

Part 1 General

1.1 ADMINISTRATIVE

- .1 Submit to 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 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 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 Contract Administrator's review of submittals.
- .7 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by 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 Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.
- .6 Make changes in shop drawings as Contract Administrator may require, consistent with Contract Documents. When resubmitting, notify Contract Administrator in writing of revisions other than those requested.
- .7 After 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 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 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 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 Contract Administrator's business address.
- .3 Notify Contract Administrator in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing prior to proceeding with Work.
- .6 Make changes in samples which Contract Administrator may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UPS

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

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 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 Contract Administrator instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 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 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work.
- .2 Co-operate to provide reasonable facilities for such access.

1.3 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.

1.4 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by 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 Contract Administrator.

1.5 REPORTS

- .1 Submit copies of inspection and test reports to the City and Contract Administrator.
- .2 Provide copies to subcontractor of work being inspected or tested.

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

1.6 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 Contract Administrator and as specified in specific Section.
- .3 Prepare mock-ups for 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 unless otherwise noted in the specification section.

1.7 MILL TESTS

- .1 Submit mill test certificates as requested.

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 Bids, 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, 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 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Contract Administrator based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY

- .1 Immediately upon issuance of Purchase Order signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. 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.
- .2 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.

1.4 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 Contract Administrator.
- .9 Touch-up damaged factory finished surfaces to Contract Administrators 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 Contract Administrator in writing, of conflicts between specifications and manufacturer's instructions, so that 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 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 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, 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.

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 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 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 30 – Form and Pour with Repair Mortar.

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 O121-2008, Douglas Fir Plywood.
 - .3 CSA O151-09, Canadian Softwood Plywood.
 - .4 CSA O153-M1980(R2008), Poplar Plywood.
 - .5 CSA-O325-07, Construction Sheathing.
 - .6 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
 - .7 CSA-O86-09, Engineering Design in Wood.
 - .8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
 - .9 CAN/CSA-S269.3-M92(R2008), Concrete Formwork, National Standard of Canada

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: 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 Form ties: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 235.4 mm (1") diameter in concrete surface.
- .3 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene.
- .4 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 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .3 Align form joints and make watertight. Keep form joints to minimum.
- .4 Use 25.4 mm (1 inch) chamfer strips on external corners and/or 25.4 mm (1 inch) fillets at interior corners, joints, unless specified otherwise.
- .5 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .6 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.
- .7 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 Grouting repairs: Three (3) or the time it takes to reach 20 MPa, whichever is greater.
 - .3 Form and Pour repairs: Three (3) or the time it takes to reach 20 MPa, whichever is greater.
 - .4 Miscellaneous curbs, pads, etc.: One (1) day.
- .2 Provide necessary re-shoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .3 Space reshoring in each principal direction at not more than 2400 mm (8') apart.
- .4 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 92 12 – Top Surface Concrete Repairs with Rapid Setting Mortar.
- .2 Section 03 92 20 –Scaling Repairs.
- .3 Section 03 93 30 – Form and Pour with Repair Mortar.

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - .2 ASTM A775/A775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .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 W186-M1990(R2016, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .3 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 MEASUREMENT PROCEDURES

- .1 Measure reinforcing steel in kilograms of steel incorporated into Work, computed from theoretical unit mass specified in CSA-G30.18 for lengths and sizes of bars as indicated or authorized in writing by Contract Administrator.
 - .1 These unit prices will only cover supplemental reinforcing steel in concrete repair areas or as designated by the Contract Administrator. All other reinforcing steel costs must be included in the fixed price portions of the work to which they correspond.
- .2 Dowels will be measured individually and will include dowel drilling, cleaning, preparation, epoxy supply and placement, bar insertion and steel costs. 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.
- .3 No measurement will be made under this Section for reinforcing steel specifically shown and called for on drawings.

Part 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Contract Administrator.
- .2 Reinforcing steel: All reinforcing steel to be CAN/CSA-G30.18M grade 400R deformed bars.

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

.4 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.

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

2.2 FABRICATION

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

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

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

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

2.3 SOURCE QUALITY CONTROL

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

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

Part 3 Execution

3.1 FIELD BENDING

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

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

.3 Replace bars, which develop cracks or splits.

3.2 PLACING REINFORCEMENT

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

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

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

3.3 DOWELING PROCEDURES

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

.1 10M bars, 150 mm (6 inches).

.2 15M bars, 200 mm (8 inches).

.3 20M bars, 300 mm (12 inches).

.2 Use only approved adhesive to manufacturer's instructions. Acceptable product:

- .1 Hilti HIT HY-200 by Hilti Canada.
- .2 Sikadur AnchorFix 4^{CA} by Sika Canada Inc.
- .3 Clean hole thoroughly prior to application of adhesive. Use injection or caulking gun to ensure that the adhesive fills the bottom of the hole prior to embedment of bar.

3.4 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 The care that is exercised during the removal and preparation phases of concrete repairs can be the most important factor in determining the longevity of the repair, regardless of the material or technique used. This Section covers the removal of deteriorated concrete and surface preparation for the repair of deteriorated concrete resulting from reinforcing steel corrosion and is applicable to horizontal, vertical, and overhead repairs.

- .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 10 00 – Concrete Forming and Accessories.

- .2 Section 03 20 00 – Concrete Reinforcing.

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

- .4 Section 03 92 20 – Scaling Repairs.

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

- .6 Section 07 95 50 – Expansion Joint Waterproofing.

1.3 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 546-14, 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-4, Surface Repair Using Form-and-Pour Techniques.
 - .5 ACI RAP-6, Vertical and Overhead Spall Repair by Hand Application.

- .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.

1.4 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 Contract Administrator prior to commencement of work.
- .2 Refer to applicable Sections for measurement procedures for each type of 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 QUALITY ASSURANCE

- .1 Contractor Qualifications:
 - .1 Minimum of 5 years experience in the repair and restoration of concrete structures.
 - .2 Upon request 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.
 - .3 Site Superintendent to have a minimum of 5 years experience exhibiting successful performance in concrete restoration projects. Provide references upon request.
 - .4 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 0.1 sq.m. (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 Contract Administrator.
 - .4 Chisel-type blades are to be used for removal only. Do not use pointed chisels for removal.
- .2 Sandblast equipment shall consist of:
 - .1 Air compressor of sufficient capacity to drive the equipment and blast media selected.
 - .2 Blast media hopper (meters the media into the air stream passing through the hose and nozzle).
 - .3 Moisture and oil separators to insure clean, dry air supply.
 - .4 Blast nozzle and hose.
 - .5 Materials. The blast medium consistent with equipment, site conditions, and capable of obtaining specified surface profile.
- .3 High pressure waterblast: capable of maintaining a sustained pressure of not less than 4,000 psi.

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 Contractor 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 Contractor 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 Contractor 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 Contractor 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 repair 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 or as indicated otherwise on the project drawings.

3.3 CONCRETE DELAMINATION REMOVAL

- .1 Refer also to Figure 1 in this Section.
- .2 Remove all loose and or delaminated concrete above corroded reinforcing steel.
- .3 Do not operate hammers or mechanical chipping tools at an angle in excess of 45° measured from the surface of the slab.
- .4 Use chipping to extend concrete removal along reinforcing bars and ensure bars are completely free of corrosion and well bonded to the surrounding concrete. Notify Contract Administrator of increases in areas.
- .5 Where the bond between existing concrete and reinforcing steel or mesh has been destroyed (either by the concrete's deterioration or corrosion of the reinforcing steel) or if the chipping operation has caused more than 1/3 the periphery of a bar to be exposed for a distance of 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.
- .6 If non-corroded reinforcing steel is exposed, do not damage the bar's bond to the surrounding concrete. If bond between the bar and concrete is destroyed, exposing the bar will be required.

- .7 The perimeter of the areas marked as delaminated are to be saw cut to a depth of 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.
- .8 Ensure saw cut encompasses the boundaries of corrosion that have been established.
- .9 Ensure the entire area within the saw cut is removed to a depth consistent with the type of repair and repair material specified in other Sections.
- .10 Chip patch edges to provide a clean vertical edge along the patch perimeter to the required minimum depth.
- .11 Conduct soundings to determine if any further unsound or delaminated concrete is present, which must be removed.
- .12 After all delaminated, unsound, or loose material is removed, the Contractor shall request an inspection from the Contractor 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 Contractor 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-5 or better. Sample surfaces are available for inspection in the Contractor Administrator 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 Contractor Administrator.
- .5 Vacuum clean surface and/or 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 Contractor 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 Contractor 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 Contractor Administrator, provide supplemental reinforcing steel to Section 03 20 00.
- .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 4 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 Contractor Administrator. Provide minimum 24 hours notice prior to each phase of the work.
- .2 Contractor 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/or delamination are to be repaired by mechanical removal of the deteriorated concrete and infilling with a rapid-setting mortar.
- .2 All spalling and/or delaminated concrete must be removed down to sound concrete in accordance with Section 03 91 10.

1.2 RELATED SECTIONS

- .1 Section 03 10 00 – Concrete Forming and Accessories.
- .2 Section 03 20 00 – Concrete Reinforcing.
- .3 Section 03 91 10 – Surface Preparation of Concrete Delamination 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- S448.1-10, Repair of Reinforced Concrete in Buildings.
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM C309-07, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.]
 - .2 ASTM C928/C928M-09, Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs.
- .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 The 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 Contract Administrator prior to commencement of work. These measurements will form the basis of payment for the area.
- .2 Unit prices must include all supervision, labour and materials, and equipment.
- .3 The following unit prices have been requested which will be covered under this Section:

- .1 Top surface concrete repairs over structural slab and beam areas:
 - .1 Removal depths of up to 76 mm (3.0 inches) and at no point less than 51 mm (2.0 inches) in depth into the structural slab.
 - .2 A second unit price must also be submitted which will apply to removal depths of up to 152 mm (6.0 inch) depth and at no point less than 76 mm (3.0 inches) in depth.
- .4 Minimum payment for repair areas will be 0.05 sq.m. (½ sq.ft.).
- .5 The Contractor is to note that 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.

1.5 QUALITY ASSURANCE

- .1 Contractor Qualifications: to Section 03 91 10.
- .2 Field Mock-up:
 - .1 Install field mock-up at Project site or pre-selected area of building or location approved by Contract Administrator. Install material in accordance with this Section.
 - .2 Field mock-up will be standard for judging workmanship on remainder of Project.
 - .3 Manufacturer's representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Comply with Section 01 61 00.
- .2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.
- .4 Keep materials in manufacturer's original, unopened containers and packaging until installation.
- .5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.7 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.

