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 03 30 00 - Cast-in-Place Concrete

.2 04 05 13 - Masonry Mortar and Grout

.3 04 05 19 - Masonry Anchorage and Reinforcing

.4 04 05 23 - Masonry Accessories

### 1.2 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 CSA Group (CSA)

.1 CAN/CSA-A165 Series, CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).

.2 CAN/CSA-A179, Mortar and Grout for Unit Masonry.

.3 CAN/CSA-A371, Masonry Construction for Buildings.

.3 International Masonry Industry All-Weather Council (IMIAC)

.1 Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

### 1.3 ADMINISTRATIVE REQUIREMENTS

.1 Preinstallation meetings: comply with Section 01 31 19 - Project Meetings. Conduct preinstallation meeting one week before commencing work of this Section and on-site installations to:

.1 Verify project requirements.

.2 Verify substrate conditions.

.3 Coordinate products, installation methods and techniques.

.4 Sequence work of related sections.

.5 Coordinate with other building subtrades.

.6 Review manufacturer's installation instructions.

.7 Review masonry cutting operations, methods and tools and determine worker safety and protection from dust during cutting operations.

.8 Review warranty requirements.

.2 Sequencing: sequence with other work. Comply with manufacturer's written recommendations for sequencing construction operations.

### 1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for masonry and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit digital copies of WHMIS SDS.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.

.2 Submit shop drawings detailing temporary bracing required, designed to resist lateral forces during installation.

.4 Certificates: submit manufacturer's product certificates certifying materials comply with specified requirements.

.5 Test and Evaluation Reports:

.1 Submit certified test reports in accordance with Section 01 29 83 - Payment Procedures for Testing Laboratory Services.

.2 Test reports to certify compliance of masonry units and mortar ingredients with specified performance characteristics and physical properties.

.3 Submit data for masonry units, in addition to requirements set out in referenced CSA and ASTM Standards, indicating initial rates of absorption.

## 1.5 CLOSEOUT SUBMITTALS

.1 Submit manufacturer's instructions for care, cleaning and maintenance of prefaced masonry units for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

## 1.6 EXTRA MATERIALS

.1 Submit manufacturer's instructions in accordance with Section 01 78 00 - Closeout Submittals covering maintenance requirements and parts catalogue, with cuts and identifying numbers.

## 1.7 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect material packages from nicks, scratches, and blemishes.

.3 Keep materials dry until use except where wetting of bricks is specified.

.4 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

.5 Replace defective or damaged materials with new.

**1.8 SITE CONDITIONS**

.1 Ambient Conditions: assemble and erect components when temperatures are above 10 degrees C.

.2 Cold weather requirements:

.1 To CAN/CSA-A371 with following requirements.

.1 Maintain temperature of mortar between 5 degrees C and 50 degrees C until batch is used or becomes stable.

.2 Maintain ambient temperature of masonry work and it's constituent materials between 5 degrees C and 50 degrees C and protect site from windchill.

.3 Maintain temperature of masonry above 0 degrees C for minimum of 7 days, after mortar is installed.

.4 Preheat unheated wall sections in enclosure for minimum 72 hours above 10 degrees C, before applying mortar.

.2 Hot weather requirements:

.1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

.2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.

.3 Spray mortar surface at intervals and keep moist for maximum of 3 days after installation.

**1.9 WARRANTY**

.1 For Work in this Section 04 05 00 - Common Work Results for Masonry, 12 months warranty period is extended to 24 months.

**Part 2 Products**

**2.1 MATERIALS**

.1 Masonry materials are specified elsewhere in related Sections:

.1 04 22 00 - Concrete Unit Masonry.

**Part 3 Execution**

**3.1 INSTALLERS**

.1 Experienced and qualified masons with minimum (5) years of experience with similar projects to carry out erection, assembly and installation of masonry work.

**3.2 EXAMINATION**

.1 Examine conditions, substrates and work to receive work of this Section.

.2 Examine openings to receive masonry units. Verify opening size, location, and that opening is square and plumb, and ready to receive work of this Section.

.1 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

.2 Proceed with installation after unacceptable conditions have been remedied and after receipt of written approval from Contract Administrator.

.3 Verification of Conditions:

.1 Verify that:

.1 Substrate conditions which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions before installation of concrete block.

.2 Site conditions are acceptable and are ready to receive work.

.3 Built-in items are in proper location, and ready for roughing into masonry work.

.2 Commencing installation means acceptance of existing substrates.

**3.3 PREPARATION**

.1 Surface Preparation: prepare surface in accordance with manufacturer's written recommendations and coordinate with Section 01 71 00 - Examination and Preparation.

.2 Establish and protect lines, levels, and coursing.

.3 Protect adjacent materials from damage and disfiguration.

**3.4 INSTALLATION**

.1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise

.2 Build masonry plumb, level, and true to line, with vertical joints in alignment, respecting construction tolerances permitted by CAN/CSA-A371

.3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

**3.5 CONSTRUCTION**

.1 Exposed masonry:

.1 Remove chipped, cracked, and otherwise damaged units, in accordance with CAN/CSA-A165, in exposed masonry and replace with undamaged units.

.2 Jointing:

.1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints where concave joints are indicated.

.3 Cutting:

.1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.

.2 Make cuts straight, clean, and free from uneven edges.

.4 Building-In:

.1 Build in items required built into masonry.

.2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.

.3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.

.5 Wetting of bricks:

.1 Except in cold weather, wet bricks having initial rate of absorption exceeding 1 g/minute/1000 mm²: wet to uniform degree of saturation, 3 to 24 hours before laying, and do not lay until surface dry.

.2 Wet tops of walls built of bricks qualifying for wetting, when recommencing work on such walls.

.6 Support of loads:

.1 Use 25 MPa concrete to Section 03 30 00 - Cast-in-Place Concrete, where concrete fill is used instead of solid units.

.2 Use grout to CAN/CSA-A179 where grout is used instead of solid units

.3 Install building paper below voids to be filled with concrete; keep paper 25 mm back from faces of units.

.7 Provision for movement:

.1 Leave 3 mm space below shelf angles.

.2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.

.3 Built masonry to tie in with stabilizers, with provision for vertical movement.

.8 Loose steel lintels:

.1 Install loose steel lintels. Center over opening width.

.9 Control joints:

.1 Construct continuous control joints as indicated.

.10 Movement joints:

.1 Build-in continuous movement joints as indicated.

.11 Interface with other work:

.1 Cut openings in existing work as indicated.

.2 Openings in walls: approved by Contract Administrator.

.3 Make good existing work. Use materials to match existing.

## 3.6 SITE TOLERANCES

.1 Tolerances in notes to CAN/CSA-A371 apply

## 3.7 SITE QUALITY CONTROL

.1 Site Tests, Inspection:

.1 Perform site inspection and testing in accordance with Section 01 45 00 - Quality Control.

.2 Notify inspection agency minimum of 24 hours in advance of requirement for tests.

.2 Manufacturer's Services:

.1 Schedule site visits to review work as installation is about to begin.

.2 Schedule site visits to review work at stages listed:

.1 Twice during progress of work at 25% and 60% complete.

.2 Upon completion of work, after cleaning is carried out.

.3 Obtain reports within 3 days of review and submit immediately to Contract Administrator.

**3.8 CLEANING**

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

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

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

**3.9 PROTECTION**

.1 Temporary Bracing:

.1 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

.2 Bracing approved by Contract Administrator.

.3 Brace masonry walls as necessary to resist wind pressure and lateral forces during construction.

.2 Moisture Protection:

.1 Keep masonry dry using waterproof, non staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until completed and protected by flashing or other permanent construction.

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

.3 Air Temperature Protection: protect completed masonry as recommended in 1.9, SITE CONDITIONS.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 04 05 00 - Common Work Results for Masonry

### 1.2 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 CSA Group (CSA)

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

.2 CAN/CSA-A179, Mortar and Grout for Unit Masonry.

.3 CAN/CSA-A371, Masonry Construction for Buildings.

.4 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.3 International Masonry Industry All-Weather Council (IMIAC)

.1 Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

.4 South Coast Air Quality Management District (SCAQMD)

.1 SCAQMD Rule 1168, Adhesive and Sealant Applications.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for masonry mortar and grout and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit digital copies of WHMIS SDS in accordance with Section.

.3 Manufacturers' Instructions: submit manufacturer's installation instructions.

### 1.4 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties, and in accordance with Section 04 05 00 - Common Work Results for Masonry.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

**1.5 DELIVERY, STORAGE AND HANDLING**

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 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 masonry mortar and grout packages from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

**1.6 SITE CONDITIONS**

.1 Ambient Conditions: maintain materials and surrounding air temperature to:

.1 Minimum 10 degrees C prior to, during, and 48 hours after completion of masonry work.

.2 Maximum 32 degrees C prior to, during, and 48 hours after completion of masonry work.

.2 Weather Requirements: CAN/CSA-A371

**Part 2 Products**

**2.1 MATERIALS**

.1 Use same brands of materials and source of aggregate for entire project.

.2 Cement:

.1 Portland Cement: to CAN/CSA-A3000, MS - Moderate sulphate-resistant hydraulic cement (Type 20)

.1 Use low VOC products in compliance with SCAQMD Rule 1168.

.2 Masonry Cement: to CAN/CSA-A3002 and CAN/CSA-A179, Type S.

.3 Mortar Cement: to CAN/CSA-A3002 and CAN/CSA-A179, Type S.

.1 Use low VOC products in compliance with SCAQMD Rule 1168.

.4 Packaged Dry Combined Materials for mortar: to CAN/CSA-A179, Type S.

.3 Aggregate: supplied by one supplier.

.1 Fine Aggregate: to CAN/CSA-A179, natural sand, manufactured sand, or silica sand.

.2 Course Aggregate: to CAN/CSA-A179

.4 Water: clean and potable.

**2.2 MORTAR MIXES**

.1 Mortar for interior masonry:

.1 Non-Load Bearing: type S.

**2.3 MORTAR MIXING**

.1 Use pre-blended, pre-coloured mortar prepackaged under controlled factory conditions. Ingredients batching limitations to within 1% accuracy.

.2 Mix mortar ingredients in accordance with CAN/CSA-A179 in quantities needed for immediate use

.3 Maintain sand uniformly damp immediately before mixing process.

.4 Using anti-freeze compounds including calcium chloride or chloride based compounds is prohibited.

.5 Adding air entraining admixture to mortar mix is prohibited.

.6 Use a batch type mixer in accordance with CAN/CSA-A179

.7 Pointing mortar: prehydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into ball. Allow to stand for not less than 1 hour no more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.

.8 Re-temper mortar only within two hours of mixing, when water is lost by evaporation.

.9 Use mortar within 2 hours after mixing at temperatures of 32 degrees C, or 2-1/2 hours at temperatures under 10 degrees C.

**2.4 GROUT MIXES**

.1 Bond Beams: grout mix 20 MPa strength at 28 days; 200-250 mm slump; premixed type in accordance with CSA A23.1/A23.2.

.2 Lintels: grout mix 20 MPa strength at 28 days; 200-250 mm slump; premixed type in accordance with CSA A23.1/A23.2.

.3 Grout: Minimum compressive strength of 20 MPa at 28 days. Maximum aggregate size and grout slump: CAN/CSA-A179

**2.5 GROUT MIXING**

.1 Mix batched and delivered grout in accordance with CSA A23.1/A23.2 transit mixed

.2 Mix grout ingredients in quantities needed for immediate use in accordance with CAN/CSA-A179.

.3 Add admixtures in accordance with manufacturer's instructions; mix uniformly.

.4 Using calcium chloride or chloride based admixtures is prohibited.

**2.6 MIX TESTS**

.1 Testing Mortar Mix:

.1 Test mortar to requirements of Section 01 45 00 - Quality Control, and in accordance with CAN/CSA-A179, for mortar based on property specification and proportion specification. Test prior to construction and during construction for:

.1 Compressive strength.

.2 Consistency.

.3 Mortar aggregate ratio.

.4 Sand/cement ratio.

.5 Water content and water/cement ratio.

.6 Air content.

.7 Splitting tensile strength.

.2 Testing Grout Mix:

.1 Test grout to requirements of Section 01 45 00 - Quality Control, and in accordance with CAN/CSA-A179, for grout based on property specification and proportion specification. Test prior to construction and during construction for:

.1 Compressive strength.

.2 Sand/cement ratio.

.3 Water content and water/cement ratio.

.4 Slump.

## Part 3 Execution

### 3.1 EXAMINATION

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

.1 Visually inspect substrate in presence of Contract Administrator.

.2 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Contract Administrator.

### 3.2 PREPARATION

.1 Plug clean-out holes with block masonry units. Brace masonry for wet grout pressure.

### 3.3 CONSTRUCTION

.1 Do masonry mortar and grout work in accordance with CAN/CSA-A179 except where specified otherwise

### 3.4 MIXING

.1 Pointing mortar can be mixed using a regular paddle mixer. Only electric motor mixers are permissible. Mixers run on hydrocarbons are not permitted, due to fumes.

.2 Clean mixing boards and mechanical mixing machine between batches.

.3 Mortar: equal to or weaker than units it is binding.

.4 Contractor to appoint one individual to mix mortar, for duration of project. In event that this individual is changed, mortar mixing must cease until new individual is trained, and mortar mix is tested.

## 3.5 MORTAR PLACEMENT

.1 Install premix mortar to manufacturer's instructions.

.2 Install mortar to requirements of CAN/CSA-A179

.3 Remove excess mortar from grout spaces.

## 3.6 GROUT PLACEMENT

.1 Install grout in accordance with manufacturer's instructions.

.2 Install grout in accordance with CAN/CSA-A179

.3 Work grout into masonry cores and cavities to eliminate voids.

.4 Installing grout in lifts greater than 400 mm, without consolidating grout by rodding is prohibited.

.5 Displacing reinforcement while placing grout is prohibited.

## 3.7 FIELD QUALITY CONTROL

.1 Site Tests, Inspection: in accordance with Section 04 05 00 - Common Work Results for Masonry supplemented as follows:

.1 Test and evaluate mortar prior to construction and during construction in accordance with CAN/CSA-A179

.2 Test and evaluate grout prior to construction and during construction to CAN/CSA-A179; test in conjunction with masonry unit sections specified

## 3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Remove droppings and splashings using clean sponge and water.

.3 Clean masonry with low pressure clean water and soft natural bristle brush.

.4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

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

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

**3.9 PROTECTION**

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

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 04 05 00 - Common Work Results for Masonry

### 1.2 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A36/A36M, Standard Specification for Carbon Structural Steel.

.2 ASTM A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.3 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

.4 ASTM A580/A580M, Standard Specification for Stainless Steel Wire.

.5 ASTM A641/A641M, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

.6 ASTM A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

.7 ASTM A1022, Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement.

.3 CSA Group (CSA)

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

.2 CAN/CSA-A179, Mortar and Grout for Unit Masonry.

.3 CAN/CSA-A370, Connectors for Masonry.

.4 CAN/CSA-A371, Masonry Construction for Buildings.

.5 CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.

.6 CSA S304, Design of Masonry Structures.

.7 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC)

.1 Reinforcing Steel Manual of Standard Practice.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for anchorage and reinforcing materials and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit digital copies of WHMIS SDS.

.3 Shop Drawings:

.1 Submit drawings detailing bar bending details, anchorage details lists and placement drawings

.2 On placement drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.

**1.4 QUALITY ASSURANCE**

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties, and in accordance with Section 04 05 00 - Common Work Results for Masonry.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

**1.5 SITE MEASUREMENTS**

.1 Make site measurements necessary for proper fit of members.

**1.6 DELIVERY, STORAGE AND HANDLING**

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 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 anchorage and reinforcing materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 MATERIALS**

.1 Bar reinforcement: Steel to CAN/CSA-A371and CSA G30.18 , Grade 400.

.2 Connectors: to CAN/CSA-A370 and CSA S304.1

.3 Fasteners: installed post-construction:

.1 Bolts and Screws: size and type to suit application, locate where indicated.

.2 Nails: case-hardened cut or spiral nails, size and type to suit fastening application.

.3 Powder-Driven Fasteners: pin styles and lengths to suit fastening application in accordance with manufacturers use, load and hold recommendations.

.4 Adhesives : epoxies, mastics and contact cements for fastening applications, use in accordance with manufacturers' recommendations.

.4 Ties

.1 Joint Reinforcement Ties: CSA A371 with corrosion protection to CSA S304 and CSA A370 :

.1 Single Wythe Joint Reinforcement: truss type:

.1 Steel wire, hot dip galvanized: to ASTM A 641.

.2 Cold drawn steel wire.

.5 Anchors: to CAN/CSA-A370 :

.1 Conventional Anchors: type steel bolts with bent bar anchors, shape J, sized to suit application.

.2 Post-Installed Anchors: Threaded rod to ASTM A36 Grade 36 c/w Hilti Hit-Hy 200 V3 or approved equivalent. Minimum 150 embedment.

.3 Spiral Anchors: 8 mm stainless steel spiral anchors to Grade 304.

.6 Conventional Bolts:

.1 Bolts: to ASTM A36, bar stock shop threaded, straight bolts with square or hex-headed nuts, bent bar anchors, L shaped.

.2 Plate anchors: steel to ASTM A36, weld square of circular steel plate perpendicular to axis of steel bar threaded on opposite end

.3 Through bolt rods: to ASTM A307 threaded rod or threaded ASTM A36 bar stock

**2.2 FABRICATION**

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

.2 Fabricate connectors in accordance with CAN/CSA-A370.

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

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

.5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

**2.3 SOURCE QUALITY CONTROL**

.1 Upon request, provide Contract Administrator with certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcement work.

.2 Upon request, inform Contract Administrator of proposed source of supplied material.

## Part 3 Execution

**3.1 EXAMINATION**

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for anchorage and reinforcing materials installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Contract Administrator.

.2 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions remedied and after receipt of written approval to proceed from Contract Administrator.

**3.2 PREPARATION**

.1 Direct and coordinate placement of metal anchors for masonry supplied to other Sections.

**3.3 INSTALLATION**

.1 Supply and install masonry connectors and reinforcement in accordance with CAN/CSA-A370 , CAN/CSA-A371 , CSA A23.1/A23.2 and CSA S304.1 unless indicated otherwise

.2 Prior to placing concrete/mortar/grout, obtain Contract Administrator's approval of placement of reinforcement.

**3.4 BONDING AND TYING**

.1 Install unit, adjustable, single wythe and multiple wythe joint reinforcement where indicated and in accordance with CAN/CSA-A370and CAN/CSA-A371 and manufacturer's instructions.

.1 Install masonry in running bond pattern.

.2 Install horizontal joint reinforcement 400 mm on centre.

.3 Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 400 mm each side of opening.

.4 Place joint reinforcement continuous in first and second joint below top of walls.

.5 Lap joint reinforcement ends minimum 150 mm.

**3.5 REINFORCED LINTELS AND BOND BEAMS**

.1 Reinforce masonry beams, masonry lintels and bond beams as indicated.

.2 Place and grout reinforcement in accordance with CSA S304.1, CAN/CSA-A371, and CAN/CSA-A179.

.3 Support and position reinforcing bars in accordance with CAN/CSA-A371

**3.6 GROUTING**

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

**3.7 ANCHORS**

.1 Supply and install metal anchors.

**3.8 LATERAL SUPPORT AND ANCHORAGE**

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

**3.9 MOVEMENT JOINTS**

.1 Reinforcement not continuous across movement joints unless otherwise indicated.

**3.10 FIELD BENDING**

.1 Do not field bend reinforcement and connectors except where indicated or authorized by Contract Administrator.

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

.3 Replace bars and connectors with cracks or splits.

**3.11 FIELD QUALITY CONTROL**

.1 Site inspections in accordance with Section 04 05 00 - Common Work Results for Masonry.

.2 Obtain Contract Administrator approval of placement of reinforcement and connectors, prior to placing mortar/grout.

**3.12 FIELD TOUCH-UP**

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

**3.13 CLEANING**

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

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

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

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 04 05 00 - Common Work Results for Masonry

### 1.2 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 ASTM International

.1 ASTM D 2240, Standard Test Method for Rubber Property - Durometer Hardness.

.3 CSA Group (CSA)

.1 CAN/CSA-A371, Masonry Construction for Buildings.

.4 International Organization for Standardization (ISO)

.1 ISO 14021, Environmental Labels and Declarations - Self Declared Environmental Claims (Type II Environmental Labelling).

.5 South Coast Air Quality Management District (SCAQMD)

.1 SCAQMD Rule 1168, Adhesive and Sealant Applications.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for masonry accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Indicate on drawings:

.1 Flashing, installation details, sizes, spacing, location and quantities of fasteners.

### 1.4 QUALITY ASSURANCE

.1 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.2 Manufacturer's Instructions: submit manufacturer's instructions as follows:

.1 Submit installation instructions for fillers, adhesives, vents, screens, and flashings.

