Part 1 General

1.1 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, in accordance with relevant municipal, provincial and other regulations.

1.2 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with the Contract Administrator to facilitate work as stated.

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

.3 Where security is reduced by work provide temporary means to maintain security.

.4 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

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

1.3 WORKING HOURS

.1 Working hours will be restricted to between 7:00 a.m. and 5:00 p.m. Monday through Friday.

.2 No work permitted on Saturdays, Sundays and Statutory holidays.

.3 Notwithstanding the above, all Work shall be completed in conformance with City of Winnipeg Neighbourhood Liveability By-Law No. 1/2008.

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 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, in accordance with relevant municipal, provincial and other regulations.

1.2 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with the Contract Administrator to facilitate work as stated.

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

.3 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

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

.5 The building will be turned over to the Contractor for the duration of the Work. The Contractor is to maintain site security at all times.

1.3 WORKING HOURS

.1 The contractor will not be restricted to working hours within the building. The Contractor is responsible for maintaining the building secure.

.2 All Work shall be completed in conformance with City of Winnipeg Neighbourhood Liveability By-Law No. 1/2008.

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 PRECONSTRUCTION MEETING

.1 In accordance with Supplemental Conditions Clause D14 - Commencement.

1.2 PROGRESS MEETINGS

.1 In accordance with Supplemental Conditions Clause D20 – Job Meetings

1.3 PRE-INSTALLATION MEETING

.1 Convene pre-installation meeting minimum one week prior to beginning on site installation of on-site work and mock-up.

.2 Establish date, time and location of meeting and notify parties concerned minimum 5 days before conference.

.3 Contractor, Subcontractors involved in work and Contract Administrator to be in attendance.

.4 Agenda for conference:

- .1 Verify project requirements.
- .2 Review installation and substrate conditions.
- .3 Co-ordinate with subtrades.
- .4 Review manufacturer’s installation instructions and warranty requirements.
- .5 Review compatibility of materials.
- .6 Review testing requirements.

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 ADMINISTRATIVE

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

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

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

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

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

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

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

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

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Manitoba, Canada.

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

.4 Allow 5 working days for Contract Administrator’s review of each submission.

.5 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.

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

.7 After the Contract Administrator's review, distribute copies.

.8 Submit electronic copy in PDF format of shop drawings for each requirement requested in specification Sections and as the Contract Administrator may reasonably request.

.9 Submit electronic copy in PDF format 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.

.10 Delete information not applicable to project.

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

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

1.3 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 the Contract Administrator's business address.

.3 Notify the 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 the Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing prior to proceeding with Work.

.6 Make changes in samples which the 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.

1.4 MOCK-UPS

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

1.5 CERTIFICATES AND TRANSCRIPTS

.1 Submit Workers' Compensation Board status in accordance with Supplemental Conditions Clause D14 - Commencment.

.2 Submit certificate of insurance in accordance with Supplemental Conditions Clause D10 - Insurance.

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 Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

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

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

.4 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.

1.2 INDEPENDENT INSPECTION AGENCIES

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

.1 Cost of such services will be paid by the Contractor as a Unit Price component in accordance with Bidding Procedures Clause B10 - Prices.

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

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

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by the Contract Administrator at no cost to The City. Pay costs for retesting and reinspection.

1.3 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work.

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

1.4 PROCEDURES

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

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

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

1.5 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by 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 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 Contract Documents, amount of which will be determined by the Contract Administrator.

1.6 REPORTS

.1 Submit copies of inspection and test reports to The City and the Contract Administrator.

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

.3 Provide copies of concrete test results to Concrete Supplier.

1.7 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

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

1.8 MOCK-UPS

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

.2 Construct in locations acceptable to the Contract Administrator and as specified in specific Section.

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

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

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

.6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

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 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.2 WATER SUPPLY

.1 The City will make available, for the extent that it is available, a supply of potable water for construction use at no charge to the Contractor

.2 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.

.3 The Contractor shall provide all necessary hoses, lines, connections, and other ancillary hardware which may be required.

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

1.3 TEMPORARY HEATING AND VENTILATION

.1 Permanent heating system of building will remain in operation during construction.

.2 Provide temporary heating required during construction period as required to supplement the permanent heating system of building, including attendance, maintenance and fuel.

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

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

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

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

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

.3 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.

.4 Ventilating:

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

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

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

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

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

.7 Control humidity levels in construction areas to accommodate specified products.

.5 Permanent heating system of building, may be used for heating. Be responsible for damage to heating system if use is permitted.

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

.1 Conform with applicable codes and standards.
.2 Enforce safe practices.
.3 Prevent abuse of services.
.4 Prevent damage to finishes.
.5 Vent direct-fired combustion units to outside.

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

1.4 TEMPORARY POWER AND LIGHT

.1 The City will make available, for the extent that it is available temporary power during construction for temporary lighting and operating of power tools.

.2 Connect to existing power supply in accordance with Canadian Electrical Code and provide meters and switching.

.3 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.

.4 Temporary power for equipment requiring in excess of that available on-site is responsibility of the Contractor.

.5 Provide and maintain temporary lighting throughout project.

1.5 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for cellular telephone for site superintendent and use of the Contract Administrator.

1.6 FIRE PROTECTION

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

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA O121-08, Douglas Fir Plywood.

1.2 SUBMITTALS

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

.2 Shop Drawings:

.1 Submit shop drawings bearing the seal of professional engineer registered in the Province of Manitoba.

1.3 SCAFFOLDING

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

.1 Where Manitoba Regulation 217/2006 requires scaffolds to be designed by a professional engineer. Submit shop drawings bearing the seal of professional engineer registered in the Province of Manitoba.

1.4 SITE STORAGE/LOADING

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

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

1.5 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not interfere with normal operations, fire, ambulance and emergency access and egress or disrupt performance of Work.

1.6 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.

1.7 SANITARY FACILITIES

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

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

1.8 POLLUTION CONTROL

.1 The use of gas or diesel powered equipment within interior areas is strictly prohibited.

.2 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures and/or other control methods. If necessary, arrange for shutdown of air handling units which have air intakes in the vicinity of the work. Dust can trigger fire alarm smoke detectors and can plug ducts and filters. Dust and suspended particles can damage air-cooled mechanical and electrical equipment. If necessary, arrange for shutdown of this equipment. Contractor shall be responsible for all damages. Prior to start of work, identify locations of air intakes and air-cooled mechanical and electrical equipment within and adjacent to the area of work.

.3 Control noxious and hazardous gases. Prevent hazardous accumulations. Control emission from equipment and plant to local authority's emission requirements.

.4 On exterior, cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.9 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 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.2 HOARDING

.1 The Contractor must barricade off the area under construction to prevent the general public from improper access to the construction area. Suitable barricades and protection systems include:

.1 Lock and barricade existing doors to work areas. Post warning signage on doors.

.2 Erect barricades within work areas around open through slab repairs with materials design to withstand guard loading.

.2 Repair surface coatings and finishes which are damaged by temporary hoardings and barricades.

.3 Provide adequate signage, fencing, etc. to inform the public of the work being undertaken.

1.3 DUST TIGHT SCREENS

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

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

1.4 FIRE ROUTES

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

1.5 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.

1.6 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 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

Part 1 General

1.1 REFERENCES

.1 Within text of each specifications section, reference may be made to reference standards. Conform to these reference standards, in whole or in part as specifically requested in specifications.

.2 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

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

.4 The Cost for such testing will be borne by the Contractor or Supplier.

1.2 QUALITY

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

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

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

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

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

1.3 AVAILABILITY

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

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

1.4 STORAGE, HANDLING AND PROTECTION

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

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

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

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

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

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

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

.8 Remove and replace damaged products at own expense and to satisfaction of the Contract Administrator.

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

1.5 TRANSPORTATION

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

1.6 MANUFACTURER'S INSTRUCTIONS

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

.2 Notify the Contract Administrator in writing, of conflicts between specifications and manufacturer's instructions, so that the Contract Administrator will establish course of action. Where conflicts exist, the more stringent instruction will be enforced.

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

1.7 QUALITY OF WORK

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

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

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

1.8 CO-ORDINATION

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

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

1.9 REMEDIAL WORK

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

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

1.10 PROTECTION OF WORK IN PROGRESS

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

1.11 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants.

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

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

.2 Remove waste materials from site at daily regularly scheduled times. Do not burn waste materials on site.

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

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

.5 Dispose of waste materials and debris off site.

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

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

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

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

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

1.2 HIGH LEVEL CLEANING

.1 At completion of Work, complete a high level cleaning of the Pool Area.

.2 Clean ductwork and mechanical equipment in accordance with Section 23 10 30.51 – HVAC Duct Cleaning.

.3 Provide scaffolding to complete high-level cleaning. Remove scaffolding upon completion of cleaning.

.4 Maintain ceiling tiles and ceiling tracking in place.

.5 Clean by wet wipe and vacuum accessible horizontal surfaces and ledges including but not limited to:

- .1 Structural steel members not covered by the suspended ceiling system. Including but not limited to:
  - .1 Steel beam flanges.
  - .2 Truss chords.
  - .3 Bridging members.
- .2 Ceiling tracking accessible without removing ceiling system.
- .3 Mechanical and electrical fixtures.
- .4 Furnishings.

1.3 FINAL CLEANING

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

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

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

.4 Remove waste products and debris other than that caused by The City or other Contractors.

.5 Remove waste materials from site at regularly scheduled times. 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 Remove stains, spots, marks and dirt from existing surfaces, fixtures, and finishes within the work area or affected by the Work.

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

.9 Remove dirt and other disfiguration from exterior surfaces.

.10 Sweep and power wash clean all work areas.

1.4 FLOOR DRAIN CLEANING

.1 Prior to commencement of Work, remove debris from drain and pits. Mechanically clean drain lines.

.2 Following completion of Work, remove construction debris from drain and pits. Mechanically clean drain lines.

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 REFERENCES

.1 General Conditions C12.

.2 Supplemental Conditions D17.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Conduct the following in addition to requirements outlined in General Conditions C12 and Supplemental Conditions D17.

.2 Acceptance of Work Procedures:

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

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

.2 Request Contract Administrator’s inspection.

.2 Contract Administrator’s Inspection:

.1 The Contract Administrator and Contractor to inspect Work and identify defects and deficiencies.

.2 Contractor to correct Work as directed.

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

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

.2 Defects: corrected and deficiencies completed.

.3 Work: complete and ready for final inspection.

.4 Final Inspection:

.1 When completion tasks are done, request final inspection of Work by The City, The Contract Administrator, and Contractor.

.2 When Work incomplete according to The City and the Contract Administrator, complete outstanding items and request re-inspection.

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

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

.7 Final Payment:

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

.2 Refer to General Conditions C12: when Work deemed incomplete by the Contract Administrator, complete outstanding items and request re-inspection.

.8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.3 FINAL CLEANING

.1 Clean in accordance with Section 01 74 11 – Cleaning.

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Operation and maintenance data.

.2 As-built drawings, samples, and specifications.

.3 Product data, materials and finishes, and related information.

.4 Record documents.

.5 Final site survey.

.6 Equipment and systems.

.7 Spare parts, special tools and maintenance materials.

.8 Warranties and bonds.

1.2 SUBMISSION

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.2 Copy will be returned after final inspection, with Contract Administrator’s comments.

.3 Revise content of documents as required prior to final submittal.

.4 Two weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, four final copies of operating and maintenance manuals in English.

.5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.6 If requested, furnish evidence as to type, source and quality of products provided.

.7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.8 Pay costs of transportation.

1.3 OPERATION AND MAINTENANCE MANUAL FORMAT

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

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

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

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

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

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

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

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

1.4 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;

.1 date of submission;

.2 names, addresses, and telephone numbers of The City, Contract Administrator and Contractor with name of responsible parties; and

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

.2 For each product or system, list names, addresses and telephone numbers of Subcontractors and Suppliers, including local source of supplies and replacement parts.

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

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

.5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.5 AS-BUILT DOCUMENTS AND SAMPLES

.1 In addition to requirements in General Conditions, maintain at the site for the Contract Administrator one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to the Contract.

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

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store as-built documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label as-built documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "AS-BUILT DOCUMENTS" in neat, large, printed letters.

.4 Maintain as-built documents in clean, dry and legible condition. Do not use as-built documents for construction purposes.

.5 Keep as-built documents and samples available for inspection by the Contract Administrator.

1.6 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of black line opaque drawings, and in a copy of the Project Manual, provided by the Contract Administrator.

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

.3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

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

.1 Field changes of dimension and detail.
.2 Changes made by change orders.
.3 Details not on original Contract Drawings.
.4 References to related shop drawings and modifications.

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

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
.2 Changes made by Addenda and change orders.

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

1.7 RECORD DOCUMENTS

.1 Prior to Substantial Performance of the Work, electronically transfer the marked up information from the as-built documents to a master set of drawing and specification files provided by the Contract Administrator, as follows:

.1 Drawings: AutoCAD Release 2017.
.2 Specifications: Adobe Acrobat 2019.

.2 Mark revised documents as "RECORD DOCUMENTS". Include all revisions.

.3 Employ a competent computer draftsperson to indicate changes on the electronic set of record drawings. Provide updated record drawings in AutoCAD Release 2017.

.4 Employ a competent specification writer to indicate changes to the electronic set of record specifications. Provide updated record specifications in Adobe Acrobat 2019.

.5 Submit completed record documents to the Contract Administrator on a CD-ROM.

1.8 MATERIALS AND FINISHES

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

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

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

.4 Building Envelope: include copies of drawings of building envelope components, illustrating the interface with similar or dissimilar items to provide an effective air, vapour and thermal barrier between indoor and outdoor environments. Include an outline of requirements for regular inspections and for regular maintenance to ensure that on-going performance of the building envelope will meet the initial building envelope criteria.

.5 Additional Requirements: as specified in individual specifications sections.

1.9 SPARE PARTS

.1 Provide spare parts, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to the Place of the Work; place and store.

.4 Receive and catalogue all items. Submit inventory listing to the Contract Administrator. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered Products and submit prior to final payment.

1.10 MAINTENANCE MATERIALS

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to the Place of the Work; place and store.

.4 Receive and catalogue all items. Submit inventory listing to the Contract Administrator. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered Products and submit prior to final payment.

1.11 SPECIAL TOOLS

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to the Place of the Work; place and store.

.4 Receive and catalogue all items. Submit inventory listing to the Contract Administrator. Include approved listings in Maintenance Manual.

1.12 STORAGE, HANDLING AND PROTECTION

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

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

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

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

.5 Remove and replace damaged Products at own expense and to satisfaction of the Contract Administrator.

1.13 WARRANTIES AND BONDS

.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 the applicable item of work.

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

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

.6 Co-execute submittals when required.

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Duct and HVAC equipment cleaning of HVAC systems serving the pool area.

1.2 QUALITY ASSURANCE

.1 Contractor Qualifications:

.1 Duct cleaning contractor to be member of National Air Duct Cleaners Association (NADCA).

Part 2 Products

2.1 MATERIALS

.1 Access Panel: Fabricated sheet metal closure.

.1 Minimum of same gauge as ductwork.
.2 Minimum ¾" larger than opening on all sides.
.3 Attached with sheet metal screws.
.4 Sealed with duct sealant.

Part 3 Execution

3.1 PREPARATION

.1 Protection: Protect adjacent Work areas and finish surfaces from damage during duct cleaning.

.2 Take precautions to ensure that dust and debris do not spread outside of duct system during the cleaning process.

.3 Mark position of balancing dampers prior to start of cleaning work. Return dampers to pre-cleaning positions after cleaning has been completed.

.4 Discharge vacuum exhaust system directly outdoors.

.1 Exhaust indoors as follows:

.1 At the discretion of the Contract Administrator.
.2 Duct cleaning equipment equipped with a High Efficiency Particulate Aerosol (HEPA) filter 99.9% effective at filtering particulate 0.3 microns in diameter.

3.2 CLEANING

.1 Vacuum clean and remove debris from interior surfaces of supply, return and exhaust systems serving the pool area including:

.1 Ductwork.
.2 Plenums.
.3 Air handling equipment.
.4 Coils.
.5 Terminal units.

.2 Provide high powered suction equipment to item to be cleaned and clean with:

.1 Compressed air and mechanical agitation.

.3 Do not used mechanical brushes on acoustic lines ductwork.

.4 Clean diffusers and grilles.

.5 Replace filters in air handling equipment.

END OF SECTION

Part 1 General

1.1 Section Includes

.1 Pipe and equipment hangers and supports.

.2 Equipment bases and supports.

.3 Sleeves and seals.

.4 Flashing and sealing equipment and pipe stacks.

1.2 Related Sections

.1 Section 22 10 00 - Plumbing Piping.

.2 Section 22 05 00 – Common Work Results for Plumbing.

1.3 References

.1 ASME B31.9 - Building Services Piping.

.2 ASTM F708 - Design and Installation of Rigid Pipe Hangers.

.3 MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

.4 MSS SP69 - Pipe Hangers and Supports - Selection and Application.

.5 MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.4 Submittals

.1 Submit in accordance with Sections 22 05 00 - Common Work Results for Plumbing and 01 33 00 - Submittal Procedures.

.2 Shop Drawings: Indicate system layout with location and detail of trapeze hangers.

.3 Product Data: Provide manufacturers catalogue data including load capacity.

.4 Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

.5 Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.5 Regulatory Requirements

.1 Conform to applicable code for support of plumbing piping.

Part 2 Products

2.1 PIPE HANGERS AND SUPPORTS

.1 Manufacturers:

.1 Anvil.

.2 Grinnel.

.2 Plumbing Piping - DWV:

.1 Conform to ASME B31.9.

.2 Cast Iron DWV Piping:

.1 Hangers for Pipe Sizes 13 to 38 mm (1/2 to 1-1/2 inch): Carbon steel, adjustable swivel, split ring.

.2 Hangers for Pipe Sizes 50 mm (2 inches) and over: Carbon steel, adjustable, clevis.

.3 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

.4 Wall Support for Pipe Sizes to 75 mm (3 inches): Cast iron hook.

.5 Wall Support for Pipe Sizes 100 mm (4 inches) and over: Welded steel bracket and wrought steel clamp.

.6 Vertical Support: Steel riser clamp.

.7 Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.8 Clamping for MJ couplings: Socket-pipe clamps with washers, threaded rod, and nuts (Anvil Fig. 594 & 595 or equal).

.3 PVC DWV Pipe Support: to manufacturer’s requirements.

2.2 Accessories

.1 Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

2.3 Inserts

.1 Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

Part 3 Execution

3.1 Installation

.1 Install to manufacturer's written instructions.

3.2 Inserts

.1 Provide inserts for placement in concrete formwork.

.2 Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

.3 Provide hooked rod to concrete reinforcement section for inserts carrying pipe over100 mm (4 inches).

.4 Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

.5 Install galvanized oversize pipe sleeves on all pipes passing through walls or partitions, for building into wall construction by other trades.

.6 All sleeves are to be large enough to accommodate pipe insulation as specified.

.7 The Mechanical Division shall include in tender price all cost of drilling for sleeves up to 175 mm (7") in precast sections relative to work under Mechanical Division. Prior to drilling all openings/locations must be checked by the Contract Administrator. Drilling shall be done using diamond core drilling machinery.

.8 All sleeves in mechanical rooms, janitors closets and washrooms shall extend 100 mm (4") above the finished floor level to prevent water seeping down.

.9 Caulk the space between pipes and floor sleeves or openings, to prevent water seeping down, with an approved caulking compound. The caulking compound and method of application shall be to the Contract Administrator's approval.

.10 Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

3.3 Pipe Hangers And Supports

.1 Install to manufacturer's written instructions.

.2 Perforated strap or wire hangers will not be permitted.

.3 Support horizontal piping as scheduled.

.4 Support for buried pipe under a new slabs or existing shall be hung from the slab using epoxy coated or stainless steel hangers, hardware and hanger rod secured to the rebar.

