

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises
 - .1 Structural repairs along an existing process piping trench;
 - .2 Installation of new drainage pit within select locations within existing process piping trench
- For the Winnipeg Transit Maintenance Garage located at 421 Osborne Street.

1.2 REFERENCES AND CODES

- .1 Perform Work in accordance with the National Building Code of Canada (NBC) including all amendments up to the Bid Opportunity closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of Contract documents, specifications, as specified standards, codes and referenced documents, latest editions.

1.3 WORK BY OTHERS

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Contract Administrator.
- .2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Contract Administrator, in writing, any defects which may interfere with proper execution of Work.

1.4 WORK SEQUENCE

- .1 Construct Work in stages to accommodate City Of Winnipeg's continued use of adjacent areas during construction.
- .2 Contractor is to allow for time in his schedule for the City Of Winnipeg to vacate areas adjacent to construction, areas affected by construction activities.

1.5 CONTRACTOR USE OF PREMISES

- .1 Limit use of premises for Work, for storage, and for access, to allow:
 - .1 City Of Winnipeg occupancy.
 - .2 Work by other Contractors.
- .2 Co-ordinate use of premises under direction of Contract Administrator.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

- .5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Contract Administrator.
- .6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.6 CITY OF WINNIPEG OCCUPANCY

- .1 City Of Winnipeg will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with City Of Winnipeg in scheduling operations to minimize conflict and to facilitate City Of Winnipeg usage.

1.7 EXISTING SERVICES

- .1 Notify, City Of Winnipeg and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves connecting to existing services, give City Of Winnipeg minimum 48 hours notice for necessary interruption of associated mechanical or electrical service throughout course of work. Minimize duration of interruptions.
- .3 Where unknown services are encountered, immediately advise Contract Administrator and confirm findings in writing.
- .4 Protect, relocate or maintain existing active services.

1.8 DOCUMENTS REQUIRED

- .1 Maintain at Site, one copy each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 Change Orders.
 - .6 Other Modifications to Contract.
 - .7 Field Test Reports.
 - .8 Copy of Approved Work Schedule.
 - .9 Health and Safety Plan and Other Safety Related Documents including:
 - .1 Material data sheets (MSDS) on all products used in Project.
 - .10 Other documents as specified.

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 01 11 00 – Summary of Work.

1.2 ACCESS AND EGRESS

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

1.3 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Contract Administrator to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Ensure that Contractor personnel employed on Site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .5 Keep within limits of work and avenues of ingress and egress.

1.4 WORKING HOURS

- .1 Working hours for concrete demolition or other work process deemed to be excessively noisy or disruptive will be restricted to between 2:00p.m. and 7:00a.m. Monday through Friday.
- .2 Working hours for all other work process will be allowed to take place at all hours of day Monday through Friday, subject to allowing for continual operation within the premises.
- .3 Notwithstanding the above, all Work shall be completed in conformance with City of Winnipeg Neighbourhood Liveability By-Law No. 1/2008.
- .4 Notwithstanding the above, all Work shall be completed in conformance with the City of Winnipeg Noise Control By-Law No. 2480/79.

1.5 SPECIAL REQUIREMENTS

- .1 Construct Work to provide for continuous public usage. Do not close off public access to facilities until proper notification has be provided to both the Contract Administrator and City Of Winnipeg and use of completed phases will provide alternate usage if necessary.
- .2 Ensure that Contractor personnel employed on Site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .3 Keep within limits of work and avenues of ingress and egress.

1.6 BUILDING SMOKING ENVIRONMENT

.1 Smoking is not allowed.

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 30 00 – Cast-in-Place Concrete.
- .2 Section 03 92 10 – Top Surface Concrete Repairs With Ready Mix Concrete
- .3 Section 03 93 30 – Concrete Form And Pour Repairs

1.2 CASH ALLOWANCES FOR TESTING, EXAMINATION

- .1 Include in Contract Price, allowances to cover costs of Site and laboratory testing and examination listed.
- .2 Tests and testing requirements, as specified shall be carried out by independent examining, testing companies, as appointed by the Contractor and acceptable to the Contract Administrator.
- .3 Obtain quotations from examining and testing companies and submit to Contract Administrator for review.
- .4 Pay all costs for specified examination, testing work performed by independent examining and testing companies, from cash allowance specified.
- .5 The invoices for work performed by the specialist examining and testing companies shall be directed to the Contractor, and forwarded with monthly request for payment. Invoices will be processed onto a Change Order periodically to formalize an expenditure from the Cash Allowance.
- .6 Cash Allowance is for payment of examining, testing company invoices only. Contractor costs for Site supervision and coordination is deemed to be part of overhead included in the Total Estimated Contract Price.
- .7 Specific testing requirements are outlined in respective technical Sections. Materials failing to meet specified requirements shall be replaced or repaired and retested as directed by Contract Administrator, with all costs involved in retesting borne by the Contractor.
- .8 Include testing/examination allowances for:
 - .1 Testing cash allowance lump sum of \$750.00.