2.2 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: MasterKure ER 50 (formerly Confilm) by BASF Building Systems at a minimum application rate of 4.9 m²/L.
- .3 Cure and sealing compound: to ASTM C309, Type 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.

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

3.2 INFILLING PROCEDURES

- .1 Obtain Contract Administrator's approval before placing repair material. Provide minimum 24 hours notice.
- .2 Maintain the substrate in a saturated surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.
- .3 Mixing of rapid-setting 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 Contract Administrator in accordance with CSA-A23.1 and Section 01 45 00 - Quality Control and as described herein.

- .2 Inspection or testing by 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 Contract Administrator for each individual use.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This section covers the removal and replacement of scaled surface areas the structural deck to provide a smooth surface for installation of the membrane.
- .2 The scaling will be removed with a bush hammer and subsequently infilled with thin patching compound. Topping shall be removed and replaced using the same material, extended with aggregate.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 546-04, Concrete Repair Guide.
- .2 Canadian Standards Association (CSA)
 - .1 CSA- S448.1-10, Repair of Reinforced Concrete in Buildings.
- .3 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 Scaling repairs covered under this Section will be completed under a unit price and measured for repair depths of up to 25.4 mm (1.0 inch). Unit prices must include all supervision, labour and materials, and equipment.
- .2 Minimum payment for repair areas will be 0.05 sq.m. (½ sq.ft.).
- .3 The repair areas will be identified by the Contract Administrator on-site by a chain drag sounding survey to 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 Contract Administrator prior to commencement of work. These measurements will form the basis of payment for the area.
- .4 The Contractor is to note that 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.

1.5 QUALITY ASSURANCE

- .1 Contractor Qualifications: to Section 03 91 10.

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

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Comply with Section 01 61 00.
- .2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.
- .4 Keep materials in manufacturer's original, unopened containers and packaging until installation.
- .5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.7 PROJECT CONDITIONS

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

Part 2 Products

2.1 MATERIALS

- 1. One-component high-performance, cementitious mortar that produces high-early strength and contains modified cement, aggregate, and additives meeting the following performance requirements:
 - 1. Properties
 - .1 Complies with ASTM C928.
 - .2 Compressive Strength, ASTM C109:
 - .1 3 Hour: minimum 6 MPa
 - .2 1 Day: minimum 30 MPa.
 - .3 7 Days: minimum 50 MPa.
 - .3 Set Time, ASTM C266, minimum 21°C:
 - .1 Initial: 75 minutes or less
 - .2 Final: 90 minutes or less.
 - .4 Flexural Strength, ASTM C348:
 - .1 1 Day: minimum 4 MPa.
 - .2 7 Days: minimum 6 MPa.

- .5 Modulus of Elasticity at 28 days, ASTM C469: 35 ± 5 GPa.
- .6 Splitting Tensile Strength, ASTM C496:
 - .1 1 Day: minimum 3.5 MPa.
 - .2 7 Days: minimum 7.5 MPa.
- .7 Slant Shear Bond Strength, ASTM C882 Modified:
 - .1 1 Day: minimum 12 MPa.
 - .2 7 Days: minimum 20 MPa.
- .8 Rapid chloride permeability, AASHTO-T277/ASTM C1202: less than 1,000 coulombs.
- .9 Scaling Resistance (weight loss, lb/ft²), ASTM C672:
 - .1 25 cycles: CaCl₂: 0.003, NaCl: 0.067
 - .2 50 cycles: CaCl₂: 0.005, NaCl: 0.084
- .10 Freeze-Thaw Resistance, ASTM C666, (Procedure A) 100% Relative Dynamic Modulus at 300 cycles: 98.5.
- 2. Acceptable product:
 - .1 MasterEmaco T 430 (formerly Emaco T-430) by BASF Building Systems.

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

Part 3 Execution

3.1 SCALING REMOVAL PROCEDURES

- .1 The Contract Administrator will mark out the perimeter of the scaled or debonded areas, which are to be removed as specified herein.
- .2 The Contractor must saw-cut the perimeter of the scaled repair area to 6.4 mm (¼") using wet cut methods. Removal of the scaled material shall be accomplished by the use of a short stroke electric chipping hammer with a sharp bush hammer bit to remove the surface scaling within the marked-out areas.
- .3 Minimum depth of removal will be 6.4 mm (¼"), and maximum depth will be 25.4mm (1") for scaling repairs.
- .4 Once the areas have been bush hammered, the Contractor must chain drag all areas to determine if any further unsound material is present, which must be removed.
- .5 Once the areas are determined by the Contractor to be sound, request a final inspection from the Contract Administrator. This inspection shall be done in the presence of the Contractor, who shall complete any further work at the time of the inspection.
- .6 Within 24 hours prior to infilling, sandblast and/or shotblast 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-5 or better. Sample surfaces are available for inspection in the Contract Administrator's office. These samples will be used as the standard of acceptance.

- .7 Vacuum clean surface and/or air blast with oil free compressed air to remove residue and spent media created by surface preparation.
- .8 Maintain substrate in a clean condition using polyethylene film until the overlay is ready to be placed.

3.2 INFILL PROCEDURE

- .1 Obtain Contract Administrator's approval before placing repair material. Provide minimum 24 hours notice.
- .2 Maintain the substrate in a saturated surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.
- .3 Mixing of rapid-setting mortar [horizontal mortar]:
 - .1 Mix materials in accordance with manufacturer's instructions.
 - .2 Ensure repair mortar is thoroughly mixed.
 - .3 Do not use free-fall mixers.
 - .4 Never mix partial bags.
- .4 Bonding Slurry Application:
 - .1 Apply the bonding slurry consisting of neat rapid-setting mortar to a saturated surface dry (SSD) substrate with no standing water and dry to the touch. A SSD substrate typically exhibits a colour change of dark grey to light grey. Remove standing water by vacuuming.
 - .2 Scrub plastic slurry into substrate with stiff bristled broom or brush to produce a uniform thickness of 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 re-temper. If the bond slurry dries prior to placement of the concrete, removal of the dried slurry will be required. The concrete substrate will then be cleaned and prepared in accordance with the requirements described in the previous sections.
- .5 Immediately place repair material, into the prepared patch area from one side to the other. Work the repair material firmly into the bottom and sides of the patch, and underneath reinforcing steel, to assure good bond.
- .6 Ensure that rate of placing is sufficient to complete proposed placing, finishing and curing operations within scheduled time. Limit batch sizes as required if placing procedures are slower than anticipated.
- .7 Continuously consolidate and finish to matching elevations, ensuring patch thickness and required elevations are maintained.
- .8 Ensure reinforcement, floor drains, inserts, etc. are not disturbed during concrete placement.

3.3 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 Contract Administrator in accordance with CSA-A23.1 and Section 01 45 00 - Quality Control and as described herein.
- .2 Testing agency to submit copies of concrete test reports directly to City and Contract Administrator.
- .3 Inspection or testing by 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 Contract Administrator for each individual use.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Slab soffit areas, beams, columns and walls exhibiting extensive spalling and/or delamination in which patching would be uneconomical are to be repaired by mechanical removal of the deteriorated concrete and replacement using the form and pour method.
- .2 All spalling and/or delaminated concrete must be removed down to sound concrete in accordance with Section 03 91 10.

1.2 RELATED SECTIONS

- .1 Section 03 20 00 – Concrete Reinforcing.
- .2 Section 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

1.3 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 546-14, 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. (50-mm) Cube Specimens).
- .3 Canadian Standards Association (CSA)
 - .1 CSA- S448.1-10, Repair of Reinforced Concrete in Buildings.
- .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).

1.4 MEASUREMENT PROCEDURES

- .1 The areas of repair 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 Contract Administrator prior to commencement of work.
- .2 Unit prices must include all supervision, labour and materials, and equipment.
- .3 The following unit prices have been requested which will be covered under this Section:
 - .1 Removal depths of up to 76 mm (3.0 inches) and at no point less than 51 mm (2 inches) in depth.
 - .2 A second unit price must also be submitted which will apply to removal depths of up to a 152 mm (6 inch) depth and at no point less than 76 mm (3 inches) in depth.
- .4 Minimum payment for repair areas will be 0.05 sq.m. (½ sq.ft.).

- .5 The Contractor is to note that 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.

1.5 QUALITY ASSURANCE

- .1 Contractor Qualifications: to Section 03 91 10.
- .2 Field Mock-up:
 - .1 Install field mock-up at Project site or pre-selected area of building or location approved by Contract Administrator. Install material in accordance with this Section.
 - .2 Field mock-up will be standard for judging workmanship on remainder of Project.
 - .3 Manufacturer's representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Comply with Section 01 61 00.
- .2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.
- .4 Keep materials in manufacturer's original, unopened containers and packaging until installation.
- .5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.7 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 be cement-based, one-component, self-consolidating with the following properties:
 - .1 Drying shrinkage to ASTM C157:
 - .1 less than 0.10% at 28 days.
 - .2 Compressive Strength, ASTM C109:
 - .1 1 day: minimum 10.0 MPa.

- .2 7 days: minimum 28.0 MPa.
- .3 28 days: minimum 35.0 MPa.
- .3 Freeze/Thaw Resistance, ASTM C666 at 300 cycles:
 - .1 minimum 98% relative dynamic modulus.
- .4 Coefficient of Thermal Expansion, ASTM C531:
 - .1 28 days: $10 \pm 1.0 \times 10^{-6}$ cm/cm per degree C.
- .2 Acceptable product is:
 - .1 MasterEmaco S 440 (formerly LA40 Repair Mortar) by BASF Building Systems.
 - .2 Sikacrete-08 SCC by Sika Canada.

2.2 ACCESSORIES

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

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 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 Contract Administrator. Do not remove or cause damage to existing reinforcing steel in order to install placement openings.
- .10 A minimum of 20 mm (3/4") 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 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.
- .2 Leave formwork in place until repair mortar reaches compressive strength of 20 MPa but not less than 3 days.

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 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 Contract Administrator in accordance with CSA-A23.1 and Section 01 45 00 - Quality Control and as described herein.
- .2 Testing agency to submit copies of concrete test reports directly to City and Contract Administrator.
- .3 Inspection or testing by 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 Contract Administrator for each individual use.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This section specifies and includes supplying all materials, labour, supervision, equipment, and ancillary requirements to complete the installation of a flexible, cold fluid-applied waterproofing membrane system. This specification shall be read in conjunction with the project drawings.