.5 Hangers in new concrete structural floor systems shall be supported by inserts placed prior to pouring of concrete. Inserts shall be Grinnell cast iron or wrought steel adjustable type.

.6 Where hangers must be installed in existing concrete slabs, approved expansion type inserts shall be used, or if heavy weights must be supported, a hole shall be drilled through the slab and a 50 mm x 50 mm (2" x 2") washer and nut installed above rough slab before the floor finish is poured.

.7 Where the structural system is open web steel joists, piping shall be supported by means of angles spanning the top chords of adjacent joists. The number of joists to be spanned in this way shall be determined by the incident load of piping.

.8 In no case shall the hanging of piping directly from roof or ceiling decking be allowed, unless special permission is obtained from the Contract Administrator.

.9 Install hangers to provide minimum 13 mm (1/2 inch) space between finished covering and adjacent work.

.10 Place hangers within 300 mm (12 inches) of each horizontal elbow.

.11 Use hangers with 38 mm (1-1/2 inch) minimum vertical adjustment.

.12 Support horizontal cast iron pipe adjacent to each hub, with 1.5 m (5 feet) maximum spacing between hangers.

.13 Support all pipe with MJ couplings on both sides of the joint. At multiple fittings or short lengths, support every 300 mm (12”).

.14 Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub or with pipe clamps on hubless pipe.

.15 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

.16 Support riser piping independently of connected horizontal piping.

.17 Provide copper plated hangers and supports for copper piping.

.18 Design hangers for pipe movement without disengagement of supported pipe.

.19 All hanger rods shall have sufficient threaded length to allow for vertical adjustment of hangers after pipe is in place. Use 2 nuts on each rod, one above the clevis or angle iron and one below.

.20 Where pipes or equipment are supported from floors or walls, structural steel supports shall be fabricated, using welded joints except where provision is made for adjustment. Where details of construction are not indicated, drawings shall be submitted to Contract Administrator for approval before fabrication.

.21 Clamps should be located immediately below a coupling if possible. Risers up to 50 mm (2") size shall be braced at intervals not over 2100 mm (7').

.22 Vertical piping other than risers through floors shall be provided with suitable supports, sway braces, etc.

.23 Vertical piping shall be supported at the base in an approved manner.

.24 On insulated piping supported by roller supports or trapeze supports (angle iron) provide at each hanger or support a protection saddle of 16 ga. galvanized sheet steel, rolled to match the outside diameter of the insulation. The saddle shall cover approximately the bottom one third of the circumference of the insulation. The length shall be at least as long as that recommended by the insulation manufacturer as published in their data.

.25 On insulated pipe up to and including 50 mm (2") pipe, clevis hangers shall be sized to suit the O.D. of the pipe. On insulated pipe of 63 mm (2½") and above, the hangers shall be sized to suit the O.D. of the insulation and protection saddles, as described above shall be installed.

.26 Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.4 Schedules

.1 Maximum spacing between pipe supports:

- .1 Hangers shall be installed not more than 12” (300mm) from each change in direction of pipes.
- .2 Where there are concentrations of valves and fittings, closer spacing will be necessary.
- .3 Cast Iron Pipe
  - .1 Maximum spacing – maximum 5 ft. (1.5m)
  - .2 Support M.J. pipe on both sides of joint. Provide with sway braces and anchors to Contract Administrator’s approval. At multiple fittings, or short lengths, support every 300mm (12”).
- .4 Plastic (PVC, CPVC, PEX)

.1 As recommended by manufacturer for corresponding sizes and materials.

.2 All sizes – do not exceed 1.2m (4 ft).

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Definitions:

.1 Alternate Disposal: reuse and recycling of materials by designated facility, user or receiving organization which has valid Certificate of Approval to operate. Alternative to landfill disposal.

.2 Deconstruction: systematic dismantling of structure in a manner that achieves safe removal/disposal of hazardous materials and maximum salvage/recycling of materials.

.1 Ultimate objective is to recover potentially valuable resources while diverting from landfill what has traditionally been significant portion of waste system.

.3 Demolition: rapid destruction of structure with or without prior removal of hazardous materials.

.4 Disassembly: physical detachment of materials from structure: prying, pulling, cutting, unscrewing.

.5 Hauler: company (possessing appropriate and valid Certificate of Approval) contracted to transport waste, reusable or recyclable materials off site to designated facility, user or receiving organization.

.6 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, including but not limited to: corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health, well being or environment if handled improperly.

.7 Processing: tasks which are subsequent to disassembly and may include: moving materials, denailing, cleaning, separating and stacking.

.8 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.

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

.10 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form.

.1 Recycling does not include burning, incinerating, or thermally destroying waste.

.11 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from remodelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.12 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.13 Source Separation: acts of keeping different types of waste materials separate, beginning from first time they became waste.

.14 Used Building Material Receipt: receipt issued at end destination for materials designated for alternate disposal.

.15 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying (by volume or weight) amounts of materials and wastes generated during deconstruction. Indicates quantities of reuse, recycling and landfill.

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

.17 Waste Reduction Workplan (WRW): written report which outlines actions to be taken to reduce, reuse and recycle materials during course of deconstruction. Actions based on finding of the Waste Audit (WA).

.18 Weigh Bill: receipt received from recycling facility indicating weight and content of each load/bin of material.

.2 Reference Standards:

.1 Canadian Council of Ministers of the Environment (CCME)

.1 PN 1326-2003, Environmental Code of Practice for Aboveground and Underground Tank Systems Containing Petroleum Products and Allied Petroleum Products.

.2 CSA International

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

.3 Federal Legislation

.1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.

.2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

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

.4 Motor Vehicle Safety Act 1993, c. 16 (MVSA).

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:

.1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion. In event of unforeseen delay notify the Contract Administrator in writing.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Keep copies of submittals on file for minimum of five years after completion of project.

.3 WMC is responsible for fulfillment of reporting requirements.

.4 Prior to start of Work on site, submit detailed WA indicating descriptions of and anticipated quantities of materials to be reused, recycled and landfilled.

.5 Based on findings of WA submit WRW indicating schedule of selective demolition, material descriptions and quantities to be salvaged, number and location of bins, anticipated frequency of tippage, and names and addresses of haulers facilities receiving organizations.

.6 Hazardous Materials:

.1 Submit description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.

.7 Workers, haulers and subcontractors must possess current, applicable Certificates of Approval to remove, handle and dispose of wastes categorized hazardous.

.1 Provide proof of compliance within 24 hours upon written request of the Contract Administrator.

1.4 DECONSTRUCTION DRAWINGS

.1 Where required by authorities having jurisdiction, submit for approval drawings, diagrams and details showing sequence of deconstruction work, materials designated for salvage and support of structures and underpinning.

.2 Submit drawings stamped and signed by qualified professional Architect registered or licensed in Manitoba, Canada.

1.5 QUALITY ASSURANCE

.1 Qualifications: provide adequate workforce training through meetings and demonstrations. Have someone on site with deconstruction experience throughout project for consultation and supervision purposes.

1.6 DELIVERY, STORAGE AND HANDLING

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

1.7 ENVIRONMENTAL REQUIREMENTS

.1 Ensure deconstruction work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air noise pollution.

.2 Fires and burning of waste or materials is not permitted on site.

.3 Do not bury waste or materials on site unless approved in writing by the Contract Administrator.

.4 Do not dispose of waste or volatile materials into watercourses, storm or sanitary sewers.

.1 Ensure proper disposal procedures in accordance with CEPA TDGA applicable Provincial/Territorial regulations.

.5 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties in accordance with authorities having jurisdiction.

.6 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction as directed by the Contract Administrator.

.7 Protect trees, plants and foliage on site and adjacent properties where indicated.

.8 Prevent extraneous materials from contaminating air beyond deconstruction area, by providing temporary enclosures during Work.

.9 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on temporary roads.

.10 Employ reasonable means necessary to protect salvaged materials from vandalism, theft, adverse weather, or inadvertent damage by heavy machinery.

.11 Use natural lighting to do Work where possible.

.1 Shut off lighting except those required for security purposes at end of each day.

.12 Organize site and workers in manner which promotes efficient flow of materials through disassembly, processing, stockpiling, and removal.

1.8 SITE CONDITIONS

.1 Existing Conditions:

.1 Should materials resembling spray or trowel applied asbestos or other designated substance listed as hazardous be encountered in course of deconstruction, stop work, take preventative measures, and notify the Contract Administrator immediately. Do not proceed until written instructions have been received.

.2 Label and package component parts of mechanical and electrical material specified for salvage as specified in accordance with the Contract Administrator's instructions to prevent damage or loss.

.2 Storage and Protection:

.1 Store materials salvaged for reuse and recycling designated for alternate disposal as directed by the Contract Administrator.

.2 Maximum permitted duration of material storage on site 3 months, determined in consultation with the Contract Administrator after project completion.

.3 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, trees, landscaping, adjacent grades. Provide bracing shoring underpinning as required. Repair damage caused by deconstruction as directed by the Contract Administrator.

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

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

Part 2 Products

2.1 DEMOLITION PACKAGES

.1 Refer to Drawing A1.1 – Demolition Plan.

2.2 SELECTED ITEMS SALVAGED FOR REUSE

.1 All existing specialty items such as diving platform, pool ladders, stairs and all other pool equipment shall be carefully removed, cleaned and stored in the designated storage room for inventory and/or reuse & reinstall. Refer to architectural drawings.

.2 All wall mounted accessories and equipment affected by the demolition shall be carefully removed, cleaned and stored in the designated storage room for inventory and/or reuse & reinstall. Refer to architectural drawings.

.3 Sauna Area – Remove wood door, wood sidings, wood seating, wood ceiling, associated framing and accessories, clean and store for reinstall & reuse. Refer to architectural drawings.

.4 Remove all mechanical grilles, clean, store for reuse & reinstall. Refer to architectural drawings.

.5 Remove all floor drains cover & skimmers covers. Refer to Mechanical for re-use & reinstall.

2.3 SELECTIVE DEMOLITION ITEMS

.1 Remove Flooring tiles down to concrete surface within area of construction. Pool tank tiles & pool deck tiles. Refer to Structural & Architectural Demolition drawings and new elevations for reference.

.2 At the perimeter of east, south and west walls remove tiles up to one row above mechanical duct horizontal enclosure. 8" plus/minus high. Refer to Structural & Architectural Demolition drawings and new elevations for reference.

.3 At the perimeter of the north wall, including passage area, remove base tile. 4" plus/minus high. Refer to Structural & Architectural Demolition drawings and new elevations for reference.

.4 Existing wall tiles on the bench/mechanical boxed-up (wall & seat) to be removed & replaced with new tiles, with cove base & corners with related trims & profiles. Keep existing structural base & ducting. Refer to Structural & Architectural Demolition drawings and new elevations for reference.

Part 3 Execution

3.1 SELECTIVE DEMOLITION

.1 Reuse of Building Elements: this project has been designed to result in end of project rates for reuse of building elements as follows: Do not demolish building elements beyond what is indicated on drawings without approval by the Contract Administrator.

.1 Building Structure and Shell: 75 percent.

.2 Interior Non-Shell Elements: 95 percent.

3.2 SITE VERIFICATION OF CONDITIONS

.1 Employ necessary means to assess site conditions and structures to determine quantity and locations of hazardous materials.

.2 Investigate site and structures to determine dismantling, processing and storage logistics required prior to beginning of Work.

.3 Develop strategy for deconstruction to facilitate optimum salvage of reusable and recyclable materials.

3.3 PREPARATION

.1 Obtain necessary permits and approvals including demolition.

.1 Provide copies to the Contract Administrator prior to start of Work on site within 24 hours of written request.

.2 Disconnect and re-route electrical, telephone and communication service lines entering buildings to be deconstructed. Post warning signs on electrical lines and equipment which must remain energized to serve other products during period of demolition.

.3 Locate and protect utility lines. Do not disrupt active or energized utilities traversing premises designated to remain undisturbed.

.4 Disconnect and cap designated mechanical services.

.1 Natural gas supply lines: remove in accordance with utility company requirements as directed by the Contract Administrator.

.2 Sewer and water lines: remove in accordance with requirements of authority having jurisdiction as directed by the Contract Administrator.

.3 Post signs in visible locations and appropriate languages which indicates to workers, subcontractors, haulers, and public, location of processing stockpiling of each material, bin location and use i.e. ("CLEAN WOOD ONLY") site sale.

3.4 REMOVAL OF HAZARDOUS WASTES

.1 Prior to start of deconstruction work remove contaminated or hazardous materials as directed by the Contract Administrator from site and dispose of at designated disposal facilities in safe manner in accordance with TDGA and other applicable regulatory requirements.

3.5 DISASSEMBLY

.1 Throughout course of deconstruction pay close attention to connections and material assemblies. Employ workmanship procedures which minimize damage to materials and equipment.

.2 Ensure workers and subcontractors are briefed trained to carry out work in accordance with appropriate deconstruction techniques.

.3 Project supervisor with previous deconstruction experience must be present on site throughout project.

.4 Deconstruct in accordance with CSA S350 other applicable safety standards.

.5 Workers must utilize adequate fall protection certified harness and belay systems where the Contract Administrator considers it necessary.

.6 Maintain structural integrity of structure.

.7 Systematically remove finishes, furnishings, and mechanical and electrical equipment of value as indicated as instructed by the Contract Administrator.

.8 Carefully remove doors from structure.

.9 Wherever possible, transfer material assemblies from heights to ground level for easier disassembly. Take appropriate measures to ensure safety.

.10 Separate from waste stream, material designated for alternate disposal in condition suitable for reuse and/or recycling listed to required rates of diversion.

.11 Remove and store materials to be salvaged, in manner to prevent damage.

.1 Store and protect in accordance with requirements for maximum preservation of material.

.2 Handle salvaged materials as new materials.

.12 Source separate for recycling materials that cannot be salvaged for reuse including wood, metal, concrete and asphalt.

.13 Remove materials that cannot be salvaged for reuse or recycling and dispose of in accordance with applicable codes at licensed facilities.

.14 Where existing materials are to be re-used in Work, use special care in removal, handling, storage and re-installation to assure proper function in completed work.

3.6 PROCESSING

.1 Designate location for processing of materials which eliminates double handling and provides adequate space to maintain efficient material flow.

.2 Denail, Strip, Separate, materials to ensure best possible condition of salvaged materials.

.3 Keep processing area clean and free of excess debris.

.4 Supply separate, marked disposal bins for categories of waste material. Do not remove bins from site until inspected and approved by the Contract Administrator. Notify the Contract Administrator prior to removal of bins from site.

.5 Separate processed materials into organized piles for stockpiling. Provide collection area for materials processed listed designated for alternate disposal. Pile materials on pallets to facilitate transport off-site to storage area s.

3.7 STOCKPILING

.1 Label stockpiles, indicating material type and quantity.

.2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.

.3 Locate stockpiled materials convenient for use in new construction. Eliminate double handling wherever possible.

.4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

.5 Material designated for alternate disposal not retailed on site should be marketed to facilities listed in Waste Reduction Workplan.

3.8 REMOVAL FROM SITE

.1 Transport material designated for alternate disposal by approved facilities receiving organizations listed in waste reduction workplan and in accordance with applicable regulations. Do not deviate from haulers facilities receiving organizations listed in waste reduction workplan without prior written authorization from the Contract Administrator.

.2 Dispose of materials not designated for alternate disposal in accordance with applicable regulations. Disposal facilities must be approved of and listed in waste reduction workplan. Do not deviate from disposal facilities listed in waste reduction workplan without prior written authorization from the Contract Administrator.

3.9 CLEANING AND RESTORATION

.1 Keep site clean and organized throughout deconstruction.

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

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 03 20 00 – Concrete Reinforcing.

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

.3 Section 03 93 20 – Pressure Grouting.

.4 Section 03 93 30 – Form and Pour.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-O86-14, Engineering Design in Wood.

.3 CSA O121-17, Douglas Fir Plywood.

.4 CSA O437 Series-93(R2011), Standards for OSB and Waferboard.

.5 CSA S269.1-16, Falsework and Formwork.

1.3 MEASUREMENT PROCEDURES

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

Part 2 Products

2.1 MATERIALS

.1 Formwork materials:

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

.2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.

.2 Form ties:

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

.2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

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

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

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

Part 3 Execution

3.1 FABRICATION AND ERECTION

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

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

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

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

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

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

.7 Use 1 inch (25 mm) chamfer strips on external corners and/or 1 inch (25 mm0 fillets at interior corners, joints, unless specified otherwise.

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

.9 Construct forms for architectural concrete, and place ties as indicated.

.1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.10 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.

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

3.2 REMOVAL AND RESHORING

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

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

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

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

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

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

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

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

.4 Space reshoring in each principal direction at not more than 8’ apart.

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

END OF SECTION

Part 1 General

1.1 SUMMARY

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

1.2 RELATED SECTIONS

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

.2 Section 03 93 10 – Hand Patching.

.3 Section 03 93 20 – Pressure Grouting.

.4 Section 03 93 30 – Form and Pour.

1.3 REFERENCES

.1 ASTM International

.1 ASTM A143/A143M-07(2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.2 ASTM A775/A775M-17, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

.3 ASTM A1064 / A1064M - 18a, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

.2 CSA International

.1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A23.3-14, Design of Concrete Structures.

.3 CSA-G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement.

.4 CSA-G40.20/G40.21-13(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

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

.6 CSA W186-M1990(R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.3 Reinforcing Steel Institute of Canada (RSIC)

.4 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.4 MEASUREMENT PROCEDURES

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

.1 These unit prices will only cover supplemental reinforcing steel in addition to that shown on concrete repair details as designated by the Contract Administrator. All other reinforcing steel costs must be included in the base bid and unit price components of the work to which they correspond.

.2 Dowels will be measured individually and will include dowel drilling, cleaning, preparation, epoxy supply and placement, and bar insertion, but excluding steel costs which will be covered by the rate per kilogram unit prices. The Contract Administrator and the Contractor will count and agree upon the numbers and lengths of bars as well as the number of bar embedments. These agreed upon number will form the basis for payment.

.1 These unit prices will only cover dowels in addition to that shown on concrete repair details as designated by the Contract Administrator. All other dowel costs must be included in the base bid and unit price components of the work to which they correspond.

1.5 SUBMITTALS

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

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

.3 Shop Drawings:

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

.1 Indicate placing of reinforcement and:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

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

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

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

Part 2 Products

2.1 MATERIALS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

2.2 FABRICATION

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

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

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

2.3 SOURCE QUALITY CONTROL

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

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

Part 3 Execution

3.1 PREPARATION

.1 Galvanizing to include chromate treatment.

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

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

3.2 FIELD BENDING

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

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

.3 Replace bars, which develop cracks or splits.

3.3 PLACING REINFORCEMENT

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

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

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

3.4 DOWELING PROCEDURES

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

.1 10M bars, 6 inches.

.2 15M bars, 8 inches.

.3 20M bars, 12 inches.

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

.3 Acceptable product:

.1 Hilti HIT HY-200 MAX by Hilti Canada.

.2 Substitutions will be considered in accordance with General Conditions B6.

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

3.5 FIELD TOUCH-UP

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Removal of deteriorated concrete and surface preparation for the repair of deteriorated concrete resulting from reinforcing steel corrosion and is applicable to horizontal, vertical, and overhead repairs.

.2 All delaminated or deteriorated concrete must be removed down to sound concrete. The reinforcing may have to be exposed at these locations by removing additional concrete, if there is any sign of corrosion. All concrete and exposed reinforcing shall be cleaned of all corrosion by mechanical means.

1.2 RELATED SECTIONS

.1 Section 03 20 00 – Concrete Reinforcing.

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

.3 Section 03 93 10 – Hand Patching

.4 Section 03 93 20 – Pressure Grouting

.5 Section 03 93 30 – Form and Pour

1.3 MEASUREMENT PROCEDURES

.1 Concrete areas of repair will be identified and quantified via soundings completed by the Contract Administrator in the presence of and with the assistance of the Contractor. The areas will then be measured and agreed upon by the Contractor and the Contract Administrator prior to commencement of work.