1.3 ADJUSTMENTS OF CASH ALLOWANCES

- .1 Contractor shall not exceed Cash Allowances without authority from Contract Administrator. Contractor will not be allowed expenses or profit on overage unless authority for over expenditure is obtained. Over expenditure of Cash Allowances may, at Contract Administrator's discretion, be deducted from sums of money due Contractor, should Contractor exceed allowance without authority from the Contract Administrator.

- .2 Adjustments to the Cash Allowances will be made by a written Change Order, signed by the City Of Winnipeg, or as amendments to the Contract at the time of final payment, on the basis of submitted net cost invoices.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 PRECONSTRUCTION MEETING

- .1 Within 5 Working Days after award of Contract, request a meeting of parties in Contract to discuss and resolve administrative procedures and responsibilities.
- .2 Senior representatives of City Of Winnipeg, Contract Administrator, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum [5] days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Submission of shop drawings, concrete mix statements & samples. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .3 Requirements for temporary facilities, Site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
 - .4 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
 - .5 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .6 Delivery schedule of specified materials.
 - .7 Monthly progress claims, administrative procedures, photographs, hold backs.
 - .8 Appointment of inspection and testing agencies or firms.
 - .9 Insurances, transcript of policies.

1.2 PROGRESS MEETINGS

- .1 During course of Work schedule progress meetings at biweekly intervals.
- .2 Contractor, major Subcontractors involved in Work, Contract Administrator and City Of Winnipeg's representative are to be in attendance.
- .3 Contract Administrator will be responsible for recording minutes of meetings and circulate to attending parties and affected parties not in attendance within [5] Working Days after meeting.
- .4 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Review of off-Site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.

- .7 Revision to construction schedule.
- .8 Progress schedule, during succeeding work period.
- .9 Review submittal schedules: expedite as required.
- .10 Maintenance of quality standards.
- .11 Review proposed changes for affect on construction schedule and on completion date.
- .12 Other business.

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 30 00 – Cast-in-Place Concrete.

1.2 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.

1.3 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 e Consultant, based on the specifContract 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.

1.4 **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.

1.5 **MOCK-UPS**

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

1.6 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

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 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Manitoba
 - .1 The Workers Compensation Act RSM 1987 - Updated 2006.
 - .2 Manitoba Regulation 217/2006 – Workplace Safety and Health Regulation.

1.2 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit copies of incident and accident reports.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets on all products used in conjunction with the Work.
- .4 W.H.I.M.I.S. Training: Provide copies of valid certification/training for all employees (regular or temporary) including all Subcontractors.
 - .1 All individuals involved in the application of any product shall meet all WHMIS/provincial standards safety/protection requirements at all times.

1.3 GENERAL REQUIREMENTS

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

1.4 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on Site, safety of property on Site and for protection of persons adjacent to Site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with Site-specific Health and Safety Plan.

1.5 PERSONAL PROTECTIVE EQUIPMENT (PPE)

- .1 All employees (regular or temporary) of Contractor and Subcontractors shall wear PPE in accordance with Manitoba Regulation 217/2006.
- .2 Fall Protection: Provide fall protection in accordance with Manitoba Regulation 217/2006.

1.6 WORK STOPPAGE

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

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 21 00 – Allowances.

1.2 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.

1.3 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged for purpose of inspecting and/or testing portions of Work. Cost of such services will be paid by the Contractor via the testing cash allowance.
- .2 Allocated costs: to Section 01 21 00 - Allowances.
- .3 Provide equipment required for executing inspection and testing by appointed agencies.
- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Contract Administrator at no cost to City Of Winnipeg. Pay costs for retesting and reinspection.

1.4 ACCESS TO WORK

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

1.5 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.

1.6 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, City Of Winnipeg 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.

1.7 REPORTS

- .1 Submit copies of inspection and test reports to City Of Winnipeg and Contract Administrator.
- .2 Provide copies to Subcontractor of work being inspected or tested [manufacturer or fabricator of material being inspected or tested].
- .3 Provide copies of concrete test results to Concrete Supplier.

1.8 TESTS AND MIX DESIGNS

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

1.9 MILL TESTS

- .1 Submit mill test certificates as [requested] [required of specification Sections].

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from Site all such work after use.

1.2 WATER SUPPLY

- .1 The City Of Winnipeg will make available, for the extent that it is available, a supply of potable water for construction use at no charge to the Contractor
- .2 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.
- .3 The Contractor shall provide all necessary hoses, lines, connections, and other ancillary hardware which may be required.
- .4 The services are to be returned to their original condition at the temporary locations, or left in an altered condition only as approved by the City Of Winnipeg.

1.3 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .2 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .3 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.