### 1.5 SITE MEASUREMENTS

.1 Make site measurements necessary to ensure proper fit of members.

**1.6 DELIVERY, STORAGE AND HANDLING**

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect masonry accessories from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 MATERIALS**

.1 Movement joint filler: purpose-made elastomer to ASTM D 2240 of size and shape indicated

.1 Use low VOC products in compliance with SCAQMD Rule 1168.

.2 Material type: fibre board.

.2 Lap adhesive: recommended by masonry flashing manufacturer. Use low VOC products.

.3 Weep hole vents: purpose-made PVC.

**2.2 MOISTURE CONTROL**

.1 Weep Hole Vents: PVC.

**2.3 FLASHINGS**

.1 Sheet metal: galvanized steel.

**Part 3 Execution**

**3.1 EXAMINATION**

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

.1 Visually inspect substrate in presence of Contract Administrator.

.2 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions remedied and after receipt of written approval to proceed from Contract Administrator.

**3.2 INSTALLATION: MATERIALS**

.1 Install continuous movement joint fillers in movement joints.

.2 Lap adhesive: apply adhesive to flashing lap joints.

.3 Mechanical fasteners: install fasteners to suit application and in accordance with manufacturer's written installation instructions.

## 3.3 INSTALLATION: MOISTURE CONTROL

.1 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre.

.2 Mortar diverters: install purpose made diverters in cavities where indicated and as directed, size and shape to suit purpose and function.

.3 Grout screens: install purpose made screens in cavities where indicated and as directed, size and shape to suit purpose and function.

## 3.4 INSTALLATION: FLASHINGS

.1 Build in flashings in masonry in accordance with CAN/CSA-A371

.1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings, and at base of cavity wall and where cavity interrupted by horizontal members or supports and as shown on drawings. Install flashings under weep hole courses and as indicated.

.2 In cavity walls and veneered walls, carry flashings from front edge of exterior masonry, under outer wythe, then up backing minimum 150 mm, and as follows:

.1 For masonry backing embed or bond flashing 25 mm in joint.

.2 For concrete backing, insert or bond flashing into reglets.

.3 For wood frame backing, staple flashing to walls behind water resistive paper, and lap joints.

.4 For gypsum board and glass fibre faced sheathing backing, bond to wall using manufacturer's recommended adhesive.

.3 Lap joints 150 mm and seal with adhesive.

.2 Form flashing (end dams) at lintels, sills and wall ends to prevent water from travelling horizontally past flashing ends.

.3 Install vertical flashing where outer veneer returns at window or door jambs, to prevent contact of veneer with inner wall.

## 3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

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

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

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 04 05 00 - Common Work Results for Masonry

.2 04 05 13 - Masonry Mortar and Grouting

.3 04 05 19 - Masonry Anchorage and Reinforcing

.4 04 05 23 - Masonry Accessories

### 1.2 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 CSA Group (CSA)

.1 CAN/CSA-A165, CSA Standards on Concrete Masonry Units consists: A165.1, A165.2, A165.3.

.2 CAN/CSA-A371, Masonry Construction for Buildings.

.3 CSA S304.1, Design of Masonry Structures.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for concrete masonry units and include product characteristics, performance criteria, physical size, finish and limitations.

### 1.4 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties, and in accordance with Section 04 05 00 - Common Work Results for Masonry.

### 1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.1 Offload concrete unit masonry packages using equipment that will not damage the surfaces.

.2 Do not use brick tongs to move or handle masonry.

.2 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Do not double stack cubes of concrete unit masonry.

.3 Cover masonry units with non-staining waterproof membrane covering.

.4 Allow air circulation around units.

.5 Installation of wet or stained masonry units is prohibited.

.6 Keep concrete unit masonry in individual cardboard packaging provided by manufacturer until units are ready to be installed.

.7 Store and protect concrete unit masonry from nicks, scratches, and blemishes.

.8 Replace defective or damaged materials with new.

## Part 2 Products

### 2.1 MATERIALS

.1 Standard concrete block units as indicated to CAN/CSA-A165 CAN/CSA-A165 CAN/CSA-A165

### 2.2 CLEANING COMPOUNDS

.1 Use low VOC products in compliance with SCAQMD Rule 1168.

.2 Compatible with substrate and acceptable to masonry manufacturer for use on products.

.3 Cleaning compounds compatible with concrete unit masonry and in accordance with manufacturer's written recommendations and instructions.

### 2.3 TOLERANCES

.1 Tolerances for standard concrete unit masonry tolerances in accordance with CAN/CSA-A165.1, supplemented as follows:

.1 Maximum variation between units within specific job lot not to exceed 2 mm.

.2 No parallel edge length, width or height dimension for individual unit to differ by more than 2 mm.

.3 Out of square tolerance not to exceed 2 mm.

.2 Tolerances for architectural concrete masonry units in accordance with CAN/CSA-A165.1, supplemented as follows:

.1 Maximum variation in length or height between units within specific job lot for specified dimension not to exceed 2 mm.

.2 No parallel edge length, width or height dimension for individual unit to differ by more than 2 mm.

.3 Out of square tolerance not to exceed 2 mm.

.4 Maximum variation in width between units within specific job lot for specified dimension not to exceed 2 mm.

## Part 3 Execution

### 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for concrete unit masonry installation in accordance with manufacturer's written instructions.

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

### 3.2 PREPARATION

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

### 3.3 INSTALLATION

.1 Concrete block units:

- .1 Bond: running.
- .2 Coursing height: 200 mm for one block and one joint.
- .3 Jointing: concave where exposed or where paint or other finish coating is specified.

### 3.4 CONSTRUCTION

.1 Cull out masonry units, in accordance with CAN/CSA-A165.

.2 Build in miscellaneous items such as bearing plates, steel angles, bolts, anchors, inserts, sleeves and conduits.

.3 Construct masonry walls using running bond unless otherwise noted.

.4 Build around frames previously set and braced. Fill behind hollow frames within masonry walls with mortar or grout and embed anchors.

.5 Fit masonry closely against electrical and plumbing outlets so collars, plates and covers overlap and conceal cuts.

.6 Install movement joints and keep free of mortar where indicated.

.7 Hollow Units: spread mortar setting bed from outside edge of face shells. Gauge amount of mortar on top and end of unit to create full joints, equivalent to shell thickness. Avoid excess mortar.

.8 Solid Units: apply mortar over entire vertical and horizontal surfaces. Avoid bridging of airspace between brick veneer and backup wall with mortar.

.9 Ensure compacted head joints. Use full or face-shell joint as indicated.

.10 Tamp units firmly into place.

.11 Do not adjust masonry units after mortar has set. Where resetting of masonry is required, remove, clean and reset units in new mortar.

.12 Tool exposed joints concave; strike concealed joints flush.

.13 After mortar has achieved initial set up, tool joints.

.14 Do not interrupt bond below or above openings.

**3.5 REPAIR/RESTORATION**

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

**3.6 FIELD QUALITY CONTROL**

.1 Site Tests, Inspection: in accordance with Section 04 05 00 - Common Work Results for Masonry supplemented as follows:

**3.7 CLEANING**

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Standard Concrete Unit Masonry:

.1 Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block. Clean wall surface with suitable brush or burlap.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

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

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

**3.8 PROTECTION**

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

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 – Metal Fabrications

.2 Section 09 85 00 – Concrete Resurfacing Lining and Coating Specifications

### 1.2 DEFINITIONS

.1 Application Specialist: An individual who performs surface preparation and application of protective coatings and linings to steel and concrete surfaces of complex industrial structures.

### 1.3 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 ASTM International (ASTM):

.1 ASTM A36/A36M, Standard Specification for Carbon Structural Steel

.2 ASTM A193/A193M, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High-Pressure Service and Other Special Purpose Applications

.3 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

.4 ASTM A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

.5 ASTM A325M, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength[Metric]

.6 ASTM A490M, Standard Specification for High-Strength Steel Structural Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints Metric

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-85.10, Protective Coatings for Metals

.4 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA):

.1 Handbook of the Canadian Institute of Steel Construction

.2 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel

.5 CSA Group (CSA):

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

.2 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles

.3 CAN/CSA-S16, Limit States Design of Steel Structures

.4 CAN/CSA-S136, North American Specifications for the Design of Cold Formed Steel Structural Members

.5 CSA W47.1, Certification of Companies for Fusion Welding of Steel

.6 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding

.7 CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings

.8 CSA W59, Welded Steel Construction (Metal Arc Welding)

.6 The Master Painters Institute (MPI):

.1 MPI-INT 5.1, Structural Steel and Metal Fabrications

.2 MPI-EXT 5.1, Structural Steel and Metal Fabrications

.7 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International:

.1 NACE No. 3/SSPC SP-6, Commercial Blast Cleaning

## 1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.

.3 Erection drawings:

.1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:

.1 Description of methods.

.2 Sequence of erection.

.3 Type of equipment used in erection.

.4 Temporary bracings.

.4 Fabrication drawings:

.1 Submit fabrication drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the Manitoba, Canada.

.5 Samples:

.1 Not used.

.6 Source Quality Control Submittals:

.1 Submit digital copies of mill test reports 4 weeks before fabrication of structural steel.

.1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.

.2 Provide mill test reports certified by metallurgists qualified to practise in Manitoba, Canada.

.7 Fabricator Reports:

.1 Provide structural steel fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

**1.5 DELIVERY, STORAGE AND HANDLING**

.1 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.

.2 Packaging Waste Management: Remove for reuse and/or return of pallets, crates, padding, and, packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

**Part 2 Products**

**2.1 MATERIALS**

.1 Structural Steel: To CSA-G40.20/G40.21 Grade as indicated.

.2 Welding Materials: To CSA W48 Series, CSA W59 and certified by Canadian Welding Bureau.

.3 Shop Paint Primer: To CISC/CPMA 2-75 solvent reducible alkyd, red oxide.

.4 Hot Dip Galvanizing: Galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m².

**2.2 FABRICATION**

.1 Fabricate structural steel in accordance with CAN/CSA-S16, CAN/CSA-S136, and in accordance with approved shop drawings.

**2.3 SHOP PAINTING**

.1 Clean, prepare surfaces, and shop prime structural steel in accordance with CAN/CSA-S16, CAN/CSA-S136, and/or MPI EXT 5.1 except where members to be encased in concrete.

.2 Clean members, remove loose mill scale, rust, oil, dirt and foreign matter. Prepare surface according to NACE No.3/SSPC-SP-6.

.3 Apply one coat of primer in shop to steel surfaces to achieve minimum dry film thickness of 10 to 12 mils, except:

.1 Surfaces to be encased in concrete.
.2 Surfaces to receive site installed stud shear connections.
.3 Surfaces and edges to be site welded.
.4 Faying surfaces of slip-critical connections.
.5 Below grade surfaces in contact with soil.

.4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.

.5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.

.6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

## Part 3 Execution

### 3.1 GENERAL

.1 Structural Steel Work: In accordance with CAN/CSA-S16 and CAN/CSA-S136.

.2 Welding: in accordance with CSA W59

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components

### 3.2 CONNECTION TO EXISTING WORK

.1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Contract Administrator for direction before commencing fabrication.

### 3.3 MARKING

.1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection

.2 Match marking: shop mark bearing assemblies and splices for fit and match.

### 3.4 ERECTION

.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16, CAN/CSA-S136, and in accordance with approved erection drawings.

.2 Site cutting or altering structural members: to approval of Contract Administrator.

.3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.

.4 Continuously seal members by continuous welds where indicated. Grind smooth.

### 3.5 SITE QUALITY CONTROL

.1 Inspection of materials and workmanship will be carried out by Contract Administrator.

.2 Provide safe access and working areas for inspections on site.

### 3.6 SITE PAINTING

.1 Touch-up damaged surfaces and surfaces without shop coat with primer to NACE No.3/SSPC-SP-6 except as specified otherwise. Apply in accordance: MPI Architectural Painting Specification Manual

### 3.7 CLEANING

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

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

**END OF SECTION**

## 1. GENERAL

### 1.1 RELATED SECTIONS

.1 Not Applicable

### 1.2 REFERENCES

.1 Canadian Standards Association (CSA):

.1 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.2 CAN/CSA-S157, Strength Design in Aluminum.

.3 CSA W47.2, Certification of Companies for Fusion Welding of Aluminum.

.4 CSA W59.2, Welded Aluminum Construction.

.5 CSA W55.3 - Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.108, Bituminous Solvent Type Paint.

.3 American Society for Testing and Materials (ASTM):

.1 ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

.2 ASTM A668M Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.

.3 ASTM A 490, Specification for Heat Treated, Steel Structural Bolts, 150 ksi (1035 Mpa) Tensile Strength.

.4 ASTM A 490M, Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3 for Structural Steel Joints Metric.

.5 ASTM B 209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate Metric.

.6 ASTM B 210M, Specification for Aluminum-Alloy Drawn Seamless Tubes Metric.

.7 ASTM B 211M, Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire Metric.

.8 ASTM B 316M Standard Specification for Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods Metric

.4 Aluminum Association, Inc. (AA):

.1 Designation System for Aluminum Finishes.

.5 American Welding Society (AWS):

.1 AWS A5.10, Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods.

**1.3 SHOP DRAWINGS**

.1 Shop Drawings:

.1 Submit shop drawings including fabrication and erection documents consisting of connection and design details, shop details, erection diagrams, erection procedures and material lists in accordance with Section 01 33 00 – Submittals.

.2 Indicate cuts, copes, connections, holes, threaded fasteners, rivets, welds and other items. Indicate welds using welding symbols as shown in Appendix A of CSA W59.2.

.3 Submit description of methods, sequence of erection and type of equipment to be used in erecting structural aluminum.

**1.4 SAMPLES**

.1 Not Applicable.

**1.5 MEASUREMENT AND PAYMENT**

.1 The work described herein will be paid for under the Contract Lump Sum Price for "Miscellaneous Metals". Said price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this specification, accepted by the Contract Administrator.

1.1.1 A maximum of ninety-five percent (95%) may be submitted for progress payments prior to the total completion of the associated services, including the provision of As-Built Drawing mark-ups and O&M Manuals.

**2. PRODUCTS**

**2.1 MATERIALS**

.1 Aluminum bar, rod, and wire: to ASTM B 211M.

.2 Aluminum and Aluminum-Alloy Extruded Bar, Rods, Wire, Shapes, and Tubes: to ASTM B 221M.

.3 Aluminum sheet or plate: to ASTM B 209M.

.4 Aluminum drawn tubes: to ASTM B 210M.

.5 Aluminum bolts and rivets: to ASTM B 316M

.6 Aluminum welding wire: to AWS A5.10.

.7 Stainless steel bolts: to AISI Steel Products Manual No. 13.

.8 Steel bolts: to ASTM A 668M.

.9 Bituminous paint: to CAN/CGSB-1.108, type 1, 2, without thinner.

.10 Galvanizing hot dip galvanize steel bolts to CAN/CSA-G164, minimum zinc coating of 600g/$m^2$.

.11 Access Hatches:

.1 See 05 50 00.

**2.2 FABRICATION**

.1 Fabricate in accordance with CAN/CSA-S157 and in accordance with shop drawings.

**2.3 FINISHES**

.1 Plain mill finish, unless otherwise indicated.

**3. EXECUTION**

**3.1 GENERAL**

.1 Structural aluminum work: in accordance with CAN/CSA-S157.

.2 Welding: in accordance with CSA W59.2.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.2 for fusion welding of aluminum and/or CSA W55.3 for resistance welding of structural components.

.4 Paint aluminum surfaces in contact with concrete with two (2) coats of alkali resistant bituminous paint.

**3.2 ERECTION**

.1 Erect structural aluminum as indicated and in accordance with CAN/CSA-S157 and approved erection drawings.

.2 Field cutting or altering structural members: to approval of the Engineer.

**3.3 FIELD QUALITY CONTROL**

.1 Inspection and testing of materials and workmanship may be carried out by testing laboratory designated by Engineer.

.2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Engineer.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 05 12 23 – Structural Steel for Buildings

### 1.2 DEFINITIONS

.1 Application Specialist: An individual who performs surface preparation and application of protective coatings and linings to steel and concrete surfaces of complex industrial structures.

### 1.3 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 ASTM International (ASTM)

- .1 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .2 ASTM A269M, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .3 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 CSA Group (CSA)

- .1 CSA G40.20 /G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA S16, Design of Steel Structures.
- .4 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
- .5 CSA W59, Welded Steel Construction (Metal Arc Welding) Metric

.4 Environmental Choice Program (ECP)

- .1 CCD-048, Surface Coatings - Recycled Water-borne

.5 Green Seal Environmental Standards (GS)

- .1 GS-11, Paints and Coatings

.6 The Master Painters Institute (MPI)

- .1 Architectural Painting Specification Manual

.7 NACE International

- .1 NACE International
  - .1 ANSI/NACE No. 13/SSPC-ACS-1, Industrial Coating and Lining Application Specialist Qualification and Certification.

## 1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit digital copies of WHMIS SDS.

.1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.

.3 Shop Drawings:

.1 Submit drawings.

.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.4 Certificates:

.1 Submit certifications for Application Specialists to demonstrate compliance to the requirements of ANSI/NACE No.13.

## 1.5 QUALITY ASSURANCE

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

.2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Qualifications:

.1 Ensure that 100% of industrial coating specialists, who perform concrete and steel surfaces preparation and coating applications, are certified by a recognized Applicator Certification Agency, in accordance with NACE 13 /SSPC ACS-I, Applicator Certification Standard (ACS).

.2 Maintain a current and valid ACS certification during project period.

.1 Application specialists who perform surface preparation and coating application work on this project must have a current ACS.

.3 Notify Contract Administrator of any change in application specialist certification status.

.1 Any delays to the completion of the Project due to invalid certifications will not be considered, and liquidated damages shall not be waived for any non-performance by Contractor.

## 1.6 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

## Part 2 Products

### 2.1 MATERIALS

.1 As indicated in the drawings.

.2 Welding materials: to CSA W59.

.3 Welding electrodes: to CSA W48 Series.

.4 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

.5 Access Hatches:

.1 Install hatches where indicated on drawings.

.2 Applicable Equipment:

.1 Location:

.1 Applicable to SEWPCC only as shown on Drawings

.2 Specified Equipment: **Access Hatch**

.1 Manufacturer: MSU Mississauga Ltd. or approved equivalent.

.2 Model: Type M – CL 625.

.3 Opening Size: 900 mm x 900 mm

.4 Doors: 1 (900mm x 900mm)

.5 Finish: Factory Finish

.6 Installation: Cast-in-place

.1 All surfaces cast against concrete to receive 2 coats bitumen.

.7 Options:

.1 Material: 316 Stainless Steel hardware.

.2 Gas Tight with d-profile neoprene sealing gasket.

### 2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Use self-tapping shake-proof truss or hex headed screws on items requiring assembly by screws or as indicated.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Exposed welds continuous for length of each joint. File or grind exposed welds smooth and flush.

### 2.3 FINISHES

.1 Galvanizing: as indicated in drawings.

.2 Zinc primer: zinc rich, ready mix to MPI -EXT 5.2C.

**2.4 ISOLATION COATING**

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

.1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.

.2 Concrete, mortar and masonry.

.3 Wood.

**2.5 SHOP PAINTING**

.1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Paint when temperature minimum 7 degrees C.

.3 Clean surfaces to be field welded; do not paint.

**Part 3 Execution**

**3.1 EXAMINATION**

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts acceptable for metal fabrications installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Contract Administrator.

.2 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions remedied and after receipt of written approval to proceed from Contract Administrator.

**3.2 ERECTION - GENERAL**

.1 Do welding work in accordance with CSA W59 unless specified otherwise

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Contract Administrator such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.4 Exposed fastening devices to match finish and be compatible with material through which they pass.

.5 Supply components for work by other trades in accordance with shop drawings and schedule.

.6 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

.7 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion.

.8 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

## 3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

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

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

## 3.4 PROTECTION

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

.2 Repair damage to adjacent materials caused by metal fabrications installation.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 03 01 37 - Concrete Restoration

.2 03 30 00 - Cast-in-place Concrete

.3 05 50 00 – Metal Fabrications

.4 07 92 00 - Joint Sealants

### 1.2 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 ASTM International

.1 ASTM A276/A276M – Standard Specification for Stainless Steel Bars and Shapes.

.2 ASTM A506, Standard Specification for Alloy and Structural Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-Rolled.

.3 ASTM B370, Standard Specification for Copper Sheet and Strip for Building Construction.

.4 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.5 ASTM D2369, Standard Test Method for Volatile Content of Coatings.

.6 ASTM D2832, Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.

.7 ASTM D5116, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.

.3 CSA Group (CSA)

.1 CSA B111, Wire Nails, Spikes and Staples.

.4 Green Seal Environmental Standards (GS)

.1 GS-11, Standard for Paints and Coatings.

.2 GS-36, Standard for Adhesives for Commercial Use.

.5 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual.

.1 MPI #76, Primer, Alkyd, Quick Dry, for Metal.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for hatches and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.1 Indicate VOC's for caulking materials during application and curing.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.