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

1.4 REFERENCES

.1 American Concrete Institute (ACI)

.1 ACI 546-04, Concrete Repair Guide.
.2 ACI RAP-5, Surface Repair Using Form-and-Pump Techniques.
.3 ACI RAP-7, Spall Repair of Horizontal Concrete Surfaces.
.4 ACI RAP-3, Spall Repair by Low-Pressure Spraying.
.5 ACI RAP-4, Surface Repair Using Form-and-Pour Techniques.
.6 ACI RAP-6, Vertical and Overhead Spall Repair by Hand Application.
.7 ACI RAP-9, Spall Repair by the Preplaced Aggregate Method.

.2 Canadian Standards Association (CSA)

.1 CSA- S448.1-10, Repair of Reinforced Concrete in Buildings.

.3 International Concrete Repair Institute (ICRI)

.1 ICRI concrete Repair Terminology (2010 Edition).
.2 ICRI Guideline No. 120.1–2009, Guidelines and Recommendations for Safety in the Concrete Repair Industry.

.3 ICRI Guideline No. 130.1R–2009, Guide for Methods of Measurement and Contract Types for Concrete Repair Work (formerly No. 03735).

.4 ICRI Guideline No. 310.1R–2008, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion (formerly No. 03730).

.5 ICRI Guideline No. 310.2R–2, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.5 DEFINITIONS

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

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

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

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

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

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

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

1.6 PRE-INSTALLATION MEETING

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

.2 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation of mock-up. Agenda for meeting to include:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Review installation details.

.4 Co-ordinate with other subtrades.

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

.6 Review compatibility of materials.

.7 Review testing requirements.

1.7 SUBMITTALS

.1 Qualification Statements:

.1 Contractor Qualifications Statement:

.1 Provide minimum 5 examples of local projects demonstrating successful performance concrete repairs of similar size and complexity to specified Work within the last 3 years.

.2 Provide minimum 3 references exhibiting successful performance concrete repairs within the last 3 years.

.2 Site Superintendent Qualification Statement:

.1 Provide minimum 5 examples of local projects demonstrating successful performance as site superintendent of concrete repairs of similar size and complexity to specified Work within the last 3 years.

.2 Provide minimum 3 references exhibiting successful performance as site superintendent of concrete repairs within the last 5 years.

1.8 QUALITY ASSURANCE

.1 Contractor Qualifications:

.1 Minimum of 5 years experience in the repair and restoration of concrete structures.

.2 Site Superintendent to have a minimum of 5 years experience exhibiting successful performance in concrete restoration projects.

.3 Ensure all personnel involved with concrete restoration is adequately trained and familiar with the requirements of this Section.

.2 Field Mock-ups:

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

.2 Field mock-up shall be a minimum of 2 sq.ft. and incorporate all aspects of the concrete surface preparation described in this Section. Trial repairs areas shall be chosen to include exposure of embedded reinforcing steel.

.3 Field mock-up areas shall be used as a standard against which subsequent work shall be judged.

Part 2 Products

2.1 EQUIPMENT

.1 Electric or pneumatic chipping hammers are to be used for demolition within the following limits:

.1 Initial bulk removal of delaminated concrete above corroded reinforcing steel: maximum 30 lb. electric or pneumatic chipping hammers.

.2 Final removal and undercutting of reinforcing steel: maximum 15 lb. electric chipping hammers.

.3 Bulk removal of full depth repairs: electric or pneumatic jack hammers with weight ratings above 30 lbs. may be used upon approval by the Contract Administrator.

.4 Chisel-type blades are to be used for removal only. Do not use pointed chisels for removal.

.2 Sandblast equipment shall consist of:

.1 Air compressor of sufficient capacity to drive the equipment and blast media selected.

.2 Blast media hopper (meters the media into the air stream passing through the hose and nozzle).

.3 Moisture and oil separators to insure clean, dry air supply.

.4 Blast nozzle and hose.

.5 Materials. The blast medium consistent with equipment, site conditions, and capable of obtaining specified surface profile.

Part 3 Execution

3.1 EXAMINATION

.1 The location number and extent of repairs shown on Drawings are indicative only. Repairs areas will be identified on-site by the Contract Administrator in the presence of and with the assistance of the Contractor. The approximately periphery of the repair will be marked on the surface of the member and the location and extent recorded on drawings

.2 Allow time in the Schedule for survey and inspection work carried out by the Contract Administrator ahead of repairs. Provide sufficient safe access to enable review of all areas designated for repairs.

.3 The Contractor shall make available as required throughout the Contract labour to carry out the following under the direction of the Contract Administrator:

.1 Identification of repairs.

.2 Sample chipping and/or drilling.

.3 Operators for access equipment.

.4 The Contractor shall make available as required throughout the Contract equipment for the use of the Contract Administrator:

.1 Marking paint and chalk.

.2 Hammer and chain for sounding surveys.

.3 Tape measure.

3.2 PREPARATION

.1 All necessary measures shall be taken to provide protection to the general public, occupants of the building.

.2 Remove or protect all surface attachments (e.g. signs, notices, electrical fittings) from the areas to be repaired or from positions that obstruct access or which may be damaged from Work.

.3 Carefully store items removed during the course of the works. Reinstall when restoration work is complete.

.4 The Contractor shall make good or rectify any damage caused as a result of insufficient protection.

.5 Provide temporary access required to facilitate Work.

.6 The perimeter of the through-slab must be adequately shored. The perimeter of the through-slab must be adequately shored. The Contractor is responsible for confirmation of shoring requirements prior to commencement of, and during demolition.

.1 Costs of shoring to be included in the unit price.

3.3 CONCRETE DELAMINATION REMOVAL

.1 Remove all loose and or delaminated concrete above corroded reinforcing steel.

.2 Do not operate hammers or mechanical chipping tools at an angle in excess of 45° measured from the surface of the slab.

.3 Use chipping to extend concrete removal along reinforcing bars and ensure bars are completely free of corrosion and well bonded to the surrounding concrete. Notify the Contract Administrator of increases in areas.

.4 Where the bond between existing concrete and reinforcing steel or mesh has been destroyed (either by the concrete's deterioration or corrosion of the reinforcing steel) or if the chipping operation has caused more than 1/3 the periphery of a bar to be exposed for a distance of 6 inches (150 mm) or more, the concrete adjacent to the bar shall be removed by maximum 15 lb. electric chipping hammers to provide sufficient clearance between the reinforcement and concrete.

.1 Provide a minimum 3/4 inches (20 mm) clearance, or 1/4 inch (6 mm) larger than the largest aggregate in the repair material, whichever is greater.

.5 If non-corroded reinforcing steel is exposed, do not damage the bar’s bond to the surrounding concrete. If bond between the bar and concrete is destroyed, exposing the bar will be required.

.6 The perimeter of the areas marked as delaminated are to be saw cut to a depth of 1/2 inch (12 mm). Feather edging is not permitted. If reinforcing steel is encountered, the saw depth must be immediately reduced as required. Check depth of the cut regularly.

.7 Ensure sawcut encompasses the boundaries of corrosion that have been established.

.8 Ensure the entire area within the saw cut is removed to a depth consistent with the type of repair and repair material specified in other Sections.

.9 Chip patch edges to provide a clean vertical edge along the patch perimeter to the required minimum depth.

.10 Conduct soundings to determine if any further unsound or delaminated concrete is present, which must be removed.

.11 After all delaminated, unsound, or loose material is removed, the Contractor shall request an inspection from the Contract Administrator. This inspection is to be completed in the presence of the Contractor and if any further Work is required, the Contractor is to complete it immediately. The purpose of this inspection is to provide assurance to the Contract Administrator that all loose material has been removed and the substrate is sound.

3.4 SURFACE PREPARATION OF CONCRETE AND REINFORCING STEEL

.1 Within 24 hours prior to infilling, sandblast the substrate to remove loose and deteriorated concrete, laitance, dust, dirt, oil, and any other material that could interfere with the bond of the new concrete. Provide a uniform surface profile of ICRI-CSP-10. Sample surfaces are available for inspection in the Contract Administrator’s office. These samples will be used as the standard of acceptance.

.2 Surface preparation applies equally to any horizontal or vertical concrete surfaces to which the concrete is to bond.

.3 Exposed reinforcing steel to be cleaned to near white metal and totally free of rust for the full circumference of the bar.

.4 Secure any reinforcement which is loose by tying to other secured bars or by other methods approved by the Contract Administrator.

.5 Vacuum clean surface and air blast with oil free compressed air to remove residue and spent media created by surface preparation.

.6 Maintain substrate in a clean condition using polyethylene film until the patch material is ready to be placed.

.7 After all surface preparation is complete the Contractor shall request an inspection from the Contract Administrator to review the existing reinforcing steel. The purpose of this inspection is to provide assurance that all heavy corrosion and scale is removed from the bar. At that time, the Contract Administrator will review the condition of the reinforcing steel and determine if the addition of supplemental reinforcing steel will be required. At locations identified by the Contract Administrator, provide supplemental reinforcing steel to Section 03 20 00 – Concrete Reinforcing.

.8 Final cleaning of the concrete substrate shall consist of a high pressure waterblast substrate at minimum 4,000 psi to remove any residual dust and dirt.

.9 Maintain substrate in a saturated condition for a period of not less than 8 hours prior to infilling. Do not allow the concrete surface to dry. If the concrete surface becomes wet and subsequently dries, the surface preparation and cleaning procedure must be repeated.

3.5 FIELD QUALITY CONTROL

.1 Coordinate site work and inspections with the Contract Administrator. Provide minimum 24 hours notice prior to each phase of the work.

.2 The Contract Administrator inspection to be completed at the following times:

- .1 Prior to demolition to identify and quantify repair locations and types.
- .2 Following initial demolition to confirm all loose, deteriorated, or unsound concrete has been removed from the substrate.
- .3 Following concrete substrate preparation to review concrete surface profile and condition of reinforcing steel.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 The top surface of slabs exhibiting extensive spalling and delamination are to be repaired by mechanical removal of the deteriorated concrete and infilling with a rapid-setting mortar.

.2 Where spalling and delamination extend throughout the depth of the slab, complete through slab concrete repair. Locations to be identified by the Contract Administrator.

.3 All spalling and/or delaminated concrete must be removed down to sound concrete in accordance with Section 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

1.2 RELATED SECTIONS

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

.2 Section 03 20 00 – Concrete Reinforcing.

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

1.3 REFERENCES

.1 American Concrete Institute (ACI)

.1 ACI 546-04, Concrete Repair Guide.

.2 ACI RAP-7, Spall Repair of Horizontal Concrete Surfaces.

.2 Canadian Standards Association (CSA)

.1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.3 American Society for Testing and Materials (ASTM)

.1 ASTM C39 / C39M – 18, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

.2 ASTM C109 / C109M - 16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).

.3 ASTM C191 - 18a, Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle.

.4 ASTM C309-11, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.5 ASTM C496 / C496M – 17, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens

.6 ASTM C666 / C666M – 15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

.7 ASTM C672 / C672M – 12, Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals.

.8 ASTM C928/C928M-13, Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs.

.9 ASTM C1202 – 19, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.

.4 International Concrete Repair Institute

.1 ICRI concrete Repair Terminology (2010 Edition).

.2 ICRI Guideline No. 120.1–2009, Guidelines and Recommendations for Safety in the Concrete Repair Industry.

.3 ICRI Guideline No. 130.1R–2009, Guide for Methods of Measurement and Contract Types for Concrete Repair Work (formerly No. 03735).

1.4 MEASUREMENT PROCEDURES

.1 Repair areas will be handled as a unit price repair.

.2 Repair areas will be identified by the Contract Administrator on-site by a chain drag sounding survey which will be completed in the presence of, and with the assistance of the Contractor. The areas will then be measured and agreed upon by the Contractor and the Contract Administrator prior to commencement of work. These measurements will form the basis of payment for the repair area.

.3 Unit prices are to include:

.1 Supervision, labour and materials, and equipment.

.2 Shoring as required.

.3 Reinforcing as shown on Drawing details.

.4 If the area of the repair is increased over that originally measured without consultation with the Contract Administrator, then the Contractor will not be paid for the increased area.

.5 Unit prices:

.1 Top surface concrete repairs – 0” to 3” Deep:

.1 Removal and infill depths of up to a 3 inches and at no point less than 1 inch in depth into the structural slab.

.1 Unit of measure: per square foot (S.F.).

.2 Minimum payment for repair areas will be 1 S.F.

.2 Top surface concrete repairs – 3” to 6” Deep:

.1 Removal and infill depths of up to a 6 inch depth and at no point less than 3 inches in depth into the structural slab.

.1 Unit of measure: per square foot (S.F.)

.2 Minimum payment for repair areas will be 1 S.F.

.3 Full depth concrete slab repair:

.1 Removal and infill of entire slab thickness through slab repair.

.1 Unit of measure: per square foot (S.F.)

.2 Minimum payment for repair areas will be 1 S.F.

.4 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Contract Administrator in accordance with CSA-A23.1.

.1 Unit of measure: per specimen.

.2 Minimum payment for testing will be 1 specimen.

.5 Direct pull-out tensile tests to determine bond strength of concrete repair.

.1 Unit of measure: per test location.

.2 Minimum payment for testing will be 1 test location.

1.5 PRE-INSTALLATION MEETING

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

.2 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation of mock-up. Agenda for meeting to include:

.1 Verify project requirements.
.2 Review installation and substrate conditions.
.3 Review installation details.
.4 Co-ordinate with other subtrades.
.5 Review manufacturer's installation instructions and warranty requirements.
.6 Review compatibility of materials.
.7 Review testing requirements.

1.6 QUALITY ASSURANCE

.1 Field Mock-up:

.1 Install field mock-up at Project site or pre-selected area of building or location approved by the Contract Administrator. Install material in accordance with this Section.
.2 Field mock-up will be standard for judging workmanship on remainder of Project.
.3 Manufacturer’s representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Comply with Section 01 61 00 – Common Product Requirements.

.2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

.4 Keep materials in manufacturer’s original, unopened containers and packaging until installation.

.5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.8 PROJECT CONDITIONS

.1 Environmental Requirements:

.1 Ensure that substrate surface and ambient air temperature are minimum of 4°C and rising at application time and remain above 4°C for at least 24 hours after application. Ensure that frost or frozen surfaces are thawed and dry.
.2 Ensure that substrate surface and ambient air temperature are below of 32°C and remain below 32°C for at least 8 hours after application.
.3 Do not apply material if snow, rain, fog, and mist are anticipated within 12 hours after application. Allow surfaces to attain temperature and conditions specified before proceeding with application.

Part 2 Products

2.1 MATERIALS

.1 Rapid Setting Repair Mortar: One-component, shrinkage-compensated, cement-based mortar with extended working time for repairing horizontal concrete surfaces.

.1 Provide mortar material complying with the following requirements:

.1 Compliance: ASTM C928.

.2 Compressive Strength, ASTM C109, 2-inch (51-mm) cubes:

.1 3 Hours: 3,000 psi (21 MPa).

.2 1 Day: 6,000 psi (41 MPa).

.3 28 Days: 8,000 psi (55 MPa).

.3 Compressive Strength, ASTM C39, 3-inch by 6-inch (76-mm by 152-mm) cylinders:

.1 28 Days: 7,400 psi (51 MPa).

.4 Set Time, ASTM C191, 72 degrees F (22 degrees C):

.1 Initial: 50 minutes.

.2 Final: 80 minutes.

.5 Splitting Tensile Strength, ASTM C496:

.1 1 Day: 400 psi (3 MPa).

.2 28 Days: 450 psi (3 MPa).

.6 Freeze-Thaw Resistance, ASTM C666, Procedure A, at 300 cycles:

.1 100 percent relative dynamic modulus.

.7 Scaling Resistance, ASTM C672, at 25 cycles:

.1 Zero rating; no scaling.

.8 Length Change, ASTM C928:

.1 Drying Shrinkage: Minus 0.05 percent.

.2 Wetting Expansion: Plus 0.03 percent.

.9 Rapid Chloride Permeability, ASTM C1202:

.1 Less than 300 Coulombs.

.10 Coefficient of Thermal Expansion, CRD C39:

.1 6.8×10^{-6} in/in/degree F (12.6×10^{-6} cm/cm/degree C).

.2 Acceptable Product:

.1 MasterEmaco T 1061 formerly (10-61 Rapid Mortar) by BASF Building Systems.

.2 Substitutions will be considered in accordance with Biding Procedures B7 - Substitutions.

2.2 ACCESSORIES

.1 Aggregate Extension: extend mortar material with washed, graded, 3/8 inch (10 mm), low-absorption, saturated surface-dry aggregate at mortar manufacturers recommended rates.

.1 For repair areas 2 – 4" (50 – 100 mm) in depth, the minimum recommended addition is 15 – 25 lbs (6.8 – 11.4 kg) of 3/8" (10 mm) washed, graded, rounded, SSD, low-absorption, high-density aggregate per 50 lb (22.7 kg) bag.

.2 For areas greater than 4" (100 mm) in depth, the minimum recommended addition is 25 – 50 lbs (11.4 – 22.7 kg) of 3/8" (10 mm) washed, graded, rounded, SSD, low-absorption, high-density aggregate per 50 lb bag.

.3 The maximum aggregate extension is 50 lbs (22.7 kg) of pea gravel per bag.

.2 Evaporation retardant:

.1 Acceptable Product:

.1 MasterKure ER 50 formerly (Confilm) by BASF Building Systems at a minimum application rate of 4.9 m^2/L.

.2 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.3 Cure and sealing compound: to ASTM C309, Type 1.

.1 Acceptable product(s):

.1 Florseal WB by Sika Canada Inc. at a minimum application rate of 4.9 m²/L.

.2 MasterKure CC 160 WB formerly (Kure-N-Seal WB) by BASF Building Systems at a minimum application rate of 4.9 m²/L.

.3 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

Part 3 Execution

3.1 PREPARATION

.1 Protection: Protect adjacent Work areas and finish surfaces from damage during repair mortar application.

.2 Surface Preparation:

.1 Complete concrete delamination repairs to 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.3 The repair area must be thoroughly cleaned and well soaked prior to infilling. The surface should be thoroughly wetted for a period of not less than two (2) hours. The repair areas shall be kept continuously wet until just before infilling. Any standing water must be removed prior to grouting.

.4 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.5 Obtain the Contract Administrator's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.

.6 Through slab repair forming:

.1 Provide formwork in accordance with Section 03 10 00 – Concrete Forming and Accessories to match existing profiles.

.2 Design and install formwork and shoring to accommodate the mass and pressure of the repair material.

.3 Securely anchor formwork to substrate. Anchors to be sized and space to prevent deflection of the forms placement and curing.

.4 Construct forms to fit tightly against existing concrete surfaces. Seal around edge of formwork with sealant to prevent leakage during grouting.

.5 Anchors:

.1 Completely removable.

.2 Patch anchor holes with grout mixed to dry pack consistency.

.3 Completely fill all anchor holes.

.6 A minimum of 30 mm concrete cover over the primary reinforcing steel will be required, thus, an adjustment of the formwork such as a notch may be required to ensure sufficient cover.

.7 Provide drainage outlets in formwork for presoaking and, if beneath a soffit, provide air venting. Provide suitable access points to pour mixed repair mortar into place.

.8 Use form-release agent to facilitate removal of forms from cast material.

.9 Within two (2) hours immediately prior to placement of repair material, test formwork to determine watertightness. Completely fill formwork with clean water and let stand for not less than 15 minutes. Any areas of leakage are to be sealed prior to placement of repair material. Re-test as required.

3.2 INFILLING PROCEDURES

.1 Obtain the Contract Administrator's approval before placing repair material. Provide minimum 24 hours notice.

.2 Maintain the substrate in a saturated surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.3 Mixing of rapid-setting mortar horizontal extended mortar:

.1 Mix materials in accordance with manufacturer's instructions.

.2 Ensure repair mortar is thoroughly mixed.

.3 Do not use free-fall mixers.