1.2 RELATED SECTIONS

- .1 Section 03 92 12 – Top Surface Concrete Repairs with Rapid Setting Mortar.
- .2 Section 03 92 20 – Scaling Repairs.
- .3 Section 07 92 10 – Concrete Joint Sealants.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C836-15 – Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
 - .2 ASTM C898-09 – Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane With Separate Wearing Course.
 - .3 ASTM D412-16 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
 - .4 ASTM D2240-15 – Standard Test Method for Rubber Property - Durometer Hardness.
 - .5 ASTM D4263-83(2012) – Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
 - .6 ASTM D5034-09(2013) – Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
- .2 Canadian Standards Association (CSA)
 - .1 CSA- S413-07, Parking Structures.
- .3 International Concrete Repair Institute (ICRI)
 - .1 ICRI concrete Repair Terminology (2010 Edition).
 - .2 ICRI Guideline No. 310.2–1997, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays (formerly No. 03732).

1.4 MEASUREMENT PROCEDURES

- .1 No measurement will be made under this section. The Contractor shall include in the appropriate fixed price component all labour, materials, supervision, and equipment as required to complete the work required under this Section and as shown on the Drawings.

1.5 SUBMITTALS

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

- .2 Upon request, manufacturer to submit independent laboratory certification attesting that the materials conforms to the latest edition of ASTM C957. Complete documentation, including a referenced method, the material specification limits, and typical test results to be included.

1.6 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 Contract Administrator. Install material in accordance with this Section.
 - .2 Provide mock-up of at least 4.6 sq.m. (50 sq.ft.) to include surface profile, sealant joint, crack, flashing, and juncture details and allow for evaluation of slip resistance and appearance.
 - .3 Field mock-up will be standard for judging workmanship on remainder of Project.
 - .4 Maintain field sample during construction for workmanship comparison.
 - .5 Manufacturer's representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.
 - .6 All costs associated with the installation of the field mock-up are to be included in the fixed price for membrane installation.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Comply with Section 01 61 00.
- .2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.
- .4 Keep materials in manufacturer's original, unopened containers and packaging until installation.
- .5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.8 PROJECT CONDITIONS

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

1.9 WARRANTY

- .1 The system manufacturer shall furnish a written single-source performance warranty that the membrane system will be free of defects related to workmanship or material deficiency for a five (5) year period from the date of Substantial Performance. The following problems shall be specifically covered under the warranty:
 - .1 cohesive or adhesive failure of the system;
 - .2 deficiencies resulting in crack-bridging failure of the system;
 - .3 leakage as a result of any installation or material deficiency.
- .2 The waterproofing contractor shall supply the owner with a written and signed document, guaranteeing that all work (supply and installation of membrane) completed shall remain as installed, free from any application defect and to be bonded, for a period of three (3) years from date of acceptance of the Work of this trade and so stated by the Contract Administrator.

Part 2 Products

2.1 MATERIALS

- .1 One-component, moisture-curing, bitumen-modified polyurethane, elastomeric, cold liquid applied waterproofing membrane complying with ASTM C836.
- .2 Performance Requirements: The following properties are based on product's standard system.
 - .1 Minimum Recovery: 90 percent.
 - .2 Swelling in Water (3 days at room temperature): None.
 - .3 Service Temperature Range:
 - .1 Minimum: Minus 40 degrees F (Minus 40 degrees C).
 - .2 Maximum: 120 degrees F (49 degrees C).
 - .4 Hardness, Shore OO to ASTM C836: 85.
 - .5 Tensile Strength to ASTM D412: 1.0 MPa (150 psi).
 - .6 Average Elongation to ASTM D412: 600 percent.
 - .7 100 Modulus to ASTM D412: 0.6 MPa (80 psi).
 - .8 Moisture-Vapor Permeability (dry perms) to ASTM E96: 0.1.
 - .9 Crack Bridging Test to ASTM C836: Passed 2 mm (1/16 inch).
 - .10 Extensibility After Heat Aging to ASTM C836: No cracking.
 - .11 Weight Loss (20 percent maximum) to ASTM C836: 16 percent.
- .3 Acceptable Product:
 - .1 MasterSeal HLM 5000 by BASF Building Systems.

2.2 ACCESSORIES

- .1 Protection Board: Multilayer fibre board bonded and laminated with water resistant adhesive.
 - .1 Thickness: 3 mm (120 mils).
 - .2 Weight (3 mm): minimum 20 N/m²
 - .3 Burst strength to ASTM D2529: minimum 1.2 MPa (175 psi).
 - .4 Puncture resistance to ASTM D781: minimum 5.0 N-m (45 in-lbs).
- .2 Polypropylene Drainage Board Composite:

- .1 Performance requirements:
 - .1 Core weight to ASTM D3776: minimum 3.0 g/m².
 - .2 Composite Properties:
 - .1 Horizontal Water-flow rate to ASTM D4716: minimum 330 L/min/m.
 - .2 Compressive strength to ASTM D1621: minimum 862 kN/m² (18,000 psf).
 - .3 Thickness: 10 mm
 - .3 Filter Fabric Properties:
 - .1 Grab tensile to ASTM D4632: minimum 1.6 N.
 - .2 Elogation to ASTM D4623: minimum 24%.
 - .3 Trapezoidal tear to ASTM D4623: minimum 0.5 N.
 - .4 Puncture strength to ASTM D4833: minimum 0.45 N.
 - .5 Mullen burst to ASTM D3786: minimum 3,300 kPa.
 - .6 Permittivity to ASTM D4491: minimum 1.30 sec⁻¹.
 - .7 Water flow rate (fabric) to ASTM D4491: minimum 4,000 L/min/m².
- .2 Acceptable Product:
 - .1 MasterSeal 976 (formerly DBS 9000) by BASF Building Systems.
- .3 Insulation Boards:
 - .1 Extruded polystyrene (XPS) to CAN/ULC-S701:
 - .1 Type: 4.
 - .2 Compressive strength: 35 psi.
 - .3 Water absorption: less than 0.7% (ASTM D2842).
 - .4 Thermal resistance: R-5.0 (ASTM C518) per inch
 - .5 Thickness: to match existing boards or as otherwise indicated on drawings.
 - .6 Size: largest available sheet sizes.
 - .7 Edges: shiplapped.
 - .8 Acceptable product:
 - .1 STYROFOAM Brand ROOFMATE Extruded Polystyrene Foam Insulation by Dow Chemical Canada ULC.
- .4 Sealants: refer to Section 07 92 10.

Part 3 Execution

3.1 PROTECTION

- .1 Protect adjacent surfaces against any damage that could result from the waterproofing installation.

3.2 EXAMINATION

- .1 Inspect existing caulked joints to ensure there is no deteriorated sealant, adhesion loss or non elastomeric sealants installed in joints. Remove and replace all deficient sealant in accordance with Section 07 92 10.
- .2 Inspect all deck penetrations, including electrical, lighting, signage, plumbing, HVAC, fire sprinkler piping for watertight seal. Remove and replace deficient sealant in accordance with Section 07 92 10 and as shown on the drawings.

3.3 SURFACE PREPARATION

- .1 Substrates must be sound and free of dust, dirt, laitance, paints, oils, grease, curing compounds, or any other contaminants.
- .2 Preparation of Concrete Surfaces:
 - .1 All new concrete surfaces to have minimum compressive strength of 21 MPa and be cured for minimum of 28 days or 80 percent of design strength.
 - .1 All surfaces must be clean and dry. Ensure relative humidity is below 75% at 40% of the slab depth.
 - .2 Concrete moisture content must be less than 3% at the time of application.
 - .3 Confirm moisture content by plastic sheet in accordance with ASTM D4263.
 - .2 There may be surface voids, pop outs, or rough areas of repair which must be prepared prior to membrane application. Limit surface irregularities to within 1.6 mm (1/16"). The concrete deck surface shall be made free of all ridges, surface voids, bugholes, and sharp projections.
 - .1 Smooth out localized ridges, voids, bug holes, popouts, and scaled areas (generally 1.6 mm (1/16") to 3.2mm (1/8"), which are otherwise sound, by applying a levelling material consisting of either an epoxy resin and silica sand mixture, or matrix of membrane material and aggregate when approved by the membrane manufacturer.
 - .1 Profile and prepared substrate by bush hammering, sandblasting, shot blasting, and/or grinding to obtain a smooth surface with a profile of ICRI-CSP-3 or greater.
 - .2 Apply a slurry coat with a flat squeegee to fill in the voids. The slurry coat would consist of resin mixed with 2-3 parts 20/40 or 16-30 mesh silica sand.
 - .3 Fill larger voids with a mortar consisting of resin with 4-5 parts silica sand. Where defects are shallow or sporadic apply resin neat, tight squeegee and broadcast to refusal
 - .4 While the resin is still wet, broadcast silica sand (16-30 mesh) to refusal, allow to cure then remove all loose sand. The repair area must have a sand finish, not smooth. If a smooth surface results, it must be sandblasted or shotblasted.
 - .5 The costs of localized repairs are to be carried in the fixed price for the membrane installation.
 - .3 Larger areas of scaling, top surface deterioration will be repaired by the mechanical removal of the deteriorated concrete and infilling with a proprietary repair mortar or concrete in accordance with the applicable Sections. The cost of these repairs will be paid for on a unit price basis.
 - .4 Shotblast all horizontal surfaces to remove existing coatings, laitance, and miscellaneous surface contamination, and to clean and texture the surface. The specified surface profile is ICRI-CSP-3.
 - .5 Sandblast all perimeters, vertical projections, and areas not accessible by shotblasting to remove existing coatings, laitance, and miscellaneous surface contamination, and to clean and texture the surface. The specified surface profile is ICRI-CSP-3.
 - .6 For concrete with macro-synthetic fibres, all protruding fibres must be removed prior to shotblasting. Acceptable removal method consists of "tiger-torching" the surface to burn-off fibres. Do not over expose concrete surface to the torch. Excess heating of the slab can result in permanent damage.
 - .7 Additional surface preparation may be required where contamination remains after the initial surface preparation and cleaning. Costs for additional cleaning, shotblasting and/or sandblasting are to be included in the Contractor's price.