.1 Indicate size and description of components, materials, attachment devices, description of frame and finish, and construction details.

.4 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

## 1.4 QUALITY ASSURANCE

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

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

## 1.5 CLOSEOUT SUBMITTALS

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

.2 Submit operation and maintenance data for hardware complete with pertinent details, spare parts lists and warnings against harmful maintenance materials and practices for incorporation into manual.

## 1.6 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect hatches from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse by manufacturer and return of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

## Part 2 Products

### 2.1 DESIGN REQUIREMENTS

.1 Hatches must withstand occasional traffic loads with a CL-625 ONT wheel load per clause 3.8.4.3(a) of CAN/CSA-S6 with an impact factor of 15%.

### 2.2 MATERIALS

.1 Stainless Steel: to ASTM A276/A276M Grade 304 or 316.

.2 Gas spring, slam lock, and hold open arm: to ASTM A276/A276M Grade 316.

.3 Hinges: to ASTM A276/A276M Grade 304

.4 Gaskets: extruded resilient neoprene, with full recovery after 50% compression.

.5 Fasteners: stainless steel screws to manufacturers standard.

.6 Coating: in accordance with manufacturer's recommendations for surface conditions

.7 Primer paint for steel: to MPI #76

.8 Isolation coating: alkali resistant bituminous paint or epoxy solution.

### 2.3 ACCESSORIES

.1 Screws: stainless steel for curb to structure and for hatch lip frame to outer attachment.

.2 Hinges: Continuous piano stainless-steel type recommended by hatch manufacturer.

.3 Latch: positive snap with turn handles inside and out and padlock hasps inside.

.4 Securing latch: hold open operating arm with vinyl grip handle to permit one-handed release.

.5 Resilient gasket/seal to inner face of lid in contact with hatch lid support frame.

### 2.4 FABRICATION

.1 Fabricate components free of twists, bends, or visual distortion and insulated. Weld corners and joints.

.2 Assemble hatch components as indicated.

.3 Ensure continuity of weather-tight seal and gas tight seal.

.4 Design extrusions to collect and lead off accumulated condensation.

## Part 3 Execution

### 3.1 EXAMINATION

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

.1 Visually inspect substrate in presence Contract Administrator.

.2 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed Contract Administrator.

### 3.2 MANUFACTURER'S INSTRUCTIONS

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

### 3.3 INSTALLATION

.1 Erect components plumb, level and in proper alignment.

.2 Adjust and seal assembly with provision for expansion and contraction of components.

.3 Coat aluminum and copper in contact with dissimilar materials, with isolation coating.

.4 Secure and seal frame to slab.

### 3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

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

### 3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by hatch installation.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

### 1.2 REFERENCE STANDARDS

.1 Standards listed below reference the current edition at the date of Tender.

.2 Canadian General Standards Board (CGSB)

- .1 CGSB 19-GP-5M, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
- .2 CAN/CGSB-19.13, Sealing Compound, One-component, Elastomeric, Chemical Curing.
- .3 CGSB 19-GP-14M, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
- .4 CAN/CGSB-19.17, One-Component Acrylic Emulsion Base Sealing Compound.
- .5 CAN/CGSB-19.24, Multi-component, Chemical Curing Sealing Compound.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

- .1 Safety Data Sheets (SDS).

.4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

- .1 SCAQMD Rule 1168, Adhesives and Sealants Applications.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for 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 digital copies of WHMIS SDS.

.3 Manufacturer's Instructions:

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

### 1.4 CLOSEOUT SUBMITTALS

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

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

**1.5 DELIVERY, STORAGE AND HANDLING**

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect joint sealants from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

**1.6 SITE CONDITIONS**

.1 Ambient Conditions:

.1 Proceed with installation of joint sealants only when:

.1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.

.2 Joint substrates are dry.

.3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.2 Joint-Width Conditions:

.1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

**1.7 ENVIRONMENTAL REQUIREMENTS**

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Safety Data Sheets (SDS) acceptable to Health Canada.

**Part 2 Products**

**2.1 SEALANT MATERIALS**

.1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.2 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.

.3 Where sealants are qualified with primers use only these primers.

**2.2 SEALANT MATERIAL DESIGNATIONS**

.1 Polysulfide two part:

.1 Self-levelling to CAN/CGSB-19.24, Type 1, Class B.

.2 Polysulfide two part:

.1 Non-sag: to CAN/CGSB-19.24, Type 2, Class B.

.3 Polysulfide one part:

.1 Self-levelling: to CAN/CGSB-19.13.

.4 Polysulfide one part:

.1 Non-sag: to CAN/CGSB-19.13.

.5 Urethanes two part:

.1 Self-levelling: to CAN/CGSB-19.24, Type 1, Class B.

.6 Urethanes two part:

.1 Non-sag: to CAN/CGSB-19.24, Type 2, Class B.

.7 Urethanes one part:

.1 Self-levelling: to CAN/CGSB-19.13, Type 1.

.8 Urethanes one part:

.1 Non-sag: to CAN/CGSB-19.13, Type 2.

.9 Silicones one part: to CAN/CGSB-19.13

.10 Acrylics one part: to CGSB 19-GP-5M

.11 Acrylic latex one part: to CAN/CGSB-19.17

.12 Butyl: to CGSB 19-GP-14M

.13 Preformed compressible and non-compressible back-up materials:

.1 Polyethylene, urethane, neoprene or vinyl foam:

.1 Extruded open cell foam backer rod.

.2 Size: oversize 30 to 50%.

.2 Neoprene or butyl rubber:

.1 Round solid rod, Shore A hardness 70.

.3 High density foam:

.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m$^3$ density, or neoprene foam backer, size as recommended by manufacturer.

.4 Bond breaker tape:

.1 Polyethylene bond breaker tape which will not bond to sealant.

**2.3 JOINT CLEANER**

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

.2 Primer: in accordance with sealant manufacturer's written recommendations.

**Part 3 Execution**

**3.1 EXAMINATION**

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

.1 Visually inspect substrate in presence of Contract Administrator.

.2 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 SURFACE PREPARATION**

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

**3.3 PRIMING**

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

**3.4 BACKUP MATERIAL**

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

**3.5 MIXING**

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

## 3.6 APPLICATION

.1 Sealant:

.1 Apply sealant in accordance with manufacturer's written instructions.

.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.

.3 Apply sealant in continuous beads.

.4 Apply sealant using gun with proper size nozzle.

.5 Use sufficient pressure to fill voids and joints solid.

.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.

.7 Tool exposed surfaces before skinning begins to give slightly concave shape.

.8 Remove excess compound promptly as work progresses and upon completion.

.2 Curing:

.1 Cure sealants in accordance with sealant manufacturer's instructions.

.2 Do not cover up sealants until proper curing has taken place.

## 3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Clean adjacent surfaces immediately.

.3 Remove excess and droppings, using recommended cleaners as work progresses.

.4 Remove masking tape after initial set of sealant.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

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

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

## 3.8 PROTECTION

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

.2 Repair damage to adjacent materials caused by joint sealants installation.

**END OF SECTION**

## Part 1 General

### 1.1 SCOPE OF WORK

.1 This section covers all workmanship, materials, supervision and quality requirements for concrete surface preparation, repair and resurfacing; and protective lining and coating work on the following structures at the City of Winnipeg Manitoba SEWPCC & WEWPCC plants.

.1 Prepare, apply resurfacing, and epoxy lining to all concrete surfaces as shown on drawings for 6 sludge holding tanks. Includes sawcut terminations and construction details of lining system as required.

.2 Prepare and apply a polyurethane cement coating system to the floor above the tanks in the WEWPCC facility including cove base, sawcut terminations and construction details of coating system as required.

.2 The scope of work also includes all lining and coating system terminations, necessary environmental controls and the legal collection, temporary storage, removal, and disposal of all debris.

.3 Refer to the System Thickness Requirements in 3.14 of this Section.

### 1.2 RELATED WORKS

.1 Division 00 – Bidding and Contracting Requirements

.2 Division 01 – General Requirements

.3 03 01 30 – Repair and Rehabilitation of Cast-In-Place Concrete

### 1.3 DEFINITIONS

.1 Terminology used in this section is in accordance with definitions contained in ASTM D 16, ASTM D 3960, and the following definitions:

.1 Abrasive: Material used for blast cleaning, such as sand, grit or shot.

.2 Abrasive Blast Cleaning: Cleaning/surface preparation by abrasive propelled at high speed.

.3 Anchor Pattern: Profile of prepared surface(s).

.4 Bug Holes: Small cavities resulting from entrapment of air bubbles in the surface of formed concrete during placement and compaction.

.5 Coating/Paint/Lining Thickness: The total dry film thickness of primer, intermediate and/or finish coats.

.6 Coating Consultant: Corrosion Probe, Inc. (CPI)

.7 Dew point: Temperature of a given air/water vapor mixture at which condensation starts.

.8 Drying Time: Time interval between application and curing of material.

.9 Dry to Recoat: Time interval between application of material and ability to receive next coat.

.10 Dry to Touch: Time interval between application of material and ability to touch lightly without damage.

.11 Feather Edging: Reducing the thickness of the edge of paint.

.12 Feathering: Operation of tapering off the edge of a point with a comparatively dry brush.

.13 Field Coat: The application or the completion of application of the coating system after installation of the surface at the site of the work.

.14 Filler/Surfacer: See Resurfacer/Resurfacing Material

.15 Hold Point: A defined point at which work shall be halted for QC and/or QA related inspection.

.16 Holiday: A discontinuity, skip, or void in coating or coating system film that results in low dielectric strength.

.17 Honeycomb: Segregated condition of hardened concrete due to non-consolidation.

.18 Hydro blast: A term meaning the same as high or ultra-high-pressure water jetting.

.19 Incompatibility: Inability of a coating to perform well over another coating because of bleeding, poor bonding, or lifting of old coating; inability of a coating to perform well on a substrate.

.20 Immersion: Refers to a service condition in which the substrate is below the waterline or submerged in water or wastewater at least intermittently if not constantly.

.21 Inspection and Test Plan: A plan by the CSA that incorporates all the required QC testing into the CSA's work plan for the project. The I&TP systematically lists the inspection hold points, test methods, and acceptance criteria for each procedure in each phase of the project Work.

.22 Laitance: A layer of weak, non-durable concrete containing cement fines that is brought to the surface through bleed water because of concrete finishing and/or over-finishing.

.23 Mil: 0.001 inch.

.24 Overspray: Dry spray, particularly such paint that failed to strike the intended surface.

.25 Pinhole: A small diameter discontinuity in a coating or coating system film that is typically created by outgassing of air from a void in a concrete substrate resulting in exposure of the substrate or a void between coats.

.26 Pot Life: Time interval after mixing of components during which the coating can be satisfactorily applied.

.27 Process Control Procedure: Documents one process, such as mobilization and setup, abrasive blasting, coating mixing, coating application and curing, clean-up, etc. that together make up the work plan.

.28 Quality Assurance: An audit process conducted to verify (after the fact) that the work performed meets the specifications and to validate the testing and measurements conducted through the QC program. QA incudes visual observation along with various physical tests and measurements (many of the same tests

performed in the QC program) at defined hold points. QA may be performed by the Contractor, CSA, or Contract Administrator.

.29 Quality Control: The program, designed and managed by the CSA, to control the project execution parameters through visual observation, measurements, physical tests, policies, procedures, and training programs in order to produce a final product that complies with the project specifications. QC includes testing that identifies deficiencies while the work is progressing so that methods and techniques can be modified to meet the specification requirements.

.30 Resurfacer/Resurfacing Material: Also, filler/surfacer, a layer of cementitious and/or resin-base material used to fill or otherwise restore surface continuity to worn or damaged concrete surfaces.

.31 Shelf Life: Maximum storage time for which a material may be stored without losing its usefulness.

.32 Shop Coat: One or more coats applied in a shop or plant prior to shipment to the site of the work, where the field or finishing coat is applied.

.33 Spreading Rate: Area covered by a unit volume of paint at a specific thickness.

.34 Stripe Coat: A separate coat of paint applied to all weld seems, pits, nuts/bolts/washers and edges by brush. This coat shall not be applied until any previous coat(s) have cured and once applied, shall be allowed to cure prior to the application of the subsequent coat(s).

.35 Tie Coat: An intermediate coat used to bond different types of paint coats. Coatings used to improve the adhesion of a succeeding coat.

.36 Touch-Up Painting: The application of paint on areas of painted surfaces to repair marks, scratches, and areas where the coating has deteriorated to restore the coating film to an unbroken condition.

.37 Ultrahigh-Pressure Water jetting (UHPWJ) – A method of surface preparation employing clean water as the media at or above 210 MPa (30,000 psi).

.2 The following abbreviations may be used herein:

.1 ANSI - American National Standards Institute

.2 CSM - Coating System Manufacturer. Refers to the acceptable coating system manufacturer.

.3 CSA – Coating System Applicator. A generic reference to the specialty subcontractor or subcontractors retained by the Contractor to install the coating systems specified in this Section. If no specialty subcontractor is retained, the CSA may be the same entity as the Contractor.

.4 CTR - Coating System Manufacturer's Technical Representative. Refers to the technical representative(s) of the acceptable Coating System Manufacturer and is abbreviated as CTR.

.5 DFT - Dry Film Thickness. The thickness of cured film, usually expressed in mils (0.001 inch).

.6 I&TP – Inspection & Testing Plan

.7 ICRI - International Concrete Repair Institute

.8 NACE - National Association of Corrosion Engineers

.9 NSF – National Sanitation Foundation

.10 PCP – Process Control Procedure

.11 QA – Quality Assurance

.12 QC – Quality Control

.13 SHT – Sludge Holding Tank

.14 SSD - Surface Saturated Dry. Refers to concrete surface condition where the surface is saturated (damp) without the presence of standing water.

.15 SSPC - The Society for Protective Coatings

.16 TPC - Technical Practice Committee

.17 VOC - Volatile Organic Compound. The portion of the coating that is a compound of carbon, is photochemically reactive, and evaporates during drying or curing, expressed in grams per liter (g/l) or pounds per gallon (lb./gal). VOC is determined by EPA Method 24.

.18 WFT - Wet Film Thickness. The primer or coating film's thickness immediately following application. Wet film thickness is measured in mils or thousandths of an inch (0.001 inch) and is abbreviated WFT.

## 1.4 REFERENCE STANDARDS

.1 This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

.2 Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

| **REFERENCE STANDARDS** | |
|---|---|
| **Reference** | **Title** |
| | |
| **American Concrete Institute (ACI)** | |
| ACI 308 | Recommended Practice for Curing Concrete |
| ACI 318 | Building Code Requirements for Reinforced Concrete and Commentary |
| ACI 350 | Code Requirements for Environmental Engineering Structures |
| **AMPP (Association for Materials Protection and Performance)** | |
| AMPP SP21548 | Pressurized Water Cleaning of Concrete & Cementitious Materials |
| | |

| REFERENCE STANDARDS | |
|---|---|
| **Reference** | **Title** |
| **ANSI (American National Standards Institute)** | |
| ANSI/ASC 29.4<br>Exhaust Systems | Abrasive Blasting Operations – Ventilation and Safe Practice |
| ANSI B74.18 | Grading of Certain Abrasive Grain on Coated Abrasive Material |
| ASTM D16 | Standard Terminology for Paint, Related Coatings, Materials, and Applications |
| | |
| **ASTM (American Society for Testing and Materials)** | |
| ASTM A615 | Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement |
| ASTM A706 | Standard Specification for Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement. |
| ASTM A775 | Standard Specification for Epoxy-Coated Steel Reinforcing Bars |
| ASTM C42 | Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete |
| ASTM C109 | Standard Test Method for Compressive Strength of Hydraulic Cement Mortars |
| ASTM C348 | Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars |
| ASTM C496 | Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens |
| ASTM C882 | Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear |
| ASTM C1107 | Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink) |
| ASTM C1583 | Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method) |
| ASTM D1752 | Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction |
| ASTM D2200<br>(SSPC-VIS1) | Pictorial Surface Preparation Standards for Painting Steel Surfaces |
| ASTM D3960 | Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings |
| ASTM D4262 | Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces |
| ASTM D4263 | Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method |
| ASTM D4285 | Standard Test Method for Indicating Oil or Water in Compressed Air |

| REFERENCE STANDARDS | |
|---|---|
| **Reference** | **Title** |
| ASTM D4414 | Standard Practice for Measurement of Wet Film Thickness by Notch Gages |
| ASTM D4417 | Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel |
| ASTM D4541 | Standard Test Methods for Pull-Off Strength of Coatings on Metal Substrates Using Portable Adhesion Testers |
| ASTM D4787 | Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates |
| ASTM D5162 | Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates |
| ASTM D7234 | Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Adhesion Testers. |
| ASTM E337 | Standard Test Method for Measuring Humidity with a Psychrometer |
| ASTM F1869 | Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride |
| | |
| | |
| **ICRI (International Concrete Restoration Institute)** | |
| ICRI 310.2 | Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair |
| | |
| **NACE (National Association of Corrosion Engineers)** | |
| NACE Publication 6D-163 | A Manual for Painter Safety |
| NACE Publication 6F-163 | Surface Preparation of Steel or Concrete Tank/Interiors |
| NACE Publication 6G-164 A | Surface Preparation Abrasives for Industrial Maintenance Painting |
| NACE Standards | January 1988 Edition of the National Association of Corrosion Engineers, TPC. |
| NACE SP0188 | Standard Practice – Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates |
| NACE SP0288 | Standard Recommended Practice, Inspection of Linings on Steel and Concrete |
| NACE SP0892 | Standard Recommended Practice, Linings Over Concrete in Immersion Service |
| NACE Publication TPC2 | Coatings and Linings for Immersion Service |
| NACE SP0178 | Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service. |
| | |

| REFERENCE STANDARDS | |
|---|---|
| **Reference** | **Title** |
| **NAPF (National Association of Pipe Fabricators)** | |
| NAPF 500-03 | Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings |
| NAPF 500-03-04 | Abrasive Blast Cleaning for Ductile Iron Pipe |
| NAPF 500-03-05 | Abrasive Blast Cleaning for Cast Ductile Iron Fittings |
| | |
| **OSHA (U.S. Occupational Safety and Health Administration)** | |
| OSHA 1910.144 | Safety Color Code for Marking Physical Hazards |
| OSHA 1915.35 | Standards – 29CFR - Painting |
| | |
| **SSPC (The Society for Protective Coatings)** | |
| SSPC | Paint Application Specification No. 1. |
| SSPC-AB 1 | Mineral and Slag Abrasives |
| SSPC-PA 1 | Shop, Field, and Maintenance Painting of Steel |
| SSPC-PA 2 | Measurement of Dry Coating Thickness with Magnetic Gages |
| SSPC-PA 9 | Measurement of Dry Coating Thickness on Cementitious Substrates Using Ultrasonic Gages |
| SSPC-PA Guide 12 | Guide for Illumination of Industrial Painting Project |
| SSPC-PA Guide 3 | A Guide to Safety in Paint Application |
| SSPC-PA Guide 6 | Guide for Containing Debris Generated During Paint Removal Operations |
| SSPC-PA Guide 11 | Guide for Stripe Coating |
| SSPC SP1 | Solvent Cleaning |
| SSPC SP2 | Hand Tool Cleaning |
| SSPC SP3 | Power Tool Cleaning |
| SSPC SP5 | White Metal Blast Cleaning |
| SSPC SP6 | Commercial Blast Cleaning |
| SSPC SP7 | Brush-Off Blast Cleaning |
| SSPC SP10 | Near-White Blast Cleaning |
| SSPC SP11 | Power Tool Cleaning to Bare Metal |
| SSPC WJ 1-4 | Surface Preparation and Cleaning of Steel and Other Hard Materials by High and Ultra-High-Pressure Water Jetting Prior to Recoating |
| SSPC SP13 | Surface Preparation of Concrete |
| SSPC-SP CAB1 | Thorough Abrasive Blast Cleaning of Concrete & Masonry Surfaces |
| SSPC-TR2 | Wet Abrasive Blast Cleaning |
| SSPC-TU-3 | Overcoating |

| REFERENCE STANDARDS | |
|---|---|
| **Reference** | **Title** |
| SSPC- Guide 15 | Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates. |
| SSPC V2 | Systems and Specifications: Steel Structures Painting Manual, Volume 2 |
| SSPC-VIS 1 | Visual Standard for Abrasive Blast Cleaned Steel |
| SSPC-VIS 3 | Visual Standard for Power and Hand – Tool Cleaned Steel |
| SSPC-VIS 4 | Visual Standards (Water Jetting) |
| SSPC-VIS 5 | Visual Standards (Wet Abrasive Blast Cleaning) |
| | |
| **WPCF (Water Pollution Control Federation)** | |
| WPCF Manual of Practice No. 17 | Paints and Protective Coatings for Wastewater Treatment Facilities. Guide and Paint Application Specifications. |

## 1.5 QUALITY REQUIREMENTS

.1 Contractor Qualifications:

.1 The CSA shall be an approved applicator of the specified system by the CSM. This shall be documented in writing by the CSM.