.4 Never mix partial bags.

.4 Bonding Slurry Application:

.1 Apply the bonding slurry consisting of neat rapid-setting mortar to a saturated surface dry (SSD) substrate with no standing water and dry to the touch. A SSD substrate typically exhibits a colour change of dark grey to light grey. Remove standing water by vacuuming.

.2 Scrub plastic slurry into substrate with stiff bristled broom or brush to produce a uniform thickness of 1/8" over entire area.

.3 Place repair material while the bonding slurry is still plastic. Do not apply more slurry than can be covered with concrete before it dries. Do not retemper. If the bond slurry dries prior to placement of the concrete, removal of the dried slurry will be required. The concrete substrate will then be cleaned and prepared in accordance with the requirements described in the previous sections.

.5 Immediately place repair material, into the prepared patch area from one side to the other. Work the repair material firmly into the bottom and sides of the patch, and underneath reinforcing steel, to assure good bond.

.6 Ensure that rate of placing is sufficient to complete proposed placing, finishing and curing operations within scheduled time. Limit batch sizes as required if placing procedures are slower than anticipated.

.7 Continuously consolidate and finish to matching elevations, ensuring patch thickness and required elevations are maintained.

.8 Ensure reinforcement, floor drains, inserts, etc. are not disturbed during concrete placement.

3.3 FINISHING

.1 Following consolidation and screeding, the surface shall be immediately bull-floated to close and smooth the surface.

.2 Apply evaporation retardant at manufacturers recommended coverage rate immediately following final finishing. Do not apply evaporation retardant during any finishing operation nor should it be worked into the surface.

.3 Protect freshly placed concrete from exposure to dust, debris and precipitation.

3.4 CURING

.1 Concrete repairs to be cured for a minimum of 3 days at 10°C.

.2 Immediately after final finishing, apply evaporation retardant to prevent drying shrinkage until the concrete has enough strength to support the placement of the wet burlap.

.3 Burlap to be thoroughly presoaked by immersing it in water for a period of at least 24 hours immediately prior to placement.

.4 Commence wet curing as soon as the surface will support the weight of the wetted burlap without deformation. Burlap to be applied in one layer with strips overlapping at least 3" and be securely held in place without marring the concrete surface.

.5 Wet curing with burlap and water must be maintained throughout entire curing period.

.6 Workers shall not be allowed on the overlay for 12 hours after placement. Do not place load upon new concrete until curing period is over.

3.5 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Contract Administrator in accordance with CSA-A23.1 and Section 01 45 00 - Quality Control and as described herein.

.2 The Contractor will pay for costs of tests as a Unit Price.

.3 Inspection or testing by the Contract Administrator will not augment or replace Contractor quality control nor relieve contractual responsibility.

.4 Direct pull-out tensile tests to determine bond strength will be completed throughout the course of the work but not less than the following:

- .1 Two (2) tests will be completed within the first phase of repairs.
- .2 Not less than one (1) bond test will be completed in each phase.
- .3 The Contract Administrator reserves the right to take additional bond tests if concrete or bonding system is suspect.
- .4 Infilling of the core hole will be the responsibility of the General Contractor. Unless otherwise directed by the Contract Administrator, repair in accordance with this Section.

.5 Testing agency to submit copies of concrete test reports directly to The City and the Contract Administrator.

3.6 DEFECTIVE CONCRETE

.1 Defective concrete: bond strengths below minimum specified value, cracking, spalling, scaling and concrete not conforming to required lines, details, dimensions, tolerances, finishes or specified requirements.

.2 Repair or replacement of defective concrete will be determined by the Contract Administrator, based on the specifications and the above guidelines.

.3 Do not patch, fill, touch up, repair or replace exposed concrete except upon express direction of the Contract Administrator for each individual use.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Slab soffit areas, beams, columns, and walls exhibiting extensive spalling and/or delamination requiring localized repairs less than 2" in depth will be repaired by removing the deteriorated concrete, cleaning and preparing the substrate, and patching the area with a cementitious patching material

1.2 RELATED SECTIONS

.1 Section 03 20 00 – Concrete Reinforcing.

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

.3 Section 03 93 20 – Pressure Grouting.

1.3 MEASUREMENT PROCEDURES

.1 Repair areas will be handled as a unit price repair.

.2 Repair areas will be identified and quantified via hammer soundings by the Contract Administrator in the presence of and with the assistance of the Contractor. The areas will then be measured and agreed upon by the Contractor and the Contract Administrator prior to commencement of work.

.3 Unit prices are to include:

- .1 Supervision, labour and materials, and equipment.
- .2 Shoring as required.
- .3 Reinforcing as shown on Drawing details.

.4 If the area of the repair is increased over that originally measured without consultation with the Contract Administrator, then the Contractor will not be paid for the increased area.

.5 Unit Prices:

- .1 Hand patching concrete repairs – 0” to 2” deep:
  - .1 Apply to removal depths of up to 2 inches and at no point less than 1/2 inch in depth.
    - .1 Unit of measure: per square foot (S.F.).
    - .2 The minimum area of payment will be one 1/2 S.F.
  - .2 Repairs over 2 inches in depth will be repaired via pressure grouting in accordance with Section 03 93 20.
- .2 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Contract Administrator in accordance with CSA-A23.1.
  - .1 Unit of measure: per specimen.
  - .2 Minimum payment for testing will be 1 specimen.
- .3 Direct pull-out tensile tests to determine bond strength of concrete repair.
  - .1 Unit of measure: per test location.
  - .2 Minimum payment for testing will be 1 test location.

1.4 REFERENCES

.1 American Concrete Institute (ACI)

.1 ACI 546-04, Concrete Repair Guide.

.2 ACI RAP-6, Vertical and Overhead Spall Repair by Hand Application.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM C109 / C109M - 16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).

.2 ASTM C157 / C157M – 17, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.

.3 ASTM C309-11, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.4 ASTM C469 / C469M – 14, Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression.

.5 ASTM C666 / C666M – 15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

.6 ASTM C672 / C672M – 12, Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals.

.3 Canadian Standards Association (CSA)

.1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.4 International Concrete Repair Institute (ICRI)

.1 ICRI concrete Repair Terminology (2010 Edition).

.2 ICRI Guideline No. 120.1–2009, Guidelines and Recommendations for Safety in the Concrete Repair Industry.

.3 ICRI Guideline No. 130.1R–2009, Guide for Methods of Measurement and Contract Types for Concrete Repair Work (formerly No. 03735).

1.5 PRE-INSTALLATION MEETING

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

.2 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation of mock-up. Agenda for meeting to include:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Review installation details.

.4 Co-ordinate with other subtrades.

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

.6 Review compatibility of materials.

.7 Review testing requirements.

1.6 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittals.

.2 Qualification Statements:

.1 Provide references of successful completion of a minimum of 5 projects of similar size and complexity to specified Work within the last 3 years.

1.7 QUALITY ASSURANCE

.1 Contractor Qualifications:

.1 Minimum of 5 years experience in application of specified (or similar) products on projects of similar size and scope.

.2 Successful completion of a minimum of 5 projects of similar size and complexity to specified Work within the last 3 years.

.2 Field Mock-up:

.1 Install field mock-up at Project site or pre-selected area of building or location approved by the Contract Administrator. Install material in accordance with this Section.

.2 Field mock-up will be standard for judging workmanship on remainder of Project.

.3 Manufacturer’s representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Comply with Section 01 61 00 – Common Product Requirements.

.2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

.4 Keep materials in manufacturer’s original, unopened containers and packaging until installation.

.5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.9 PROJECT CONDITIONS

.1 Environmental Requirements:

.1 Ensure that substrate surface and ambient air temperature are minimum of 4°C and rising at application time and remain above 4°C for at least 24 hours after application. Ensure that frost or frozen surfaces are thawed and dry.

.2 Ensure that substrate surface and ambient air temperature are below of 32°C and remain below 32°C for at least 8 hours after application.

.3 Do not apply material if snow, rain, fog, and mist are anticipated within 12 hours after application. Allow surfaces to attain temperature and conditions specified before proceeding with application.

Part 2 Products

2.1 MATERIALS

.1 Patching Mortar: Infilling with a one-component, thixotropic, rheoplastic, cement-based, fiber-reinforced, shrinkage-compensated, sulfate-resistant structural repair mortar.

.1 Drying shrinkage to ASTM C157:

.1 less than 0.10% at 28 days.

.2 Compressive Strength to ASTM C109:

.1 Minimum 7 MPa at 3 hours.

.2 Minimum 21 MPa at 1 day.

.3 Minimum 28 MPa at 7 days.

.3 Modulus of elasticity to ASTM C469:

.1 $25x10^3$ MPa ± $10x10^3$ MPa.

.4 Freeze/Thaw Resistance to ASTM C 666, Procedure A:

.1 Minimum 96.0% RDM at 300 cycles.

.5 Salt Scale Resistance to ASTM C672:

.1 Less than 0.05 kg/m² at 50 cycles.

.2 Acceptable product(s):

.1 MasterEmaco S 488 CI (formerly Emaco S88 CI) by BASF Building Systems.

.2 Planitop X by Mapei.

.3 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

2.2 ACCESSORIES

.1 Evaporation retardant: MasterKure ER 50 (formerly Confilm) by BASF Building Systems at a minimum application rate of 4.9 m²/L.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Cure and sealing compound: to ASTM C309, Type 1.

.1 Acceptable product(s):

.1 Florseal WB by Sika Canada Inc. at a minimum application rate of 4.9 m²/L.

.2 MasterKure CC 160 WB formerly (Kure-N-Seal WB) by BASF Building Systems at a minimum application rate of 4.9 m²/L.

.3 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

Part 3 Execution

3.1 PREPARATION

.1 Protection: Protect adjacent Work areas and finish surfaces from damage during repair mortar application.

.2 Surface Preparation:

.1 Complete concrete delamination repairs to 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.3 The repair area must be thoroughly cleaned and well soaked prior to infilling. The surface should be thoroughly wetted for a period of not less than two (2) hours. The repair areas shall be kept continuously wet until just before infilling. Any standing water must be removed prior to grouting.

.4 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

3.2 APPLICATION PROCEDURES

.1 Obtain the Contract Administrator's approval before placing repair material. Provide minimum 24 hours notice.

.2 The patch material must be installed and cured in strict accordance with manufacturer's specifications.

.3 Apply repair mortar to a saturated surface dry (SSD) substrate with no standing water and dry to the touch. A SSD substrate typically exhibits a colour change of dark grey to light grey.

.4 Apply a bond slurry, consisting of neat patching mortar, to the prepared surface. Thoroughly scrub a thin layer of normal consistency mortar into the saturated surface with a stiff bristle brush to produce a uniform thickness of approximately 1/8" over entire area.

.5 Apply repair mortar by hand towelling on vertical or overhead surfaces in depths ranging from 1/2" to 2".

.1 Vertical Applications: Repair mortar can be applied on vertical applications up to a 2" depth per lift.

.2 Overhead Applications: Do not exceed 1.5" thickness per lift. For depths greater than 1.5", limit succeeding lifts to 1" thickness.

.3 Multiple Passes: Place succeeding lifts after repair mortar has developed initial set. Scarify the surface of the first lift to ensure integral bond between successive layers.

3.3 FINISHING

.1 Level surface of repair mortar using a float or screed.

.2 Apply final finish when mortar has begun to stiffen using a wooden, plastic, or synthetic sponge float or trowel.

.3 Spray apply undiluted evaporation reducer lightly to aid in finishing.

.4 Trim or shape to the desired profile if required.

3.4 CURING

.1 Protect fresh mortar from premature evaporation.

.2 Concrete repairs to be cured for a minimum of 7 days at 10°C.

.1 Keep patch continuously moist with water for a minimum of 7 days.

.2 Apply two coats curing compound in accordance with manufacturer's specifications. Apply the first coat immediately upon removal of forms. Apply the second coat about 24 hours later.

3.5 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Contract Administrator in accordance with CSA-A23.1 and Section 01 45 00 - Quality Control and as described herein.

.2 The Contractor will pay for costs of tests as a unit price component.

.3 Not less than one test per 50 square feet of patching material placed and not less than one test for each day of placement.

.1 Test samples to be prepared by a CSA certified laboratory in accordance with ASTM C109.

.4 Direct pull-out tensile tests to determine bond strength will be completed throughout the course of the work but not less than the following:

.1 Two (2) tests will be completed within the first phase of repairs.

.2 Not less than one (1) bond test will be completed in each phase.

.3 The Contract Administrator reserves the right to take additional bond tests if concrete or bonding system is suspect.

.4 Infilling of the core hole will be the responsibility of the Contractor. Unless otherwise directed by the Contract Administrator, repair in accordance with this Section.

.5 Testing agency to submit copies of concrete test reports directly to The City and the Contract Administrator.

.6 Inspection or testing by the Contract Administrator will not augment or replace Contractor quality control nor relieve contractual responsibility.

3.6 DEFECTIVE CONCRETE

.1 Defective concrete: bond strengths below minimum specified value, cracking, spalling, scaling and concrete not conforming to required lines, details, dimensions, tolerances, finishes or specified requirements.

.2 Repair or replacement of defective concrete will be determined by the Contract Administrator, based on the specifications and the above guidelines.

.3 Do not patch, fill, touch up, repair or replace exposed concrete except upon express direction of the Contract Administrator for each individual use.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Slab soffit areas, beams, columns and walls exhibiting extensive spalling and/or delamination in which patching would be uneconomical are to be repaired by mechanical removal of the deteriorated concrete and replacement with a pumpable grout.

.2 All spalling and/or delaminated concrete must be removed down to sound concrete in accordance with Section 03 91 10 - Surface Preparation for Concrete Delamination Repairs.

1.2 RELATED SECTIONS

.1 Section 03 20 00 – Concrete Reinforcing.

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

.3 Section 03 93 10 – Hand Patching.

1.3 MEASUREMENT PROCEDURES

.1 Repair areas will be handled as a unit price repair.

.2 Repair areas will be identified and quantified via hammer soundings by the Contract Administrator in the presence of and with the assistance of the Contractor. The areas will then be measured and agreed upon by the Contractor and the Contract Administrator prior to commencement of work.

.3 Unit prices are to include:

.1 Supervision, labour and materials, and equipment.
.2 Shoring as required.
.3 Reinforcing as shown on Drawing details.

.4 If the area of the repair is increased over that originally measured without consultation with the Contract Administrator, then the Contractor will not be paid for the increased area.

.5 Unit Prices:

.1 Pressure grout repair – 0” to 3” deep:
.1 Removal and infill depths of up to 3 inches and at no point less than 2 inches in depth.
.1 Unit of measure: per square foot (S.F.).
.2 The minimum area of payment will be one (1) S.F.

.2 Pressure grout repair – 3” to 6” deep:
.1 Removal depths of up to 6 inch depth and at no point less than 3 inches in depth.
.1 Unit of measure: per square foot (S.F.).
.2 The minimum area of payment will be one (1) S.F.

.3 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Consultant in accordance with CSA-A23.1.
.1 Unit of measure: per specimen.
.2 Minimum payment for testing will be 1 specimen.

.4 Direct pull-out tensile tests to determine bond strength of concrete repair.

.1 Unit of measure: per test location.

.2 Minimum payment for testing will be 1 test location.

1.4 REFERENCES

.1 American Concrete Institute (ACI)

.1 ACI 546-04, Concrete Repair Guide.

.2 ACI RAP-5, Surface Repair Using Form-and-Pump Techniques.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM C109 / C109M - 16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).

.2 ASTM C157 / C157M – 17, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.

.3 ASTM C309-11, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.4 ASTM C496 / C496M – 17, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.

.5 ASTM C531 – 18, Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.

.6 ASTM C666 / C666M – 15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

.7 ASTM C882 / C882M - 13a, Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.

.8 ASTM C1202 – 19, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.

.3 Canadian Standards Association (CSA)

.1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.4 International Concrete Repair Institute (ICRI)

.1 ICRI concrete Repair Terminology (2010 Edition).

.2 ICRI Guideline No. 120.1–2009, Guidelines and Recommendations for Safety in the Concrete Repair Industry.

.3 ICRI Guideline No. 130.1R–2009, Guide for Methods of Measurement and Contract Types for Concrete Repair Work (formerly No. 03735).

1.5 PRE-INSTALLATION MEETING

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

.2 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation of mock-up. Agenda for meeting to include:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Review installation details.

.4 Co-ordinate with other subtrades.

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

.6 Review compatibility of materials.

.7 Review testing requirements.

1.6 SUBMITTALS

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

.2 Qualification Statements:

.1 Provide references of successful completion of a minimum of 5 projects of similar size and complexity to specified Work within the last 3 years.

1.7 QUALITY ASSURANCE

.1 Contractor Qualifications:

.1 Minimum of 5 years experience in application of specified (or similar) products on projects of similar size and scope.

.2 Successful completion of a minimum of 5 projects of similar size and complexity to specified Work within the last 3 years.

.2 Field Mock-up:

.1 Install field mock-up at Project site or pre-selected area of building or location approved by the Contract Administrator. Install material in accordance with this Section.

.2 Field mock-up will be standard for judging workmanship on remainder of Project.

.3 Manufacturer’s representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Comply with Section 01 61 00 – Common Product Requirements.

.2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

.4 Keep materials in manufacturer’s original, unopened containers and packaging until installation.

.5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.9 PROJECT CONDITIONS

.1 Environmental Requirements:

.1 Ensure that substrate surface and ambient air temperature are minimum of 4°C and rising at application time and remain above 4°C for at least 24 hours after application. Ensure that frost or frozen surfaces are thawed and dry.

.2 Ensure that substrate surface and ambient air temperature are below of 32°C and remain below 32°C for at least 8 hours after application.

.3 Do not apply material if snow, rain, fog, and mist are anticipated within 12 hours after application. Allow surfaces to attain temperature and conditions specified before proceeding with application.

Part 2 Products

2.1 MATERIALS

.1 One-component, shrinkage-compensated, micro concrete consisting of cement, graded aggregate, shrinkage-compensating agents, and additives complying with the following performance requirements:

- .1 Compressive Strength, ASTM C109:
  - .1 1 day: minimum 17.0 MPa.
  - .2 7 days: minimum 34.5 MPa.
  - .3 28 days: minimum 41.0 MPa.
- .2 Slant Sheer Bond Strength, ASTM C 882:
  - .1 1 Day: minimum 5.0 MPa.
  - .2 7 Days: minimum 10.0 MPa.
  - .3 28 days: minimum 16.0 MPa.
- .3 Drying Shrinkage, ASTM C157, Unmodified, 1-inch (25-mm) prisms:
  - .1 28 Days: less than 350 µstrain.
- .4 Drying Shrinkage, ASTM C157, Modified, 3-inch (76-mm) prisms, air cured at 73 degrees F (23 degrees C), 50 percent relative humidity:
  - .1 7 Days: less than 225 µstrain.
  - .2 28 Days: lest than 500 µstrain.
- .5 Coefficient of Thermal Expansion, ASTM C531:
  - .1 28 days: $10 \pm 0.1 \times 10^{-6}$ cm/cm per degree C.
- .6 Freeze/Thaw Resistance, ASTM C666 at 300 cycles:
  - .1 minimum 96% relative dynamic modulus.
- .7 Splitting Tensile Strength, ASTM C496:
  - .1 28 days: minimum 4.0 MPa.
- .8 Rapid Chloride Permeability, ASTM C1202:
  - .1 Less than 1,000 Coulombs
- .9 Acceptable products:
  - .1 MasterEmaco S 440 MC, formerly (LA Repair Mortar) by BASF Building Systems.
  - .2 Sikacrete-211 Flow Plus by Sika Canada.
  - .3 Sikacrete 08-SCC by Sika Canada.
  - .4 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

2.2 EQUIPMENT

.1 Pumping equipment: Mono-type, piston/ball valve, or hydraulic/swing valve pumps capable of pumping specified grout. Pumping equipment must have adequate controls to regulate flow rates and pressures

2.3 ACCESSORIES

.1 Cure and sealing compound: to ASTM C309, Type 1.