- .4 Prevent damage to finishes.
- .5 Vent direct-fired combustion units to outside.
- .4 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.4 TEMPORARY POWER AND LIGHT

- .1 The City Of Winnipeg will make available, for the extent that it is available temporary power during construction for temporary lighting and operating of power tools.
- .2 Connect to existing power supply in accordance with Canadian Electrical Code .
- .3 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.
- .4 Temporary power for equipment requiring in excess of that available on-Site is responsibility of the Contractor.
- .5 Provide and maintain temporary lighting throughout project.

1.5 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on Site.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA O121-08, Douglas Fir Plywood.

1.2 SITE STORAGE/LOADING

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.3 CONSTRUCTION PARKING

- .1 Parking will be permitted on Site provided it does not interfere with normal operations, access by tenants or the public, or disrupt performance of Work.

1.4 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on Site in manner to cause least interference with work activities.

1.5 SANITARY FACILITIES

- .1 The Contractor may use on-Site facilities for the duration of the project. The facilities must be maintained in a neat condition or use will be revoked.

1.6 POLLUTION CONTROL

- .1 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures and/or other control methods. If necessary, arrange for shutdown of air handling units which have air intakes in the vicinity of the work. Dust can trigger fire alarm smoke detectors and can plug ducts and filters. Dust and suspended particles can damage air-cooled mechanical and electrical equipment. If necessary, arrange for shutdown of this equipment. Contractor shall be responsible for all damages. Prior to start of work, identify locations of air intakes and air-cooled mechanical and electrical equipment within and adjacent to the area of work.
- .2 Control noxious and hazardous gases. Prevent hazardous accumulations. Control emission from equipment and plant to local authority's emission requirements.
- .3 On exterior, cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.7 CLEAN-UP

- .1 Remove construction debris, waste materials, packaging material from work Site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 INSTALLATION AND REMOVAL

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from Site all such work after use.

1.2 HOARDING

- .1 The Contractor must barricade off the area under construction to prevent the general public or occupants of facility from improper access to the construction area. Suitable barricades and protection systems include:
 - .1 Stanchions with a minimum of three (3) horizontal bands of fluorescent warning tape and/or snow fencing around perimeter of work area. Spacing of stanchions not to exceed 20'.
 - .2 Cover all surface patches not able to be completed prior to days end with ¾" plywood, secured to deck to prevent shifting. Ensure coverings are capable of supporting a construction load of 20 psf.
- .2 Repair surface coatings and/or finishes which are damaged by temporary hoardings and barricades.
- .3 Provide adequate signage, fencing, etc. to inform the public of the work being undertaken.

1.3 DUST TIGHT SCREENS

- .1 Provide dust tight screens to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Maintain and relocate protection until such work is complete.

1.4 FIRE ROUTES

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

1.5 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

1.6 PROTECTION OF BUILDING FINISHES

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Be responsible for damage incurred due to lack of or improper protection.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Within text of each specifications section, reference may be made to reference standards. Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .2 Conform to latest date of issue of referenced standards in effect on date of submission of 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 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 Administrator's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

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

1.6 MANUFACTURER'S INSTRUCTIONS

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

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by City Of Winnipeg or other Contractors.
- .2 Remove waste materials from Site at daily regularly scheduled times. Do not burn waste materials on Site.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-Site containers for collection of waste materials and debris.
- .5 Dispose of waste materials and debris off Site.
- .6 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than that caused by City Of Winnipeg or other Contractors.
- .5 Remove waste materials from Site at regularly scheduled times. Do not burn waste materials on Site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

-
- .7 Remove stains, spots, marks and dirt from existing surfaces, fixtures, and finishes within the work area or affected by the affected by the Work.
 - .8 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
 - .9 Remove dirt and other disfiguration from exterior surfaces.
 - .10 Sweep and power wash- clean all work areas.
 - .11 Remove construction debris from drain and pits.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Contract Administrator in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request Contract Administrator's inspection.
 - .2 Contract Administrator's Inspection:
 - .1 Contract Administrator and Contractor to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Work: complete and ready for final inspection.
 - .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Contract Administrator, and Contractor.
 - .2 When Work incomplete according to Contract Administrator, complete outstanding items and request re-inspection.
 - .5 Declaration of Substantial Performance: when Contract Administrator considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
 - .6 Commencement of Lien and Warranty Periods: date of City Of Winnipeg's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
 - .7 Final Payment:
 - .1 When Contract Administrator considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
 - .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with Contractual agreement.

1.2 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 11 – Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

Part 2 **Products**

2.1 **NOT USED**

 .1 Not Used.

Part 3 **Execution**

3.1 **NOT USED**

 .1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 List of significant generic types of products, work, or requirements specified. This listing should not include procedures, process, preparatory work, accessories, components, secondary products, or final cleaning.

1.2 RELATED SECTIONS

- .1 Section 03 92 10 – Top Surface Repairs with Ready-Mix Concrete
- .2 Section 03 93 30 – Form and Pour with Ready-Mix Concrete.