.2 Perform all field surface preparation and lining applications by an AMPP QP-8 Certified field painting Contractor in good standing for all concrete applications. Should the contractor working on concrete substrates not have an AMPP QP-8 certification, an AMPP QP-1 contractor certification will be acceptable providing the QP-1 contractor can show verifiable proof of performing work successfully on 5 verifiable concrete projects similar in size and scope as the project that is part of this specification. For floor coating applications, if the QP1 Contractor is not certified applicator for Polyurethane Cement Coating with significant application experience, they shall retain the services of a flooring applicator subcontractor certified by the floor coating manufacturer. The floor coating applicator is exempt from QP-1 qualifications.

.3 Employ only supervisory and lead applicator trades people who have at least 5 years of experience performing similar work in operating wastewater treatment facilities to perform any of the surface preparation and installation work as specified herein.

.4 The Contractor shall at all time have a competent superintendent or supervisor in charge who is thoroughly familiar with the work in progress. The superintendent or supervisor shall represent the Contractor and shall have authority to receive and respond to all questions and non-conformance issues raised by the Contract Administrator.

.5 The CSA shall be a firm with at least five (5) years of experience properly preparing concrete substrates by ultrahigh-pressure water jetting and abrasive blast cleaning and applying cementitious restoration/resurfacing and waterborne epoxy cementitious mortar, as well as applying specialty spray and trowel applied epoxy coating and lining materials over concrete substrates in operating wastewater treatment facilities. This experience requirement shall be

documented with at least five (5) verifiable project references going back no more than 5 years with contact name, telephone numbers, and email addresses.

.6 All of the CSA's application crew to be assigned to the work covered by this section shall be trained in the proper, hands-on application of the concrete restoration materials, specified resurfacing materials, and epoxy lining materials by the CSM. This training to be performed off-site at the CSA's shop facilities or elsewhere shall ensure that the same application tools, equipment, and methods to be used on the Work are used by the CSA's application personnel during the training exercise. All application crew personnel shall have mixed and applied the specified materials during the training. This training shall be documented in writing by the CSM and the CSA in letters stating the employees' names, the dates of the training, the products applied and certifying that all listed personnel received the training. All employees' signatures shall also be provided in these letters from both the CSM and the CSA. This can be done as a joint letter. The training provided shall be given by technical service personnel from the CSM experienced in the application of all of the specified materials. This training shall not be given by regional or national sales or marketing personnel from the CSM or its agents. This training shall consist of a minimum of 8 hours of hands-on/classroom training. Alternatively, the Contractor can provide a written letter from the CSM stating that the application personnel (listed by name) who will perform coating work are approved by the CSM without further or additional training.

.2 Standardization

.1 Materials and supplies provided shall be the standard products of CSMs. Materials in each coating system shall be the products of a single CSM.

.2 The standard products of CSMs other than those specified may be acceptable when it is demonstrated to the Engineer that they are equal in composition, durability, usefulness, and convenience for the purpose intended. Requests for consideration of CSMs other than those specified in this Section will be considered, provided the following minimum conditions are met. Such requests are not a substitution for submittals after the alternative CSMs have been considered and accepted.

.1 The proposed coating system shall use an equal or greater number of separate coats to achieve the required total dry film thickness.

.2 The proposed coating system (all materials including resurfacing mortars, repair mortars and coating/lining materials) shall be of the same generic type as that specified including curing agent type if an epoxy coating and any internal reinforcement. However, if the proposed alternate coating provides similar performance for the expected service conditions specified herein for the standard coating system, please provide a written explanation of its generic type (including curing agent or type) and provide performance data which compares it to the specified products.

.3 The CSM shall provide a list of at least three (3) references for the proposed product where the coating of the same generic type or performance capabilities has been applied and has performed successfully for over 5 years in similar service conditions. The reference

list shall include the project name, city, state, owner, phone number of owner; coating system reference and number; type of facility in which it was used, generic type, and year coating was applied.

.3 Minimum Contractor Quality Assurance Requirements

.1 The CSA is solely responsible for the workmanship and quality of the coating system installation. Inspections by the Engineer, Coating Consultant or the CTR will not relieve or limit the Contractor's responsibilities.

.2 The CSA shall provide full-time inspection with trained and certified quality control (QC) inspectors performing all QC procedures as the coating work proceeds in accordance with the requirements of this section. Minimum qualifications for QC inspectors on concrete projects are AMPP-CCI Level 1 with a minimum of 3 years' experience in QC processes, providing they are under the direct supervision of a AMPP Certified CCI Level 2 Concrete Coatings Inspector. If the CSA does not have a certified AMPP-CCI Level 1 or AMPP-CCI Level 2 inspector on staff, a minimum AMPP Basic Coating Inspector (NACE/SSPC Level 1) with a minimum of 3 years' experience in concrete QC processes is acceptable, providing they are under the direct supervision of a AMPP Certified Coatings Inspector (NACE/SSPC Level 2) or AMPP Senior Coatings Inspector (NACE/SSPC Level 3) in good standing, with at least 10 years of similar coatings work experience successfully on 5 verifiable concrete projects similar in size and scope as the project that is part of this specification.

.3 The Contractor shall prepare an Inspection and Test Plan (I&TP) that complies with this Section for all aspects of the resurfacing and lining application. A sample ITP will be supplied to the bidders as a reference.

.4 A pre-job meeting shall be conducted with the Contractor to review the quality program I&TP and the production schedule. Coating Inspection requirements shall be based on NACE SP0288.

.5 The CSA shall at all times have a competent superintendent or supervisor in charge who is thoroughly familiar with the work in progress. The superintendent or supervisor shall represent the CSA and shall have authority to receive and respond to all questions and non-conformance issues raised by the Engineer and the City.

.6 The CSA's methods shall conform to the requirements of this specification and the standards referenced in this Section. Changes to the coating system installation requirements will be allowed only with the written acceptance of the Engineer before work commences.

.7 Contaminated, outdated, diluted materials, and/or materials from previously opened containers shall not be used.

.8 The CSA shall provide all points of access for inspection by the Contract Administrator. The CSA shall provide ventilation, ingress and egress, and other means necessary for the Contract Administrator personnel to access safely the work areas.

.9 The Contractor shall conduct the work so that the lining and coating systems are installed as specified and shall inspect the work continually to ensure that the coating system is installed as specified. Coating system work that does not

conform to the specifications or is otherwise not acceptable shall be corrected as specified or as required in writing by the CSM at no additional cost to the City.

.10 The CSA shall prepare Process Control Procedures (PCP) for all processes to be utilized on this project and combine these into a coherent Work Plan which describes in detail the CSAs schedule and plan to effectively execute these specifications and complete the Work.

.11 The CSA shall provide written daily QC reports that present, in summary form, test data, work progress, surfaces covered, ambient conditions, quality control inspection test findings, and other information pertinent to the coating system installation. The CSA's QC manager shall certify the Work is in compliance with these specifications. QC reports for each day of Work shall be available for review by the Contract Administrator on the following day.

.12 The CSA shall provide all the necessary environmental control required to complete the work and maintain the required environmental conditions (including air temperature and humidity) including, but not limited to, shelters, enclosures, dehumidification equipment, fans, heating equipment, and fuels for all equipment at no additional cost to the City.

.4 Minimum QC Inspection Requirements (Acceptance Criteria in 3.11 of this Section):

As part of its overall Quality Control program, the CSA shall conduct Quality Control inspections during the concrete resurfacing and coating system installation and record the results from those inspections. These daily inspection reports shall be provided to the Contract Administrator on a daily basis. The CSA shall coordinate such inspections with the Contract Administrator such that the Contract Administrator may observe CSA's inspections or conduct separate independent Quality Assurance inspections on a scheduled basis. The minimum QC milestones shall be as follows:

.1 Inspect all materials upon receipt to ensure that all are supplied by the approved manufacturer.

.2 Provide specified storage conditions for all materials, solvents, and abrasives.

.3 Conditions Prior to Surface Preparation - Prior to coating application all surfaces shall be inspected by the CSA and any issues or conditions that would prevent compliance with this Section shall be brought to the attention of the Contract Administrator in writing.

.4 Dry abrasive blast cleaning equipment shall be maintained and tested as follows: A paper blotter test in accordance with ASTM D 4285 shall be performed by the CSA on each air compressor being used at the beginning of each workday and again once for every 4 hours worked to determine if the air is sufficiently free of oil to not produce detrimental effects on coating system adhesion.

.5 Post Surface Preparation Cementitious Surfaces – Upon completion of the surface preparation, the CSA shall inspect for proper degree of surface preparation as specified in this Section and in the CSM's written instructions. The degree of surface preparation shall be in accordance with this Section and the CSM's requirements regarding surface profile as per ICRI 310.2. This shall include inspecting for the achievement of the CSM's written requirements concerning concrete surface profile in accordance with ICRI 310.2.

.6 Unless stipulated otherwise by the CSM, after application of all cementitious resurfacing materials but prior to application of any polymer-based liners, perform concrete substrate moisture tests per ASTM D 4263 on each different surface (i.e., wall, floor, ceiling, etc.). The plastic sheet test shall be performed to ensure there is no moisture problem with the coating. The test shall be performed over the resurfaced concrete prior to lining to assure proper sealing of the plastic sheet to the substrate. Do not apply coating or lining materials until acceptable results are obtained.

.7 pH testing of the concrete by the CSA shall be performed at the minimum rate of one test per every 100 square feet (or any part thereof) of surface area using Hydrion Insta-Check Jumbo 0-13 or equal. The surface of the concrete shall be lightly abraded to expose loose cement paste particles. The paper shall be touched to the surface once using moderate pressure. The surface shall not be wiped or moved laterally to disturb the surface during pH testing. Following the exposure of the paper to the substrate which has been abraded, lift the paper vertically to not "wipe" the surface. Compare the color indicated with the scale provided and record the pH.

When a dry substrate is encountered, the surface where the pH test is to be performed shall be abraded as described above and sprayed lightly with distilled, de-ionized water from a commercially available spray bottle that has been properly rinsed to preclude any dissolved solids. The spray shall just wet the surface to a "shiny" appearance and water shall not run. Wait 30 seconds to allow chemical equilibrium to be established and then test the pH of the water on the surface and record the value.

.8 Environment and Site Conditions - Prior to commencing an activity associated with coating system installation, the CSA shall measure, record, and confirm acceptability of ambient air temperature, substrate surface temperature and relative humidity as well as other conditions such as proper protective measures for surfaces not to be coated at a minimum of once prior to the start of coating application and thereafter every two hours during coating application. Perform relative humidity measurements in accordance with ASTM E337. The acceptability of the weather and/or environmental conditions within the structure shall be determined by the requirements specified by the CSM of the coating system being used.

.9 Provide correct mixing of all materials in accordance with the manufacturer instructions.

.10 Conduct adhesion testing in accordance with ASTM C1583 in each separate structure that is part of this scope of work at a minimum of 2 locations for each structure on the cementitious resurfacing material applied to concrete substrates. The locations tested shall be equally distributed throughout the structure. Repair of these locations will be the Contractor’s responsibility in accordance with the CSM’s recommendations at no additional cost to the City. Each test location shall consist of three separate adhesion tests within a 300 mm by 300 mm (12 in. by 12 in.) area. The average of the three tests (excluding cohesive failure of the concrete) shall be reported as a single value. The Contractor shall be responsible for resurfacing material removal and replacement in areas demonstrating unacceptable adhesion.

.11 Monitoring of Coatings Application – The CSA shall inspect, measure, and record the wet film thickness and general film quality (visual inspection) for lack of runs, sags, pinholes, holidays, etc. as the application work proceeds. Perform WFT measurements in accordance with ASTM D4414 at a minimum rate of one measurement for every 10 SF coated.

.12 Post Application Inspection – The CSA shall identify defects in application work including pinholes, holidays, excessive runs or sags, inadequate or excessive film thickness and other problems as may be observed.

.13 Verify curing of the coating in accordance with the manufacturer's instructions.

.14 Post Cure Evaluation – Upon completion of the lining system installation, surfaces shall be cleaned and prepared to permit close visual inspection by the Contract Administration at any given location. Any and all deficiencies or defective work (not in compliance with this section or related sections) will be marked for repair or removal/replacement by the CSA at no additional cost to the City. Following cure, coatings and linings shall be measured for dry film thickness by the CSA. The DFT shall be measured:

.1 For carbon steel surfaces, this shall be performed in accordance with SSPC-PA 2.

.2 Method 1 for concrete surface shall be performed in accordance with SSPC-PA 9 using ultrasonic thickness gauges calibrated in accordance with the instrument manufacturer's instructions.

OR

.3 Method 2 for concrete surfaces shall utilize either a Tooke Gage or by the removal of small core samples through the lining system.

Any coating found to be below the specified DFT shall receive additional applications of the coating or lining or shall be removed or reapplied as required to meet the total DFT requirements specified in this Section at no additional cost to the City.

.15 Conduct high voltage holiday detection over 100% of coated concrete surfaces in accordance with ASTM D4787 and follow the CSM's recommendations for appropriate voltage settings.

.16 Conduct adhesion testing in accordance with ASTM D7234 in each structure at a minimum of 2 locations on the lining system applied to concrete substrates. The locations tested shall be equally distributed throughout the structure. Repair of these locations will be the Contractor's responsibility in accordance with the CSM's recommendations at no additional cost to the City. Each test location shall consist of three separate adhesion tests within a 300 mm by 300 mm (12 in. by 12 in.) area. The Contractor shall be responsible for lining system removal and replacement in areas demonstrating unacceptable adhesion at no additional cost to the City.

.17 Follow-up to corrective actions and Final Inspection. The CSA shall measure and re-inspect corrective coating work performed to repair defects identified at prior Hold Points. This activity also includes final visual inspection along with follow-up tests such as holiday detection, adhesion tests, and DFT surveys.

.5 Responsibilities of the CTR:

.1 General:

.1 Provide the services of the CTR to be on site to perform the Contractor and/or CSA application training and to routinely verify in writing that the application personnel have successfully performed representative portions of the surface preparation work, filler/surface application, coating system application, and QC Inspection in accordance with this Section. Include testing, checking, or witnessing the contractors testing for the required degree of cleanliness, surface pH for concrete substrates, surface profile of substrates, proper mixing of coating materials, application (including checking the WFT and DFT of the coating systems), proper cure of the coating systems, and proper treatment of coating systems at terminations, transitions, joints and cracks in substrates. This verification is in addition to the inspection performed by the Contractor in accordance with this Section. The CTR must be a technical representative of the CSM's Technical Service Department and not a local sales representative. The CTR shall provide an adequate level of oversight of the contractor's QC processes, at their discretion, to provide sign off that the CSM's products have been properly installed.

.2 Coating System Installation Training:

.1 Provide a minimum of 8 hours of classroom and off-site training for application and supervisory personnel of the Contractor (CSA). Provide training to a minimum of 2 supervisory personnel from the CSA. Alternatively, provide a written letter from the CSM stating that the application personnel (listed by name) who will perform coating work are approved by the CSM without further or additional training.

.2 The same CTR shall provide training for all application and supervisory personnel. Include the following as a minimum:

.1 A detailed explanation of mixing, application, curing, and termination details.

.2 Hands-on demonstration of how to mix and apply the coating systems.

.1 A detailed explanation of the ambient condition requirements (temperature and humidity) and surface preparation requirements for application of the coating system as well as a detailed explanation of re-coat times, cure times, and related ambient condition requirements.

.3 Provide a letter stating that training was satisfactorily completed by the personnel listed by name in the letter.

.3 Representative Coating System Inspections:

.1 While on site to verify or witness the QC processes of the contractor, the CTR shall verify representative steps of the coating work are performed properly per the manufacturer's instructions, the CTR shall coordinate and confirm the planned inspections by the Contractor's QC person are being performed per the project ITP to assure quality of the work meets the

requirements of both these specifications and any additional manufacturer's requirements

.2 The CTR shall verify or witness the following QC processes, at their discretion and as delineated above in 1.5.

.1 Inspect ambient conditions during various coating system installation at hold points for conformance with the specified requirements.

.2 Inspect the surface preparation of the substrates where the coating system will terminate or will be applied for conformance to the specified application criteria.

.3 Inspect preparation and application of coating detail treatment (for example, terminations at joints, metal embedments in concrete, etc.).

.4 Inspect application of the filler/surface materials for concrete and masonry substrates.

.5 Inspect application of the primers and finish coats including WFT and DFT of the coatings.

.6 Inspect coating systems for cure.

.7 Review coating system discontinuity testing for conformance to specified criteria.

.8 Review coating system discontinuity testing for conformance to specified criteria.

.9 Observe adhesion testing work to assure it meets specification requirements.

.10 Inspect and record representative localized repairs made to discontinuities identified via continuity testing.

.11 Conduct a final review of completed coating system installation for conformance to the specifications.

.3 Prepare and submit a site visit report following each site visit that documents the acceptability of the coating work observed and inspected in accordance with the CSM's Recommendations.

.4 Final Report:

.1 Upon completion of coating work for the project, the CTR shall prepare a letter summarizing the inspection findings and shall attach the site visit reports required in 1.5. Include a statement that the completed work was performed in accordance with the requirements of this Section 09 85 00 and the CSM’s recommendations based on the inspections carried out by the CTR.

**1.6 SUBMITTALS**

.1 Submit the following in accordance with Division 01:

.1 A detailed work plan, which shall incorporate the Inspection & Test Plan, including scope of work, methods of staging, equipment and methods to be used for cleaning and coating application for each surface, contingencies and a bar chart schedule which shall include at a minimum:

.1 Mobilization
.2 Removal/relocating/protection of mechanical equipment
.3 Erection of staging/scaffolding
.4 Protection
.5 Containment
.6 Surface preparation
.7 Concrete repair and resurfacing work
.8 Lining and coating application
.9 Testing
.10 Clean-up
.11 De-mobilization

.2 Manufacturer's current printed recommendations and product data sheets for all products including performance criteria, surface preparation and application requirements, volatile organic compound (VOC) data, and safety requirements.

.3 Material Safety Data Sheets (MSDS) for any materials brought on-site including all coating materials, solvents, abrasive blast media or any other materials intended to be used for the work specified.

.4 Storage requirements including temperature, humidity, and ventilation for all materials to be used for the specified work.

.5 Applicators' certification that materials comply with federal, state, and local regulations for VOC (Volatile Organic Compounds).

.6 Letter(s) certifying that surfaces to be treated have been prepared in accordance with manufacturer’s printed instructions and are ready for installation work, citing location thereof. Marked-up drawings that show location of all Work will be submitted. Reference drawings provided in the bid package can be used.

.7 Letter signed by CSM certifying that submitted products are suitable for application on the surfaces to be treated and for the service conditions.

.8 Certification that the entity installing the coating/lining system is an approved applicator of the CSM for the specified repair products, resurfacing products and coating system.

.9 Submit documentation evidencing work experience of project superintendent, supervisors, abrasive blasters, and lining applicators.

.10 Letter(s) certifying that all of the CSA’s application personnel received hands-on training by the CSM in accordance with 1.5-1-6 of this Section.

.11 Submit written letter of approval from CSM, product data sheets, and material safety data sheets for concrete restoration curing compound products to be used on this project.

.12 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site.

.13 Prior to starting work, submit a scaffold/rigging plan for the project that includes methods for protection of the skimmer mechanism such that it can be reviewed by the Engineer prior to scaffold installation.

**1.7 DELIVERY, STORAGE AND HANDLING**

.1 Provide in accordance with Division 01 and as specified herein.

.2 Materials shall be stored in enclosed structures and shall be protected from weather and excessive heat or cold in accordance with the CSM instructions. Flammable materials shall be stored in accordance with State and Local codes. Materials exceeding storage life recommended by the manufacturer shall be removed from the site. Cold storage or heated storage to be provided by the Contractor if required to ensure proper storage of the materials.

.3 Store all materials only in areas designated by the Contract Administrator solely for this purpose. Confine mixing, thinning, associated operations, clean up and storage of materials and related debris to authorized areas. All materials are to be stored on pallets or similar storage/handling skids off the ground in sheltered areas in which the storage temperature is maintained in accordance with the manufacturer recommendations.

.4 Mix all materials in various areas as needed to complete the work. These enclosed areas must protect the mixing operation and materials from direct sunlight, inclement weather, freezing, or other means of damage or contamination. Protect all other concrete and metallic surfaces and finishes from any spillage of material(s) within the mixing area. Protect the ground from splash or spillage of all materials using plastic, drop cloths and other appropriate materials.

.5 Do not use any process drains or storm drains within the treatment facility for disposal of waste or materials.

.6 The Contractor shall take all precautions and implement all measures necessary to avert potential hazards associated with all materials as described on the pertinent Material Safety Data Sheets and container labels.