- .1 Acceptable products:
  - .1 Florseal WB by Sika Canada Inc. at a minimum application rate of 4.9 m²/L.
  - .2 MasterKure CC 160 WB, formerly(Kure-N-Seal WB) by BASF Building Systems at a minimum application rate of 4.9 m²/L.

.3 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Sealant: Dowsil 795.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

Part 3 Execution

3.1 PREPARATION

.1 Protection: Protect adjacent Work areas and finish surfaces from damage during repair mortar application.

.2 Surface Preparation:

.1 Complete concrete delamination repairs to 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.3 The repair area must be thoroughly cleaned and well soaked prior to infilling. The surface should be thoroughly wetted for a period of not less than two (2) hours. The repair areas shall be kept continuously wet until just before infilling. Any standing water must be removed prior to grouting.

.4 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.5 Forming:

.1 Unless otherwise indicated provide plywood formwork to match existing profiles.

.2 Install chamfers at outside corners and filets at inside corners in accordance with Section 03 10 00 or to match existing profiles.

.3 Design formwork to accommodate the mass and pressure of the repair material but not less than 14 psi (100 kPa).

.4 Securely anchor formwork to substrate. Anchors to be sized and space to prevent deflection of the forms during pressure grouting.

.5 Construct forms to fit tightly against existing concrete surfaces. Seal around edge of formwork with sealant to prevent leakage during grouting.

.6 Anchors shall be completely removable. All anchor holes shall be patched with same grout utilized for the repairs but mixed to dry pack consistency. Completely fill all anchor holes.

.7 A minimum of 30 mm concrete cover over the primary reinforcing steel will be required, thus, an adjustment of the formwork such as a notch may be required to ensure sufficient cover.

.8 Provide drainage outlets in formwork for presoaking and, if beneath a soffit, provide air venting. Provide suitable access points to pump mixed repair mortar into place.

.9 Space ports for pump line attached in a grid pattern.

.10 Use form-release agent to facilitate removal of forms from cast material.

.11 Within two (2) hours immediately prior to grouting, pressure test formwork to determine watertightness. Completely fill formwork with clean water and let stand for not less than 15 minutes. Any areas of leakage are to be sealed prior to grouting. Re-test as required.

3.2 INFILLING PROCEDURES

.1 Obtain the Contract Administrator's approval before placing repair material. Provide minimum 24 hours notice.

.2 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.3 Mixing:

- .1 Mix materials in accordance with manufacturer's instructions.
- .2 Ensure repair mortar is thoroughly mixed.
- .3 Do not use free-fall mixers.
- .4 Never mix partial bags.

.4 Within 15 minutes of mixing, pump the grout into the prepared form. Work in a manner to avoid air entrapment with a variable pressure pump.

.5 Start pumping at one corner for horizontal surfaces, or at the lowest point for vertical surfaces, continue filling in a manner that prevents air entrapment.

.6 Continue pumping until material flows from adjacent ports and all air is expelled. After all air is expelled, temporarily stop pumping, close off port, and begin pumping from next port that has seen material flow. Repeat sequence until the cavity is completely filled.

.7 Monitor pump-line pressure to prevent excessive back-pressure when pumping long distances.

.8 Vibrate the form while pumping, as required, to achieve flow and compaction. Flowable grout must be confined in either the horizontal or vertical direction, leaving a minimum of exposed surface.

3.3 CURING

.1 Concrete repairs to be cured for a minimum of 3 days at 10°C. Provide supplemental heat and hoarding as required throughout curing period.

.2 Leave formwork in place until repair mortar reaches compressive strength of 20 MPa.

.3 Upon removal of forms, apply two coats curing compound in accordance with manufacturer's specifications. Apply the first coat immediately upon removal of forms. Apply the second coat about 24 hours later.

3.4 FINISHING

.1 After stripping of formwork, any spaces not filled should be trimmed, cleaned, and dry-packed with grout to the desired profile. Do not proceed with repairs without the Contract Administrator's written approval.

3.5 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Contract Administrator in accordance with CSA-A23.1 and Section 01 45 00 - Quality Control and as described herein.

.2 The Contractor will pay for costs of tests as a unit price component.

.3 Not less than one test per 50 square feet of patching material placed and not less than one test for each day of placement.

.1 Test samples to be prepared by a CSA certified laboratory in accordance with ASTM C109.

.4 Direct pull-out tensile tests to determine bond strength will be completed throughout the course of the work but not less than the following:

.1 Two (2) tests will be completed within the first phase of repairs.

.2 Not less than one (1) bond test will be completed in each phase.

.3 The Contract Administrator reserves the right to take additional bond tests if concrete or bonding system is suspect.

.4 Infilling of the core hole will be the responsibility of the General Contractor. Unless otherwise directed by the Contract Administrator, repair in accordance with this Section.

.5 Testing agency to submit copies of concrete test reports directly to The City and the Contract Administrator.

.6 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve contractual responsibility.

3.6 DEFECTIVE CONCRETE

.1 Defective concrete: bond strengths below minimum specified value, cracking, spalling, scaling and concrete not conforming to required lines, details, dimensions, tolerances, finishes or specified requirements.

.2 Repair or replacement of defective concrete will be determined by the Contract Administrator, based on the specifications and the above guidelines.

.3 Do not patch, fill, touch up, repair or replace exposed concrete except upon express direction of the Contract Administrator for each individual use.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Slab soffit areas, beams, columns and walls exhibiting extensive spalling and delamination in which patching would be uneconomical are to be repaired by mechanical removal of the deteriorated concrete and replacement using the form and pour method.

.2 All spalling and delaminated concrete must be removed down to sound concrete in accordance with Section 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

1.2 RELATED SECTIONS

.1 Section 03 20 00 – Concrete Reinforcing.

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

.3 Section 03 93 10 – Hand Patching.

.4 Section 03 93 20 – Pressure Grouting.

1.3 MEASUREMENT PROCEDURES

.1 Repair areas will be handled as a unit price repair.

.2 Repair areas will be identified and quantified via hammer soundings by the Contract Administrator in the presence of and with the assistance of the Contractor. The areas will then be measured and agreed upon by the Contractor and the Contract Administrator prior to commencement of work.

.3 Unit prices are to include:

- .1 Supervision, labour and materials, and equipment.
- .2 Shoring as required.
- .3 Reinforcing as shown on Drawing details.

.4 If the area of the repair is increased over that originally measured without consultation with the Contract Administrator, then the Contractor will not be paid for the increased area.

.5 Unit prices:

- .1 Form and pour concrete repair – 0” to 3” deep:
  - .1 Removal and infill depths of up to a 3 inches and at no point less than 1 inch in depth.
    - .1 Unit of measure: per square foot (S.F.).
    - .2 The minimum area of payment will be one (1) SF.
- .2 Form and pour concrete repair – 3” to 6” deep:
  - .1 Removal and infill depths of up to a 6 inch depth and at no point less than 3 inches in depth.
    - .1 Unit of measure: per square foot (S.F.).
    - .2 The minimum area of payment will be one (1) S.F.

.3 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Contract Administrator in accordance with CSA-A23.1.

.1 Unit of measure: per specimen.

.2 Minimum payment for testing will be 1 specimen.

.4 Direct pull-out tensile tests to determine bond strength of concrete repair.

.1 Unit of measure: per test location.

.2 Minimum payment for testing will be 1 test.

1.4 REFERENCES

.1 American Concrete Institute (ACI)

.1 ACI 546-04, Concrete Repair Guide.

.2 ACI RAP-4, Surface Repair Using Form-and-Pour Techniques.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM C109 / C109M - 16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).

.2 ASTM C157 / C157M – 17, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.

.3 ASTM C309-11, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.4 ASTM C531 – 18, Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.

.5 ASTM C666 / C666M – 15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

.3 Canadian Standards Association (CSA)

.1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.4 International Concrete Repair Institute (ICRI)

.1 ICRI concrete Repair Terminology (2010 Edition).

.2 ICRI Guideline No. 120.1–2009, Guidelines and Recommendations for Safety in the Concrete Repair Industry.

.3 ICRI Guideline No. 130.1R–2009, Guide for Methods of Measurement and Contract Types for Concrete Repair Work (formerly No. 03735).

1.5 PRE-INSTALLATION MEETING

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

.2 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation of mock-up. Agenda for meeting to include:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Review installation details.

.4 Co-ordinate with other subtrades.

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

.6 Review compatibility of materials.

.7 Review testing requirements.

1.6 SUBMITTALS

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

.2 Qualification Statements:

.1 Provide references of successful completion of a minimum of 5 projects of similar size and complexity to specified Work within the last 3 years.

1.7 QUALITY ASSURANCE

.1 Contractor Qualifications:

.1 Minimum of 5 years experience in application of specified (or similar) products on projects of similar size and scope.

.2 Successful completion of a minimum of 5 projects of similar size and complexity to specified Work within the last 3 years.

.2 Field Mock-up:

.1 Install field mock-up at Project site or pre-selected area of building or location approved by the Contract Administrator. Install material in accordance with this Section.

.2 Field mock-up will be standard for judging workmanship on remainder of Project.

.3 Manufacturer’s representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Comply with Section 01 61 00 – Common Product Requirements.

.2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

.4 Keep materials in manufacturer’s original, unopened containers and packaging until installation.

.5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.9 PROJECT CONDITIONS

.1 Environmental Requirements:

.1 Ensure that substrate surface and ambient air temperature are minimum of 4°C and rising at application time and remain above 4°C for at least 24 hours after application. Ensure that frost or frozen surfaces are thawed and dry.

.2 Ensure that substrate surface and ambient air temperature are below of 32°C and remain below 32°C for at least 8 hours after application.

.3 Do not apply material if snow, rain, fog, and mist are anticipated within 12 hours after application. Allow surfaces to attain temperature and conditions specified before proceeding with application.

Part 2 Products

2.1 MATERIALS

.1 The repair mortar shall cement-based, one-component, self-consolidating with the following properties:

.1 Drying shrinkage to ASTM C157:

.1 less than 0.10% at 28 days.

.2 Compressive Strength, ASTM C109:

.1 1 day: minimum 10.0 MPa.

.2 7 days: minimum 28.0 MPa.

.3 28 days: minimum 35.0 MPa.

.3 Freeze/Thaw Resistance, ASTM C666 at 300 cycles:

.1 minimum 98% relative dynamic modulus.

.4 Coefficient of Thermal Expansion, ASTM C531:

.1 28 days: $10 \pm 1.0 \times 10^{-6}$ cm/cm per degree C.

.5 Acceptable products:

.1 MasterEmaco S 440, formerly (LA40 Repair Mortar) by BASF Building Systems.

.2 Sikacrete-08 SCC by Sika Canada.

.3 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

2.2 ACCESSORIES

.1 Cure and sealing compound: to ASTM C309, Type 1.

.1 Acceptable product(s):

.1 Florseal WB by Sika Canada Inc. at a minimum application rate of 4.9 m²/L.

.2 MasterKure CC 160 WB, formerly (Kure-N-Seal WB) by BASF Building Systems at a minimum application rate of 4.9 m²/L.

.3 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Sealant: Dowsil 795.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

Part 3 Execution

3.1 PREPARATION

.1 Protection: Protect adjacent Work areas and finish surfaces from damage during repair mortar application.

.2 Surface Preparation:

.1 Complete concrete delamination repairs to 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

.3 The repair area must be thoroughly cleaned and well soaked prior to infilling. The surface should be thoroughly wetted for a period of not less than two (2) hours. The repair areas shall be kept continuously wet until just before infilling. Any standing water must be removed prior to grouting.

.4 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.5 Forming:

.1 Unless otherwise indicated provide plywood formwork to match existing profiles.

.2 Install chamfers at outside corners and filets at inside corners in accordance with Section 03 10 00 or to match existing profiles.

.3 Design formwork to accommodate the mass and pressure of the repair material.

.4 Securely anchor formwork to substrate. Anchors to be sized and space to prevent deflection of the forms placement and curing.

.5 Construct forms to fit tightly against existing concrete surfaces. Seal around edge of formwork with sealant to prevent leakage during grouting.

.6 Anchors shall be completely removable. All anchor holes shall be patched with grout mixed to dry pack consistency. Completely fill all anchor holes.

.7 Placement openings or chutes are required to place the repair material behind vertical forms. Chutes should be constructed to permit development of a hydraulic head above the prepared upper edges of the concrete surface. This will provide for repair material supply into these upper horizontal zones after concrete is consolidated.

.8 For large, vertical surfaces exceeding 10 ft (3 m) in height, multiple lifts should be considered to reduce free-fall segregation and excessive formwork pressures.

.9 Formwork for overhead surfaces does not require openings for placement of repair materials. Place repair materials through openings in the slab from above. Size and location of openings to be approved by the Contract Administrator. Do not remove or cause damage to existing reinforcing steel in order to install placement openings.

.10 A minimum of 30 mm concrete cover over the primary reinforcing steel will be required, thus, an adjustment of the formwork such as a notch may be required to ensure sufficient cover.

.11 Provide drainage outlets in formwork for presoaking and, if beneath a soffit, provide air venting. Provide suitable access points to pour mixed repair mortar into place.

.12 Use form-release agent to facilitate removal of forms from cast material.

.13 Within two (2) hours immediately prior to placement of repair material, test formwork to determine watertightness. Completely fill formwork with clean water and let stand for not less than 15 minutes. Any areas of leakage are to be sealed prior to placement of repair material. Re-test as required.

3.2 INFILLING PROCEDURES

.1 Obtain the Contract Administrator’s approval before placing repair material. Provide minimum 24 hours notice.

.2 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.3 Mixing:

.1 Mix materials in accordance with manufacturer’s instructions.

.2 Ensure repair mortar is thoroughly mixed.

.3 Do not use free-fall mixers.

.4 Never mix partial bags.

.4 Within 15 minutes of mixing, pour repair material into the prepared form. Work in a manner to avoid air entrapment with a variable pressure pump.

.5 Vibrate the form while pumping, as required, to achieve flow and compaction.

.6 Ensure that the uppermost surfaces are filled adjacent to the chute or opening where placement occurs. Rod or tamp material to ensure proper filling.

3.3 CURING

.1 Concrete repairs to be cured for a minimum of 3 days at 10°C. Provide supplemental heat and hoarding as required throughout curing period.

.2 Leave formwork in place until repair mortar reaches compressive strength of 20 MPa.

.3 Upon removal of forms, apply two coats curing compound in accordance with manufacturer's specifications. Apply the first coat immediately upon removal of forms. Apply the second coat about 24 hours later.

3.4 FINISHING

.1 After stripping of formwork, any spaces not filled should be trimmed, cleaned, and dry-packed with grout to the desired profile. Do not proceed with repairs without the Contract Administrator's written approval.

3.5 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Contract Administrator in accordance with CSA-A23.1 and Section 01 45 00 - Quality Control and as described herein.

.2 The Contractor will pay for costs of tests as a Unit Price Component.

.3 Not less than one test per 50 square feet of patching material placed and not less than one test for each day of placement.

.1 Test samples to be prepared by a CSA certified laboratory in accordance with ASTM C109.

.4 Direct pull-out tensile tests to determine bond strength will be completed throughout the course of the work but not less than the following:

.1 Two (2) tests will be completed within the first phase of repairs.

.2 Not less than one (1) bond test will be completed in each phase.

.3 The Contract Administrator reserves the right to take additional bond tests if concrete or bonding system is suspect.

.4 Infilling of the core hole will be the responsibility of the General Contractor. Unless otherwise directed by the Contract Administrator, repair in accordance with this Section.

.5 Testing agency to submit copies of concrete test reports directly to The City and the Contract Administrator.

.6 Inspection or testing by the Contract Administrator will not augment or replace Contractor quality control nor relieve contractual responsibility.

3.6 DEFECTIVE CONCRETE

.1 Defective concrete: bond strengths below minimum specified value, cracking, spalling, scaling and concrete not conforming to required lines, details, dimensions, tolerances, finishes or specified requirements.

.2 Repair or replacement of defective concrete will be determined by the Contract Administrator, based on the specifications and the above guidelines.

.3 Do not patch, fill, touch up, repair or replace exposed concrete except upon express direction of the Contract Administrator for each individual use.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This Section includes furnishing all labor, tools, materials, equipment and services necessary to properly install embedded galvanic anodes.

.2 Embedded galvanic anodes are designed to provide localized corrosion protection. When placed at the appropriate spacing along the perimeter of concrete patches or along the interface between new/existing concrete, the anodes mitigate active corrosion and the formation of new corrosion sites in the existing concrete in adjacent areas.

1.2 RELATED SECTIONS

.1 Section 03 20 00 – Concrete Reinforcing.

.2 Section 03 91 10 – Surface Preparation for Concrete Delamination Repair.

1.3 MEASUREMENT PROCEDURES

.1 Repair areas requiring galvanic anodes will be handled as a unit price repair.

.2 Repair areas requiring galvanic anodes will be identified and quantified the Contract Administrator in the presence of and with the assistance of the Contractor. The areas requiring galvanic anodes will then be measured and agreed upon by the Contractor and the Contract Administrator prior to commencement of work.

.3 Unit prices are to include:

- .1 Supervision, labour and materials, and equipment.
- .2 Shoring as required.
- .3 Reinforcing as shown on Drawing details.

.4 If the quantity of anodes installed is increased over that originally measured without consultation with the Contract Administrator, then the Contractor will not be paid for the increased quantity.

.5 Unit prices:

- .1 Galvanic anodes:
  - .1 Supply and installation of galvanic anodes.
    - .1 Unit of measure: per anode.
    - .2 Minimum payment for repair areas will be 1 anode.

1.4 REFERENCES

.1 American Concrete Institute (ACI)

- .1 ACI 546-04, Concrete Repair Guide.
- .2 ACI 562-12, Code Requirements for Evaluation, Repair and Rehabilitation of Concrete Buildings
- .3 ACI RAP-8, Installation of Embedded Galvanic Anodes.

.2 American Society for Testing and Materials International (ASTM):

- .1 ASTM B6 – 18, Standard Specification for Zinc

.3 International Concrete Repair Institute (ICRI)

.1 ICRI concrete Repair Terminology (2010 Edition).

.2 ICRI Guideline No. 120.1–2009, Guidelines and Recommendations for Safety in the Concrete Repair Industry.

.3 ICRI Guideline No. 130.1R–2009, Guide for Methods of Measurement and Contract Types for Concrete Repair Work (formerly No. 03735).

.4 ICRI Guideline No. 310.1R–2008, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion (formerly No. 03730).

.5 ICRI Guideline No. 310.2–1997, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays (formerly No. 03732).

1.5 SEQUENCING

.1 Co-ordinate and sequence installation of galvanic anodes with various concrete repair methods specified.

1.6 SUBMITTALS

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

.1 Manufacturers Instructions: Submit manufacturer’s installation instructions.

1.7 QUALITY ASSURANCE

.1 Contractor Qualifications:

.1 Minimum of 5 years experience in application of specified (or similar) products on projects of similar size and scope.

.2 Successful completion of a minimum of 5 projects of similar size and complexity to specified Work within the last 3 years.

.2 Field Mock-up:

.1 Install field mock-up at Project site or pre-selected area of building or location approved by the Contract Administrator. Install material in accordance with this Section.

.2 Field mock-up will be standard for judging workmanship on remainder of Project.

.3 Manufacturer’s representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Comply with Section 01 61 00 – Common Product Requirements.

.2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

.4 Keep materials in manufacturer’s original, unopened containers and packaging until installation.

.5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.9 WARRANTY

.1 Warranty:

.1 Manufacturer warranty:

.1 Standard manufacturer warranty including:

.1 Statement that materials in contact with another have been tested and verified to be compatible.

.2 Include written testing documentation and test reports if requested by the Contract Administrator.

Part 2 Products

2.1 MATERIALS

.1 Embedded galvanic anodes:

.1 A highly alkaline cementitious shell with a pH of 14 or greater

.2 Contain no added constituents corrosive to reinforcing steel or detrimental to concrete, e.g. chloride, bromide, sulfates, etc.