- .8 Surfaces contaminated with oil, grease, car fluids or other materials, are to be vigorously scrubbed with a stiff bristle broom and a strong non-sudsing detergent acceptable to the manufacturer. Thoroughly wash, clean, and dry surface. Where oil or other contaminants penetrate deep into the concrete, removal by mechanical methods may be required and will be paid for on a unit price basis.
 - .9 After the concrete surface has been prepared to the required soundness and surface profile, complete final cleaning by vacuuming and/or air blasting with oil free compressed air to remove the residue created by the surface preparation method and to remove spent media.
 - .10 Cleaned surfaces are to be covered and protected against exposure to vehicles, dust, and debris.
 - .11 If the prepared surface becomes wet, or is contaminated, repeat surface preparation as described above.
 - .12 Install membrane to prepared and approved surfaces within 24 hours of completion of surface preparation.
- .3 Re-Coat of Existing Waterproofing Membrane: Where the existing membrane is designated to be re coated, the Contract Administrator will chain drag the membrane to identify areas of debonded membrane and/or delaminated concrete which will require removal and repair.
- .1 Remove all loose and debonded areas of membrane and complete concrete repairs at locations identified by the Contract Administrator in accordance with Section 03 92 12 and 03 92 20. Allow minimum 3 days cure.
 - .2 Pressure wash existing membrane at minimum 3,000 psi to remove road grime, dirt/dust and debris. The cleaning shall be of sufficient duration to remove all surface grime, dirt, debris, oil staining, etc.
 - .1 If oil spots, vehicle fluids or other surface stains remain following initial cleaning which may inhibit bond, apply citrus degreaser and pressure wash at minimum 3,000 psi. Repeat as necessary.
 - .3 Shotblast surface with medium-heavy blast use 390 shot. The purpose of the shotblast is to open of the surface of the membrane as well as to remove any loose aggregate within the wear course.
 - .4 Solvent wipe/mist surface just prior to coating application. Ensure all solvent has flashed off prior to application of new material. Use only manufacturer approved solvents.
- .4 Surface Preparation of Metals:
- .1 Sandblast or wire brush all incidental metal to bright metal. Prime surfaces according to manufacturer's recommendations.
 - .2 Vent, drain pipe, and post penetrations: Clean metal surfaces to bright metal and prime with manufacturer approved primer. Allow to dry. Reprime surfaces according to manufacturer's recommendations.
 - .3 Install appropriate sealant cant as shown on drawings. Refer to Section 07 92 10. Allow sealant to cure.

3.4 APPLICATION

- .1 The cold fluid-applied waterproofing membrane must be installed in strict accordance with the system manufacturer's recommendations, by a certified installer with proven experience with the specified systems. Where discrepancies exist between the manufacturer's specifications, project specifications and drawings, the more stringent will govern.
- .2 Unless otherwise indicated, all costs associated with detailing joints, surface defects, cracks and joints, terminations, and corners described above are to be included in the fixed price for membrane installation.

- .3 Concrete Surface Defects and Static Cracks and Joints:
 - .1 Clean and prepare surface in accordance with preceding section.
 - .2 Open up air void pockmarks and honeycombs to allow liquid waterproofing to fill cavities completely.
 - .3 Parge coat substrates with excessive pinholes, bug holes, or porosity which might cause blisters or pinholes in membrane. Use approved cementitious waterproofing only.
 - .4 Apply 1.5 mm (60 wet mils) prestripe of liquid membrane to nonmoving joints and cracks less than 3 mm (1/8 inch) wide. Fill and overlap joint or crack 75 mm (3 inches) on each side. Feather edges.
 - .5 Rout and clean cracks and joints over 3 mm (1/8") wide to minimum of 6 mm x 6 mm (1/4" x 1/4"). Install bond breaker tape to prevent adhesion to bottom of joint. Prime joint faces and seal with manufacturer approved sealant in accordance with Section 07 92 10. Allow sealant to cure.
 - .6 Apply coat of liquid household carnauba wax, teflon bond breaker tape, or approved equivalent over cured sealant to prevent waterproofing membrane from adhering to joint sealant. Allow wax to dry.
- .4 Inside Corners and Penetrations:
 - .1 Clean and prepare surface in accordance with preceding section.
 - .2 Sealant cants to be installed at all inside corner details.
 - .3 Prime surface and form sealant cant into corner at junction of all horizontal and vertical surfaces (e.g. wall sections, curbs, or columns). Unless otherwise noted on the drawings, install bond breaker tape in corner and apply 25 mm x 25 mm cant of sealant. Tool to 45 degree cant. Allow sealant to cure.
 - .4 For deck to wall joints, apply masking tape to vertical sections at appropriate height above sealant cant to provide clean termination as shown on the drawings.
- .5 Outside Corners:
 - .1 Round all outside corners to create a 10 mm fillet.
 - .2 Install high-build fluid-applied waterproofing complete with reinforcing fabric as flashing in all outside corners. Extend reinforcing fabric min 300 mm (12 inches) onto each face of outside corner.
- .6 Primer:
 - .1 Where required by manufacturer, apply manufacturer's specified primer to all areas receiving deck coating. Apply at to manufacturer's recommendations.
 - .2 Roll apply uniform coat to penetrate concrete surface, avoid puddling.
 - .3 Force primer into pores and voids to eliminate pinholes.
 - .4 Do not apply Primer over prestripping.
 - .5 Allow primer to dry tack free.
 - .6 Apply membrane base coat within manufacturer's specified timeframe.

3.5 INSTALLATION

- .1 Complete all preparatory work before installation begins.
- .2 Waterproofing work shall be performed on a continuous basis as surface and weather conditions allow.
- .3 Install waterproofing elements on clean and dry surfaces.
- .4 Do not install materials in conditions of rain, snow or fog.

- .5 Mark off areas of 11.6 m² (125 ft²) on horizontal applications.
- .6 High-Build Reinforced Installation:
 - .1 Apply one layer of cold applied liquid waterproofing at minimum 65 wet mils.
 - .2 Spread immediately to ensure workability. Repeat procedure until entire surface is covered.
 - .3 Verify applied thickness of 65 wet mils with wet thickness gauge as Work progresses.
 - .4 Allow first coat to cure overnight.
 - .5 Apply second layer of cold applied liquid waterproofing at minimum 65 wet mils.
 - .6 Spread immediately to ensure workability. Repeat procedure until entire surface is covered.
 - .7 Verify applied thickness of 65 wet mils with wet thickness gauge as Work progresses.
 - .8 **Total thickness of cured system is to be 100 dry mils.**
 - .9 Allow to cure 48 hours at 21° C and 50 percent relative humidity. Extend curing time at lower temperatures and relative humidity.
 - .10 Protect waterproofing membrane from traffic before placement of drainage composite.
 - .11 As called for on the drawings install tightly butted drainage composite, insulation or protection board as soon as possible.
- .7 Fastening bars shall be used at all terminations on vertical surfaces unless otherwise shown on the drawings.

3.6 FIELD QUALITY CONTROL

- .1 Calculate and submit for review by the Contract Administrator, theoretical wet mil thickness and coverage rates required for each phase of the installation. Make allowances for loss of material resulting from surface irregularities and detailing.
- .2 Confirmation of theoretical wet mil film thickness (Applicable to membrane base coat and wearing coat(s)):
 - .1 Wet mil thickness measurements will be taken at random locations throughout the application of all coats of the membrane.
 - .2 Apply additional material where the measure wet mil thickness is 5 mils less than the specified wet mil thickness.
- .3 Confirmation of dry mil film thickness (Applicable to membrane base coat only):
 - .1 Cut tests of the membrane base coat will be completed at locations selected by the Contract Administrator to confirm thicknesses.
 - .2 If a discrepancy exists between the theoretical wet mil thickness and the measured dry mil thickness, dry mil thickness readings will govern.
 - .3 A minimum of two (2) cut tests will be completed at the initial membrane application. Further cut test will be completed as required and deemed necessary by the Contract Administrator. The Contract Administrator will measure the thicknesses using a micrometre and the average thickness calculated. The base coat application will be considered acceptable if the average thickness is **not less than 50 dry mils**. The following remedial work will be required where membrane thickness is less than specified.
 - .1 Average thickness is less than 45 dry mils: place additional 5 wet mils of material to increase average thickness to greater than 50 dry mils. Contract

- Administrator will determine extent of the area requiring additional application.
- .2 Individual cut test reading is less than 40 dry mils: place additional 10 wet mils of material. Contract Administrator will determine extent of the area requiring additional application.
 - .4 Manufacturer's Field Service. Final inspection: Warranty request. Manufacturer's representative will inspect finished surface preparation, application, and finished coating and may require further preparation or application to achieve appropriate result. In no case will manufacturer's representative approve surface or finish if following conditions are found: pinholes, insufficient coating thickness, or any other conditions, that, in manufacturer's representative's opinion, may cause failure of installation.
 - .1 Acceptance of any stage of the work by the manufacturer's representative does not necessarily reflect the opinion of the Contract Administrator.
 - .2 Do not take instructions directly from the manufacturer's representative unless approved by the Contract Administrator.

3.7 CLEAN UP

- .1 Clean site of refuse of this work, including adjacent areas or fixtures. Use of manufacturers applied solvent will be required. Use caution as solvents are extremely flammable.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Work in this section consists of furnishing all labour, material, equipment, supervision, and incidentals as necessary to prepare the existing substrate and install a complete traffic-bearing waterproofing membrane system. Existing surface preparation is also included in this section.

1.2 RELATED SECTIONS

- .1 Section 03 92 12 – Top Surface Concrete Repairs with Rapid Setting Mortar.
- .2 Section 03 92 20 – Scaling Repairs.
- .3 Section 07 92 10 – Concrete Joint Sealants.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C957/C957M-15, Standard Specification for High-Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane With Integral Wearing Surface.
 - .2 ASTM C1127-01(2009), Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface.
 - .3 ASTM D4263-83(2012), Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
- .2 Canadian Standards Association (CSA)
 - .1 CSA- S413-07, Parking Structures.
- .3 International Concrete Repair Institute (ICRI)
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1.4 MEASUREMENT PROCEDURES

- .1 No measurement will be made under this section. The Contractor shall include in the appropriate fixed price component all labour, materials, supervision, and equipment as required to complete the work required under this Section and as shown on the Drawings.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Upon request, manufacturer to submit independent laboratory certification attesting that the materials conforms to the latest edition of ASTM C957. Complete documentation, including a referenced method, the material specification limits, and typical test results to be included.
- .3 Prior to each phase of membrane installation, calculate and submit to Contract Administrator for review, theoretical wet mil thickness and coverage rates for base and top coat(s). Make allowances for loss of material resulting from surface irregularities and detailing. The submittal must include the following information:

- .1 Location of work, including Level and Grid references.
- .2 Total area of Phase.
- .3 Specified application rate in mils for each layer.
- .4 Theoretical application rate in sq.ft./gallon for each layer.
- .5 Theoretical application rate in wet mils for each layer.
- .6 Total material required in gallons for each layer.
- .7 Aggregate loading in lbs./100 sq.ft. for each layer.