.7 Deliver all materials to the job site in their original, unopened containers. Each container shall bear the manufacturer's name and label.

.1 Labels on all material containers must show the following information:

.1 Name or title of product.

.2 Federal specification number if applicable.

.3 Manufacturer's batch number and date of manufacture.

.4 Manufacturer's name.

.5 Generic type of material.

.6 Application and mixing instructions.

.7 Hazardous material identification label.

.8 Shelf-life date.

.9 Storage requirements.

.2 All containers shall be clearly marked indicating any personnel safety hazards associated with the use of or exposure to the materials.

.3 All materials shall be handled and stored to prevent damage or loss of label.

.8 New reinforcing steel shall be substantially free from mill scale, rust, dirt, grease, or other foreign matter.

.9 Reinforcing steel shall be shipped and stored with bars of the same size and shape fastened in bundles with durable tags, marked in a legible manner with waterproof markings.

.10 Reinforcing steel shall be stored off the ground, protected from moisture and kept free from dirt, oil, or other injurious contaminants. Coated reinforcing steel shall be stored on padded wooden or steel cribbing. Coatings damaged by fabrication, handling or installation shall be repaired to conform to the applicable coating requirements.

## 1.8 COORDINATION OF WORK

.1 Work Areas:

.1 The work areas on the job site will be designated by the Contract Administrator. The Contractor's personnel shall not be permitted in any area other than those expressly designated by the Contract Administrator.

.2 Use of Facilities:

.1 The Contract Administrator will make available a hydrant from which the CSA may obtain potable water. The hydrant will be metered and the CSA will be required to pay for the volume of water used.

## 1.9 SAFETY

.1 Provide in accordance with the requirements of Division 00 and Division 01 and the requirements included herein.

.2 General - Personnel safety is the Contractor's responsibility. The Contractor is responsible for assuring compliance with all applicable federal, provincial, and local safety requirements and the Contractors own approved Safe Work Plan.

.3 The Contractor's work forces should comply with any and all applicable federal, provincial, and local regulations and the provisions outlined in the following documents:

.1 SSPC-PA 10 - “Guide to Safety and Health Requirements for Industrial Painting Projects”

.2 NACE Publication - “A Manual for Painter Safety”

.4 The Contractor shall provide personnel with all safety equipment necessary to protect them during any phase of the work. This shall include, but not be limited to safety glasses, face shields, fresh air breathing hoods, goggles, earplugs, hard hats, steel toed work shoes, appropriate protective clothing, gloves, and plant approved respirators where required.

.5 Keep any flammable materials such as solvents, thinners, coating or sealant materials away from open flames, sparks or temperatures higher than 38$^{o}$C (100$^{o}$F). Drums containing flammable materials will be properly grounded at all times. Only small

quantities of solvents for smoothing the lining will be allowed inside containment enclosures or permitted confined spaces during installation work.

.6 Power tools are to be in good working order to avoid open sparking. All electrical tools used on this project will be equipped with ground fault interrupters (GFIs).

.7 The Contractor shall fireproof all work areas by maintaining a clean work area and having Underwriter's Laboratories approved fire extinguishers on-hand. The Contractor shall furnish these fire extinguishers.

.8 Workers doing abrasive blasting or water jetting operations shall wear a fresh air supplied protective helmet and hood and personal protective clothing acceptable to industry standards and all government regulations.

.9 Dispose of rags used for wiping up coating materials, solvents, and thinners by drenching them with water and placing in a metal container with a tight-fitting metal cover. Complete this disposal process at the end of each day. Remove these materials from the plant site at the end of every shift. Final disposal of these materials is the Contractor's responsibility.

.10 Matches, flames, or sparks resulting from any source including welding, must be remote from the work area during coating work. Smoking is only permitted in areas designated by the Contract Administrator.

**1.10 JOB CONDITIONS**

.1 The jobsite is an operating wastewater treatment facility that will continue to operate prior to and during the work specified herein. No work performed by the Contractor shall interrupt plant operations.

**1.11 WARRANTY**

.1 Contractor’s Warranty:

.1 For a period of five (5) years from the date of beneficial use of the specific sludge tanks and floor coating treatments, the Contractor warrants to the City that the concrete restoration, repair and lining installation work provided under this specification Section conforms to these specifications and is free from defects in materials and workmanship. The date of beneficial use shall be concurrent with the date of the final inspection indicated in 3.12 of this Section, provided the requirements of said Section have been accomplished by the Contractor. The Contractor shall repair or replace, at the sole option of and at no cost to the City, any work found to be defective within said warranty period. Such repairs or replacements shall include the cost of removal and reinstallation.

.2 The quality of both materials and workmanship for the installed concrete restoration and lining work shall be the sole responsibility of the Contractor. It is hereby warranted that should these installed materials delaminate, disbond, crack cohesively, blister, or otherwise fail due to improper surface preparation, improper mixing or application, or lack of proper cure of the materials due to inadequate control of substrate or ambient conditions within the structures by the Contractor or

due to a lack of quality of the materials provided by the Coating System Manufacturer, the Contractor shall be solely responsible for performing and or paying for the repair or replacement work required by the Contract Administrator to remedy the failed materials and workmanship to meet the original requirements of this Section and all contract drawings at no cost to the City and at the City's convenience. This warranty further stipulates that any incompatibility with or error in formulation or manufacturing of the restoration or lining materials installed which results in an installed restoration or lining material failure be and remain a financial matter strictly between the Contractor and the CSM. The financial responsibility and accountability for such a material related failure would remain solely with the Contractor with respect to this warranty made to the City.

.3 The Contractor guaranties to replace or repair defective work for which he is accountable in an expeditious manner at the City's convenience and at no cost to the City. Any failure of the installed restoration or lining materials which results from mechanical or physical damage from plant maintenance or process work performed by The City of Winnipeg or others, or other conditions which are not considered normal to the facility operation will not be the Contractor's responsibility for repair or replacement under this warranty to the City.

.2 Coating System Manufacturer's Warranty:

.1 The Contractor shall obtain from the manufacturer its warranty that the restoration, repair and lining products provided will be free from defects in formulated or manufactured material quality which could cause the installed work to fail. Said warranty, containing no exclusions or limitations, shall be in a form acceptable to, and for the benefit of the City, and shall be submitted by the Contractor as a condition of final payment. The Coating System Manufacturer's Warranty shall be provided on the CSM's letterhead and shall be signed and dated by a company officer of the CSM.

.3 Warranty Period Inspections:

.1 The City shall perform periodic inspections (as operating conditions permit) within the established warranty periods to determine the need for remedial work as required under paragraphs 1 and 2 of 1.11 above.

.2 The Contractor is encouraged to participate in each periodic inspection, however mandatory contractor attendance shall be required only one time, at a date to be established by the City prior to expiration of the Contractor warranty. The City shall notify the Contractor thirty (30) days prior to the required mandatory inspection.

## Part 2 Products

### 2.1 MANUFACTURER

.1 The following Coating System Manufacturers (CSM) are approved for this project:

1. Carboline
   200 Confederation Pkwy Unit 2
   Concord, ON L4K 4T8
   Local Contact: Kirk Benz- kirk.benz@carboline.com
   780-232-2215

2. PPG
   8200 Kele St
   Concord, ON L4K 2A5
   Local Contact: Steve Ditta- sditta@ppg.com
   226-751-5975

3. Sherwin Williams Company
   418 North Service Rd E #200
   Oakville, ON L6H 5R2
   Local Contact: Rob Fritz- rfritz@sherwin.com
   306-716-0942

4. Sauereisen, Inc.
   160 Gamma Dr.
   Pittsburg, PS 15238
   Local Contact: Doug Sutherland- doug.hpr@outlook.com
   780-909-5046

5. Tnemec Company
   123 W. 23rd Avenue
   Kansas City, MO 64116
   Local Contact: Cloverdale Paint/Tnemec
   Norm Walline- nwalline@cloverdalepaint.com
   825-995-1523

6. Or Approved Equal

**2.2 Approved Materials**

.1 The following repair materials and linings are approved for this project:

.2 Protective Linings for Sludge Tank Rehabilitation

.1 Carboline

.1 Cementitious Filler/Surfacers- Carboguard 510

.2 Epoxy Filler/Surfacer- Carboguard 501

.3 Concrete Lining- Plasite 5371 Epoxy Mortar

.2 PPG

.1 Cementitious Filler/Surfacers- PPG Raven 760 EMC

.2 Epoxy Filler/Surfacer- Amercoat 114A

.3 Concrete Lining- Raven 405 Trowel

.3 Sauereisen

.1 Cementitious Filler/Surfacers-RestoKrete F-120 or F-121

.2 Epoxy Filler/Surfacer – Steel Seam FT910
.3 Concrete Lining - SewerGard 210TN Epoxy Mortar

.4 Sherwin-Williams
.1 Cementitious Filler/Surfacers – Dura-Plate 2300
.2 Epoxy Filler/Surfacer – Steel Seam FT910
.3 Concrete Lining – Dura-Plate 6000 Epoxy Mortar

.5 Tnemec
.1 Cementitious Filler/Surfacers- MortarClad Series N218
.2 Epoxy Filler/Surfacer - Series 215 surfacing epoxy
.3 Concrete Lining - Series G434 Epoxy Mortar

.6 Or Approved Equal

.3 Polyurethane Cement Floor Coating

.1 Carboline
.1 Floor Coating System
.1 Deep Repair/ Resurfacing/Sloping Material – Carbocrete 4000
.2 Cove Base- Shock-Crete Vertical
.3 Polyurethane Cement Coating - Shock-Crete SR/Shock-Crete HR
.4 Topcoat- Shock-Crete TCUV

.2 PPG
.1 Floor Coating System
.1 Deep Repair/ Resurfacing/Sloping Material – Pumadur RT
.2 Cove Base- Pumadur UNI-PAK CG
.3 Polyurethane Cement Coating - Pumadur UNI-PAK DP
.4 Topcoat- PPG 688 Polyaspartic

.3 Sherwin-Williams
.1 Floor Coating System
.1 Deep Repair/ Resurfacing/Sloping Material – Poly-Crete WR or Chemlak MTR
.2 Cove Base- Poly-Crete WR
.3 Polyurethane Cement Coating – Poly-Crete MDB
.4 Topcoat- Accelera One Polyaspartic

.4 Tnemec
.1 Floor Coating System
.1 Cementitious Resurfacing/Sloping Material – MortarCrete 217
.2 Cove Base- Ultra-Tread V Series N243
.3 Polyurethane Cement Coating – Ultra-Tread S 242
.4 Topcoat- Series 256 Excellathane

.5 Or Approved Equal

.4 Abrasive Blast Media shall comply with SSPC AB1.

.1 The Contractor shall utilize blast media free of all chlorides or other materials which may contaminate or become imbedded in the profile of the metallic or concrete substrates.

.2 The blast media shall be of a size and shape capable of producing the specified concrete surface profile on metallic and concrete substrates.

.3 Blast media shall be single use. No recycling of blast media will be permitted on this project.

## Part 3 Execution

### 3.1 GENERAL REQUIREMENTS

.1 Initial Cleaning of all structures to be rehabilitated

.1 The City will drain and isolate the sludge tanks prior to making them available to the Contractor.

.2 Prior to beginning Work, the Contractor shall remove all wastewater residue and debris from the structures by water wash and vacuum cleaning or by other suitable means. Blow down cleaning will not be acceptable.

.3 As the initial step, degrease all surfaces to be treated using a water-based, emulsifying, biodegradable, non-flammable, phosphate-free cleaning solution, followed by rinsing with clean, potable water until all traces of contaminants including detergent have been removed. Rinse concrete surfaces multiple times with high-pressure water using a minimum pressure of 5,000 psi and a minimum volume of 6 gallons per minute. Use only potable water. All traces of degreasing and cleaning solutions shall be completely removed.

.4 Remove and dispose of all debris and spent cleaning water by pumping and/or by vacuum cleaning. The cleaning liquid and debris shall not be deposited in sumps or drains or elsewhere at the treatment facility and must be removed from the site and legally disposed of by the Contractor.

.2 Scaffolding System Erection and Access Requirements

.1 A scaffolding/platform system shall be erected by the contractors to allow continuous access to all wall surfaces. The scaffold/platform shall provide safe and convenient access to all surfaces within the limits of construction for installation of the terminations, surfacing, lining and all required testing.

.2 Erect the scaffolding system to ensure that the necessary minimum load support capacity, strength, rigidity, and durability are provided to reliably support the concrete repair and lining work.

.3 Shoring shall be installed securely against the floor slabs to provide sufficient support to scaffolding system for all dead and live loads during construction. However, it shall not be wedged, or jacked in such a way that floor slab is deformed, destabilized, or damaged.

.4 Lateral bracing/anchorage shall be provided as required to maintain stability of the scaffolding system. Shoring shall have sufficient strength and rigidity to

withstand loads and vibrations caused by construction operations during repair and lining work. When outriggers or lateral bracing is used or removed and reinstalled for the scaffolding system, a neoprene pad or similar material shall be placed between the wall and the outrigger pad to protect the concrete repair work or new lining from damage. The bracing will have to be removed and reinstalled as work progresses.

.5 Adjustment of the scaffolding system shall be performed if necessary to maintain support for the structure as construction progresses.

.6 Scaffolding shall bear against the structure only at areas of sound concrete.

.7 All scaffolding costs shall be included in the contractors base bid price.

.3 Protection

.1 If the structures include mechanical components. It is the Contractors responsibility, at his discretion, to protect all of the mechanical components during the surface preparation and resurfacing/lining work. Any damage to any mechanical component during the Work will be the sole responsibility of the Contractor.

.2 Cover or otherwise protect finish work or other surfaces not being coated.

.3 Do not coat over nameplates, tagging or other identification devices on equipment, piping, etc.

.4 Erect and maintain protective tarps, enclosures and/or masking to contain debris generated during any and all work activities from adversely affecting personnel or property outside the work area. This includes, but is not limited to, the use of dust/debris collection apparatus as required.

.5 Provide protection of the structures internal piping during abrasive blast cleaning and concrete restoration material and lining installation work to prevent over blast cleaning of ductile iron or steel substrates and to prevent application of the concrete restoration or protective lining materials from being applied on the pipe surfaces where not specifically required by these specifications.

.4 Initial Inspection of Surfaces to Be Lined:

.1 Contractor shall examine the areas and conditions under which the protective lining Work is to be performed in accordance with NACE SP0892 and SSPC-SP-CAB/SSPC-SP13/NACE No. 6 and notify the City in writing of conditions unfavorable to the proper and timely completion of the Work and/or compliance with these Specifications. It is the responsibility of the Contractor to inspect and report unacceptable surface conditions to the Contract Administrator prior to the commencement of surface preparation activities. Unacceptable surface conditions are defined as the presence of deteriorated substrates with deep depressions or other substrate conditions not acceptable for quality coating or lining material application.

.2 Commencement of the Work of this Section shall indicate that the substrate and other conditions of installation are acceptable to the Contractor and his CSA and will produce a finished product meeting the requirements of the Specifications. All defects resulting from accepted conditions shall be corrected by Contractor at his own expense.

.5 Environmental

.1 Comply with CSM's recommendations regarding ambient environmental conditions under which the specified materials may be applied and cured.

.2 The Contractor is responsible for all environmental controls necessary to maintain the CSM's recommended environmental conditions throughout the duration of the project. These controls include but are not limited to enclosure, heating with indirect fire heaters, dehumidification, etc.

.3 Do not apply materials when dust is being generated.

.4 The Contractor shall provide all temporary lighting inside the structure and at all levels of the scaffold during the work equivalent to 200 foot-candles per Table 1 of SSPC-Guide 12.

.6 Enclosures

.1 Provide the following per SSPC-Guide 6 based on surface preparation method:

.1 Class 2A – Containment A2, B1, C2, D1, E2, Ventilation F2, G2, H2, I1, J1, Level 2 Emissions.

.2 Class 2W – Containment A2, B3a, C2, D1, E3, Ventilation F2, G2, H3, I2, J2, Level 2 Emissions.

.3 Class 3P – Containment A2, B2a, C3, D2, E4, Ventilation F2, G2, H3, I2, J2, Level 2 Emissions.

.7 Thinners and Solvents

.1 The Contractor shall use only solvents and thinners approved by the CSM.

## 3.2 LINING SYSTEM TERMINATION DETAILS

.1 Prior to performing overall surface preparation work on metal and concrete substrates, perform all work necessary to complete all detail treatment for lining system termination as shown on the Drawings.

.2 All lining system details must be inspected and approved by the Engineer prior to the commencement of lining system installation work.

.3 Any terminations necessary for the proper application of the lining system that are not specifically provided in the Drawings, shall be performed by the Contractor in accordance with the CSM's termination detail requirements.

## 3.3 CONTROL OF AMBIENT CONDITIONS

.1 It shall be the Contractor's responsibility to control ambient conditions within the structures being rehabilitated via protective enclosures, heating/ventilation and/or dehumidification apparatus during surface preparation, application, and curing, to meet the specified conditions or conditions recommended by the CSM for application and curing of the specified materials.

.2 The minimum ambient condition requirements for application work shall be in strict accordance with CSM's written recommendations.

.3 The Contractor shall provide all means necessary to exhaust harmful gases/fumes, dust and odors during execution of the work specified herein. No dust generation shall be allowed during coating or lining or concrete restoration material application.

## 3.4 SURFACE PREPARATION

.1 Surface Preparation Requirements

.1 All specified surface preparation shall be performed in accordance with the latest version of the AMPP, SSPC, NACE and ICRI standards referenced herein. Employ methods as specified herein to ensure that the degree of cleanliness and surface profile for all substrates, as specified herein, are attained.

.2 Perform field quality control inspection and testing as specified in 1.05 of this Section.

.3 If, between final surface preparation work and lining/coating system application, contamination of the prepared and cleaned substrates occurs, or if the prepared substrates' appearances darken or change color, re-cleaning shall be required until the specified degree of cleanliness is reclaimed.

.4 The Contractor is responsible for dust control and for protection of mechanical, electrical, and all other equipment within, adjacent to and surrounding the work area as specified. The Contractor shall protect existing equipment and structures within the work area as specified.

.5 Cleaning, surface preparation and material application shall be scheduled so that dust and spray from the cleaning process will not fall on wet, newly resurfaced or coated substrates.

.6 The Contractor shall be responsible for cleaning of only those surfaces to be resurfaced or coated or those surfaces on which his work has caused contamination.

.7 Regulators, gauges, filters, and separators will be in good working order for all of the compressor air lines to blasting nozzles at all times during this work.

.8 The quality, volume, and velocity of life support and ventilation air used during surface preparation shall be in accordance with applicable safety standards to ensure adequate air volume, and dissipation of airborne debris that would adversely affect the health of the public or personnel working for the Contractor, CSA, Subcontractors, City, Contract Administrator, Coating Consultant, Engineer, or anyone who may be affected by on-site work activities.

.9 The Contractor must provide adequate ventilation for airborne particulate evacuation and lighting (meeting all pertinent safety standards) to optimize visibility for both blast cleaning and inspection of the substrate during surface preparation work.

.2 Concrete Surface Preparation-Sludge Tanks

.1 Use methods as specified herein and as delineated in SSPC-SP-CAB#1 and SSPC-SP 13/NACE #6 and ICRI Guideline No. 310.2 to prepare concrete surfaces to produce a sound, clean substrate free of all existing coatings/linings, carbonated concrete, laitance, surface contaminants, loose materials, or substances otherwise deleterious to good resurfacing material or lining system

adhesion. Leaving shelled over, hidden air voids ("bugholes") beneath the exposed concrete surface will not be acceptable. All bugholes are to be completely opened up by surface preparation. See Drawings.

.2 Initial surface preparation of the sludge tanks (regardless of method chosen) for the purposes of applying cementitious repair mortar shall produce a uniform minimum concrete surface profile of CSP 6 in accordance with ICRI 310.2 with a minimum surface pH of 10.0 as outlined in 3.10 of this Section. Follow the requirements in 1.05 of this Section for pH testing procedures.

.3 After the cementitious repair mortar has been installed and sufficiently cured/dried enough for additional surface preparation to commence, surface preparation of the cementitious repair mortar shall be in accordance with the CSM's explicit written instructions for level of abrasive blast and surface profile requirements for the application pf the lining. Some CSM's repair mortar may not require sweep blasting prior to the installation of the lining. It is the Contractors' responsibility to fully understand the CSM's requirements for final surface preparation.

.4 All abandoned, metallic components embedded in the concrete such as threaded rods, dowels, etc., shall be torch cut or ground below the existing concrete surface. These metallic components shall be cleaned to the equivalent of an SSPC SP 5 White Metal Blast Cleaning and coated with the specified epoxy filler/surfacer.

.5 Surface preparation of the concrete floors to receive a Polyurethane Cement Coating System shall produce a uniform minimum concrete surface profile of in accordance with the CSM's explicit instructions and ICRI 310.2 with a minimum surface pH of 10.0 as outlined in 3.10 of this Section. Follow the requirements in 1.5 of this Section for pH testing procedures.