1.3 REFERENCES

- .1 ASTM International
 - .1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - .2 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- .2 CSA International
 - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.
 - .3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .6 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .3 Reinforcing Steel Institute of Canada (RSIC)
- .4 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.4 MEASUREMENT PROCEDURES

- .1 Include reinforcement costs in items of concrete work in Section 03 30 00 - Cast-In-Place Concrete. No measurement will be made for work incorporated under this Section.
- .2 Supplemental Repair Dowels will be measured individually and will include dowel drilling, cleaning, preparation and placement, but excluding steel costs which will be covered by the rate per kilogram unit prices. The Contract Administrator and the Contractor will count and agree upon the numbers and lengths of bars as well as the number of bar embedments. These agreed upon number will form the basis for payment.

1.5 SUBMITTALS

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

- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba.
 - .1 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Contract Administrator, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
 - .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
 - .1 Provide type B tension lap splices unless otherwise indicated.

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 except column ties and beam stirrups which shall be grade 400W.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .1 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2. All accessories to be non-corroding or epoxy coated.
- .2 Mechanical splices: subject to approval of Contract Administrator.
- .3 Plain round bars: to CSA-G40.20/G40.21.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Contract Administrator's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Contract Administrator, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

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, minimum 4 weeks 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 placing drawings and in accordance with CSA-A23.1/A23.2.
- .2 Prior to placing concrete, obtain Contract Administrator's 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, 6 inches
 - .2 15M bars, 8 inches
 - .3 20M bars, 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.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 10 00 – Concrete Forming and Accessories.
- .2 Section 03 20 00 – Concrete Reinforcing.
- .3 Section 03 91 10 – Surface Preparation Of Concrete Delamination Repairs
- .4 Section 03 92 10 – Top Surface Repairs With Ready Mix Concrete
- .5 Section 03 93 30 – Form And Pour Repairs

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005)
 - .3 CSA A283-06, Qualification Code for Concrete Testing Laboratories.
- .2 American Concrete Institute (ACI)
 - .1 ACI 309R-96, Guide for the Consolidation of Concrete.
- .3 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C260/C260M-10a, Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-07, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M-10a Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C928/C928M-09, Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .5 City of Winnipeg Standard Construction Specifications
 - .1 CW 3110 – Sub-Grade, Sub-Base and Base Course Construction.

1.3 MEASUREMENT PROCEDURES

- .1 No measurement will be made under this section for new cast-in-place concrete drainage pit.
- .2 Include all costs for concrete required for concrete repairs in appropriate unit prices.

1.4 ABBREVIATIONS

- .1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).
 - .1 Type GU or GUb - General use cement.
 - .2 Type CI - with CaO content ranging from 8 to 20%.
- .2 SCM – Supplemental cementing materials.
- .3 SSD - Saturated surface dry.
- .4 WRA – Water reducing agent.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to Site of Work and discharged not to exceed 120 minutes after batching.
 - .1 Modifications to maximum time limit must be agreed to Contract Administrator and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by Contract Administrator.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 Products

2.1 MATERIALS

- .1 The concrete constituents shall comply with the following standards:
 - .1 Cement: to CAN/CSA-A3001.
 - .2 Blended Hydraulic cement: to CAN/CSA-A3001.
 - .3 Supplementary cementing materials: to CAN/CSA-A3001.
 - .4 Water: To CSA-A23.1.
 - .5 Aggregates: to CSA-A23.1. Coarse aggregates to be normal density.
 - .6 Air entraining admixture: ASTM C260.
 - .7 Chemical admixtures: ASTM C494/C494M. Contract Administrator to approve accelerating or set retarding admixtures during cold and hot weather.

2.2 MIX REQUIREMENTS

- .1 Proportion normal density concrete in accordance with CSA-A23.1, Table 5, Alternative 1 to obtain the following performance:
 - .1 Type 1: Structural concrete repairs (ie. top surface, form & pour, etc.)
 - .1 Class of exposure: C-1
 - .2 Minimum compressive strength at 28 days: 35 MPa.
 - .3 Air category: 1 (5 to 8%)
 - .4 Nominal size of coarse aggregate: 20 mm.
 - .5 Slump at point of discharge: consistent with placement and consolidation methods, equipment, and Site conditions and as approved by Contract Administrator.

- .2 Type 2: Cast-In-Place Concrete Drainage Pit
 - .1 Class of exposure: C-1
 - .2 Minimum compressive strength at 28 days: 35 MPa.
 - .3 Air category: 1 (5 to 8%)
 - .4 Nominal size of coarse aggregate: 20 mm.
 - .5 Slump at point of discharge: consistent with placement and consolidation methods, equipment, and Site conditions and as approved by Contract Administrator.

2.3 ACCESSORIES

- .1 Evaporation retardant: Acceptable Product:
 - .1 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, formerly (Kure-N-Seal) by BASF Building Systems at a minimum application rate of 4.9 m²/L.
- .3 Vapour Barrier: 10 mil polyethylene film to CAN/CGSB-51.34.

2.4 GRANULAR BASE

- .1 Comply with City Of Winnipeg Standard Construction Specification CW 3110 where required.