1.6 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 Contract Administrator. Install material in accordance with this Section.
 - .2 Provide mock-up of at least 4.6 sq.m. (50 sq.ft.) to include surface profile, sealant joint, crack, flashing, and juncture details and allow for evaluation of slip resistance and appearance.
 - .3 Field mock-up will be standard for judging workmanship on remainder of Project.
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- .1 Comply with Section 01 61 00.
- .2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.
- .4 Keep materials in manufacturer's original, unopened containers and packaging until installation.
- .5 Protect materials during storage, handling, and application to prevent contamination or damage.

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- .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.

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- .1 The system manufacturer shall furnish a written single-source performance warranty that the membrane system will be free of defects related to workmanship or material deficiency for a ten (5) year period from the date of Substantial Performance. The following problems shall be specifically covered under the warranty:
 - .1 cohesive or adhesive failure of the system;
 - .2 deficiencies resulting in crack-bridging failure of the system;
 - .3 leakage as a result of any installation or material deficiency.
- .2 The waterproofing contractor shall supply the owner with a written and signed document, guaranteeing that all work (supply and installation of membrane) completed shall remain as installed, free from any application defect and to be bonded, for a period of three (3) years from date of acceptance of the Work of this trade and so stated by the Contract Administrator.

Part 2 Products

2.1 MANUFACTURERS

- .1 The waterproofing membrane shall be of the same manufacturer throughout the work of this section.
- .2 Alternates to acceptable manufacturer will be considered only on basis of written requests by the Contractor at the time of tender. Include substantiation of product performance and confirmation that it meets or exceeds the performance criteria specified herein.
 - .1 Alternates will be subject to approval based on performance requirements. A site mockup will also be required to confirm suitability.

2.2 MATERIALS

- .1 The waterproofing membrane shall be complete system of compatible materials including primer coat, base coat, top coats, flashings, aggregates and miscellaneous materials as required by the system manufacturer and meet the following performance requirements.
 - .1 Compliance:
 - .1 ASTM C957/C957M.
 - .2 Weight loss of base coat: to ASTM C1250
 - .1 Maximum 1%.
 - .3 Low Temperature Flexibility and Crack Bridging to ASTM C1305 (modified):
 - .1 no cracking in base coat.
 - .4 Adhesion-in-Peel after Water-Immersion (Base Coat) to ASTM C794 (modified):
 - .1 Concrete: minimum 22.2 N (5 lbf).
 - .5 Chemical resistance to ASTM D471 (modified), average tensile retention:
 - .1 Water exposure: minimum 70%.
 - .2 Ethylene glycol exposure: minimum 70%.
 - .3 Mineral spirits exposure: minimum 45%.
 - .6 Weather Resistance and recovery from elongation:
 - .1 Recovery from elongation: minimum 90%

- .2 Average tensile retention: minimum 80%
- .3 Elongation retention: minimum 90%
- .7 Abrasion resistance: to ASTM C501(modified):
 - .1 Maximum 50 mg.
- .8 Stability: to ASTM C957
 - .1 Minimum 6 months.

2.3 ACCEPTABLE SYSTEMS

- .1 MasterSeal Traffic 2500 (formerly Conipur II System) by BASF Building Systems.
 - .1 Primer: MasterSeal P 255 (formerly Conipur 78) Primer, as per manufacturer's recommendations.
 - .2 Base Coat: MasterSeal M 265 (formerly Conipur 265-Z).
 - .3 Wearing Courses:
 - .1 Intermediate: MasterSeal TC 275 (formerly Conipur 275).
 - .2 Top Coat (no UV exposure): MasterSeal TC 275 (formerly Conipur 275).
 - .3 Top Coat (UV exposure): Master Seal TC 295 (formerly Conipur 295 UV).
- .2 Duodeck by Sika Canada Inc.
 - .1 Primer: as per manufacturer's recommendations.
 - .2 Base Coat: Duochem 390.
 - .3 Wearing Courses:
 - .1 Intermediate: Duochem 391.
 - .2 Top Coat (no UV exposure): Duochem 391.
 - .3 Top Coat (UV exposure): Duochem 394.
- .3 Qualideck by Advanced Polymer Technology
 - .1 Primer: Q102 or Q152, as per manufacturer's recommendations.
 - .2 Base Coat: Q252.
 - .3 Wearing Courses:
 - .1 Intermediate: Q372.
 - .2 Top Coat (no UV exposure): Q372.
 - .3 Top Coat (UV exposure): Q372 SPF.
- .4 Autogard FC by Neogard.
 - .1 Primer: as per manufacturer's recommendations.
 - .2 Base Coat: FC7500/FC7960.
 - .3 Wearing Courses:
 - .1 Intermediate: FC7510/FC7961.
 - .2 Top Coat (no UV exposure): FC7510/FC7961.
 - .3 Top Coat (UV exposure): FC7540/FC7964.

2.4 APPLICATION RATES

- .1 Stairs and Bleachers:
 - .1 Primer: as per manufacturer's specifications.
 - .2 Base Coat: 28 ± 2 wet mils to achieve minimum **25 dry mils**.
 - .3 Top Coat: 20 wet mils with 0.75 silica sand at 10-20 lbs./100 ft² back-rolled to encapsulate aggregate.

2.5 ACCESSORIES

- .1 Sealants: to Section 07 92 10.

Part 3 Execution

3.1 PROTECTION

- .1 Protect adjacent surfaces against any damage that could result from the waterproofing installation.

3.2 EXAMINATION

- .1 Inspect existing caulked joints to ensure there is no deteriorated sealant, adhesion loss or non elastomeric sealants installed in joints. Remove and replace all deficient sealant in accordance with Section 07 92 10.
- .2 Inspect all deck penetrations, including electrical, lighting, signage, plumbing, HVAC, fire sprinkler piping for watertight seal. Remove and replace deficient sealant in accordance with Section 07 92 10 and as shown on the drawings.

3.3 SURFACE PREPARATION

- .1 Substrates must be sound and free of dust, dirt, laitance, paints, oils, grease, curing compounds, or any other contaminants.
- .2 Preparation of Concrete Surfaces:
 - .1 All new concrete surfaces to have minimum compressive strength of 21 MPa and be cured for minimum of 28 days or 80 percent of design strength.
 - .1 All surfaces must be clean and dry. Ensure relative humidity is below 75% at 40% of the slab depth.
 - .2 There may be surface voids, pop outs, or rough areas of repair which must be prepared prior to membrane application. Limit surface irregularities to within 1.6 mm (1/16"). The concrete deck surface shall be made free of all ridges, surface voids, bugholes, and sharp projections.
 - .1 Smooth out localized ridges, voids, bug holes, popouts, and scaled areas (generally 1.6 mm (1/16") to 3.2mm (1/8"), which are otherwise sound, by applying a levelling material consisting of either an epoxy resin and silica sand mixture, or matrix of membrane material and aggregate when approved by the membrane manufacturer.
 - .1 Profile and prepared substrate by bush hammering, sandblasting, shot blasting, and/or grinding to obtain a smooth surface with a profile of ICRI-CSP-3 or greater.
 - .2 Apply a slurry coat with a flat squeegee to fill in the voids. The slurry coat would consist of resin mixed with 2-3 parts 20/40 or 16-30 mesh silica sand.
 - .3 Fill larger voids with a mortar consisting of resin with 4-5 parts silica sand. Where defects are shallow or sporadic apply resin neat, tight squeegee and broadcast to refusal
 - .4 While the resin is still wet, broadcast silica sand (16-30 mesh) to refusal, allow to cure then remove all loose sand. The repair area must have a sand finish, not smooth. If a smooth surface results, it must be sandblasted or shotblasted.

- .5 The costs of localized repairs are to be carried in the fixed price for the membrane installation.
- .3 Larger areas of scaling, top surface deterioration will be repaired by the mechanical removal of the deteriorated concrete and infilling with a proprietary repair mortar or concrete in accordance with the applicable Sections. The cost of these repairs will be paid for on a unit price basis.
- .4 Shotblast all horizontal surfaces to remove existing coatings, laitance, and miscellaneous surface contamination, and to clean and texture the surface. The specified surface profile is ICRI-CSP-3.
- .5 Sandblast all perimeters, vertical projections, and areas not accessible by shotblasting to remove existing coatings, laitance, and miscellaneous surface contamination, and to clean and texture the surface. The specified surface profile is ICRI-CSP-3.
- .6 For concrete with macro-synthetic fibres, all protruding fibres must be removed prior to shotblasting. Acceptable removal method consists of "tiger-torching" the surface to burn-off fibres. Do not over expose concrete surface to the torch. Excess heating of the slab can result in permanent damage.
- .7 Additional surface preparation may be required where contamination remains after the initial surface preparation and cleaning. Costs for additional cleaning, shotblasting and/or sandblasting are to be included in the Contractor's price.
- .8 Surfaces contaminated with oil, grease, car fluids or other materials, are to be vigorously scrubbed with a stiff bristle broom and a strong non-sudsing detergent acceptable to the manufacturer. Thoroughly wash, clean, and dry surface. Where oil or other contaminants penetrate deep into the concrete, removal by mechanical methods may be required and will be paid for on a unit price basis.
- .9 After the concrete surface has been prepared to the required soundness and surface profile, complete final cleaning by vacuuming and/or air blasting with oil free compressed air to remove the residue created by the surface preparation method and to remove spent media.
- .10 Cleaned surfaces are to be covered and protected against exposure to vehicles, dust, and debris.
- .11 If the prepared surface becomes wet, or is contaminated, repeat surface preparation as described above.
- .12 Install membrane to prepared and approved surfaces within 24 hours of completion of surface preparation.
- .3 Surface Preparation of Metals:
 - .1 Sandblast or wire brush all incidental metal to bright metal. Prime surfaces according to manufacturer's recommendations.
 - .2 Vent, drain pipe, and post penetrations: Clean metal surfaces to bright metal and prime with manufacturer approved primer. Allow to dry. Reprime surfaces according to manufacturer's recommendations.
 - .3 Install appropriate sealant cant as shown on drawings. Refer to Section 07 92 10. Allow sealant to cure.