.3 Resurfacing Material Surface Preparation Requirements

.1 When required by the CSM, after curing and prior to the application of the topcoats, prepare cementitious surfaces by lightly sweep blasting all cementitious resurfacing material to remove all loose material and laitance and achieve the minimum concrete surface preparation required by the CSM and in accordance with ICRI 310.2 with a minimum surface pH outlined in 3.10 of this Section. Follow the requirements in 1.5 of this Section for pH testing procedures.

.2 Prior to the application of the lining, resurfacing material recoat limitations (if any) shall not be exceeded.

.3 If the thickness of resurfacing required is greater than that indicated herein, such resurfacing shall be provided and installed at no additional cost to the City.

## 3.5 SURFACE PREPARATION METHODS

.1 Sludge Tanks

.1 Initial surface preparation of all concrete surfaces in the sludge tanks shall be performed by ultra-high pressure water jetting (UHPWJ) using only clean, potable water. All metallic surface preparation shall be performed by dry abrasive blasting with a grit size sufficient to produce the required surface profile.

Surface preparation of the cementitious resurfacing and structural repair materials shall be performed by either wet or dry abrasive blast cleaning.

.2 Wet or Dry Abrasive Blast Cleaning:

.3 Pressure wash all surfaces to receive lining.

.4 The compressed air used for blast cleaning will be filtered free of oil and moisture. Traps will be cleaned at least once every two hours or more frequently as is appropriate.

.5 Oil separators shall be installed just downstream of compressor discharge valves and at the discharge of the blast pot discharges. Oil separators shall be cleaned at least once every four hours or more frequently as is appropriate.

.6 The abrasive blast nozzles used shall be the venturi or other high velocity type supplied with a minimum of 100 psi air pressure and suitable volume to obtain the required blast cleaning production rates and specified degrees of cleanliness.

.7 Following surface preparation, thoroughly vacuum clean all concrete surfaces to be lined to remove all loose dust, dirt, and spent abrasive leaving a dust free, sound concrete or concrete repair material substrate. Allow concrete surfaces to dry thoroughly prior to application of any lining materials. Verify substrate moisture content in accordance with the requirements in 1.5 of this Section.

.8 Following application, all cementitious concrete repair or restoration materials shall be either wet cured as required by the CSM prior to being abrasive blast cleaned before the application of any lining materials.

.2 Concrete Floors

.1 Surface preparation of concrete surfaces to receive floor coatings shall be performed by dry abrasive blasting, shot blasting or wet abrasive blasting as per SSPC-SP CAB 1/SSPC SP#13/NACE #6 and ICRI 310.2 using an abrasive media size sufficient to produce the required surface profile.

.2 Dry Abrasive/Shot Blast Cleaning:

.1 Ensure all oil, grease and other bind breaking contaminants are fully removed.

.2 If dry abrasive blasting is used as the means of preparing the concrete the compressed air used for blast cleaning will be filtered free of oil and moisture. Traps will be cleaned at least once every two hours or more frequently as is appropriate. Compressed air shall be tested as per ASTM D4285 to ensure there is no moisture or oil present.

.3 If shot blasting (centrifugal Blasting) is used as the means of preparing the concrete, all shot blast media shall be cleaned up prior to the application of concrete resurfacing or coatings to ensure no media becomes embedded in the coating materials.

.4 Oil separators shall be installed just downstream of compressor discharge valves and at the discharge of the blast pot discharges. Oil separators shall be cleaned at least once every four hours or more frequently as is appropriate.

.5 The abrasive blast nozzles used shall be the venturi or other high velocity type supplied with a minimum of 100 psi air pressure and suitable

volume to obtain the required blast cleaning production rates and specified degrees of cleanliness.

.6 Following surface preparation, thoroughly vacuum clean all concrete surfaces to be lined to remove all loose dust, dirt, and spent abrasive leaving a dust free, sound concrete or concrete repair material substrate. Allow concrete surfaces to dry thoroughly prior to application of any coating materials. Verify substrate moisture content in accordance with the requirements in 1.5 of this Section.

.7 Following application, all cementitious concrete repair or restoration materials shall be cured as required by the CSM. After sufficient cure as per the CSM's instructions, the repair mortar shall be dry abrasive/shot blast cleaned to the CSM's required cleanliness and surface profile before the application of any coating materials.

.3 Corner Cove Details

.1 After surface preparation and prior to resurfacing, the cementitious resurfacing material shall be applied to all interior corners within the battery limits of construction (i.e., wall to wall intersection) such that the corner is smoothed with a minimum 3/4-inch cove radius in accordance with Drawings.

.2 Prior to resurfacing, all exterior corners within the limits of construction shall be ground to a minimum radius of 1/8 inch.

.3 This repair shall be included in the Base Bid.

.4 Resurfacing of Concrete that has Experienced Deep Attack

.1 This section will apply to concrete surfaces that, after surface preparation, require an application of surfacing material greater than or equal to 1/4 inch but less than or equal to 2 inches to restore the concrete's original surface profile.

.2 The concrete substrate surface shall be "pre-wet" or dampened with potable water to a Saturated Surface Dry (SSD) condition; the concrete is darkened by water but there is no pooling of water on the concrete. This can be done by using a Hudson pump-up sprayer or heavy nap roller cover dampened with potable water. Note: Do not over-saturate the surface.

.3 Recoat Times - Strictly adhere to manufacturer's recommendations with regard to minimum and maximum recoat times and cure times for all materials.

.4 Apply in strict accordance with the CSM written instructions, the Cementitious Resurfacing material to build up the surface to its original contour. Depending on the depth of attack, method of application and the manufacturer's instructions, the application of the resurfacing material may require multiple lifts.

.5 Under no circumstances shall the breaking-up or partial use of kits of the specified materials be allowed during mixing and application of the coating or lining system or concrete restoration materials. Only whole kits shall be mixed and applied to avert off-ratio materials problems.

.5 Resurfacing Concrete and that has experienced Shallow Attack

.1 This section will apply to concrete surfaces that, after surface preparation, require an application of surfacing material less than 1/4 inch or equal to restore the concrete's original surface profile.

.2 The concrete substrate surface shall be "pre-wet" or dampened with potable water to a Saturated Surface Dry (SSD) condition; the concrete is darkened by water but there is no pooling of water on the concrete. This can be done by using a Hudson pump-up sprayer or heavy nap roller cover dampened with potable water. Note: Do not over saturate the surface.

.3 Recoat Times - Strictly adhere to manufacturer's recommendations with regard to minimum and maximum recoat times and cure times for all materials.

.4 Apply in strict accordance with the CSM written instructions, the Resurfacing material to build up the surface to its original contour. The CSA may, at his discretion based on the depth of repair, use the Epoxy Filler/Surfacer or the Filler Surfacer for the Shallow Attack. Depending on the depth of attack and the manufacturer's instructions, the application of the resurfacing material may require multiple lifts.

.5 Under no circumstances shall the breaking-up or partial use of kits of the specified materials be allowed during mixing and application of the coating or lining system or concrete restoration materials. Only whole kits shall be mixed and applied to avert off-ratio materials problems.

## 3.6 GENERAL RESURFACER/LINING/COATING APPLICATION REQUIREMENTS

.1 Material Systems (Sludge Tank Lining)

.1 Field coats shall consist of one finish coat of Amine Cured Epoxy Mortar to all surfaces to the specified dry film thickness. The lining system is designed to be applied in one application over a properly prepared surface where all medium depth to deep repairs have been completed. The Amine Cured Epoxy Mortar is capable of filling small imperfections during application at the same time as finishing the surface in a "fill and finish" method.

.2 Repair materials shall be applied at the thicknesses required to restore surface continuity without interruption or alteration to pitch or slope. Unless otherwise specified, linings shall not be applied until all repair work has been inspected.

.3 Areas below the Process Water Line where the host concrete surface is not severely deteriorated, may not require a full cementitious repair mortar parge coat. After surface preparation by abrasive blasting (dry or wet), if the surface is found to be in a state that the Amine Cured Epoxy Mortar alone can be used as a fill and finish without a cementitious parge coat, it will be allowed. The contractor is required to engage the CSM's technical representative to approve the use of the Amine Cured Epoxy Mortar as a fill and finish and provide written approval by the CSM to proceed.

.4 The completed lining work shall provide a satisfactory film and smooth even surface. Materials shall be thoroughly stirred, strained (as required) and kept at a uniform consistency during application. Materials consisting of two or more components shall be mixed in strict accordance with the manufacturer's instructions.

The volatile organic content (VOC) of any material (as applied) shall comply with prevailing air pollution control regulations. Unless otherwise specified, materials shall not be thinned or reduced beyond manufacturer recommendations to obtain the proper application characteristics. Thinners (as applicable) shall be as recommended by the specific material manufacturer.

.2 Material Systems (Polyurethane Cement Floor Coating)

.1 The polyurethane cement coating system shall consist of the application of the specified polyurethane cement product applied at the specified DFT and the CSM's written instructions. Materials shall only be applied to surfaces that have been properly prepared as per this specification and the CSM's instructions and all concrete repairs have been completed, the required termination details have been installed, and a minimum 2% slope to drain can been achieved. Unless otherwise specified, coatings shall not be applied until previously applied coats have been inspected.

.2 Repair materials shall be applied at the thicknesses required to restore surface continuity without interruption or alteration and the required pitch or slope has been achieved. Unless otherwise specified, coatings shall not be applied until all repair work has been inspected.

.3 The completed coating work shall provide a satisfactory film and smooth even surface, not including any anti-slip requirements. Materials shall be thoroughly stirred, strained (as required) and kept at a uniform consistency during application. Materials consisting of two or more components shall be mixed in strict accordance with the CSM's instructions. The volatile organic content (VOC) of any material (as applied) shall comply with prevailing State air pollution control regulations. Unless otherwise specified, materials shall not be thinned or reduced beyond CSM recommendations to obtain the proper application characteristics. Thinners (as applicable) shall be as recommended by the specific material CSM.

## 3.7 GENERAL REQUIREMENT

.1 Products shall not be used until the Engineer has inspected the materials, the CSM's representative has instructed the CSA and the Engineer in the surface preparation, mixing, and application of products.

.2 Accurate scales shall be provided on the site by the Contractor for measuring the water component of the repair or resurfacing materials before mixing. The water component shall be measured by weight and not by volume. The components shall be power mixed continuously for 5 minutes to obtain a uniform consistency. Mix only enough material that can be applied in 15-20 minutes. DO NOT add water to repair or resurfacing material that have hardened prior to placing.

.3 No solvent, additive, or adulterant shall be added to any component or mixed material.

.4 Surfaces not to be coated shall be masked using duct tape or other protection materials to prevent these surfaces from being coated or lined.

.5 The Contractor must follow the minimum and maximum recoat or reapplication limitation times and related temperature range restrictions between successive coats for all products specified herein.

.6 The Amine Cured Epoxy Mortar can be sprayed through a mortar pump recommended by the CSM followed by back trowelling to provide a smooth finish, or the Amine Cured Epoxy Mortar can be hand trowelled. A combination of mortar spray/back trowel and hand trowel methods can also be used providing the final appearance is consistent and uniform.

.7 The Polyurethane Cement Floor Coating shall be installed as per the manufacturers' instructions using the approved application methods and best industry standards.

.8 All equipment used for lining/coating system application shall be as recommended by the CSM.

.9 Coated or lined surfaces shall be free from runs, drips, ridges, waves, and laps. Coats shall be applied so as to produce an even film of uniform thickness completely coating corners and crevices. Coating work shall be done in accordance with the requirements of SSPC Paint Application Specification No. 1.

.10 The Contractor's equipment shall be approved by the CSM for application of the materials specified. Mortar spray equipment shall be properly sized equipped with mechanical agitators, pressure gages, and pressure regulators, and spray nozzles of the proper sizes.

.11 Care shall be exercised to avoid over spraying or spattering materials on surfaces not to be lined, coated or sealed.

.12 Adjacent areas and installations not to be coated shall be protected by taping, drop cloths, or other suitable measures.

.13 Unless specified elsewhere herein, the Contractor shall comply with the CSM's most recent written instructions with respect to the following:

.1 Mixing of all materials.

.2 Protection and handling of all materials.

.3 Recoat limitation and cure times and surface preparation of coatings or lining to be overcoated or recoated.

.4 Minimum ambient and substrate temperatures, substrate's degree of dryness, relative humidity, and dew point of air.

.5 Application.

.6 Final curing.

.7 Use of proper application equipment

.14 The applied coating and lining systems, including all resurfacing and repair materials, shall be protected from damage during curing and shall be cured as recommended by the CSM.

.15 Pay special attention to manufacturer's recommendations with regard to substrate moisture, substrate temperature, moisture vapor emissions and monitoring and testing

thereof prior to the installation of coatings, linings, and repair materials. Unless stipulated otherwise by the CSM, allow wetted concrete surfaces to dry for a minimum period of 48 hours at 75ºF & 50% (or less) relative humidity prior to coating/lining application. Prior to coating application, all concrete substrates must pass testing requirements as prescribed in 1.5 of this Section.

.16 Pay special attention to manufacturers' recommendations with regard to minimum and maximum recoat times and cure times at certain temperatures for all materials.

.17 Install all terminations of the lining system in accordance with the detail Drawings attached to this specification section.

.18 Refer to schedule in 3.16 of this Section for required thicknesses.

.19 Prior to the application of each coat of the specified coating on ferrous metal substrates, all edges, corners, intersections, bolts, nuts, washers, weld seams and other deviation from smooth surface shall be given a stripe coat by brush.

.20 Under no circumstances shall the breaking-up or partial use of kits of the specified materials be allowed during mixing and application of the lining system materials. Whole kits shall be mixed and applied only to avert off-ratio materials problems.

## 3.8 SPECIFIC APPLICATION REQUIREMENTS (SLUDGE TANKS)

.1 Crack Repair

.1 After initial blast cleaning and prior to any resurfacing or lining work, the Contract Administrator shall mark cracks for repair by the Contractor.

.2 The crack repair shall be performed in accordance with the Drawings and these Specifications.

.3 Recoat Times - Strictly adhere to manufacturer's recommendations with regard to minimum and maximum recoat times and cure times for all materials.

.4 All crack repair materials will be applied using tools and equipment and methods in strict accordance with the CSM's written instructions.

.5 Under no circumstances shall the breaking-up or partial use of kits of the specified materials be allowed during mixing and application of the coating or lining system or concrete restoration materials. Only whole kits shall be mixed and applied to avert off-ratio materials problems.

## 3.9 SPECIFIC APPLICATION REQUIREMENTS (POLYURETHANE CEMENT FLOOR COATING)

.1 Cove Base

.1 A minimum 4"- 6" seamless cove base shall be installed around all concrete equipment pads and perimeter walls (concrete and corrugated metal siding).

.2 Lower profile concrete equipment pads shall have the cove base installed at an adequate height to ensure protection of the sides of the concrete pad and provide adequate slope away from the pad.

.3 The cove base material shall be from the same CSM as the polyurethane cement coating and shall be of matching color. The cove base shall also receive the UV resistant topcoat.

.4 Cove base shall be terminated on the equipment pads as per the CSM's written instructions and detail drawings.

.5 The cove base shall seamlessly transition with the floor coating.

.2 Crack Repair

.1 The intent of this floor system installation is to create a seamless and monolithic floor treatment throughout the area being rehabilitated.

.2 After initial blast cleaning and prior to any resurfacing or coating work, the CSA and CSM shall mark cracks that require specific repair procedures that will not be addressed with the polyurethane cement application.

.3 At a minimum, all cracks shall be v-grooved using an angle grinder. V-groove both sides of the crack to a 45° angle. All debris shall be vacuum cleaned from the crack.

.4 Repair cracks as per the CSM's instruction and detail drawings.

.5 Recoat Times - Strictly adhere to CSM's recommendations regarding minimum and maximum recoat times and cure times for all materials.

.6 All crack repair materials will be applied using tools and equipment and methods in strict accordance with the CSM's written instructions.

.7 Under no circumstances shall the breaking-up or partial use of kits of the specified materials be allowed during mixing and application of the coating or coating system or concrete restoration materials. Only whole kits shall be mixed and applied to avert off-ratio materials problems.

.3 Construction/Control Joints

.1 The existing construction/control joints will <u>not</u> be honored in this application. The intent is to create a seamless and monolithic floor system. The construction/control joints in the facility may vary in depth and width. It is the CSA's responsibility to properly prepare and pre-fill the construction/control joints as per the CSM direction to prepare them for the lining installation.

.2 The construction/control joints shall be pre-filled in such a way to ensure that no sagging or dishing occurs at the joint.

.3 Construction/control joint filling materials shall be as per the CSM's direction and provided in writing to the Contract Administrator for approval before commencing with the application.

.4 The CSA shall review all joints for cracking at the construction/control joints before demobilizing. Any cracks found shall be prepared by grinding or cutting the joint, vacuum cleaning the joint and installing a polysulfide sealant recommended by the CSM.

.5 Joints will be reviewed during the anniversary warranty inspection. Any cracking will be marked and repaired by the CSA as per the CSM's instructions.

.4 Uneven Surfaces (Slab to Slab unevenness and other high spots)

.1 Prior to the final surface repairs and installation of the floor coating system, any uneven surfaces shall be ground using a floor grinder with significant weight to grind the high spots to either match the height of adjacent slabs, or to create an appropriate slope and remove sharp and abrupt edges that could cause future tripping hazards.

.5 Termination Details

.1 All termination details shall be provided in the CSA's submittal package in the form of detailed construction drawings and must be approved by the Contract Administrator. All detail drawings shall be from one of the approved CSM's that the CSA is approved/certified to install.

.2 All areas that require cementitious repair mortar or leveling compounds shall terminate/stop into a minimum ¼" x ¼" saw cut and be chipped back to provide a smooth transition.

.3 All places where the coating system will terminate/stop, shall terminate/stop into a minimum ¼" x ¼" saw cut.

.4 The following list of detail drawings is the minimum requirement, the CSA is fully responsible to consult with the CSM of the system they are approved to install and to submit detail drawings from the CSM for each of the list of required drawings listed below a-n. If the CSM requires more termination details than what is listed in the specification, provide the details and detail drawings as part of the project submittal package:

.1 Detail drawing for termination and sloping at trench drains edges.

.2 Detail drawing for terminations of cove base.

.3 Detail drawing for terminations around structural columns and bollards.

.4 Detail drawing for terminations around equipment pads.

.5 Detail drawing for terminations where the coating system will stop at the application boundaries.

.6 Detail drawing for terminations for deep repairs.

.7 Detail drawing for crack repair.

.8 Detail drawing for filling construction/control joints for seamless application.

.9 Detail drawing for terminations and sloping at drains and manhole covers.

.10 Detail drawing for terminations around fixed assets such as stairs, stacks, and other fixed assets.

.11 Detail drawing for terminations and sloping where resurfacing mortar, or repair mortar will be installed.

## 3.10 LINING ALL CEMENTITOUS SURFACES OF SLUDGE TANKS

.1 This section will apply to all prepared and surfaced concrete surfaces in the listed structures

.2 Recoat Times - Strictly adhere to manufacturer's recommendations with regard to minimum and maximum recoat times and cure times for all materials.

.3 All coating and lining materials will be applied using tools and equipment and methods in strict accordance with the CSM's written instructions.

.4 Apply the Concrete Lining to all resurfaced and prepared surfaces in strict accordance with the CSM's written instructions.

.5 Refer to schedule in 3.16 of this Section for required thicknesses.

.6 Under no circumstances shall the breaking-up or partial use of kits of the specified materials be allowed during mixing and application of the coating or lining system or concrete restoration materials. Only whole kits shall be mixed and applied to avert off-ratio materials problems.

.7 This repair shall be shall be included in the Base Bid.

## 3.11 VENTILATION REQUIREMENTS

.1 Requirements for ventilation shall be in accordance with SSPC Paint Application Guide No. 3 and all Federal, State, and local regulations standards.

## 3.12 FIELD QUALITY ASSURANCE INSPECTION TESTING

.1 Inspection by the Coating Consultant, Engineer or others does not limit the CSA's responsibilities for quality control inspection and testing as specified herein or as required by the CSM's written instructions and recommendations.

.2 As a part of a Quality Assurance program, the Contract Administrator may conduct any or all of the testing detailed in 1.5 of this Section to verify the Contractors compliance with the specifications and to validate the results of the Contractors Quality Control testing. The Contractor shall cooperate with the Contract Administrator by providing access to all of the surfaces that the Contract Administrator directs (including rigging and scaffolding as necessary), managing the confined space access program, and providing lighting and ventilation. The Contractor shall cease other Work during these inspections.

## 3.13 ACCEPTANCE CRITERIA

.1 Surface Preparation Work

.1 All surfaces shall be prepared in accordance with the specification and referenced standards herein.

.2 Ensure a contaminant free surface prior to beginning abrasive blasting and mortar repairs.