Part 3 Execution

3.1 PREPARATION

- .1 Obtain Contract Administrator's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.
- .2 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .3 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .4 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and epoxy grout to anchor and hold dowels in positions as indicated. Refer to Section 03 20 00.
- .5 Place reinforcing steel and install dowels to Section 03 20 00 - Concrete Reinforcement. Provide dowels at locations shown on the drawings.
- .6 Obtain Contract Administrator's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.
- .7 Ensure reinforcement and inserts are not disturbed during concrete placement.

- .8 Prior to placing of concrete obtain Contract Administrator's approval of proposed method for protection of concrete during placing and curing in adverse weather. Protection and curing must comply with the hot weather and cold weather requirements of CSA-A23.1.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and epoxy grout to anchor and hold dowels in positions as indicated.
- .11 Provide temporary bridging as required to permit access to all areas during placement, finishing and curing.
- .12 Do not place concrete until screed rails for hand operated strike-off devices are in place and firmly secured.
 - .1 Rails to be of type, and so installed, that no springing or deflection will occur due to weight of finishing equipment.
 - .2 Set rails or headers to elevations to produce deck true to required grade and cross section.
 - .3 Use polyethylene film or plastic coated tape if necessary to prevent concrete from bonding to rails.
 - .4 Do not treat rails with release agents or parting compounds.
 - .5 Subject to approval of the Contract Administrator, screed rail anchors which remain in the concrete may be used provided they are non-corroding and sit a minimum of 30 mm below the finished surface of the concrete.

3.2 MIX PRODUCTION

- .1 Concrete to be mixed, delivered and placed in accordance with CSA A23.1.
- .2 Concrete to be batched and mixed at a ready mix plant and delivered to Site in ready to place form.
- .3 Control of slump on the Site to be in accordance with CSA-A23.1 except as otherwise specified below:
 - .1 The addition of water to increase slump is strictly prohibited unless prior written permission from concrete supplier is obtained.
 - .2 The use of WRA may be required to aid in placement of the concrete and obtain adequate consolidation in heavily reinforced sections.
 - .3 WRA addition shall occur at the batch plant or on Site. For Site addition, concrete supplier to provide written notice minimum 2 weeks prior to commencement of concrete work, indicating recommended dosages based on slump at point of discharge.
 - .4 Site addition WRA will be the responsibility of the concrete supplier.
- .4 Slump and air must be measured both before and after addition of WRA.
- .5 The addition of water to the concrete to increase slump and aid in pumping is strictly forbidden

3.3 PLACEMENT

- .1 Place concrete work in accordance with CSA-A23.1.
- .2 Concrete shall be transported to placement location by pump or trolley. Note that regard to load limitations on the deck must be maintained to avoid overstressing the structural members.
 - .1 The live load capacity of the exterior deck is 150 psf.
 - .2 The live load capacity of the interior deck is 50 psf.
- .3 When concrete is placed by pump, the initial slurry used to prime the pump shall not be incorporated into the topping. The slurry shall be trapped and disposed off-Site.
- .4 Ensure high points and slopes to drains as shown on drawings are maintained.
- .5 Pour concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur. Install a construction dam or bulkhead in case of a delay longer than 60 minutes. During delays between 5 and 60 minutes, protect the end of the placement with damp burlap.
- .6 Protect freshly placed concrete from exposure to dust, debris and precipitation.
- .7 Sleeves and inserts.
 - .1 No sleeves, ducts, pipes or other openings shall pass through concrete members except where indicated or approved by Contract Administrator.
 - .2 Electrical conduits, junction and fixture boxes shall not be embedded within concrete members.
 - .3 Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Contract Administrator.
 - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Contract Administrator before placing of concrete.
 - .5 Check locations and sizes of sleeves and openings shown on drawings.
 - .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

3.4 FINISHING

- .1 Finish concrete in accordance with CSA-A23.1/A23.2.
- .2 Consolidate concrete in accordance with CSA A23.1 and ACI 309.
- .3 Under adverse conditions only, excess bleed water may be removed from the surface using procedures acceptable to Contract Administrator and those noted in CSA-A23.1. Ensure surface is not damaged.
- .4 Immediately after final finishing apply approved evaporation retardant at indicated coverage rate. Evaporation retardant is not to be applied during finishing operations nor should it be worked into the surface.
- .5 Unless otherwise indicated round edges of formed joints in pavements with a 10 mm radius edging tool.