3.4 APPLICATION

- .1 The elastomeric coating shall be applied in strict accordance with the system manufacturer's recommendations, by a certified installer with proven experience with the specified systems. Where discrepancies exist between the manufacturer's specifications, project specifications and drawings, the more stringent will govern.
- .2 Unless otherwise indicated, all costs associated with detailing joints, surface defects, cracks and joints, terminations, and corners described above are to be included in the fixed price for membrane installation.

- .3 Cracks and Joints:
 - .1 Rout and clean cracks and joints over 3 mm (1/8") wide to minimum of 6 mm x 6 mm (1/4" x 1/4") deep as directed by the Contract Administrator. Joint sizes will be determined on-site.
 - .1 Install bond breaker tape, prime joint faces and seal with manufacturer approved sealant in accordance with Section 07 92 10. Allow sealant to cure. Costs associated with the routing and caulking of joints and random cracks will be paid for on a unit price basis.
 - .2 Pre-stripe all joints and cracks (sealed or not) with 25 wet mils of base coat. Note: Increase application rate if required by manufacturer's specifications. Fill and overlap joint or crack 3 inches on each side. Costs associated with the pre-stripping of random cracks, and caulked joints are to be included in the fixed price for membrane application.
- .4 Inside Corners and Penetrations:
 - .1 Sealant cants to be installed at all inside corner details.
 - .2 Prime surface and form sealant cant into corner at junction of all horizontal and vertical surfaces (e.g. wall sections, curbs, or columns). Unless otherwise noted on the drawings, install bond breaker tape or 6 mm (1/4") diameter foam rod in corner and apply 1" x 1" (25 mm x 25 mm) cant of sealant. Tool to 45 degree cant. Allow sealant to cure.
 - .3 Prime and apply 25 wet mils of base coat over sealant cant and minimum 4 inches (100 mm) up vertical surface and onto deck surface.
 - .4 At locations of potential high movement, install reinforcing fabric and/or membrane flashing sheet in accordance with manufacturer's recommendations.
 - .5 Costs associated with preparing and detailing corners and penetrations are to be included in the fixed price for membrane installation.
 - .6 Use slope grade base coat for sloped areas and vertical surfaces.
- .5 Vertical Terminations:
 - .1 Waterproofing membrane to extend minimum 100 mm (4) inches up all vertical surfaces.
 - .2 Apply masking tape at appropriate height to provide clean and straight termination.
 - .3 Costs to be included in the fixed price for membrane installation.
- .6 Outside Corners:
 - .1 Round all outside corners to create a 3/8" (10 mm) fillet.
 - .2 Prime and apply 25 wet mils of base coat minimum 4 inches (100 mm) up vertical surface and onto deck surface.
 - .3 Costs associated with preparing and detailing outside corners to be included in the fixed price for membrane installation.
- .7 Horizontal Terminations:
 - .1 Rout a 3/8" (9.5 mm) wide by 1/4" (6 mm) deep reglet into concrete deck where coating system will be terminated.
 - .2 Prime surface and fill reglet with sealant in accordance with Section 07 92 10. Bond breaker tape will not be required in this instance.
 - .3 Costs associated with completing horizontal terminations shown on the Drawings are to be included in the fixed price for membrane installation.
- .8 Primer: where required by manufacturer, apply manufacturer's specified primer to all areas receiving deck coating. Apply at to manufacturer's recommendations.
 - .1 Roll apply uniform coat to penetrate concrete surface, avoid puddling.

- .2 Force primer into pores and voids to eliminate pinholes.
- .3 Do not apply Primer over prestripping.
- .4 Allow primer to dry tack free.
- .5 Apply membrane base coat within manufacturer's specified timeframe.
- .9 Base Coat:
 - .1 All preparatory work must be completed and cured before application of membrane basecoat begins.
 - .2 Apply base coat with properly sized squeegee to arrive at required wet mil thickness. Back roll to level base coat.
 - .3 Apply base coat to achieve a dry film thickness of 25 mils to entire deck surface, over coating prepared cracks, joints, and integral flashings. Verify mil thickness of all coats by use of wet mil thickness gauge.
 - .4 Use slope grade material for sloped areas and vertical surfaces.
 - .5 Allow base coat to cure before proceeding with top coat(s).
- .10 Intermediate Coat:
 - .1 Ensure base coat is free of dust which may inhibit bond. If dust is present, clean surface according to manufacturer's recommendations.
 - .2 Apply intermediate coat with properly sized squeegee to arrive at required wet mil thickness. Back roll to level coat. Verify mil thickness of all coats by use of wet mil thickness gauge.
 - .3 Broadcast aggregated at specified rate to produce an even, consistent finish. Work in small sections to ensure aggregate is applied before the membrane begins to skin over.
 - .4 Upon adequate cure, remove excess aggregate by sweeping or vacuuming.
 - .5 Allow base coat to cure before proceeding with top coat(s).
- .11 Top Coat:
 - .1 Ensure previous coat is free of dust which may inhibit bond. If dust is present, clean surface according to manufacturer's recommendations.
 - .2 Apply top coat with properly sized squeegee to arrive at required wet mil thickness. Back roll to level coat. Verify mil thickness of all coats by use of wet mil thickness gauge.
 - .3 Broadcast aggregated at specified rate to produce an even, consistent finish and to match the approved field mock-up. Work in small sections to ensure aggregate is applied before the membrane begins to skin over.
 - .4 Back roll aggregate into top coat immediately with short nap roller lightly wetted initially with top coat. Apply sufficient pressure to encapsulate aggregate and distribute evenly.
 - .5 Allow top coat to cure before completely before opening to traffic.
- .12 Plan membrane installation carefully to avoid unnecessary walking in freshly applied material.

3.5 FIELD QUALITY CONTROL

- .1 Confirmation of theoretical wet mil film thickness (Applicable to membrane base coat and wearing coat(s)):
 - .1 Wet mil thickness measurements will be taken at random locations throughout the application of all coats of the membrane.
 - .2 Apply additional material where the measure wet mil thickness is 5 mils less than the specified wet mil thickness.

- .2 Confirmation of dry mil film thickness (Applicable to membrane base coat only):
 - .1 Cut tests of the membrane base coat will be completed at locations selected by the Contract Administrator to confirm thicknesses.
 - .2 If a discrepancy exists between the theoretical wet mil thickness and the measured dry mil thickness, dry mil thickness readings will govern.
 - .3 A minimum of two (2) cut tests will be completed at the initial coating application. Further cut test will be completed as required and deemed necessary by the Contract Administrator. The Contract Administrator will measure the thicknesses using a micrometre and the average thickness calculated. The base coat application will be considered acceptable if the average thickness is **not less than 25 dry mils**. The following remedial work will be required where membrane thickness is less than specified.
 - .1 Average thickness is less than 25 dry mils: place additional 8 wet mils of material to increase average thickness to greater than 25 dry mils. Contract Administrator will determine extent of the area requiring additional application.
 - .2 Individual cut test reading is less than 18 dry mils: place additional 8 wet mils of material. Contract Administrator will determine extent of the area requiring additional application.
- .3 Manufacturer's Field Service. Final inspection: Warranty request. Manufacturer's representative will inspect finished surface preparation, application, and finished coating and may require further preparation or application to achieve appropriate result. In no case will manufacturer's representative approve surface or finish if following conditions are found: pinholes, insufficient coating thickness, or any other conditions, that, in manufacturer's representative's opinion, may cause failure of installation.
 - .1 Acceptance of any stage of the work by the manufacturer's representative does not necessarily reflect the opinion of the Contract Administrator.
 - .2 Do not take instructions directly from the manufacturer's representative unless approved by the Contract Administrator.

3.6 CLEAN UP

- .1 Clean site of refuse of this work, including adjacent areas or fixtures. Use of manufacturers applied solvent will be required. Use caution as solvents are extremely flammable.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Section includes the fabrication, supply and installation of sheet metal flashing in profiles shown on drawings.

1.2 RELATED SECTIONS

- .1 Section 07 95 50 – Expansion Joint Waterproofing.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM D523-14, Standard Test Method for Specular Gloss.
 - .3 ASTM D1005-95(2013), Standard Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers.
 - .4 ASTM D2414-13a Standard Test Method for Carbon Black-Oil Absorption Number (OAN).
 - .5 ASTM D2244-14 Standard Practice for Calculation of Colour Tolerances and Colour Differences from Instrumentally Measured Colour Coordinates.
 - .6 ASTM D2247-11 Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Samples:
 - .1 Submit duplicate 100 x 100 mm samples of each type of sheet metal material, finishes and colours.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation. Agenda for meeting to include:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions.
 - .2 Co-ordinate pre-installation meeting with Contract Administrator and the City.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver sheet-metal flashing materials to site and store in safe, protected storage area to prevent damage.
- .2 Stack flashings to prevent twisting or bending out of shape.
- .3 Prevent contact of flashing materials with corrosive substances.
- .4 Damaged materials shall be replaced with new materials.

- .5 Handle and store metal flashings so that marring and scratching of the coatings do not occur.

Part 2 Products

2.1 SHEET METAL MATERIALS

- .1 Zinc coated steel sheet: thickness as shown on drawings, commercial quality to ASTM A653/A653M, with Z275 designation zinc coating.

2.2 PREFINISHED STEEL SHEET

- .1 Prefinished steel with factory applied polyvinylidene fluoride.
 - .1 Class F1S.
 - .2 Thickness: minimum 22gauge (0.759 mm), unless otherwise indicated on drawings and details.
 - .3 Colour: as selected by City from manufacturer's standard range.
 - .4 Specular gloss: 30 units +/- in accordance with ASTM D523.
 - .5 Coating thickness: not less than 25 micrometres in accordance with ASTM D1005.
 - .6 Resistance to accelerated weathering for chalk rating of 8 in accordance with ASTM D2414.
 - .7 Resistance to colour fade 5 units or less in accordance with ASTM D2244.
 - .8 Resistance to humidity after 1000 hours of exposure in accordance with ASTM D2247.
- .2 Acceptable product: Perspectra Series by ArcelorMittal Dofasco Inc.

2.3 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Sealants: Dow Corning 795 silicone. Colour to match adjacent finish or as selected and approved by City.
- .3 Cleats: of the same materials as the metal designed to secure. Size shall be to suit components to be secured (min 100mm wide). Gauge shall be sufficient to retain the flashings in place.
- .4 Fasteners: as indicated on drawings.
- .5 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .6 Touch-up paint: as recommended by prefinished material manufacturer.