.3 Adhesion of mortar repairs shall be a minimum of 250 psi and be free of bugholes, voids and other surface defects

.4 All mortar repairs shall be sound with no hollow spots as detected by a thorough surface hammer sounding.

.5 The minimum surface profile of concrete surfaces meeting the requirements of this Section and the CSM written requirements.

.6 The pH of the concrete and the repair or resurfacing materials shall be a minimum of 10.0 prior to coating application.

.7 All coating and lining materials are from an approved manufacturer, and part of the manufacturers specified systems. All material is stored as per the specified requirements.

.8 The lining application in the sludge tanks shall be finished in a professional manner free of rough edges, trowel marks (within reason), runs, sags and other lining deficiencies.

.9 All coatings and linings shall meet the DFT requirements of this specification and the CSM's requirements

.10 The floor coating application shall be monolithic and free of surface defects

.11 All coated or lined surfaces shall be deemed pinhole free through high voltage holiday testing.

.12 The final result of all lining and coating work shall meet the approval of the Contract Administrator, specifications and CSM's requirements.

.2 Material System Application Work

.1 Dry Film Thickness (DFT) by individual coats or layers must meet the requirements as detailed in 3.14 of this Section. Film thickness tolerance variations in Dry Film Thickness for this work shall be as follows:

.1 In accordance with SSPC PA-2 and SSPC PA-9 – Restriction Level 2.

.2 The concrete surfaces passing the plastic sheet moisture test with no visible condensation prior to coating application.

.3 ASTM C1538 - Acceptable adhesion test results. The average of the three tests (excluding cohesive failure of the concrete) shall be reported as a single value. If the average of each three-test group shall be a minimum of 250 psi (and at least 85% of the failure plane within the resurfacing mortar or concrete).

.4 ASTM D7234 - Acceptable adhesion test results. The average of the three tests (excluding cohesive failure of the concrete) shall be reported as a single value. If the average of each three-test group does not meet or exceed 250 psi (and at least 85% of the failure plane within the resurfacing mortar or concrete), additional testing may be performed to determine the extent of the adhesion problem area.

.5 Acceptable work will be based upon the following:

.1 Complete hiding of previously applied coats.

.2 No excessive runs, sags, sloughs ridges, trowel marks, protrusions, or depressions.

.3 No pinholes or holidays.

.4 No intercoat bond failures between coats.

.5 No dry spray.

.6 Proper curing.

.7 Finish texture shall be uniform.

.8 No show-through of substrate cracks or resurfacing materials in finishes.

.6 Rework required on any holidays or any other inadequacies found by the Contract Administrator in the quality of the coating work shall be marked. Such areas shall be recleaned and recoated by the Contractor according to these specifications and the manufacturer's recommendations at no additional cost to the City.

.7 The Contractor is responsible for keeping the Contract Administrator informed of all progress so that inspection for quality can be achieved in a productive and supportive manner.

.8 No embedded dirt or debris will be allowed in the applied coatings. Any show-through of such dirt, etc. must be removed and the area recoated until the finish coating meets acceptance criteria. Any such required rework shall not result in additional cost to the City.

## 3.14 CLEAN UP

.1 Upon completion of coating, the Contractor shall remove surplus materials, equipment, protective coverings, and accumulated rubbish, and thoroughly clean all surfaces and repair any overspray, spatter or other related damage. The surrounding surface areas including and all other surfaces shall be restored to their pre-project condition.

## 3.15 FINAL INSPECTION

.1 Perform a final inspection to determine whether the material system work meets the requirements of these specifications. The Contract Administrator will conduct final inspection with the Contractor.

## 3.16 SYSTEM THICHKNESS REQUIREMENTS AND COATING SCHEDULE

.1 The Contractor is required to attain the total thickness (DFT) regardless of substrate condition, application method or number of coats required.

.2 Protective Lining System Thickness Requirements are as follows:

**Table 1- Cementitious Mortar Thickness Requirements (All Manufactures)**

| Substrate | Material | Dry Film Thickness (DFT) |
|---|---|---|
| Concrete | Shallow Restoration Polymer Mod. Cement Mortar | All surfaces 1/8" to 1/4" |
| | Deep Restoration Cementitious Mortar | 1/4" to 2" See Bid Form for quantity estimate |

| Table 2- Concrete Lining | | | |
|---|---|---|---|
| **Manufacturer** | **Epoxy Filler** | **Lining** | **DFT** |
| Carboline | Carboguard 501 (As Required) | Plasite 5371 Epoxy Mortar | 125-150 Mils |
| PPG | Amercoat 114A (As Required) | Raven 405 Trowel Epoxy Mortar | 125-150 Mils |
| Sauereisen | #209 Filler (As Required) | Sewergard 210TN Epoxy Mortar | 125-150 Mils |
| Sherwin Williams | Steel Seam FT910 (As Required) | Dura-Plate 6000 Epoxy Mortar | 125-150 Mils |
| Tnemec | Series 215 (As Required) | Series G434 Epoxy Mortar | 125-150 Mils |

| Table 3- Floor Coating Systems | | | | |
|---|---|---|---|---|
| **Manufacturer** | **Repair/ Sloping Mortar** | **Cove Base** | **PU Cement** | **Broadcast/Anti-Slip** |
| Carboline | Carbocrete 4000 As Required | Shock-Crete Vertical as per CSM's instructions | Shock-Crete SR/Shock-Crete HR @ 3/16"-1/4" Nominal Thickness | Broadcast to rejection using aggregate to achieve approved non-slip value |
| PPG | TBD | Pumadur UNI-PAK CG as per CSM's instructions | Pumadur UNI-PAK DP @ 3/16"-1/4" Nominal Thickness | Broadcast to rejection using aggregate to achieve approved non-slip value |
| Sherwin Williams | Poly-Crete WR As Required | Poly-Crete WR as per CSM's instructions | Poly-Crete MDB @ 3/16"-1/4" Nominal Thickness | Broadcast to rejection using aggregate to achieve approved non-slip value |
| Tnemec Company | Series 217 MortarCrete As Required | Ultra-Tread V Series N243 as per CSM's instructions | Ultra-Tread S Series N242 @ 3/16"-1/4" Nominal Thickness | Broadcast to rejection using aggregate to achieve approved non-slip value |

Sauereisen does not have floor coatings. **Note that only the Carboline and Tnemec Company coating will be acceptable at the WEWPCC facility due to the other products having curing times that exceed the allowable limit.**

**END OF SECTION**

| Project Name | | | |
|---|---|---|---|
| Owner | | Coating System Manufacturer Technical CTR | |
| General Contractor (GC) | | Coating System Applicator (CSA) | |
| Area or Structure | | Location within Structure | |
| Coating System (eg E-1) | | Coating Type (eg Epoxy, etc.) | |

## Coating System Inspection Checklist

| Step | Description | Acceptance Criteria | Parties | Name | Signature | Date |
|---|---|---|---|---|---|---|
| 1 | Completion of pre-cleaning and substrate decontamination prior to abrasive blast cleaning. (Concrete) | Surface free of all oil, grease, form release agents and all other foreign contaminants | GC QC | | | |
| | | Host Substrate Min pH9 | CTR QC | | | |
| | | ASTM F22- No Moisture Lens Formation | CSA QC | | | |
| 2 | Moisture Testing of Concrete | Step 1- Initial Testing as Per ASTM D4263- if moisture present move to step 2 | GC QC | | | |
| | | Step 2- ASTM F1869- < 3lbs/1000 sq. ft/24 hours | CTR QC | | | |
| | | Step 2 Alternate- ASTM F2170- Substrate RH 70% or less. | CSA QC | | | |
| 3 | Ensuring compressed air for abrasive blasting or coating/lining application is free of oil and moisture | ASTM D4285- Free of all oil & moisture | GC QC | | | |
| | | 1 blotter test per 4 hours of compressed air usage | CTR QC | | | |
| | | | CSA QC | | | |
| 4 | Installation of protective enclosure of structure or area and protection of adjacent surfaces or structures that are not to be coated. | Conforms to SSPC Guide 6 Guidelines and specification requirements. | GC QC | | | |
| | | | CTR QC | | | |
| | | | CSA QC | | | |
| 5 | Completion of ambient condition control in structure or building area and acceptance of ventilation methods in structure or Area. | Substrate min of 5 degrees above the dew point and stabilized. | GC QC | | | |
| | | Recording ambient conditions, a minimum of 4 times per shift/day at 2 hour intervals | CTR QC | | | |
| | | Negative pressure of enclosure. Visual inspection of enclosure tarps indicating negative | CSA QC | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | pressure. | | | | |
| 6 | Completion of Surface Preparation for concrete deep repair applications. (If required) | SSPC SP CAB 1 and SSPC-SP13/NACE #6 | GC QC | | | |
| | | Surface Profile- ICRI CSP#5 minimum | CTR QC | | | |
| | | | CSA QC | | | |
| 7 | Completion of Concrete Deep Repairs (If required) and Related Surface Preparation Rework Prior to Concrete Filler/Re-surfacer/Parge. | SSD Maintained throughout application | GC QC | | | |
| | | SSPC SP CAB 1 and SSPC-SP13/NACE #6 | CTR QC | | | |
| | | Surface Profile- ICRI CSP#5 minimum | CSA QC | | | |
| 8 | Adhesion testing of host concrete as per ASTM C1583. Conduct tests in three (3) representative locations. Three (3) tests per location. Glue failures are not considered a completed test. | Report all adhesion values measured | GC QC | | | |
| | | Report average results of test areas. | CTR QC | | | |
| | | | CSA QC | | | |
| 9 | Completion of Concrete Filler/ Re-surfacer/Parge Coat Application to Concrete Prior to Coating System Application. | SSD Maintained throughout application | GC QC | | | |
| | | Visual inspection of uniformity of fill and dispersal | CTR QC | | | |
| | | | CSA QC | | | |
| 10 | Concrete - Completion of Surface Preparation for coating & lining applications. | SSPC SP CAB 1 and SSPC-SP13/NACE #6 | GC QC | | | |
| | | Surface Profile- ICRI CSP#4 minimum | CTR QC | | | |
| | | | CSA QC | | | |

Coating System Inspection Checklist

| Step | Description | Acceptance Criteria | Parties | Name | Signature | Date |
|---|---|---|---|---|---|---|
| 11 | Concrete- Adhesion testing on installed repair mortar (after min 48 hour cure) as per ASTM C1583. Conduct tests in three (3) representative locations. Three (3) tests per location. Glue failures are not considered a completed test. | Minimum 250 psi | GC QC | | | |
| | | 75% minimum host concrete failure | CTR QC | | | |
| | | | CSA QC | | | |
| 12 | Concrete- Completion of Primer Application. (If required) | DFT meets specifications as per SSPC PA9 | GC QC | | | |
| | | Visual Inspection- Film free of coating defects, pinholes and debris. | CTR QC | | | |
| | | | CSA QC | | | |
| 13 | Concrete - Completion of Lining Application and of Detail Treatment at Transitions and Terminations. | DFT meets specifications as per SSPC PA9 | GC QC | | | |
| | | Visual Inspection- Film free of coating defects, pinholes and debris. | CTR QC | | | |
| | | | CSA QC | | | |
| 14 | Completion of Full and Proper Cure of Lining System. | ASTM D5402- No material transfer | GC QC | | | |
| | | ASTM D2240- Shore D- Must match value stated on CTR PDS data. | CTR QC | | | |
| | | | CSA QC | | | |
| 15 | Concrete - Completion of Testing of Cured Lining System including Adhesion, Holiday (Continuity) Testing. | ASTM D4787- Pinhole/holiday free | GC QC | | | |
| | | ASTM D7234- TBD by results of ASTM C1583 testing of host concrete and repair mortar | CTR QC | | | |
| | | | CSA QC | | | |
| 16 | Concrete- Completion of Localized Repairs to Lining System Following Testing. | ASTM D4787- Pinhole/holiday free | GC QC | | | |
| | | Visual inspection for film quality- no runs, sags or other defects | CTR QC | | | |
| | | | CSA QC | | | |
| 17 | Final Acceptance of Coating/Lining System Installation Including Final Clean-Up Complying with Specification Requirements and the CTR's Quality Requirements. | Coatings/linings meet all specification requirements | GC QC | | | |
| | | | CTR QC | | | |
| | | | CSA QC | | | |

| Project Name | | | |
|---|---|---|---|
| Owner | | Coating System Manufacturer Technical CTR | |
| General Contractor (GC) | | Coating System Applicator (CSA) | |
| Area or Structure | | Location within Structure | |
| Coating System (eg E-1) | | Coating Type (eg Epoxy, etc.) | |

## Coating System Inspection Checklist

| Step | Description | Acceptance Criteria | Parties | Name | Signature | Date |
|---|---|---|---|---|---|---|
| 1 | Completion of pre-cleaning and substrate decontamination prior to shot blast cleaning. (Concrete) | Surface free of all oil, grease, form release agents and all other foreign contaminants | GC QC | | | |
| | | Host Substrate Min pH9 | CTR QC | | | |
| | | ASTM F22- No Moisture Lens Formation | CSA QC | | | |
| 2 | Moisture Testing of Concrete | Step 1- Initial Testing as Per ASTM D4263- if moisture present move to step 2 | GC QC | | | |
| | | Step 2- ASTM F1869- < 3lbs/1000 sq. ft/24 hours | CTR QC | | | |
| | | Step 2 Alternate- ASTM F2170- Substrate RH 70% or less. | CSA QC | | | |
| 3 | Ensuring compressed air for abrasive blasting or coating/lining application is free of oil and moisture | ASTM D4285- Free of all oil & moisture | GC QC | | | |
| | | 1 blotter test per 4 hours of compressed air usage | CTR QC | | | |
| | | | CSA QC | | | |
| 4 | Completion of ambient condition control in structure or building area and acceptance of ventilation methods in structure or Area. | Substrate min of 5 degrees above the dew point and stabilized. | GC QC | | | |
| | | Recording ambient conditions, a minimum of 4 times per shift/day at 2 hour intervals | CTR QC | | | |
| | | Negative pressure of enclosure. Visual inspection of enclosure tarps indicating negative pressure. | CSA QC | | | |
| 5 | Completion of Surface Preparation for concrete deep repair applications. (If required) | SSPC SP CAB 1 and SSPC-SP13/NACE #6 | GC QC | | | |
| | | Surface Profile- ICRI CSP#5 | CTR QC | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | minimum | CSA QC | | | |
| 6 | Completion of Concrete Deep Repairs (If required) and Related Surface Preparation Rework Prior to Concrete Filler/Re-surfacer/Parge. | SSD Maintained throughout application | GC QC | | | |
| | | SSPC SP CAB 1 and SSPC-SP13/NACE #6 | CTR QC | | | |
| | | Surface Profile- ICRI CSP#5 minimum | CSA QC | | | |
| 7 | Completion of Concrete Filler/ Re-surfacer Application to Concrete Prior to Coating System Application. | SSD Maintained throughout application | GC QC | | | |
| | | Visual inspection of uniformity of fill and dispersal | CTR QC | | | |
| | | | CSA QC | | | |
| 8 | Concrete - Completion of Surface Preparation for coating application. | SSPC SP CAB 1 and SSPC-SP13/NACE #6 | GC QC | | | |
| | | Surface Profile- ICRI CSP#5 minimum | CTR QC | | | |
| | | | CSA QC | | | |
| | | | | | | |

Coating System Inspection Checklist

| Step | Description | Acceptance Criteria | Parties | Name | Signature | Date |
|---|---|---|---|---|---|---|
| 9 | Installation of Cove Base around perimeter walls of the floor to ensure a monolithic transition to the floor surface | As per the CSM's Instructions | GC QC | | | |
| | | As per specification requirements | CTR QC | | | |
| | | | CSA QC | | | |
| 10 | Concrete- Completion of Primer Application. (If required) | DFT meets specifications as per SSPC PA9 | GC QC | | | |
| | | Visual Inspection- Film free of coating defects, pinholes and debris. | CTR QC | | | |
| | | | CSA QC | | | |
| 11 | Concrete - Completion of Application of the polyurethane cement floor coating and of Detail Treatment at Transitions and Terminations. | DFT meets specifications as per SSPC PA9 | GC QC | | | |
| | | Visual Inspection- Film free of coating defects, pinholes and debris. | CTR QC | | | |
| | | | CSA QC | | | |
| 12 | Concrete - Completion of the polyaspartic finish coat to all floor surfaces. | DFT meets specifications as per SSPC PA9 | GC QC | | | |
| | | Visual Inspection- Film free of coating defects, pinholes and debris. | CTR QC | | | |
| | | | CSA QC | | | |
| 13 | Completion of Full and Proper Cure of Floor Coating System. | ASTM D5402- No material transfer | GC QC | | | |
| | | ASTM D2240- Shore D- Must match value stated on CTR PDS data. | CTR QC | | | |
| | | | CSA QC | | | |
| 14 | Concrete - Completion of Testing of Cured Coating System including Adhesion, Holiday (Continuity) Testing. | ASTM D4787- Pinhole/holiday free | GC QC | | | |
| | | ASTM D7234- TBD by results of ASTM C1583 testing of host concrete and repair mortar | CTR QC | | | |
| | | | CSA QC | | | |
| 15 | Concrete- Completion of Localized Repairs to Coating System Following Testing. | ASTM D4787- Pinhole/holiday free | GC QC | | | |
| | | Visual inspection for film quality- no runs, sags or other defects | CTR QC | | | |
| | | | CSA QC | | | |
| 16 | Final Acceptance of Coating System Installation Including Final Clean-Up Complying with Specification Requirements and the CTR's Quality Requirements. | Coatings/linings meet all specification requirements | GC QC | | | |
| | | | CTR QC | | | |
| | | | CSA QC | | | |

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 - Common Work Results for HVAC.

### 1.2 DEFINITIONS

.1 HVAC System: complete air duct system from outside air intake louvers to furthest air supply terminal unit and including:

.1 Rigid supply and return ductwork;

.2 Flexible ductwork;

.3 Mixing plenum boxes;

.4 Return air plenums including ceiling plenums;

.5 Cooling and heating coils and compartments;

.6 Condensate drain pans, eliminator blades and humidifiers;

.7 Fans, fan blades and fan housing;

.8 Filter housing and frames;

.9 Acoustically insulated duct linings;

.10 Diffusers, registers and terminal units;

.11 Dampers and controls;

### 1.3 REFERENCE STANDARDS

.1 National Air Duct Cleaners Association (NADCA)

.1 ACR Standard, 2021 edition: Assessment, Cleaning and Restoration of HVAC Systems.

.2 North American Insulation Manufacturers Association (NAIMA)

.1 NAIMA 2005, Cleaning Fibrous Glass Insulated Duct Systems - Recommended Practices.

.3 United States Environmental Protection Agency (US EPA)

.1 US EPA 1999, 40 CFR Parts 152 and 156.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

.1 Provide submittals in accordance with Section 23 05 00 – Common Work Results for HVAC.

**1.5 CLOSEOUT SUBMITTALS**

.1 Submit in accordance with Section 23 05 00 – Common Work Results for HVAC.

.2 Post Cleaning Inspection Report: submit 4 copies of Final Inspection Report, including data collected, observations and recommendations as well as following information:

.1 Name and address of facility;

.2 Name and address of HVAC cleaning contractor;

.3 Description of HVAC systems with identifying systems cleaned;

.4 Comments complete with photographs of system and other observed system features;

.5 Identify systems tested, observations, actions taken and recommendations for future maintenance.

**1.6 QUALITY ASSURANCE**

.1 Contractor: Verification of membership in NADCA.

.2 Project Co-ordinator: Air System Cleaning Specialist (ASCS) certified by NADCA on full time basis.

**Part 2 Products**

**2.1 AIR DUCT CLEANING EQUIPMENT**

.1 Manually propelled full contact brushes:

.1 Ensure brushes are specifically manufactured and shaped to fit individual ducts, equipment and components of HVAC system.

.1 Ensure brushes are sized to fit various duct sizes in HVAC system.

.2 Ensure brushes make scrubbing motion and full contact with HVAC system interior surfaces to be cleaned.

## 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.

.1 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.

.1 Ensure HEPA filters are clean and maintain vacuum unit and HEPA filter to run efficiently.

# Part 3 Execution

## 3.1 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;

## 3.2 EXAMINATION / PRE-CLEANING INSPECTION

.1 Verification of Conditions:

.1 Make visual inspection of interior of HVAC system using 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 initial inspection immediately stop work and inform Contract Administrator.

.1 Do not proceed further with inspection operations until written approval from Contract Administrator.

## 3.3 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 closed-cell polyurethane foam or 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 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.

.6 Clean equipment, components and other features in isolated zone before moving to next zone of HVAC air duct system.

.7 Advise Contract Administrator 72 hours minimum before deactivation of fire alarm and smoke detectors for duct cleaning operations.

## 3.4 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 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.

## 3.5 FIELD QUALITY CONTROL/FINAL INSPECTIONS

.1 Post Cleaning Inspection: carry out final inspection using camera and other visual inspection methods after final cleaning has been completed.