- .6 Flatwork:
 - .1 Continuously consolidate and finish to specified elevations, ensuring thickness and required elevations are maintained.
 - .2 Use of a floating vibratory screed to consolidate the top surface of the concrete will be mandatory.
 - .1 The use of screed rails may be required to meet required surface tolerances.
 - .2 Move vibrating screed forward as rapidly as possible while allowing proper consolidation and finishing of the concrete surface. Extended use of a vibratory screed may result in segregation of the concrete producing excessive mortar at the surface which can result in a weak surface layer.
 - .3 Immediately after concrete has been placed and consolidated, bull-float slab surface to a smooth uniform surface.
 - .4 When the surface is sufficiently set to accommodate the weight of a person with only minor indentation of the surface, and all bleed water has evaporated, **use one pass of a power float surface to smooth out the surface**. A light hand trowel will then be necessary to smooth out irregularities and provide a hard, dense surface.
 - .5 Use of hand trowels will be required to hand finish areas the finishing machine cannot reach.
 - .6 Surface free of all trowel marks and ridges.
- .7 Vertical Formed Surface
 - .1 Where applicable finishing of formed surfaces shall commence immediately after stripping the forms.
 - .2 All form ties and other metal items shall be removed or cut back to a depth of at least 20 mm from the surface of the concrete.
 - .3 Patch surface defects as directed by Contract Administrator.
 - .4 Unless otherwise indicated in the Schedule of Finishes all formed surfaces shall receive a smooth-form finish in accordance with CSA-A23.1.
 - .5 Vertical surfaces of curbs, walls, upstands, etc. shall receive a smooth-rubbed finish in accordance with CSA A23.1.
- .8 Schedule of finishes:
 - .1 Walls and base of new concrete drainage pits:
 - .1 Class A to CSA A23.1.
 - .2 Texture: surface to be free of all trowel marks and ridges.
 - .2 Top surface concrete repairs to receive cementitious waterproofing:
 - .1 Class A to CSA A23.1.
 - .2 Texture: surface to be free of all trowel marks and ridges.

3.5 JOINTS

- .1 Location of control and construction joints for large scale concrete repairs to be not more than 15' on-centre and matching joints in adjacent work.
- .2 Control joints and construction joints shall be formed or tooled at locations shown.
 - .1 All joints to be sawcut via specialized dry-process cutting.

- .1 Sawcut to a minimum of one 1.5" or one-quarter of the depth of the slab, whichever is greater, following initial set of concrete.
- .2 Timing of the saw cutting will vary with weather conditions however are typically completed within 1 to 4 hours after final finishing. Timing of the saw cutting will be the responsibility of the Contractor. Sawcutting 24 hours following placement will not be permitted.
- .3 Where paving abuts curbs, walls and other vertical surfaces use 12 mm asphalt impregnated fibre board.
- .4 Unless otherwise indicated, all control and construction joints to be filled with a flexible joint sealant in accordance with 07910.

3.6 CURING

- .1 Cure and protect concrete in accordance with requirements CSA A23.1.
- .2 Concrete surfaces to be cured at a minimum temperature of 10°C for the entire curing period.
- .3 Curing methods shall be in accordance with CSA A23.1 unless otherwise indicated.
 - .1 Basic curing methods shall consist of one of the following:
 - .1 polyethylene sheet;
 - .2 forms in Contract with concrete surface; or
 - .3 curing compounds to ASTM C309 at manufacturer's specified applications rates, when approved by Contract Administrator.
 - .2 Requirements for wet-curing:
 - .1 Immediately after final finishing, protect exposed surface against plastic shrinkage by means of a fog spray and/or evaporation reducer, until the concrete has enough strength to support the placement of the wetted burlap. When an evaporation reducer is used, intermittent reapplication may be required if the film evaporates before initiation of the wet cure.
 - .2 Burlap to be thoroughly presoaked by immersing it in water for a period of at least 24 hours immediately prior to placement.
 - .3 Commence wet curing with burlap and water 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 75 mm and be securely held in place without marring the concrete surface.
- .4 Curing Schedule:
 - .1 Top surface concrete repairs:
 - .1 7d at $\geq 10^{\circ}\text{C}$ and for time necessary to attain 70% of the specified strength with a **wet-curing period of not less than 3d**.
 - .2 New cast in place concrete pit:
 - .1 7d at $\geq 10^{\circ}\text{C}$ and for time necessary to attain 70% of the specified strength with a **wet-curing period of not less than 3d**.
- .5 Unless noted otherwise the curing regime shall be consistent with the Class of Exposure. Refer to related sections for curing of concrete repair materials.

3.7 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 01450 - Quality Control and as described herein.
 - .1 Testing laboratory to be certified in accordance with CSA A283.
- .2 The Contractor will pay for costs of tests via the testing cash allowance as per Section 01210 - Allowances.
- .3 Frequency and Number of Tests:
 - .1 Not less than one strength test per 50 m³ of concrete placed and not less than one test for each class of concrete placed on any one day.
 - .2 Slump and air measurements will be completed on each of the initial 3 loads of concrete per day of casting to ensure satisfactory control of the air content is established. If adequate control of air content is not established within the first 3 loads of concrete or if a test falls outside the specified limits, the testing frequency shall revert to one test per load until satisfactory control is re-established. Costs for additional testing will be the responsibility of the concrete supplier.
- .4 Contract Administrator may take additional test cylinders during cold weather concreting or when concrete quality is suspect. Cure cylinders on Site under same conditions as concrete which they represent.
- .5 Non-destructive Methods for Testing Concrete shall be in accordance with CSA-A23.2.
- .6 Inspection or testing by Contract Administrator will not augment or replace Contractor quality control nor relieve contractual responsibility.