2.4 FABRICATION

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

2.5 METAL FLASHINGS

- .1 Form flashings to profiles indicated on drawings and of minimum 24gauge prefinished steel.
- .2 Provide minimum 150 mm overlap in flashing sections.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install sheet metal work in accordance with CRCA FL series details and as indicated on drawings.
- .2 Use concealed fastenings, unless otherwise indicated on drawings and where approved before installation.
- .3 Lap joints 150 mm and provide two beads of sealant between flashing sections at lap.
- .4 Lock end joints and caulk with sealant.

3.3 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This section covers the installation of an elastomeric joint sealant in cleaned and routed cracks and joints in concrete. The work covered under this section consists of all labour, material, equipment, supervision and incidentals required to prepare and seal the joints and cracks as shown and detailed on the drawings, and as specified herein.

1.2 RELATED SECTIONS

- .1 Section 03 92 12 – Top Surface Repairs with Rapid Setting Mortar.
- .2 Section 03 93 30 – Form and Pour.
- .3 Section 07 14 16 – Cold Fluid Applied Waterproofing.
- .4 Section 07 18 16 – Vehicular Traffic Coatings.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM C719-93(2010), Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
 - .2 ASTM C920-11, Standard Specification for Elastomeric Joint Sealants.
 - .3 ASTM C1193-09 Standard Guide for Use of Joint Sealants.
 - .4 ASTM C1330-02(2007) Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
 - .5 ASTM C1521-13 – Standard Practice For Evaluating Adhesion Of Installed Weatherproofing Sealant Joints.

1.4 MEASUREMENT PROCEDURES

- .1 No measurement will be made under this section for joint sealants which are specifically shown on drawings. Include costs in items for which joint sealant is required.
- .2 Miscellaneous cracks, control joints, and double tee joints designated for routing and caulking will be identified and quantified 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 Contract Administrator prior to commencement of work.
- .3 Unit prices must include all supervision, labour and materials, and equipment. Joints/reglets to be uniform in size over the given length and conform to one of the following configurations. The following unit prices have been requested for miscellaneous joint/crack routing and caulking.
 - .1 6.4 mm (1/4") width.
 - .2 12.7 mm (1/2") width.
- .4 The minimum unit of payment will be 305 mm (1 lineal foot) for various reglet sizes.
- .5 The Contractor is to note that if he increases the area of repair over that originally measured of his own accord and without consultation with the Contract Administrator, he will not be paid for the increased area.

1.5 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: Submit manufacturer's technical bulletins and MSDS on each product.
- .3 Samples: For each product exposed to view, manufacturer's standard bead consisting of strips of actual products showing full range of colors available.

1.6 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.

1.7 DELIVERY STORAGE AND HANDLING

- .1 Comply with Section 01 60 00.
- .2 The sealant shall be delivered to the jobsite in the manufacturer's original unopened
- .3 Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number. Provide Material Safety Data Sheets for each product.
- .4 Store products in a location protected from freezing, damage, construction activity, precipitation, and direct sunlight per manufacturer's recommendations.
- .5 Handle products with appropriate precautions and care as stated on Material Safety Data Sheet.

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 Type I: Two-component polyurethane joint sealant for control joints in new and existing concrete.
 - .1 Compliance: ASTM C920, Type M, Grade NS, Class 25, Use T.
 - .2 Acceptable products:
 - .1 Sikaflex 2C/NS by Sika Canada Inc.
 - .2 MasterSeal SL2 (Slope Grade) by BASF Building Systems.

- .2 Type II: Two-component polyurethane joint sealant for routing and caulking of random cracks, control joints and miscellaneous cants below cold-applied liquid waterproofing. Multi-component, non-sag, chemically curing sealant, with consistency suitable for application by hand or pressure caulking gun, or by hand tool. The sealant when completely cured shall form an elastomeric solid capable of maintaining a weatherproof seal.
 - .1 Compliance: ASTM C920, Type M, Grade NS, Class 25, Use T, NT, M, and A.
 - .2 Acceptable products:
 - .1 Sikaflex 2C/NS by Sika Canada Inc.
 - .2 MasterSeal NP2 by BASF Building Systems.

2.2 ACCESSORIES

- .1 Primers, bond breakers and miscellaneous materials required to install the sealant shall be in accordance with manufacturer's recommendations, and as approved by the Contract Administrator. Use of aggregate bond breakers is prohibited.
 - .1 Primer: Use only manufacturer's approved primer.
 - .2 Closed-cell foam backing rod shall conform: to ASTM C1330.
 - .3 Bond breaker tape: self-adhesive, pressure sensitive tape made from TFE-fluorocarbon (Teflon), polyethylene, or similar which will not react with or adhere to the sealant.

Part 3 Execution

3.1 PROTECTION

- .1 Protect adjacent surfaces against any damage that could result from sealant installation.

3.2 EXAMINATION

- .1 Inspect existing caulked joints and cracks to ensure there is no deteriorated sealant, adhesion loss or non elastomeric sealants installed in joints. Remove and replace deficient sealant at location identified by Contract Administrator.
- .2 Inspect all deck penetrations, including electrical, lighting, signage, plumbing, HVAC, fire sprinkler piping for watertight seal. Remove and replace deficient sealant at location identified by Contract Administrator.

3.3 PREPARATION

- .1 Substrates must be sound and free of dust, dirt, laitance, paints, oils, grease, curing compounds, or any other contaminants.
- .2 All new concrete surfaces to have minimum compressive strength of 21 MPa and be cured for minimum of 28 days or 80 percent of design strength.
- .3 Joint and crack preparation:
 - .1 Completely remove sealant from existing joints and cracks designated for repair.
 - .2 Sawcut reglet along cracks and joints identified by Contract Administrator.
 - .3 Reglet dimensions are to be site confirmed based on crack dimensions and pattern and be uniform over the given length. The depth of the reglet must be consistent with the type of backing material (ie. bond breaker tape, or backing rod) and sized to produce a width to depth ratio of approximately 2:1.

- .4 Thoroughly clean joints and reglets by grinding, sandblasting, or wire brushing to expose a sound surface free of contamination and in order to provide a clean, sound substrate for optimum seal adhesion.
- .5 Remove loose particles present or resulting from grinding, abrading, or blast cleaning by blowing out joints with oil-free compressed air, or vacuuming prior to primer application.
- .6 Ensure that surfaces to be sealed are sound, dry, free from dirt, water, frost, loose scale, corrosion, oil, grease, waterproofing or water-repellent treatments, or other contaminants which may adversely affect the performance of the sealing materials.
- .7 If the substrate is suspected of being substandard, an on-site trial application is to be conducted to verify that the substrate is satisfactory. Work will not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the manufacturer. All costs associated with verification to be carried by Contractor.
- .8 Prior to installation of the sealant an inspection of both the joint and substrate is required to confirm the joint design and to ensure that the substrate is sound and acceptable for sealant application. A substrate that is unsound, cracked, or weak must be repaired prior to sealant.
- .9 Do not proceed with Work until any unsatisfactory conditions have been corrected in a manner acceptable to the Contract Administrator.

3.4 INSTALLATION

- .1 Primer: Unless otherwise approved by the sealant manufacturer, priming of all substrates is mandatory.
 - .1 Prime substrates as recommended by the sealant manufacturer.
 - .2 Primer to be installed prior to installation of the sealant backing.
 - .3 Allow primer to dry until all the solvent evaporates. This typically takes 15 to 120 minutes, depending on temperature and humidity.
 - .4 Prime only those surfaces that will be sealed with sealant the same day. If a previously primed surface that was performed the day before is encountered it must be reprimed.
- .2 Sealant backup: Where joint depth requires backup, pack joints continuously with closed cell backer rod meeting ASTM C1330
 - .1 Backer rod to be installed under adequate compression to hold it in-place in the joint opening and to resist the pressure applied when tooling a non-sag sealant into place. Backer rod diameter to be at least 25% greater than the joint width.
 - .2 Do not install backer rod with a sharp tool which could puncture the rod. Ensure surface skin of the backer rod is not punctured or cut during installation. A puncture in the backer rod may result in out-gassing into the uncured sealant resulting in voids or other defects in the cured sealant.
 - .3 Install backer rod without stretching.
 - .4 Under no circumstances should backer rod that is too small for the joint be doubled up or braided together to fit the opening.
- .3 Bond breaker: A bond breaker will be required in the bottom of all joints containing a rigid, non-flexible backing material to preclude three-side adhesion where movement will occur. A bond breaker is not required to prevent a sealant from adhering to a soft, flexible, sealant backing material that would not significantly restrict movement.
 - .1 Install bond breaker tape in joint to be sealed on top of back-up material to prevent adhesion of sealant to back-up material. The tape shall be installed continuously with no skips or voids in the tape application.
- .4 Mixing:

- .1 Prepare sealants that require mixing; follow manufacturer's recommended procedures, mixing thoroughly.
- .2 Mix only as much material as can be applied within manufacturer's recommended application time period.
- .3 Mix in a manner to prevent inclusion of foreign materials.
- .5 Sealant installation:
 - .1 Apply sealants only within manufacturer's specified application life period. Discard sealant after application life is expired or if prescribed application period has elapsed.
 - .2 Application of sealants must be completed by skilled applicators installed in accordance with manufacturer's printed directions and this Section.
 - .3 Apply sealants to meet Specification and design requirements as shown on Drawings.
 - .4 Do not install sealant on wet or damp substrates. Wet or damp substrates should be allowed to dry before application of primer and/or sealant.
 - .5 Do not install sealants under conditions of precipitation or temperatures below 4°C. Use appropriate measures for protection and supplementary heating to ensure proper curing conditions in accordance with manufacturer's recommendations if application during inclement weather occurs.
 - .6 All sealants have a temperature range for optimum handling which can vary considerably, and should be stored at a temperature within this range for at least 4 hours before use.
 - .7 Do not use sealant that has started to set in its container, exceeded shelf life or installation times as stated by the manufacturer.
 - .8 Sealant to be installed in a manner that will completely fill the cavity formed in the joint opening by the substrates and sealant backing or bond breaker.
 - .9 Apply sealant by any of the common types of hand operated guns. Nozzles shall be sized and shaped to fit the intended joint opening width, which will confine the sealant to the joint and aid in building pressure to force the sealant into the cavity. Ensure that mixing and placing procedures do not entrain air within the sealant.
 - .10 Immediately after applying the sealant, tool the bead. Tooling forces material into cavities and into more intimate contact with the substrate. Wet tooling will not be permitted.
 - .11 Tool sealant to produce a concave shaped surface. Specifically, the sealant and concrete are to be flush at the edges but recessed at the joint centre, forming a parabolic arc. Do not re-use any material forced outside of the joint by the tooling procedure.
 - .12 Sealant bead to be free of air pockets, embedded impurities, and free of ridges, wrinkles and sags.
 - .13 Use anti-tack solutions only with the approval and directions of the sealant manufacturer.