.1 Carry out video survey as directed by Contract Administrator.

.2 Include in final survey areas inspected by Contractor prior to cleaning.

.3 Identify on HVAC system record drawings access points used for inspection and cleaning.

.4 Reset components including dampers and sensors, which have been disturbed during cleaning operations.

## 3.6 SYSTEM STARTUP

.1 Restart each HVAC system.

## 3.7 CLEANING

.1 Perform cleaning in accordance with Section 23 05 00 - Common Work Results for HVAC.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Division 01 - Submittal Procedures.

.2 Product Data: Submit manufacturer’s instructions, product literature, and data sheets for products and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Indicate on drawings:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.2 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

### 1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Division 01 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data and incorporate into manual.

.1 Operation and maintenance manual approved by, and final copies submitted to Contract Administrator before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.3 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.4 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.5 Approvals:

.1 Submit draft Operation and Maintenance Manual to Contract Administrator for approval. Submission of individual data will not be accepted unless directed by Contract Administrator.

.2 Make changes as required and re-submit as directed by Contract Administrator.

.6 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

.1 Contract Administrator will provide a set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.8 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Contract Administrator for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.9 Submit copies of as-built drawings for inclusion in final TAB report.

## 1.4 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Division 01 - Closeout Submittals.

.2 Supply spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.6 One set of belts for each size of belt driven equipment.

.7 One fusible link for every ten fire dampers installed.

.8 One seat and washer for each size and type of valve.

.3 Supply one set of special tools required to service equipment as recommended by manufacturers.

.4 Supply one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

**1.5 DELIVERY, STORAGE, AND HANDLING**

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, indoors and in a dry location and in accordance with manufacturer's recommendations in a clean, dry, well-ventilated area.

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

## Part 2 Products

**2.1 NOT USED**

.1 Not Used.

## Part 3 Execution

**3.1 EXAMINATION**

.1 Verification of Conditions: verify that conditions of substrate previously installed are acceptable for installation in accordance with manufacturer's instructions.

.1 Visually inspect substrate in presence of Contract Administrator.

.2 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

## 3.2 PROJECT PHASING

.1 The work of this Division is to be performed in two phases as follows and as supplemented on mechanical drawings:

.1 Phase 1:

.1 Demolish and replace exhaust and outdoor air ventilation piping for Tanks 1 and 2 such that the existing ventilation system can remain in service for Tank 3 as indicated.

.2 Phase 2:

.1 Provide temporary ventilation to Tanks 1 and 2 as required for the tank in service for the duration of Phase 2 as indicated.

.2 After the existing ventilation system has been taken out of service and the temporary ventilation is in place, demolish and replace exhaust and outdoor air ventilation piping for Tank 3 as indicated.

.3 Demolish and replace exhaust ventilation piping for exhaust fans S692 and S694 as indicated.

## 3.3 ADJUSTING

.1 Prime and touch up marred finished paintwork to match original.

.2 Perform painting in accordance with Division 01 - Interior Painting.

.3 Restore finishes which have been damaged to a "like new" condition.

## 3.4 CLEANING

.1 Perform cleaning of ductwork and air handling equipment in accordance with Section 23 01 31 – Air Duct Cleaning for HVAC Systems.

.2 Progress Cleaning: clean in accordance with Section Division 01 - Cleaning.

.1 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section Division 01 - Cleaning.

## 3.5 DEMONSTRATION

.1 Contract Administrator will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 Tank Exhaust Fan, S692

.2 Truck Exhaust Fan, S694

.3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.4 Use operation and maintenance manual, as-built drawings, and audio-visual aids as part of instruction materials.

.5 Instruction duration time requirements as specified in appropriate Sections.

.6 Contractor will record these demonstrations for future reference.

## 3.6 PROTECTION

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

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

.3 Repair damage to adjacent materials caused by installation.

**END OF SECTION**

## Part 1 General

### 1.1 SUMMARY

.1 This Section includes requirements for selective demolition and removal of heating, ventilation and air conditioning systems, controls and automated automation components, and related mechanical components and incidentals required to complete work described in this Section.

### 1.2 RELATED REQUIREMENTS

.1 Section 02 41 19.16 - Selective Interior Demolition

.2 Section 02 81 00 - Hazardous Materials

.3 Section 23 05 00 - Common Work Results for HVAC

### 1.3 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.3 Remove and Salvage: Detach items from existing construction and deliver them to City ready for reuse.

.4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.

.6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC

1985) including latest amendments.

## 1.4 REFERENCE STANDARDS

.1 CSA Group (CSA):

.1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

## 1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with 23 05 00 – Common Work Results for HVAC.

.2 Landfill Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes.

## 1.6 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.

.2 Scheduling: Account for City’s continued occupancy requirements during selective demolition with and schedule staged occupancy and worksite activities as a defined

## 1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: Perform work of this Section in accordance with the following:

.1 Provincial/Territorial Workers' Compensation Boards/Commissions.

.2 Provincial/Territorial Occupational Health and Safety Standards and Programs.

## 1.8 SITE CONDITIONS

.1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition on date that tender is accepted.

## 1.9 SALVAGE AND DEBRIS MATERIALS

.1 Demolished items become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain City's property.

.2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of materials in accordance with Division 02 - Removal and Salvage of Construction Materials.

## Part 2 Products

### 2.1 MATERIALS

.1 General Patching and Repair Materials: Refer to Division 02 - Selective Building Demolition and Division 02 - Selective Interior Demolition for listing of patching and repair materials incidental to removal or demolition of components associated with work of this Section.

.2 HVAC Repair Materials: Use only new materials required for completion or repair matching materials damaged during performance of work of this Section; new materials are required to meet assembly or system characteristics as existing systems indicated to remain and carry CSA approval labels required by the Authority Having Jurisdiction.

.3 Fire stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

## Part 3 Execution

### 3.1 EXAMINATION

.1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Contract Administrator will not consider claims for extras for work or materials necessary for proper execution and completion of the Contract that could have been determined by a site visit.

### 3.2 PREPARATION

.1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:

.1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.

.2 Notify Contract Administrator and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

.3 Prevent debris from blocking drainage inlets.

.4 Protect mechanical systems that must remain in operation.

.2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the City and users is minimized and as follows:

.1 Prevent debris from endangering the safe access to and egress from occupied buildings.

.2 Notify Contract Administrator and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

**3.3 EXECUTION**

.1 Demolition and Removal: Coordinate requirements of this Section with information contained in Division 02 - Selective Building Demolition and Division 02 - Selective Interior Demolition and as follows:

.1 Disconnect and cap gas supply and electrical services in accordance with requirements of local Authority Having Jurisdiction.

.2 Do not disrupt active or energized utilities without approval of the City.

.3 Erect and maintain dust proof and weather tight partitions to prevent the spread of dust and fumes to occupied building areas; remove partitions when complete.

.4 Demolish parts of existing building to accommodate new construction and remedial work as indicated.

.5 At end of each day's work, leave worksite in safe condition.

.6 Perform demolition work in a neat and workmanlike manner:

.1 Remove any tools or equipment after completion of work and leave site clean and ready for subsequent renovation work.

.2 Repair and restore damages caused as a result of work of this

Section to match existing materials and finishes.

## 3.4 CLOSEOUT ACTIVITIES

.1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for reuse in new construction in accordance with Division 02 - Removal and Salvage of Construction Materials.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 - Cast-in-Place Concrete

.2 Section 05 12 23 - Structural Steel for Buildings

.3 Section 23 05 00 - Common Work Results for HVAC

.4 Section 23 31 13 - Ductwork

### 1.2 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B31.1-2024, Power Piping.

.2 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP58-2018, Pipe Hangers and Supports - Materials, Design and Manufacture.

.3 National Research Council Canada (NRC)

.1 National Building Code of Canada (2020) (NBC)

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Comply with requirements of Tender 387-2025

.2 Provide submittals in accordance with Section 23 05 00 - Common Work Results for HVAC.

### 1.4 CLOSEOUT SUBMITTALS

.1 Provide submittals in accordance with Section 23 05 00 - Common Work Results for HVAC.

### 1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Tender 387-2025 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

## Part 2 Products

### 2.1 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Construct hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58

.2 Performance Requirements:

.1 Design supports and hangers to withstand seismic events as prescribed by NBC.

**2.2 GENERAL**

.1 Fabricate hangers, supports and sway braces in accordance with MSS SP58 and ANSI B31.1.

**2.3 INSERTS**

.1 Inserts, shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms.

.1 Inserts within tanks shall be 316 stainless steel, otherwise inserts shall be galvanized steel.

.2 Size inserts to suit threaded hanger rods.

**2.4 HANGER RODS:**

.1 Threaded rod material to MSS SP58.

.1 Hanger rods within tanks shall be 316 stainless steel, otherwise inserts shall be galvanized steel.

.2 Ensure that hanger rods are subject to tensile loading only.

.3 Provide linkages where lateral or axial movement of pipework is anticipated.

**2.5 SLEEVES**

.1 Round Ducts: Form sleeves with 316 stainless steel.

.2 Size large enough to allow for expansion with continuous insulation.

**Part 3 Execution**

**3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 INSERTS**

.1 Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

.2 Set inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying piping over 100 mm or ducts over 1500 mm wide.

.3 Where concrete slabs form the finished ceiling, finish inserts flush with slab surface.

**3.3 DUCT HANGERS AND SUPPORTS**

.1 Round Duct Hangers Minimum Sizes at 3 m spacings:

.1 Up to 460 mm diameter: 25 x 1.6 mm.

.2 Vertical Duct Floor Supports Minimum Sizes:

.1 Up to 1220 mm diameter: 40 x 40 x 3 mm.

.2 Rivet to duct and tie angles together with rod, angles, or band Iron.

.3 Angle reinforcing may be used for support omitting trapeze.

**3.4 HANGER INSTALLATION**

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

**3.5 SLEEVES**

.1 Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves.

.2 Extend sleeves through potentially wet floors 25 mm above finished floor level. Caulk sleeves full depth and provide floor plate.

.3 Where piping or ductwork passes through floor, ceiling, or wall, close off space between pipe or duct and construction with non-combustible insulation. Provide tight fitting metal caps on both sides and caulk.

.4 Install chrome plated escutcheons where piping passes through finished surfaces.

**3.6 HORIZONTAL MOVEMENT**

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

## 3.7 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

## 3.8 CLEANING

.1 Perform cleaning in accordance with Section 23 05 00 - Common Work Results for HVAC.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 – Common Work Results for HVAC

### 1.2 SUMMARY

.1 Section Includes:

.1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.

### 1.3 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3, Identification of Piping Systems.

### 1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Comply with requirements of Tender 387-2025.

.2 Provide submittals in accordance with Section 23 05 00 - Common Work Results for HVAC.

### 1.5 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Division 01 - Submittal Procedures.

.2 Health and Safety:

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

### 1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle in accordance with Tender 387-2025 and with manufacturer's written instructions.

## Part 2 Products

### 2.1 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Contract Administrator.

**2.2 IDENTIFICATION DUCTWORK SYSTEMS**

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

**2.3 VALVES**

.1 Stainless steel tags with 12 mm stamped identification data filled with black paint.

**2.4 LANGUAGE**

.1 Identification in English.

**Part 3 Execution**

**3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 TIMING**

.1 Provide identification only after painting has been completed.

**3.3 INSTALLATION**

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

**3.4 LOCATION OF IDENTIFICATION ON DUCTWORK SYSTEMS**

.1 On both sides of visual obstruction or where run is difficult to follow.

.2 At least once in each small room through which piping or ductwork passes.

.3 On both sides of separations such as walls, floors, partitions.

.4 At beginning and end points of each run and at each piece of equipment in run.

.5 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.6 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

**3.5 VALVES**

.1 At valves. Secure tags with non-ferrous chains or closed "S" hooks.

.2 Number valves in each system consecutively.

**3.6 CLEANING**

.1 Perform cleaning in accordance with Section 23 05 00 - Common Work Results for HVAC.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 – Common Work Results for HVAC

### 1.2 SUMMARY

.1 TAB is used throughout this Section to describe the process, methods, and requirements of testing, adjusting, and balancing for HVAC.

.2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

### 1.3 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to Contract Administrator within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.

.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

**1.4 PURPOSE OF TAB**

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads.

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements under the following conditions:

.1 Sludge pumps and thermal are operating.

.2 Sludge pumps are operating, and the thermal oxidizer is in bypass.

**1.5 EXCEPTIONS**

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

**1.6 CO-ORDINATION**

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

**1.7 PRE-TAB REVIEW**

.1 Review contract documents before project construction is started confirm in writing to Contract Administrator adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Contract Administrator in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

**1.8 START-UP**

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

**1.9 OPERATION OF SYSTEMS DURING TAB**

.1 Operate systems for length of time required for TAB and as required by Contract Administrator for verification of TAB reports.

**1.10 START OF TAB**

.1 Notify Contract Administrator 7 days prior to start of TAB.

.2 Start TAB when work is essentially completed, including:

.3 Installation of ceilings, doors, windows, other construction affecting TAB.

.4 Application of weather-stripping, sealing, and caulking.

.5 Pressure, leakage, other tests specified elsewhere Division 23.

.6 Provisions for TAB installed and operational.

.7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment.

.2 Air systems:

.1 Filters in place, clean.

.2 Duct systems clean.

.3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.

.4 Correct fan rotation.

.5 Fire, smoke, volume control dampers installed and open.

.6 Coil fins combed, clean.

.7 Access doors, installed, closed.

.8 Outlets installed; volume control dampers open.

.3 Liquid systems:

.1 Flushed, filled, vented.

.2 Correct pump rotation.

.3 Strainers in place, baskets clean.

.4 Isolating and balancing valves installed, open.

.5 Calibrated balancing valves installed, at factory settings.

.6 Chemical treatment systems complete, operational.

## 1.11 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 HVAC systems: plus 5 %, minus 5 %.

## 1.12 ACCURACY TOLERANCES

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

## 1.13 INSTRUMENTS

.1 Prior to TAB, submit to Contract Administrator list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Contract Administrator.

**1.14 ACTION AND INFORMATIONAL SUBMITTALS**

.1 Submit, prior to commencement of TAB:

.1 Proposed methodology and procedures for performing TAB if different from referenced standard.

**1.15 PRELIMINARY TAB REPORT**

.1 Submit for checking and approval of Contract Administrator, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.

.2 Details of TAB procedures employed.

.3 Calculations procedures.

.4 Summaries.

**1.16 TAB REPORT**

.1 Format in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:

.1 Project record drawings.

.2 System schematics.

.3 Submit 6 copies of TAB Report to Contract Administrator for verification and approval, in English in D-ring binders, complete with index tabs.

**1.17 VERIFICATION**

.1 Reported results subject to verification by Contract Administrator.

.2 Provide personnel and instrumentation to verify up to 30 % of reported results.

.3 Number and location of verified results as directed by Contract Administrator.

.4 Pay costs to repeat TAB as required to satisfaction of Contract Administrator.

**1.18 SETTINGS**

.1 After TAB is completed to satisfaction of Contract Administrator, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

**1.19 COMPLETION OF TAB**

.1 TAB considered complete when final TAB Report received and approved by Contract Administrator.

**1.20 AIR SYSTEMS**

.1 Do TAB of systems, equipment, components, controls specified Division 23.

.2 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet

bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.3 Locations of equipment measurements: to include as appropriate:

.1 Inlet and outlet of tanks, fan, thermal oxidizer, and other equipment causing changes in conditions.

.2 At controllers, controlled device.

.4 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

**1.21 OTHER TAB REQUIREMENTS**

.1 General requirements applicable to work specified this paragraph:

.1 Qualifications of TAB personnel: as for air systems specified this section.

.2 Quality assurance: as for air systems specified this section.

.2 Building pressure conditions:

.1 Adjust HVAC systems, equipment, controls to ensure specified pressure conditions at all times meet design conditions.

**1.22 POST-OCCUPANCY TAB**

.1 Participate in systems checks twice during Warranty Period - #1 approximately 3 months after acceptance and #2 within 1 month of termination of Warranty Period.

**Part 2 Products**

**2.1 NOT USED**

.1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 – Common Work Results for HVAC

### 1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM D2564-20, Standard Specification for Solvent Cements for Poly (Vinyl-Chloride) (PVC) Plastic Piping Systems.

.2 American Society of Mechanical Engineers (ASME)

.1 ANSI/ASME B16.5-20, Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24, Metric/Inch Standard.

.3 Canadian Standards Association (CSA)

.1 CSA B1800:21, Thermoplastic Nonpressure Piping Compendium

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Comply with requirements of Tender 387-2025.

.2 Provide submittals in accordance with Section 23 05 00 - Common Work Results for HVAC.

### 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Tender 387-2025 and with manufacturer's written instructions.

## Part 2 Products

### 2.1 VENTILATION PIPING

.1 PVC: XFR piping to CAN/CSA B1800

.2 Stainless Steel: 316 stainless steel to ASTM A312/A312M

### 2.2 JOINTS

.1 Solvent weld for PVC: to ASTM D2564

### 2.3 FITTINGS

.1 PVC: XFR fittings to CAN/CSA B1800

.1 Flanges: Class 150 to ANSI/ASME B16.5

.2 Stainless Steel: 316 stainless steel to ASTM A312/A312M

.1 Flanges: Class 150 to ANSI/ASME B16.5

## Part 3 Execution

### 3.1 APPLICATION

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

### 3.2 INSTALLATION

.1 Protect openings against entry of foreign material.

.2 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.3 Install exposed ducting and similar items parallel or perpendicular to building lines.

.4 Ream pipe and remove other foreign material before assembly.

.5 Use eccentric reducers at pipe size changes.

.6 Install sleeves in accordance with Section 23 05 29 – Hangers and Supports for HVAC, Piping, and Equipment.

.7 Valves:

.1 Install with stems above horizontal position unless indicated.

.2 Valves accessible for maintenance without removing adjacent piping.

.3 Use butterfly valves for isolating purposes where specified.

### 3.3 CLEANING

.1 Perform cleaning in accordance with Section 23 05 00 - Common Work Results for HVAC.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 – Common Work Results for HVAC

### 1.2 REFERENCE STANDARDS

.1 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)

.1 MSS SP-67-2022, Butterfly Valves.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Comply with requirements of Tender 387-2025.

.2 Provide submittals in accordance with Section 23 05 00 – Common Work Results for HVAC.

### 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Tender 387-2025 and with manufacturer's written instructions.

### 1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Furnish following spare parts:

.1 Valve seats: one.

.2 Discs: one.

.3 Stem packing: one.

.4 Valve handles: two.

.5 Gaskets for flanges: one.

.2 Tools:

.1 Furnish special tools for maintenance of systems and equipment.

## Part 2 Products

### 2.1 BUTTERFLY VALVES

.1 Except to specialty valves, to be of single manufacturer.

.2 To be suitable for dead-end service.

.3 Sizes:

.1 Lug type: NPS 6-8.

.4 Pressure rating for tight shut-off at temperatures up to maximum for seat material.

.1 NPS 6-8: 150 psig.

.5 Minimum seat temperature ratings to 73 degrees C.

.6 Application: on-off operation.

.7 Operators:

.1 NPS 6-8: handles capable of locking in any of ten (10) positions - 0 degrees to 90 degrees. Handle and release trigger - ductile iron. Return spring and hinge pin: carbon steel.

.8 Designed to comply with MSS SP-67

.9 Compatible with ANSI Class 125/Class 150 flanges

.10 Construction:

.1 Body: PVC.

.2 Disc: PVC.

.3 Seat: EPDM.

.4 Shaft: 416 stainless steel.

.5 Taper pin: 316 stainless steel.

.6 O-Ring: EPDM.

.7 Bushings: Teflon.

## Part 3 Execution

### 3.1 PREPARATION

.1 Valve and mating flange preparation.

.1 Inspect adjacent pipeline, remove foreign material.

.2 Ensure that valve seats and pipe flange faces are free of dirt or surface irregularities which may disrupt flange seating and cause external leakage.

.3 Install butterfly valves with disc in almost closed position.

.4 Inspect valve disc seating surfaces and waterway and eliminate dirt or foreign material.

### 3.2 INSTALLATION OF VALVES

.1 Install in accordance with manufacturer's instructions.

.2 Do not use gaskets between pipe flanges and valves unless instructed otherwise by valve manufacturer.

.3 Verify suitability of valve for application by inspection of identification tag.

.4 Handle valve with care so as to prevent damage to disc and seat faces.

.5 Valves in horizontal pipe lines should be installed with stem in horizontal position to minimize liner and seal wear.

.6 Ensure that valves are centered between bolts before bolts are tightened and then opened and closed to ensure unobstructed disc movement. If interference occurs due, for example to pipe wall thickness, taper bore adjacent piping to remove interference.

**3.3 CLEANING**

.1 Perform cleaning in accordance with Section 23 05 00 – Common Work Results for HVAC.

**END OF SECTION**