3.8 DEFECTIVE CONCRETE

- .1 Defective concrete: cracking, spalling, scaling and concrete not conforming to required lines, details, dimensions, tolerances, 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.
- .4 Modify or replace concrete not conforming to lines, detail and elevations indicated on drawings.
- .5 Repair or replace concrete not properly placed, resulting in excessive honeycombing and other defects in critical areas of stress.
- .6 Notify Contract Administrator of proposed methods of repairing or replacing defective concrete. Methods of repairing or replacing defective concrete shall be acceptable to the Contract Administrator.

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 20 00 – Concrete Reinforcing.
- .2 Section 03 93 30 – Form and Pour

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.
 - .3 ACI RAP-4, Surface Repair Using Form-and-Pour Techniques.
 - .4 ACI RAP-6, Vertical and Overhead Spall Repair by Hand Application.
 - .5 ACI RAP-9, Spall Repair by the Preplaced Aggregate Method.
- .2 Canadian Standards Association (CSA)
 - .1 CSA- S448.1-10, Repair of Reinforced Concrete in Buildings.
- .3 International Concrete Repair Institute (ICRI)
 - .1 ICRI concrete Repair Terminology (2010 Edition).
 - .2 ICRI Guideline No. 120.1–2009, Guidelines and Recommendations for Safety in the Concrete Repair Industry.
 - .3 ICRI Guideline No. 130.1R–2009, Guide for Methods of Measurement and Contract Types for Concrete Repair Work (formerly No. 03735).
 - .4 ICRI Guideline No. 310.1R–2008, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion (formerly No. 03730).
 - .5 ICRI Guideline No. 310.2–1997, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays (formerly No. 03732).

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 EQUIPMENTS

- .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 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 Provide minimum 3 references exhibiting successful performance concrete repairs within the last 3 years.
 - .4 Site Superintendent to have a minimum of 5 years experience exhibiting successful performance in concrete restoration projects. Provide references upon request.
 - .5 Ensure all personnel involved with concrete restoration is adequately trained and familiar with the requirements of this Section.

- .2 Field Mock-ups:
 - .1 Complete a field mock-up for each type of repair. Locations to be Site determined.
 - .2 Field mock-up shall be a minimum of 2 sq.ft. and incorporate all aspects of the concrete surface preparation described in this Section. Trial repairs areas shall be chosen to include exposure of embedded reinforcing steel.
 - .3 Field mock-up areas shall be used as a standard against which subsequent work shall be judged.

Part 2 Products

2.1 EQUIPMENT

- .1 Electric or pneumatic chipping hammers are to be used for demolition within the following limits:
 - .1 Initial bulk removal of delaminated concrete above corroded reinforcing steel: maximum 30 lb. electric or pneumatic chipping hammers.
 - .2 Final removal and undercutting of reinforcing steel: maximum 15 lb. electric chipping hammers.
 - .3 Bulk removal of full depth repairs: electric or pneumatic jack hammers with weight ratings above 30 lbs. may be used [upon approval by Contract Administrator].
 - .4 Chisel-type blades are to be used for removal only. Do not use pointed chisels for removal.
 - .5 Bush-hammer bit attachments to be used to prepare all smooth concrete surfaces to receive specific surface profiles.
- .2 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 Contract Administrator in the presence of and with the assistance of the Contractor. The approximately periphery of the repair will be marked on the surface of the member and the location and extent recorded on drawings
- .2 Allow time in the Schedule for survey and inspection work carried out by the Contract Administrator ahead of repairs. Provide sufficient safe access to enable review of all areas designated for repairs.
- .3 The Contractor shall make available as required throughout the Contract labour to carry out the following under the direction of Contract Administrator:
 - .1 Identification of repairs.
 - .2 Sample chipping and/or drilling.
 - .3 Operators for access equipment.

- .4 The Contractor shall make available as required throughout the Contract equipment for the use of the Contract Administrator:
 - .1 Marking paint and chalk.
 - .2 Hammer and chain for sounding surveys.
 - .3 Tape measure.

3.2 PREPARATION

- .1 All necessary measures shall be taken to provide protection to the general public, occupants of the building.
- .2 Remove or protect all surface attachments (e.g. signs, notices, electrical fittings) from the areas to be repaired or from positions that obstruct access or which may be damaged from Work.
- .3 Carefully store items removed during the course of the works. Reinstall when restoration work is complete.
- .4 The Contractor shall make good or rectify any damage caused as a result of insufficient protection.
- .5 Provide temporary access required to facilitate Work.

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.