.3 Anode units shall be alkali-activated and supplied with solid zinc core cast around integral unspliced, uncoated, non-galvanized double loop steel tie wires.

.4 Anode units shall be supplied with integral non-galvanised, unspliced tie wires such that the zinc anode is connected to the reinforcement with a continuous, unspliced wire.

.2 Repair materials:

.1 Concrete and bonding agents shall be Portland cement-based materials. Non-conductive repair materials such as epoxy, urethane, or magnesium phosphate shall not be permitted. Insulating materials such as epoxy bonding agents shall not be used unless otherwise noted.

.2 Anodes used with repair materials having saturated bulk resistivity of 50,000 ohm-cm or greater, shall be embedded in manufacturer approved mortar to create a conductive bridge to the substrate prior to repair material installation.

.3 Acceptable Product: Galvashield XP4 by Vector Corrosion Technologies.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

Part 3 Execution

3.1 PREPARATION

.1 Complete concrete delamination repairs and surface preparation to Section 03 91 10 – Surface Preparation for Concrete Delamination Repair.

3.2 INSTALLATION

.1 Install anode units in accordance with manufacturer’s directions immediately following preparation and cleaning of the steel reinforcement.

.2 Install galvanic anodes in patch repair locations identified by the Contract Administrator.

.3 Provide sufficient clearance between anodes and substrate to allow repair material to encase anode.

.4 Secure the galvanic anodes as close as possible to the patch edge using the anode tie wires.

.5 The tie wires shall be wrapped around the cleaned reinforcing steel and twisted tight to allow little or no free movement.

.1 If less than 1 inch (25 mm) of concrete cover is expected, place anode beside or beneath the bar and secure to clean reinforcing steel.

.2 If sufficient concrete cover exists, the anode may be placed along a single bar or at the intersection between two bars and secured to each clean bar.

.6 If repair materials with resistivity greater than 50,000 ohm-cm are to be used or the resistivity is unknown, create a conductive grout bridge between the anode and the substrate. Pack manufacturer approved mortar to cover minimum area of 4 in (100mm) in diameter between the anode and the substrate concrete ensuring no voids exist.

.7 Electrical Continuity

.1 Confirm electrical connection between anode tie wire and reinforcing steel by measuring DC resistance (ohm,Ω) or potential (mV) with a multi-meter.

.2 Electrical connection is acceptable if the DC resistance measured with multi-meter is less than 1 Ω or the DC potential is less than 1 mV.

.3 Confirm electrical continuity of the exposed reinforcing steel within the repair area. If necessary, electrical continuity shall be established with steel tie wire.

.4 Electrical continuity between test areas is acceptable if the DC resistance measured with multi-meter is less than 1 Ω or the potential is less than 1 mV.

3.3 CONCRETE OR MORTAR REPLACEMENT

.1 Pre-wet the concrete surface and the anode units to achieve a saturated surface dry condition, and then complete the repair according to the appropriate Section.

.2 Do not soak the anode units for greater than 20 minutes.

.3 Repair materials with significant polymer modification and/or silica fume content may have high resistivity. Similarly, if bonding agents are used, they shall have suitable conductivity. Do not use insulating materials such as epoxy bonding agents.

.4 Following normal concrete repair procedures complete the repair with the repair material, taking care not to create any air voids around the anode.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Ceramic tile, backing and installation at locations shown on Drawings.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI).

.1 ANSI A108/A118/A136.1:2019, Specification for the Installation of Ceramic Tile.

.2 American Society for Testing and Materials International (ASTM):

.1 ASTM C473 – 17, Standard Test Methods for Physical Testing of Gypsum Panel Products.

.2 ASTM C518 – 17, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

.3 ASTM C666 / C666M – 15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

.4 ASTM C947 - 03(2016), Standard Test Method for Flexural Properties of Thin-Section Glass-Fiber-Reinforced Concrete (Using Simple Beam With Third-Point Loading).

.5 ASTM C1325 - 18, Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.

.6 ASTM D1037 – 12, Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.

.7 ASTM D3273 – 16, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

.8 ASTM E84 - 19a, Standard Test Method for Surface Burning Characteristics of Building Materials.

.9 ASTM E330 / E330M – 14, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

.10 ASTM G21 – 15, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

.3 Canadian Standards Association (CSA)

.1 CSA- A23.1-14/A23.2-14, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete.

.4 Terrazzo Tile and Marble Association of Canada (TTMAC)

.1 Tile Specification Guide 09 30 00 2016/2017, Tile Installation Manual.

1.3 MEASUREMENT PROCEDURES

.1 No measurement will be made under this for preparation and installation tiles and associated items.

.2 Repair of cracks in concrete substrate exposed by removal of existing ceramic tiles and mortar bed will be a Unit Price component.

.3 Repair areas will be identified by the Contract Administrator on-site by a chain drag sounding survey which will be completed in the presence of, and with the assistance of the Contractor. The areas will then be measured and agreed upon by the Contractor and the Contract Administrator prior to commencement of work. These measurements will form the basis of payment for the area.

.4 If the area of the repair is increased over that originally measured without consultation with the Contract Administrator, then the Contractor will not be paid for the increased area.

.5 Unit prices are to include all supervision, labour and materials, and equipment.

.6 Unit prices:

.1 Crack repair:

.1 Gravity feed epoxy repair of cracks.

.1 Unit of measure: per lineal foot (L.F.).

.2 Minimum payment for repair areas will be 1 L.F.

.2 Direct pull-out tensile tests to determine bond strength of tank wall mortar bed.

.1 Unit of measure: per test location.

.2 Minimum payment for testing will be 1 test location.

1.4 PRE-INSTALLATION MEETING

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

.2 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation of mock-up. Agenda for meeting to include:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Review installation details.

.4 Co-ordinate with other subtrades.

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

.6 Review compatibility of materials.

.7 Review testing requirements.

1.5 SUBMITTALS

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

.1 Product data:

.1 Each tile type, size, and shape required, including slip resistance and frost resistance where applicable.

.2 Tile chemical resistance to mortar and grout.

.3 Bonding agent characteristics

.4 Repair mortar and mortar bed

.5 Accessories specified including waterproofing membrane and reinforcing fabric.

.6 High performance, marine-grade sealants

.7 Tile setting mortar characteristics

.8 Each grout type, colour, and characteristics

.9 Grout sealer

.10 Cleaning compounds

.2 Submit manufacturer's technical information and colour charts for each product specified.

.3 Samples:

.1 Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each tile colour, texture, size and pattern, including related trims and profiles at edges, corners, transition. Make samples at least 300mm square (12” x 12”). Use grout of type and in colour or colours approved for completed Work. Adhere tile samples to 11mm thick plywood.

.2 Full-size units of each type of trim and accessory for each colour and finish required.

.4 Tiling Plans: Submit tiling plans giving all details of special fittings, expansion joints, joint layouts, etc. These plans and details must be submitted in sufficient time to allow for review & ordering of tiles so as not to cause a delay in the work.

.5 Qualification Statements

.1 Installation Contractor Qualifications:

.1 Submit five project references of successful completion of work of similar scope and complexity demonstrating experience with ceramic tiling and membrane application of pools completed within past ten years.

.1 Minimum of one project reference to be from ten years ago.

1.6 CLOSEOUT SUBMITTALS

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

.2 Maintenance data: submit maintenance data for incorporation into Operations and Maintenance Manual. Include:

.1 Cleaning and maintenance recommendations for The City's use.

.2 TTMAC Maintenance Guide. Provide specific warning of any maintenance practice or materials that may damage or disfigure finished work.

.3 Warranty: Submit final executed warranty.

.4 Extra materials:

.1 Provide minimum 5% of each type and colour of tile required for project for maintenance use. Store where directed.

.2 Maintenance material same production run as installed material.

1.7 QUALITY ASSURANCE

.1 Conform to TTMAC Manual, latest edition.

.2 Maintain one (1) copy of each document on site.

.3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten (10) years documented experience.

.4 Installation Contractor Qualifications: Company specializing in performing the work of this section with minimum ten (10) years documented experience and approved by the manufacturer.

1.8 MOCK-UP

.1 Provide 10 feet long by 20 feet wide mock-up, with finish grout, and specified accessories.

.2 Mock-up to include control joints.

.3 Locate where directed by the Contract Administrator and The City.

.4 Approved mock-up may remain as part of the Work.

.5 Schedule bond tests of mock-up as unit price component.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

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

1.10 AMBIENT CONDITIONS

.1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C for 48 hours before, during, and after, installation.

.2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.

.3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

1.11 WARRANTY

.1 Provide Setting material Manufacturer's superior 25-year materials and labour warranty against breakdown or deterioration of the waterproof membrane and setting materials.

Part 2 Products

2.1 TILES

.1 Ceramic Tile (CT-1):

.1 Acceptable product: "Keystones Series", by Daltile.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Size: 23mm x 23mm (1" x 1") Square

.3 Colour: Pepper White D037.

.4 Code: D037 (Group 1)

.5 Location: Pool Deck – Field Tiles. Refer to layout.

.6 Trims and Profiles: Include all required trims & profiles such as cove base, nosing, inside corner, outside corner, cove base corner, universal trims, etc.

.2 Ceramic Tile (CT-2):

.1 Acceptable product: "Keystones Series", by Daltile.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Size: 23mm x 23mm (1" x 1") Square

.3 Colour: Artisan Brown D144.

.4 Code: D144 (Group 2)

.5 Location: Pool Deck Border 1 (Adjacent to Pool Markers on decks & walls), Pool Tank A & B Borders (Floor & Walls), Nosings, Skimmer Drains, Step Holes, Jacuzzi Deck Border 1, Administration/ Office 4" Baseboard (all North Side Wall). Refer to layout.

.6 Trims and Profiles: Include all required trims & profiles such as cove base, nosing, inside corner, outside corner, cove base corner, universal trims, etc.

.3 Ceramic Tile (CT-3):

.1 Acceptable product: "Keystones Series", by Daltile.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Size: 23mm x 23mm (1" x 1") Square

.3 Colour: Arctic White D617.

.4 Code: D617 (Group 2)

.5 Location: Pool Deck Border 2 (Adjacent to Pool Markers on decks, walls & scupper drains), Jacuzzi Deck Border 2. Refer to layout.

.6 Trims and Profiles: Include all required trims & profiles such as cove base, nosing, inside corner, outside corner, cove base corner, universal trims, etc.

.4 Ceramic Tile (CT-4):

.1 Acceptable product: “Keystones Series”, by Daltile.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Size: 48mm x 48mm (2” x 2”) Square

.3 Colour: Black D311.

.4 Code: D311 (Group 3)

.5 Location: Pool Tank A & B Lane Markers (Floor & Walls), Depth Marker Lines (Floor & Walls), Secchi Disk. Refer to layout.

.6 Trims and Profiles: Include all required trims & profiles such as cove base, nosing, inside corner, outside corner, cove base corner, universal trims, etc.

.5 Ceramic Tile (CT-5):

.1 Acceptable product: “Keystones Series”, by Daltile.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Size: 48mm x 48mm (2” x 2”) Square

.3 Colour: Biscuit D317.

.4 Code: D317 (Group 1)

.5 Location: Pool Tank Walls & Floors. Refer to layout.

.6 Trims and Profiles: Include all required trims & profiles such as cove base, nosing, inside corner, outside corner, cove base corner, universal trims, etc.

.6 Ceramic Tile (CT-6):

.1 Acceptable product: “Keystones Series”, by Daltile.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Size: 23mm x 23mm (1” x 1”) Square

.3 Colour: Urban Putty Speckle D201.

.4 Code: D201 (Group 1)

.5 Location: Pool Deck Benches/ Mechanical boxed up (all walls, seats & 8” return), Shower Area Kerb. Refer to layout.

.6 Trims and Profiles: Include all required trims & profiles such as cove base, nosing, inside corner, outside corner, cove base corner, universal trims, etc.

.7 Ceramic Tile (CT-7):

.1 Acceptable product: “Keystones Series”, by Daltile.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Size: 150mm x 610mm (6” x 24”). To be Water Jetted for wordings & numberings.

.3 Colour: Background Tile - “Beige or White”. As per approved colour.

.4 Code: Submit for approval.

.5 Location: Depth Markers Background Tile to be Water Jet to received words & numbers indicating Depths & Warnings. Refer to layout.

.6 Submit Sample for approval before proceeding.

.8 Ceramic Tile (CT-8):

.1 Acceptable product: “Keystones Series”, by Daltile.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Size: 150mm x 610mm (6” x 24”). To be Water Jetted for wordings & numberings.

.3 Colour: Wording/ Number Tile - “Black”. In accordance with approved colour.

.4 Code: Submit for approval.

.5 Location: Depth Markers Wording/ Number Tile to be Water Jetted to be attached to the Background Tile indicating Depths & Warnings. Refer to layout.

.6 Submit Sample for approval before proceeding.

2.2 CRACK SEALER

.1 Epoxy crack sealer: Sikadur 52 SLV by Sika.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

2.3 MORTAR BED – POOL DECK FLOOR AND TANK FLOOR

.1 Accelerated-cure mortar bed.

.2 Application thickness:

.1 As required to achieve finished tile thickness to match existing tile finished thickness.

.2 ¼” to 4”: Standard mix.

.3 Extended mix up to 4”: Add up to 20 per cent by weight of washed, clean, non-reactive saturated surface dry 0.375” pea gravel.

.3 Acceptable Product:

.1 Topcem Premix by Mapei mixed with Planicrete AC by Mapei.

.2 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

2.4 MORTAR BED – TANK WALLS:

.1 Two component, fats setting, thixotropic, fibre reinforced repair mortar with corrosion-inhibitor.

.2 Application thickness:

.1 As required to achieve finished tile thickness to match existing tile finished thickness.

.2 ¼” to 2” per lift.

.3 Maximum two lifts to total thickness of 4”.

.3 Acceptable Product:

.1 Planitop 12 SR by Mapei.

.2 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

2.5 BONDING AGENT

.1 Single component, polymer-modified premium thin-set mortar, complying with ANSI A118.4.

.2 Acceptable Product:

.1 Ultraflex 3 by Mapei.

.2 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

2.6 WATERPROOFING MEMBRANE

.1 Membrane: Fast setting, flexible, thin, load bearing, premium latex-based waterproofing and crack isolation membrane complying with ANSI A118.10 and ANSI A118.12.

.2 Reinforcing fabric: Flexible, alkali-resistant, nonwoven polyester fabric.

.3 Acceptable Products:

.1 Membrane: Aquadefense by Mapei.

.2 Reinforcing fabric: Reinforcing fabric by Mapei.

.3 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

2.7 TILE SETTING MORTAR

.1 Single component, polymer-modified premium thin-set mortar, complying with ANSI A118.4.

.2 Acceptable Product:

.1 Ultraflex 3 by Mapei.

.2 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

2.8 GROUT MATERIALS

.1 Fine-aggregate, fast-setting, polymer-modified, colour-resistant, non-shrinking, efflorescence-free grout.

.2 Acceptable Products:

.1 Ultracolor Plus FA by Mapei.

.2 Colour: By The City based on manufacturer standard colour range.

.3 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

2.9 JOINT SEALANT/JOINT BACKING

.1 Joint Sealant: Mapesil T by Mapei.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Joint Backing (ASTM D1056): round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.

.3 Teflon tape bond breaker tape for control joints.

2.10 ACCESSORIES

.1 Anchors:

.1 For installation of deck fixtures removed and salvaged for re-installation.

.1 Anchor: Hilti-HS-RN 316 SS.

.1 Diameter: to match existing.

.2 Adhesive: Hilti HIT RE 500 V3.

.3 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Cement Board: DensShield Tile Backer by Georgia Pacific.

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.3 Tile Closure: Extruded, anodized clear aluminum.

.1 Profile as shown on Drawings.

2.11 TRIM SHAPES

.1 Conform to applicable requirements of adjoining floor and wall tile.

.2 Use trim shapes sizes conforming to size of adjoining field wall tile, including existing spaces, unless specified otherwise.

.3 Internal and External Corners: provide trim shapes as follows where indicated.

.1 Bullnose shapes for external corners including edges.

.2 Coved shapes for internal corners.

2.12 SCHEDULES

.1 Deck floors:

.1 Ceramic tile.

.1 Grout joints with grout materials.

.2 Tile setting mortar.

.3 Waterproofing membrane.

.4 Mortar bed – Pool deck floor and tank floor.

.5 Bonding agent.

.6 Existing concrete substrate.

.2 Deck walls:

.1 Ceramic tile.

.1 Grout joints with grout materials.

.2 Tile setting mortar.

.3 Waterproofing membrane.

.4 Existing concrete substrate.

.3 Tank floors:

.1 Ceramic tile.

.1 Grout joints with grout materials.

.2 Tile setting mortar.

.3 Waterproofing membrane.

.4 Mortar bed – Pool deck floor and tank floor.

.5 Bonding agent.

.6 Existing concrete substrate.

.4 Tank walls:

.1 Ceramic tile.

.1 Grout joints with grout materials.

.2 Tile setting mortar.

.3 Waterproofing membrane.

.4 Mortar bed – Tank walls.

.5 Existing concrete substrate.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance:

.1 Comply with manufacturer's written recommendations, instructions and specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

.2 Proportion and mix materials in accordance with manufacturer's most current written instructions and applicable ANSI standards.

3.2 DEMOLITION

.1 Demolish existing materials as shown on Drawings to allow preparation of surfaces for ceramic tiling installation.

3.3 EXAMINATION

.1 Verify that surfaces are ready to receive work.

.2 Tile installation contractor to inspect substrate.

.1 Commencement of installation shall be considered acceptance of substrate.

.3 General Contractor shall be responsible for ensuring that the substrate, the overlay and underlayment meet the specification requirements or surface flatness tolerances.

.4 Contractor to verify surface conditions in structural slab comply with TTMAC.

.5 Conduct Calcium Chloride moisture emission testing of concrete substrate:

.1 In accordance with ASTM F1869.

.2 Frequency: minimum three independent floor test locations at each tank.

.3 Acceptable conditions: moisture emission not to exceed 2,26 kg/92m^2 per 24 hours (5 lbs per 1000 S.F. per 24 hours).

3.4 PREPARATION

.1 Protect surrounding work from damage or disfiguration.

.2 Ensure that any contaminants, including but not limited to oils and solvents which may impact the bond of the thin-set are removed. The removal of such stains shall be included in the fixed price of the tile installation.

.3 Vacuum clean surfaces and damp clean.

3.5 CRACK SEALING WITH EPOXYCRACK SEALER

.1 At locations of cracks requiring repair identified by the Contract Administrator:

.1 Sawcut with 1/8" blade along length of crack identified.

.2 Clean crack with vacuum.

.3 Infill crack with epoxy crack sealer.

.4 Top crack repair with silica sand to saturation.

.5 Remove loose sand.

3.6 INSTALLATION: MORTAR BED – POOL DECK FLOOR AND TANK FLOOR

.1 Examination:

.1 Once existing tiles and mortar bed have been removed to expose existing concrete substrate, surfaces will be reviewed by the Contract Administrator in the presence of and with the assistance of the Contractor to identify concrete repairs.

.2 Concrete repairs to be completed in accordance with applicable concrete repair specifications.

.3 Once concrete repairs are complete, ensure concrete repairs have acceptable cured.

.2 Preparation:

.1 Treat existing cracks in concrete with crack sealer as shown on Drawings.

.2 Shotblast and sandblast surface of concrete and repair areas prior to installation of mortar bed.

.1 Surface preparation to ICRI CSP-3 to 5.

.3 Vacuum clean surfaces and damp clean.

.4 Thoroughly wet surfaces for a period of not less than two (2) hours.

.5 Remove standing water prior to installation of mortar bed.

.6 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.3 Installation:

.1 Bonding Agent:

.1 After the concrete surface has been prepared and cleaned, mix and apply bonding agent in accordance with manufacturer's directions and application rates.