3.5 CLEANING

- .1 Do not clean inadvertent spills or splatters of sealant on concrete or masonry with solvent because of possible permanent staining of the substrate. Scrape, wipe or scrub such spills with dry tools or rags.
- .2 Clean bulk caulking guns, barrel and nozzle completely after every day's use.
- .3 The special precautions recommended by the manufacturer shall be rigidly followed where hazardous materials are involved.

3.6 FIELD ADHESION TESTING

- .1 Field adhesion testing of miscellaneous joints and cracks will be completed at the discretion of the Contract Administrator.
- .2 Field adhesion testing will be performed as required and deemed necessary by the Contract Administrator throughout the course of the work in the presence of and with the assistance of the Contractor. The purpose of the field adhesion testing is to help detect application problems such as improper cleaning, use of improper primer, poor primer application, or improper joint configuration.
- .3 The field adhesion test shall be performed as follows:
 - .1 Make a knife cut across the full width of the joint.
 - .2 Make two (2) cuts (from the cross cut) approximately 76 mm (3") long, along both sides of the joint.
 - .3 Place a 25.4 mm (1") mark on the sealant tab.
 - .4 Grasp the 76 mm (3") sealant tab firmly (1") from its bonded edge and pull at a 90° angle.
 - .5 If dissimilar substrates are being sealed, check the adhesion of sealant to each substrate separately. This is accomplished by extending the vertical cut along one side of the joint, checking adhesion to the opposite side and then repeating for the other surface.

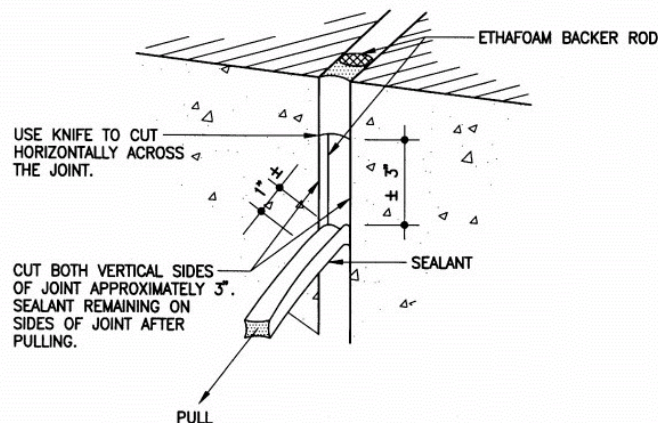


FIGURE 1.1 HAND PULL TEST

- .4 Field adhesion test criteria:
 - .1 Urethane Sealants: the sealant should tear cohesively within itself without bond loss.
- .5 At this time the joint will be inspected for complete fill. The joint should not have voids, and joint dimensions should match those shown on the drawings.
- .6 Repair of Sealant at Field Adhesion Test Locations
 - .1 Repair the sealant pulled from the test area by applying new sealant to the test area. Assuming good adhesion was obtained, use the same application procedure to repair the area as was used originally for the joint. Care should be taken to ensure that the original sealant surfaces are clean and that the new sealant is in contact with the original sealant.

- .2 Contractor shall carry costs associated with sealant testing and repair in their bid including but not limited to access, labour, materials, etc.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 The work shall consist of furnishing and installing waterproof expansion joints in accordance with the details shown on the drawings and the requirements of the specifications.

1.2 RELATED SECTIONS

- .1 Section 03 92 12 – Top Surface Repairs with Rapid-Setting Mortar.
- .2 Section 03 92 20 – Scaling Repairs.
- .3 Section 03 93 30 – Form and Pour.

1.3 MEASUREMENT PROCEDURES

- .1 No measurement will be made for Work under this Section. The Contractor shall include in the appropriate fixed price component work required under this Section and shown on Drawings including all labour, materials, supervision, and equipment to perform work as detailed in the drawings.

1.4 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product data in the form of manufacturer's product specifications, installation instructions, and general recommendations for each type of expansion joint sealant system indicated.
- .3 Samples for each expansion joint sealant system of same materials to be used in work.

1.5 QUALITY ASSURANCE

- .1 Manufacturer: Shall have a minimum ten (10) years experience specializing in the design and manufacture of expansion control systems.
- .2 Contractor Qualifications:
 - .1 Minimum of 3 years experience in the installation of expansion joint waterproofing systems.
 - .2 Provide minimum 3 examples of local projects demonstrating successful performance concrete repairs of similar size and complexity to specified Work within the last 3 years.
 - .3 Site Superintendent to have a minimum of 3 years experience exhibiting successful performance in expansion joint waterproofing projects. Provide references upon request.
 - .4 Ensure all personnel involved with concrete restoration is adequately trained and familiar with the requirements of this Section.
- .3 Field Mock-ups:
 - .1 Complete a field mock-up of the new expansion joint system. Location to be site determined.
 - .2 Field mock-up shall be a minimum of 1,525 mm (5 lin.ft.) and incorporate all aspects of the surface preparation.

- .3 Field mock-up areas shall be used as a standard against which subsequent work shall be judged.
- .4 Workers completing mock-up to be used for duration of project. In the event that crew members change during the project, new crew members are to complete a new mock-up in the presence of the Contract Administrator.
- .5 All field mock-up related costs should be included in the base bid.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Comply with Section 01 61 00 – Common Product Requirements.
- .2 Deliver products to site in Manufacturer's original, intact, labeled containers. Handle and protect as necessary to prevent damage or deterioration during shipment, handling and storage.
- .3 Store in accordance with manufacturer's installation instructions.

1.7 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 SYSTEM DESCRIPTION

- .1 Expansion joint shall be silicone pre-coated, preformed, pre-compressed, self-expanding, sealant system.

2.2 MATERIALS

- .1 Seal shall combine factory-applied, low-modulus silicone, and a backing of acrylic-impregnated expanding foam into a unified binary sealant system. Expanding foam to be open-cell polyurethane foam impregnated with a water-based, non-drying, polymer-modified acrylic.
- .2 Product to have lateral, differential deflection, shear, and torsional movement capability of +50% and -50% (total 100%) of mean temperature joint size.
- .3 Silicone external color facing to be factory-applied to the foam while it is partially pre-compressed to a width greater than maximum joint extension and cured before final compression. Coating width to be a minimum of 2 times the designed, or field measured, joint gap width. When compressed to final supplied dimension, a bellows with distinct and uniform folds to handle movement must be created in the silicone coating.
- .4 Design joint width: minimum 25.4 mm (1 inch).
 - .1 Acceptable product: Seismic Colorseal by Emseal Joint Systems.

- .2 Colour: to be selected by the City from manufacturer's standard available colour range. Submit finished colour sample to Contract Administrator for the City selection and approval prior to field mock-up

2.3 ACCESSORIES

- .1 Single component, neutral cure, silicone sealant for field applied terminations to ASTM C920, Type S, Grade NS, Class 50, Use NT, G, A and O.
 - .1 Acceptable product: 795 Silicone Building Sealant by Dow Corning.
 - .2 Colour: to match new expansion joint.

Part 3 Execution

3.1 PREPARATION

- .1 Ensure expansion joint gap is of a constant width along entire length of joint. Block out joint to the required width and depth.
- .2 Joint surfaces to receive seal shall be sound, smooth, straight, parallel, clean, dry and free of all visible contaminants.
- .3 The joint configuration and the joint surfaces shall be as indicated on the drawings and in accordance with the specifications, and in compliance with the Manufacturer requirements.
- .4 Confirm joint depth and width on-site prior to ordering new expansion joint.
- .5 Expansion joint gap must be measured by contractor and verified by manufacturer's representative to confirm acceptability prior to joint installation. The expansion joint gap size for installation is to be minimum 25.4 mm (1.5 inches).
- .6 Contractor shall clean the substrate of all contaminants and impurities prior to the expansion joint installation. Water repellents, laitance, surface dirt and rust, all old sealants and other surface treatments and protective coatings are examples of materials which must be removed from the block-out substrate surface in order to obtain the proper bond of the new joint material to the substrate.

3.2 INSTALLATION

- .1 The expansion joint system is to be installed in strict accordance with the manufacturer's recommendations. Only approved applicators will be permitted to install the expansion joint system.
- .2 Perform all cutting and fitting required for installation of expansion joint system in strict accordance with manufacturer's standard written and job-specific instructions. Install expansion joint sealant system in true alignment and proper relationship to expansion joints and adjoining finishes.
- .3 Do not proceed with the installation of expansion joint under adverse weather conditions when joint to be sealed is damp, wet or frozen, or when temperatures are below or above the manufacturer's recommended limitations for installation. Consult manufacturer for specific instructions before proceeding.
- .4 End to end joints of consecutive lengths of material to be joined by mitering across the direction of expansion of the material and joined faces to be lightly "battered" with liquid silicone. To obtain identical color sealant, use liquid silicone sealant supplied by manufacturer

from same color batch as was used to form the bellows. Color to be selected from color chart supplied by manufacturer.

- .5 Sealing against the substrate to be achieved through a combination of the pressure-sensitive adhesive impregnation, and the backpressure of the expanding foam, as well as through the addition in the field of a corner bead of silicone tooled between the preformed silicone bellows and substrate. Liquid silicone for corner beads to be supplied by the sealant manufacturer from the same color batch as was used to form the silicone bellows.

3.3 FIELD QUALITY CONTROL

- .1 Following installation and sufficient cure of the expansion joint system, the expansion joint is to be flooded and monitored for leakage.
- .2 Inspect the area beneath the floor test with Contract Administrator and confirm that no leaks exist. Any leaks detected must be identified by the Contractor and Contract Administrator from which immediate preparations or restorative action is to be implemented.
- .3 Following any repairs, the joint is to be re-tested by flooding the expansion joints.

3.4 CLEANING

- .1 Remove all waste materials from the site. Do not use waste materials for patching. Seal shall be cleaned of all foreign matter as recommended by the seal manufacturer. Leave work in a condition satisfactory to the Contract Administrator.

END OF SECTION