.2 Apply one coat of bonding agent:

.1 Brush scrub into surface.

.2 If scrub coat dries prior to application of mortar bed, re-coat bonding agent.

.2 Mortar Bed:

.3 Mix and apply mortar bed materials in accordance with manufacturer's directions and application rates.

.4 While bonding agent is still wet, spread thin layer of mortar bed materials onto the floor surface with a flat trowel.

.1 Work mortar bed materials into bonding agent with wood or magnesium float.

.5 Immediately follow with more mortar bed material to desired height.

.1 Compact and close surface.

.6 Provide slopes and contours as shown on Drawings.

.7 Allow mortar bed to cure for at least 48 hours per ½" thickness based at 21° C and 50% relative humidity, plus or minus 10% prior to application of waterproofing.

3.7 INSTALLATION: MORTAR BED – TANK WALLS

.1 Examination:

.1 Once existing tiles and mortar bed have been removed to expose the existing concrete substrate, surfaces will be reviewed by the Contract Administrator in the presence of and with the assistance of the Contractor for concrete repairs.

.2 Preparation:

.1 Shotblast and sandblast surface of concrete prior to installation of mortar bed.

.1 Surface preparation to ICRI CSP-7.

.2 Vacuum clean surfaces and damp clean.

.3 Thoroughly wet surfaces for a period of not less than two (2) hours.

.4 Remove standing water prior to installation of mortar bed.

.5 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.

.3 Application

.1 Mix and apply repair mortar material in accordance with manufacturer's directions and application rates.

.2 Apply scrub coat of repair mortar with pressure into prepared surface.

.3 Prior to scrub coat drying, quickly apply repair mortar by trowel or spray.

.4 Allow repair mortar to cure for at least 24 hours based at 23° C and 50% relative humidity prior to application of waterproofing.

3.8 WATERPROOFING INSTALLATION

.1 Preparation:

.1 Shotblast surface of concrete and repair areas prior to installation of mortar bed.

.1 Surface preparation to ICRI CSP-2.

.2 Vacuum clean surfaces and damp clean.

.3 Pre-treat cracks, floor-to-wall interfaces, inside corners and drains as shown on Drawings and in accordance with manufacturer directions.

.4 Maintain surface temperature of concrete slab at least 3°C above the dew point.

.2 Installation:

.1 Mix and apply waterproofing membrane material accordance with manufacturer's directions and application rates.

.2 Apply membrane into corners, coves, drains and penetrations.

.1 Immediately embed reinforcing fabric into membrane to 100% and remove excess membrane material.

.2 Immediately re-cover fabric with another coat of membrane.

.3 Ensure reinforcing fabric is installed at 90° angle in corners.

.4 Overlap reinforcing fabric minimum 2".

.3 Apply membrane material on areas to be waterproofed using 3/8" nap roller.

.4 Allow membrane to cure for minimum 24 hours.

.5 Apply second coat of membrane over entire application area.

3.9 CERAMIC TILE INSTALLATION

.1 Install in accordance with TTMAC and manufacturer's written instructions.

.2 Tile setting Mortar

.1 Mix and apply tile setting mortar in accordance with manufacturer's directions and application rates.

.2 Apply mortar with a notched trowel of sufficient depth ti achieve more than 95% mortar contact to both the tile and substrate.

.3 Backbutter tiles.

.4 With pressure, apply a coat using the trowel's flat side to key mortar into substrate.

.5 Apply additional mortar, combing in single direction with trowel's notched side.

.6 Spread only as much mortar as can be tiled before mortar skins over.

.7 Place tiles firmly into wet mortar.

.8 Remove excess mortar from joint so that at least 2/3 of the tile depth is available for grouting.

.3 Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

.4 Place thresholds, edge strips at exposed tile edges at locations indicated.

.5 Cut and fit tile tight to penetrations through tile. Form corners, bases neatly. Align floor, base and wall joints.

.6 Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

.7 Lippage: To TTMAC tolerances; 2 mm maximum.

.8 Sound tile after setting. Replace hollow sounding units.

.9 Grouting:

.1 Remove tile spacers, pegs, ropes and strings.

.2 Grout joints to be clean and free of standing water, dust, dirt, and foreign matter.

.3 Remove excess mortar from joints to maintain 2/3 of the depth of tile is available for grouting.

.4 Mix and apply grout in accordance with manufacturer's directions.

.5 Use hard-rubber floats with sharp edge to force grout into joints in continuous manner. Leave flush with tile edge.

.6 Compact grout in joints and maintain free of voids and gaps.

.1 Fill joints with maximum amount of grout.

.7 Remove excess grout from the face of tile.

.8 Clean tiles emmediatly following application of grout.

.9 Grout and clean in small areas.

.10 Grout joint width:

.1 In accordance with manufacturer's direction to suit tile size.

.2 All grout widths to be uniform throughout installation.

.11 Control joints:

.1 Spacing:

.1 Minimum: 4 875 mm (16'-0").

.2 Maximum: 6 100 mm (20'-0").

.2 Width: Minimum 6 mm.

.3 Show locations on tiling plans to be submitted.

.4 Keep control joints free of adhesive or grout.

.5 Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.

.6 Apply sealant to joints.

.12 Allow tile to set for a minimum of 48 hours prior to grouting.

.13 Grout tile joints.

.14 Tile installation not to impede operation of swing of doors. Check all thresholds prior to installation.

.15 Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.10 POOL TANK FILLING

.1 Fill pool tank in accordance with manufacturer's directions.

.2 Rate of tank filling and draining: not to exceed 75 cm per 24 hours.

.3 Water temperature: Difference in water temperature and tiled surface temperature not to exceed 10°C.

3.11 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services

.1 Co-ordinate with mortar bed, waterproofing and tile setting material Manufacturer's representative to inspect prepared conditions and installations as required to satisfy warranty requirements.

.2 Do not take instructions directly from the manufacturer’s representative unless approved by the Contract Administrator.

.2 Mortar Bed Bond Testing

.1 Conduct direct pull-out tensile tests in accordance with CSA A23.2, Procedure A to determine bond strength of mortar bed to:

.1 Pool deck floors: Minimum three locations.

.2 Tank floors: Minimum three locations per tank.

.3 Tank walls: Minimum three locations per tank.

.2 Schedule testing following minimum 72 hour cure of mortar bed, but prior to installation of waterproofing membrane.

.3 Infill core hole. Prepare surfaces and install mortar bed as specified.

.4 Submit test results in accordance with Section 01 33 00 – Submittal Procedures.

.3 Post waterproofing application flood test

.1 Following application of waterproofing membrane, conduct flood testing of membrane as follows:

.1 Erect scaffolding and platform in middle of tank.

.1 Provide protection of membrane at locations of scaffolding supports in contact with membrane.

.2 Elevation of scaffold platform to be 6” below pool water elevation.

.2 Place plastic 5 gallon pail on top of scaffold platform.

.3 Sequentially fill pool in accordance with waterproofing membrane manufacturer directions.

.4 Fill 5 gallon pail with water. Elevation of water in pail to match elevation of pool tank water level.

.5 Over next 72 hours:

.1 Observe pool and pail water levels.

.2 Observe leaks in tank walls and floor from underside of tank.

.6 Record difference in pool and pail water levels.

.2 Where no difference in pool to pail water levels observed and no leaks observed at underside of tank, membrane is acceptable.

.1 Empty pool water at rate in accordance with manufacturer’s directions and proceed with ceramic tiling.

.3 Where a difference in pool to pail water levels are observed or where leaks are observed at underside of tank:

.1 Empty pool water at rate in accordance with manufacturer’s directions.

.2 Visually review waterproofing application with Contract Administrator and manufacturer representative.

.3 Repair defects observed in waterproofing membrane in accordance with manufacturer’s directions.

.4 Apply another coat of waterproofing membrane.

.5 Re-test.

3.12 CLEANING

.1 Clean tile and grout surfaces.

END OF SECTION

Part 1 General

1.1 Section Includes

.1 Documents and certain applicable terminology.

.2 Associated requirements.

.3 Work expectations.

.4 Work by other parties.

.5 Words and terms.

.6 Examination

.7 Closeout submittals

.8 Operation and maintenance manual format.

.9 Contents each volume.

.10 Recording actual site conditions.

.11 Record documents.

.12 Warranties and bonds.

.13 Quality Assurance.

.14 Shop drawings and product data.

.15 Product quality, availability, storage, handling, protection, and transportation.

.16 Product changes and substitutions.

.17 Manufacturer's instructions.

.18 Quality of Work, coordination and fastenings.

.19 Accessibility of Equipment

.20 Coordination, work for other trades, electrical requirements, temporary use of equipment.

.21 Existing facilities.

1.2 Related Sections

.1 This section describes common work applicable to all Sections within project Divisions 22 and 23.

1.3 Complementary Documents

.1 Drawings, specifications, and schedules are complementary to each other and what is called for by one will be binding as if called for by all.

.2 The drawings for mechanical work are performance drawings. They are generally diagrammatic and are not to scale unless detailed otherwise. They establish scope, material and installation quality and are not detailed installation instructions showing every offset, fitting, valve or every difficulty encountered during execution of work and will not be used as an excuse for deficiencies or omissions. Where required installations are not shown on plans or are only shown diagrammatically, install in such a way as to conserve headroom and interfere as little as possible with free use or space through which they pass, while adequate space is allowed for service, maintenance, repair, or replacement for all equipment.

.3 Drawings indicate general location and route of new and existing mechanical systems. The review of exact location and routing of systems prior to bidding is the responsibility of

the Contractor. Install piping and duct systems not exactly shown in plan or indicated by note, by graphic, or diagrammatically in schematic or riser diagrams to provide an operational assembly or system.

.4 Install components to physically conserve headroom, to minimize furring spaces, to accommodate installed Work, or other obstructions.

.5 Install ceiling mounted or exposed mechanical components such as diffusers, sprinkler heads and grilles in accordance with reflected ceiling drawings or floor plans.

.6 Locate devices with primary regard for convenience of operation and usage.

.7 Examine all discipline drawings, specifications, and schedules and related Work to ensure that Work can be satisfactorily executed. Conflicts or additional Work beyond Work described, to be brought to the attention of the Contract Administrator.

.8 All specification sections of the Project Manual and Drawings are affected by requirements of Division 01 sections, Bidding Procedures, Supplemental Conditions and the General Conditions.

1.4 Description Of The Work

.1 Division of the Work among other contractors, subcontractors, suppliers or vendors is solely the Contractor's responsibility. Neither The City nor Contract Administrator assumes any responsibility to act as an arbiter to establish subcontract terms or disagreements between sectors or disciplines of the Work.

1.5 Contract Method

.1 Construct Work under the contract requirements.

.2 Contract Documents were prepared by the Contract Administrator for The City. Any use which a third party makes of the Contract Documents, or any reliance on or decisions to be made based on them, are the responsibility of such third parties. The Contract Administrator accepts no responsibility for any damages suffered by any third party as a result of decisions made or actions based on the Contract Documents.

1.6 Permits, Inspection And Testing

.1 File all necessary notices and approved layouts, obtain and pay for all Local Authority and Fire Underwriters Inspections, approvals and permits applicable to each Mechanical Section. Make changes required to secure Local Authorities approval, without extra cost. Where conflicting requirements occur, comply with most stringent regulation. Note that requirements shown or specified may exceed minimum standards set by Local Authorities.

.2 The Regulations of the A.S.M.E. Code and the Provincial Labour Department shall cover the design, manufacture, installation, welding and tests of piping and other equipment as specified hereafter.

.3 Obtain Registration Certificates for all pressure vessels, with suitable metal-framed glass covers installed where directed. Furnish all certificates required by Local Authorities before acceptance of building by The City.

.4 The The City may request the Mechanical Section to operate device or material installed for such time as Contract Administrator may require, as a thorough test, before final acceptance. Such tests shall not be construed as evidence of acceptance, and no claim for cost of such operation for test, or damage due to inadequacy or defect will be recognized.

.5 Note that site reviews by the Contract Administrator are for the purpose of determining in general if the work is proceeding in accordance with the Contract Documents, and to endeavour to guard The City against defects and deficiencies and not to superintend the execution of the work, which is the Mechanical Subcontractors' responsibility.

1.7 Words And Terms

.1 Conform to the following definitions and their defined meanings:

.1 Install: To remove from site storage, move or transport to intended location, install in position, connect to utilities, repair site caused damage, and make ready for use.

.2 Supply: To acquire or purchase, ship or transport to the site, unload, remove packaging to permit inspection for damage, re-package, replace damaged items, and safely store on-site.

.3 Provide: Wherever the term "provide" is used in relationship to equipment, piping and other materials specified for the work, it means "supply, install and connect". Wherever the terms “provide” is used in connection with services such as testing, balancing, start-up, preparation of drawings for any part of the work, it means procure, prepare, supervise, take responsibility for, and pay for these services.

.4 Typical: A representative characteristic that is standard for all installations whether individually noted or not throughout the documents. “Typical” applies to each individual or combined installation except where specifically noted or otherwise indicated that the application is non-typical.

.5 Exposed: Any work not concealed in wall, shaft, or ceiling cavities or spaces. Work behind doors, in closets or cupboards or under counters is considered exposed.

.6 New: Produced from new materials.

.7 Renewed: Produced or rejuvenated from an existing material to like-new condition to serve a new or existing service.

.8 Defective: A condition determined exclusively by the Contract Administrator.

1.8 Examination

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

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

.3 Examine all contract documents to ensure work can be performed without changes to the Work as shown on plans. No allowance will be made later for necessary changes, unless notification of interferences have been brought to Contract Administrator’s attention in writing, prior to bid closing.

.4 Verify that materials and equipment can be delivered to the place of the work and that sufficient space and access is available to permit installation as shown on the drawings.

.5 Verify the locations and inverts of service lines leaving and entering building to ensure their proper function prior to commencing work.

1.9 Closeout Submittals

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.2 Four (4) weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, three (3) final copies of operating and maintenance manuals in Canadian English.

.3 Copy will be returned with Contract Administrator's comments.

.4 Revise content of documents as required prior to final submittal.

.5 Two (2) weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, three (3) final copies of operating and maintenance manuals, revised as per Contract Administrator’s comments.

.6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.7 If requested, furnish evidence as to type, source and quality of products provided.

.8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.9 Pay costs of transportation.

1.10 Operation And Maintenance Manual Format

.1 Refer also to Section 01 78 00 for formats for manuals. Where there is a discrepancy with this section, follow the requirements of 01 78 00 – Closeout Submittals.

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

.3 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 8.5 x 11 inch (219 x 279 mm) with spine and face pockets.

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

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

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

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

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

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

1.11 Contents - Each Volume

.1 Refer also to Section 01 78 00 for formats for contents. Where there is a discrepancy with this section, follow the requirements of 01 78 00 – Closeout Submittals.

.2 Table of Contents: Provide:

.1 Title of project.

.2 Date of submission.

.3 Names, addresses, and telephone numbers of Contract Administrator and Contractor with name of responsible parties.

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

.3 For each product or system, list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

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

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

.6 Certificate of Acceptance: Relevant certificates issued by authorities having jurisdiction, including code compliance certificate, life safety systems performance certificate. pressure vessel acceptance.

.7 Training: Refer to Demonstration and Training in this Section.

1.12 Recording Actual Site Conditions

.1 Record information on a full-sized set of drawings, and within the Project Manual.

.2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.

.3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately recorded.

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

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

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

.3 Field changes of dimension and detail.

.4 Changes made by change orders.

.5 Details not on original Contract Drawings.

.6 References to related shop drawings and modifications.

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

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

.2 Changes made by Addenda and change orders.

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

1.13 Record Documents

.1 Prior to Substantial Performance of the Work, electronically transfer the marked-up information from the as-built documents, as follows:

.1 Drawings: Scan the full-sized field-verified as-built drawing set and save to PDF format. Scans shall be in colour and with good resolution to ensure drawings and markups are legible.

.2 Specifications: Adobe Acrobat (PDF).

.2 Mark revised documents as "RECORD DOCUMENTS". Include all revisions.

.3 Submit completed record documents to Contract Administrator on a CD, DVD, or by electronic transfer.

1.14 Warranties And Bonds

.1 Refer also to Section 01 78 00 for Warranties and Bonds.

.2 Provide written guarantee that complete installation including materials, work and operation of all equipment provide under Mechanical Sections are first class in every respect, subject only to improper usage by The City, and make good forthwith when reported all defects which develop within one year from date of acceptance of building by The City at no additional cost to the City.

.3 In addition, guarantee heating and cooling systems through one complete heating or cooling season, as applicable.

.4 Deliver to The City all equipment manufacturer's guarantees specified in excess of one year.

1.15 Fabrication And Workmanship

.1 Employ skilled mechanics in their respective trades, under competent supervision, and where required by Provincial or Local regulations holder of acceptable qualification certificates.

1.16 Quality Assurance

.1 Provide testing organization services as specified in subsequent Sections.

.2 Testing organization: Current member in good standing of their respective professional or industry organization and certified to perform specified services.

.3 Comply with applicable procedures and standards of the certification sponsoring association.

.4 Perform services under direction of supervisor qualified under certification requirements of sponsoring association.

.5 Qualifications:

.1 Provide adequate workforce training through meetings and demonstrations.

.2 Provide a designated experienced person on site with de-construction experience throughout the project for consultation and supervision purposes.

1.17 Shop Drawings - Administrative Requirements

.1 Shop drawings shall be submitted electronically in PDF format documents to shopdrawings@eppsiepman.com.

.2 Shop drawing documents shall be grouped by specification section. Clearly list the specification section on the front page or cover sheet of the submittal. Shop drawings related to multiple sections may not be grouped together into a single document. Documents that are groups incorrectly will be returned without being examined and shall be considered rejected.

.3 Each drawing shall include the name of project as found on the drawings or specifications, the equipment supplier and the specification section that the equipment is specified under.

.4 Submit to Contract Administrator submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 Work affected by submittal shall not proceed until review is complete.

.6 Present Shop Drawings, product data, samples and mock-ups in SI Metric and/or Imperial inch-pound units, to match the units used in the schedules.

.7 Review submittals prior to submission to Contract Administrator. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents.

.8 Submittals not stamped, signed, dated, identified as to specific project, and attesting to their being reviewed will be returned without being examined and shall be considered rejected.

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

.10 Verify field measurements and affected adjacent Work are coordinated.

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

.12 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator review.

.13 Keep one (1) reviewed copy of each submission on site.

1.18 Shop Drawings And Product Data

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

.2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications. Indicate layouts, quantity, details of equipment, control wiring diagrams, sizes, capacities and roughing in and exact requirements for concrete pits, bases and other supporting members.

.3 Each shop drawing must be certified by manufacturer and as such shall indicate that all product engineering has been performed to ensure the product will meet the requirements of the intended installation.

.4 Shop drawings for grilles, registers and diffusers shall be accompanied by an itemized list indicating the unit locations by room number and the unit size.

.5 Allow ten (10) calendar days for the Contract Administrator's review of each submission.

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

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

.8 Accompany submissions with transmittal letter, containing:

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

.9 Submissions shall include:

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

.7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationship to other parts of the Work.

.10 After Contract Administrator's review, distribute copies.

.11 Submit one (1) copy of Shop Drawings as a pdf document by email attachment for each requirement requested in specification Sections and as Contract Administrator may reasonably request. Any electronic copy of shop drawings shall bear all the required marks of certification and approval by the manufacturer and contractor(s) as indicated above. The Contract Administrator will review and mark up one copy of the shop drawing, and return to the contractor by email attachment. The contractor shall then make copies as required for ordering and documentation purposes. Multiple copies of shop drawings will not be returned.

.12 Submit one electronic copy of product data sheets or brochures for requirements requested in specification sections and as requested by Contract Administrator where Shop Drawings will not be prepared due to standardized manufacture of product. Submittals shall be submitted as a pdf document by email attachment, or delivered as a hard copy. Any electronic copy of shop drawings shall bear all the required marks of certification and approval by the manufacturer and contractor(s) as indicated above.

.13 Delete information not applicable to project.

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

.15 If upon review by Contract Administrator, no errors or omissions are discovered or if only minor corrections are made, one electronic copy will be returned and fabrication and installation of Work may proceed. If Shop Drawings are rejected, noted copy will be returned and re-submission of corrected Shop Drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed. The contractor shall then make copies as required for ordering and documentation purposes. Multiple copies of shop drawings will not be returned.

.16 Checking of shop drawings by the Contract Administrator does not constitute acceptance of responsibility. Such checking constitutes assistance only to the Mechanical Division in the proper execution of their work.

1.19 Product Quality

.1 Products, materials, equipment, parts or assemblies (referred to as Products) incorporated in Work: New, not damaged or defective, of best quality (compatible with specification requirements) for purpose intended. If requested, provide evidence as to type, source and quality of Products provided.

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

.3 Should any dispute arise as to quality or fitness of Products, decision rests strictly with Contract Administrator.

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

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

1.20 Availability

.1 Immediately upon signing Contract, review Product delivery requirements and anticipate foreseeable supply delays for any items.

.2 If delays in supply of Products are foreseeable, notify Contract Administrator of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

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

1.21 Storage And Protection

.1 Store and protect Products in accordance with manufacturers' written instructions.

.2 Store with seals and labels intact and legible.

.3 Store sensitive Products in weather tight, climate controlled, enclosures in an environment favourable to Product.

.4 For exterior storage of fabricated Products, place on sloped supports above ground.

.5 Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.

.6 Cover open ends of pipes to prevent entry of building rubbish.

.7 Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

.8 Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

.9 Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.22 Transportation And Handling

.1 Transport and handle Products in accordance with manufacturer's written instructions.

.2 Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.

.3 Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

.4 Protect all finished and unfinished work from soiling or damage, cover finished floors with tarpaulins or plywood as necessary, and repair any damage resulting from work of Mechanical Section.

.5 Protect finished surfaces to remain exposed, by paper, polyethylene or other satisfactory removable protective covering using paste acceptable to fixture manufacturer to prevent possible damage to finishes, until all reason for construction damage has passed and until acceptance by The City, and make good any such damage.

1.23 Special Cleaning

.1 Maintain tidiness within work of Mechanical Sections and at completion remove protective paper, labels, etc. and tools and waste materials. Leave clean and in perfect operating condition.

.2 Remove dirt, rubbish, grease, and dust for which this section is responsible from all exposed surfaces and fixtures.

.3 Thoroughly clean piping of dirt, cuttings and other foreign substances within the scope of work area. Disconnect, clean and reconnect whenever necessary for purpose of locating and removing obstructions. Repair work damaged in course of removing obstructions.

.4 Clean exposed surfaces of mechanical equipment, ductwork, piping, etc., and polish plated work.

.5 Remove tools, surplus, and waste material from the building site upon completion of work. Clean grease, dirt, and excess material from walls, floors, ceilings, surfaces, and fixtures for which this Contractor was responsible, and leave the premises suitable for immediate use.

.6 At the end of construction all systems shall be left ready for operation.

.7 This Section shall be responsible for repair work as may be necessary to remove dents and touch-up of factory finishes.

1.24 Product Changes & Substitutions

.1 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

1.25 Existing Utilities

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to the Work, building occupants, or pedestrian or vehicular traffic.

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

1.26 Manufacturer's Written Instructions

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

.2 Notify Contract Administrator in writing, of conflicts between specifications and manufacturer's instructions, so that Contract Administrator may establish course of action.

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

1.27 Quality Of Work

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

.2 Do not employ anyone unskilled in their required duties. Contract Administrator reserves right to require dismissal from site any workers deemed incompetent or careless.

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

.4 Assume full responsibility for layout of own work and for any damage caused to property of others through improper location or poor workmanship.

1.28 Accessibility Of Equipment

.1 The The City places a high priority on being able to safely and efficiently gain access to systems and equipment for replacement and repair. All equipment must be accessible, as defined as follows:

.1 Pipe and support racking or any other obstruction to accessibility shall be relocated at the contractor's expense by the contractor's forces.

1.29 Coordination

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

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

.3 Check levels shown before commencement to ensure adequate falls for sewers and pipes and report discrepancies immediately. Failure to so check and report does not relieve this section from responsibility for consequent extra expenditures.

.4 Where space is indicated as reserve for future equipment, leave clear and install piping and other work so that connections can be made to future equipment.

.5 Secure approval where necessary to cut holes in either finished or unfinished work, employ section whose work is involved, cut openings no larger than necessary and without damage to adjoining work and carefully repair all damage to match adjacent work. Note the Mechanical Division is responsible for all required cutting and patching relating to this Contract, except as specifically noted otherwise.

.6 Provide and set bolts, templates, sleeves and fixing materials for fixing work under this section securely to work provided under other sections, in advance of other work, where required.

.7 Locate all openings in walls, partitions, beams, etc. required for installation of ducts, pipes and equipment, etc. specified in this section of the specifications and frame all openings as required.

.8 Installation of all equipment shall allow sufficient space to facilitate ease of maintenance. Clearance space shall allow for the removal of all components of equipment without hindrance. Where clearance requirements are not shown on the mechanical plans, manufacturer clearances must be maintained at a minimum.

1.30 Work For Other Trades

.1 The Mechanical Contractor shall install rough-ins and/or connections for all equipment requiring mechanical services, as shown on drawings or mentioned elsewhere in the specifications.

.2 Supply other trades with all necessary details, rough-in drawings, wiring diagrams, etc. as required.

1.31 Concealment

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

.2 Before installation, inform Contract Administrator if there is interference. Install as directed by Contract Administrator.

1.32 Access Panels

.1 Provide in ample time for installation under relevant sections all necessary access panels in walls and ceilings to allow access to dampers, valves, etc., size 300 mm x 300 mm (12" x 12") min. or as required for proper maintenance with steel panel and frame, similar to Acudor, type to suit application. Instruct relevant section for proper location of access

panels. Final locations subject to Contract Administrator's approval. ULC approved access panels must be provided where access is through or into a fire partition or assembly. If access doors have been specified by architectural sections the architectural specification shall supersede this section.

1.33 Remedial Work

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

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

1.34 Alteration Work

.1 Where work is to be done in existing buildings, accurately survey, provide for avoidance of damage and interference to existing work and rectify any such damage due to work under Mechanical Sections. Accept existing work as it exists at time of tendering.

.2 Carefully dismantle existing mechanical equipment to be removed or relocated. Temporarily disconnect, remove, and reinstall existing equipment, piping, ductwork, conduit, light fixtures, and similar items, which interfere with the new installation after completion of new work or of existing installations to be demolished. Store equipment and materials on the premises as directed by The City.

.3 All usable salvaged equipment and materials shall remain the property of The City unless specifically noted otherwise. Such material shall be removed from the building and be safely and neatly stored on the site for removal by The City. The Contractor shall remove all rejected salvage from the site and legally dispose of it off site.

.4 Reuse existing equipment in new work after first repairing and reconditioning any defective items where noted. Safely cap and seal disconnected mechanical services within finished surfaces.

.5 The abandonment of existing equipment and material in place is not acceptable. All redundant services are to be removed back to active mains, which shall then be capped at existing point of connection.

.6 All mechanical equipment conflicting with new equipment being installed shall be moved or disconnected, without damage, by Contractor and shall remain property of The City. Remove ducts and piping not required in revised systems and interfering with new installation. This material shall become property of Contractor.

.7 Disconnect existing equipment indicated, intended to be reused, rough-in in new position, and after replacement connect fully, ready for use.

.8 Removal and relocation of mechanical equipment by relevant Mechanical Sections.

1.35 Location Of Fixtures

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

.2 Inform Contract Administrator of conflicting installation. Install as directed.

1.36 Fastenings

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

.2 Prevent electrolytic action between dissimilar metals and materials.

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

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

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

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

1.37 Fastenings - Equipment

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

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use Type 304 or 316 stainless steel for exterior areas.

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

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

1.38 Protection Of Work In Progress

.1 Prevent overloading of any part of the Project.

.2 Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated, without written approval of Contract Administrator.

END OF SECTION

Part 1 General

1.1 Section Includes

.1 Pipe, pipe fittings, valves, and connections for piping systems.

.1 Sanitary sewer.
.2 Domestic water.
.3 Storm water.

1.2 Related Sections

.1 Section 23 05 29 – Supports and Anchors.

.2 Section 22 05 00 - Common Work Results for Plumbing.

1.3 References

.1 ASTM E814 - Fire Tests of Through-Penetration Fire Stops.

.2 UL 1479 - Fire Tests of Through-Penetration Firestops.

.3 CAN/ULC-S102.2 - Standard method of test for surface burning characteristics of flooring, floor covering and miscellaneous materials and assemblies

.4 CAN/CSA-B1800 - Thermoplastic non-pressure piping

.5 NSF/ANSI 14 - Plastics Piping System Components and Related Materials

.6 MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

.7 MSS SP69 - Pipe Hangers and Supports - Selection and Application.

.8 MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

.9 ASTM F708 - Design and Installation of Rigid Pipe Hangers.

.10 ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

.11 ASTM A74 - Cast Iron Soil Pipe and Fittings.

.12 ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

.13 ASTM B32-04 - Solder Metal.

.14 CISPI 301 - Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.

.15 CISPI 310 - Joints with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

.16 ASTM D2665 - Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

.17 ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

.18 ASTM D2855-96 (2002) - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

.19 ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.20 ASTM D2241 - Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

.21 ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.22 ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

.23 AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 inch - 48 inch (350 mm - 1200mm).

.24 ASTM C1053 - Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications.

.1 CAN/CSA-B1800 - Thermoplastic non-pressure piping

.2 NSF/ANSI 14 - Plastics Piping System Components and Related Materials

.3 ASTM D4101 - Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials

.4 ASTM F1412. - Standard Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems

1.4 Submittals For Review

.1 Section 22 05 00 – Common Work Results for Plumbing.

.2 Product Data: Provide data on all valves larger than 50mm (2”), and all backflow prevention devices and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

1.5 Closeout Submittals

.1 Section 22 05 00 – Common Work Results for Plumbing.

.2 Record Documentation: Record actual locations of valves on record drawings.

1.6 Quality Assurance

.1 Perform Work to the standards of the Province and Municipality of Jurisdiction.

.2 Valves: Manufacturer's name and pressure rating marked on valve body.

.3 Welding Materials and Procedures: Conform to ASME SEC IX and applicable Provincial labour regulations.

.4 Welder's Certification: To Manitoba Department of Labour standards.

.5 Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.7 Regulatory Requirements

.1 Perform Work to the latest version of the Manitoba Plumbing Code and local Municipal requirements

.2 Perform natural gas and propane work to the latest version of the CSA B149.1 gas code, Manitoba Gas Notices and local Municipal requirements.

.3 Conform to applicable code for installation of backflow prevention devices.

.4 Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.8 Delivery, Storage, And Protection

.1 Refer to specification section Product Requirements: Transport, handle, store, and protect products.

.2 Accept valves on site in shipping containers with labelling in place. Inspect for damage.

.3 Provide temporary protective coating on cast iron and steel valves.

.4 Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

.5 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.9 Environmental Requirements

.1 Refer to specification section Environmental Protection: Environmental conditions affecting products on site.

.2 Do not install underground piping when bedding is wet or frozen.

Part 2 Products

2.1 SANITARY SEWER PIPING, BURIED WITHIN 1500 MM (5 FEET) OF BUILDING

.1 Cast-iron mechanical joint or pipe and fittings to CSA B70, Class 4000

- .1 Fittings: Cast iron.
- .2 Joints: ASTM C564 and CISPI Standard 310, neoprene gasket system and stainless steel clamp-and-shield assemblies.

.2 PVC Pipe: CAN/CSA B1800

- .1 Fittings: PVC.
- .2 Joints: ASTM D2855, solvent weld to ASTM D2564.

2.2 Sanitary Sewer Piping, Above Grade

.1 75mm (3”) and over - Cast Iron Pipe: CISPI 301, hubless, service weight. Class 4000

- .1 Fittings: Cast iron.
- .2 Joints: ASTM C564 and CISPI Standard 310, neoprene gasket system and stainless steel clamp-and-shield assemblies.

.2 Copper Tube: ASTM B306, DWV.

.1 Fittings: ASTM B306 with lead-free soldered cast brass drainage fittings to CSA B158.1 or wrought copper fittings to ANSI B16-29

.2 Joints: ASTM B32, lead-free solder, Grade 50B.

.3 PVC Pipe with FSR25: CAN/CSA B1800

.1 Fittings: PVC.

.2 Joints: ASTM D2855, solvent weld to ASTM D2564.

.4 PVC Pipe with FSR25/SDC50: CAN/CSA B1800

.1 Piping shall be tested and listed in accordance with CAN/ULC-S102.2 and clearly marked with the certification logo indicating a flame spread rating (FSR) not exceeding 25 and a smoke developed classification (SDC) not exceeding 50.

.2 Fittings: PVC.

.3 Joints: ASTM D2855, solvent weld to ASTM D2564.

.4 Manufacturer: IPEX System XFR or equal.

2.3 FIRE STOP SYSTEMS

.1 General Purpose Fire Stopping Sealant:

.1 Manufacturers:

.1 Dow Corning Silicone Elastomer Fire Stop Penetration Seal and/or Dow-Corning liquid silicone elastomer Fire Stop Foam of density, width and depth to maintain assembly fire resistive rating.

.2 Hilti.

.3 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Water based, non-slumping, premixed sealant with intumescent properties, rated for 3 hours per ASTM E814 and UL 1479.

.2 DWV Plastic Pipe Systems Fire Stopping Sealant:

.1 Manufacturers:

.1 Hilti FS-ONE Intumescent Firestop Sealant

.2 Substitutions will be considered in accordance with Bidding Procedures B7 - Substitutes.

.2 Silicone based, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours per ASTM E814 and UL 1479 with metal collars.

Part 3 Execution

3.1 Examination

.1 Verify existing conditions before starting work.

.2 Verify that excavations are to required grade, dry, and not over-excavated.

3.2 Preparation

.1 Ream pipe and tube ends. Remove burrs.

.2 Remove scale and dirt, on inside and outside, before assembly.

.3 Prepare piping connections to equipment with flanges or unions.

3.3 Installation

.1 Install to manufacturer's written instructions.

.2 Provide non-conducting dielectric connections wherever jointing dissimilar metals.

.3 Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

.4 Install piping to maintain headroom, conserve space, and not interfere with use of space.

.5 Group piping whenever practical at common elevations.

.6 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

.7 Provide clearance in hangers and from structure and other equipment and access to valves and fittings.

.8 Sleeve pipes passing through partitions, walls and floors. Set sleeves in concrete forms for all pipes passing through concrete walls, beams and slabs.

.9 Pipe sleeves to extend above floor line as follows:

.1 Unfinished areas – 25 mm (1 inches).

.2 Finished areas (copper sleeves) – 7 mm (1/4 inches).

.3 Mechanical rooms, kitchens and washrooms – 100 mm (4 inches).

.10 Caulk sleeves to provide watertight installation.

.11 Prior to installing sleeves in concrete beams, receive final jobsite approval by Structural Contract Administrator.

3.4 Pipe Pressure Testing

.1 Do not insulate pipe prior to pressure testing. Pressure test in sections if necessary before concealing or insulating pipe.

.2 Do not introduce water for testing where freezing conditions exist or where piping systems being tested are located above sensitive areas or equipment that may be damaged or contaminated by water leakage.

.3 Hydraulically test all pipe. Pneumatic testing not permitted without prior approval from the Contract Administrator and the Authority Having Jurisdiction.

.4 Should leaks develop in any part of the piping system, remove and replace defective sections, fittings and equipment. Pipe dope, caulking, tape, lead wool, dresser couplings, etc. shall not be used to correct deficiencies. The contractor shall be responsible for all cleanup related to leakage during flushing, testing, and chemical treatment of piping, including original building piping if included in the testing.

.5 Subject piping to a hydrostatic pressure of at least that 1-½ times the operating pressure of the system for a period of at least 12 hours. If leaks are detected, such leaks shall be repaired and the test started over. Record results and submit witnessed (by Contract Administrator or The City) reports to the Contract Administrator.

.6 Cast iron piping systems: water-test each portion of the system for 15 minutes at a head pressure of 10' of water. Test procedure shall be in accordance with CISPI and the manufacturer's recommendations. Compressed air shall not be used for testing.

.7 Register pressures at the highest system point.

.8 Provide at least 48 hours (during working days) notice to Contract Administrator or The City prior to testing to allow the tests to be witnessed.

3.5 APPLICATION

.1 Use grooved mechanical couplings and fasteners only in accessible locations.

.2 Install unions downstream of valves and at equipment or apparatus connections.

.3 Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

3.6 ERECTION TOLERANCES

.1 Establish invert elevations, slopes for drainage to one percent (1/8 inch per foot) minimum, except pipe sized 75 mm (3 inches) or less shall have a slope no less than two percent (1/4 inch per foot). Maintain gradients.

.2 Slope water piping minimum 0.25 percent and arrange to drain at low points.

END OF SECTION

Part 1 General

1.1 Section Includes

.1 Floor Drains

.2 Pool Skimmer Cover

1.2 Related Sections

.1 Section 22 10 00 - Plumbing Piping.

.2 Section 22 05 00 – Common Work Results for Plumbing.

1.3 REFERENCES

.1 ASME A112.21.1 - Floor Drains.

.2 ASTM D2855 - Standard Practice for the Two-Step Method of Joining PVC or CPVC Pipe and Piping Components with Tapered Sockets

.3 CSA B125.3 – Plumbing Fittings

1.4 SUBMITTALS FOR REVIEW

.1 Section 22 05 00 – Common Work Results for Plumbing.

.2 Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

.3 Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

1.5 Closeout Submittals

.1 Section 22 05 00 – Common Work Results for Plumbing.

.2 Operation Data: Indicate frequency of treatment required for interceptors.

.3 Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

.4 Record Documentation: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors, trap seal primers.

1.6 Quality Assurance

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

1.7 Regulatory Requirements

.1 Perform Work to the latest version of the Manitoba Plumbing Code and local Municipal requirements.

.2 All components installed in domestic water system to be lead free.

1.8 Delivery, Storage, And Protection

.1 Section 22 05 00 – Common Work Results for Plumbing.

.2 Accept specialties on site in original factory packaging. Inspect for damage.

Part 2 Products

2.1 Floor Drains

.1 Manufacturers:

- .1 Watts.
- .2 Zurn.
- .3 Mifab
- .4 Jay R. Smith

.2 Floor Drain

- .1 ANSI A112.21.1,
- .2 Epoxy coated cast iron two piece body with double drainage flange,
- .3 Weep holes,
- .4 ½" trap primer connection port,
- .5 Refer to floor drain schedule below,
- .6 Funnels shall be supplied in lieu of strainer as noted in schedule below,
- .7 Tile Floor
  - .1 Reversible clamping collar,
  - .2 Primary and secondary weep holes,
  - .3 Adjustable 5" (127mm) square strainer
- .8 Tile Channel
  - .1 Reversible clamping collar,
  - .2 Primary and secondary weep holes,
  - .3 Adjustable 5" (127mm) Angle strainer

Floor Drain Schedule

Tag	Body Material	Inlet Strainer	Vandal Proof	Sediment Bucket	Trap Seal Primer
FD-1	Epoxy coated Cast Iron	Square, Nickel Bronze	Yes	No	No
FD-2	Epoxy coated Cast Iron	Angle, Nickel Bronze,	Yes	No	No

Contractor shall provide the floor drain suitable for the finished floor unless otherwise noted on the drawing. Refer to architectural details and plans for membrane requirements. Floors with sheet membranes (vinyl floor, etc) shall have surface membrane clamp.

2.2 Pool Skimmer Cover

.1 Pool skimmer covers in accordance with direction from Oasis Leisure Centre.

Part 3 Execution

3.1 Installation

.1 Install to manufacturer instructions.

END OF SECTION