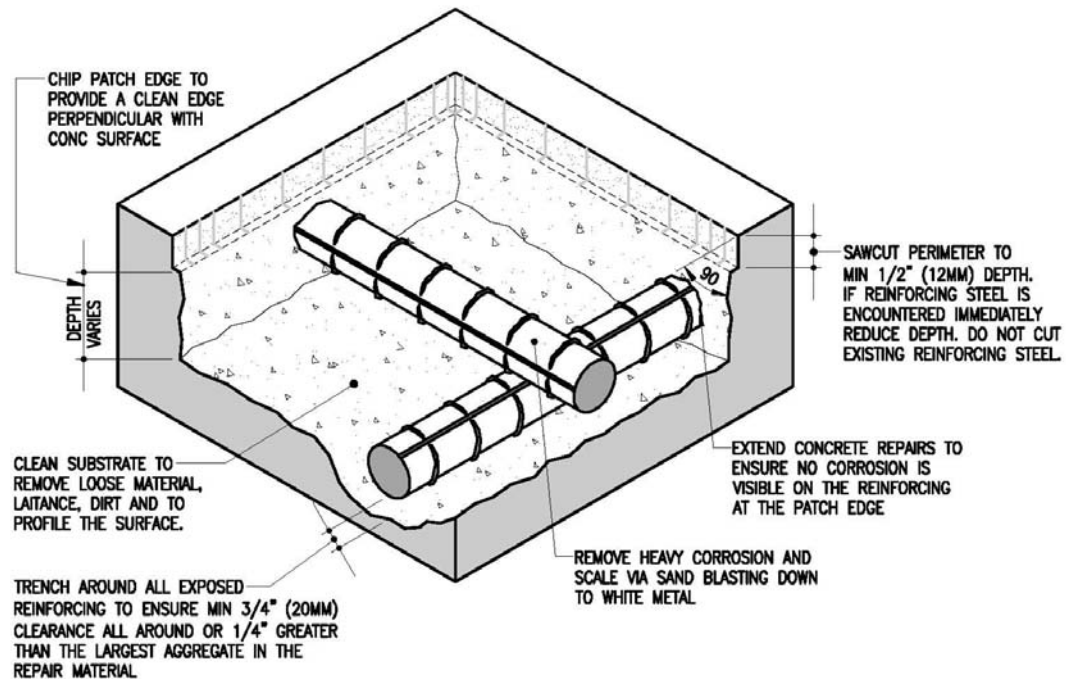
- .8 Ensure saw cut encompasses the boundaries of corrosion that have been established.
- .9 Ensure the entire area within the saw cut is removed to a depth consistent with the type of repair and repair material specified in other Sections.
- .10 Chip patch edges to provide a clean vertical edge along 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 Contract Administrator. This inspection is to be completed in the presence of the Contractor and if any further Work is required, the Contractor is to complete it immediately. The purpose of this inspection is to provide assurance to the Contract Administrator that all loose material has been removed and the substrate is sound.

3.4 SURFACE PREPARATION OF CONCRETE AND REINFORCING STEEL

- .1 Refer also to Figure 1 in this Section.
- .2 Within 24 hours prior to infilling, waterblast 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.
- .3 Surface preparation applies equally to any horizontal or vertical concrete surfaces to which the concrete is to bond.
- .4 Exposed reinforcing steel to be cleaned to near white metal and totally free of rust for the full circumference of the bar.
- .5 Secure any reinforcement which is loose by tying to other secured bars or by other methods approved by Contract Administrator.
- .6 Vacuum clean surface and/or air blast with oil free compressed air to remove residue and spent media created by surface preparation.
- .7 Maintain substrate in a clean condition using polyethylene film until the patch material is ready to be placed.
- .8 After all surface preparation is complete the Contractor shall request an inspection from the Contract Administrator to review the existing reinforcing steel. The purpose of this inspection is to provide assurance that all heavy corrosion and scale is removed from the bar. At that time, the Contract Administrator will review the condition of the reinforcing steel and determine if the addition of supplemental reinforcing steel will be required. At locations identified by the Contract Administrator, provide supplemental reinforcing steel to Section 03 20 00.

- .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.

Figure 1: Surface Preparation for Concrete Delamination Repair



3.5 FIELD QUALITY CONTROL

- .1 Coordinate Site work and inspections with Contract Administrator. Provide minimum 24 hours notice prior to each phase of the work.
- .2 Contract Administrator inspection to be completed at the following times:
- .1 Prior to demolition to identify [and quantify] repair locations and types.
 - .2 Following initial demolition to confirm all loose, deteriorated, or unsound concrete has been removed from the substrate.
 - .3 Following concrete substrate preparation to review concrete surface profile and condition of reinforcing steel.
- .3 Direct pull-out tensile tests of the substrate will be completed in accordance with CSA-A23.2-6B throughout the course of the work but not less than the following:
- .1 Prior to demolition, a minimum of three (3) direct tensile tests shall be conducted. The purpose of the testing is to provide an estimate of the insitu tensile strength of the concrete substrate. Test locations should correspond to locations which appear visibly sound as determined by hammer and chain drag soundings. Locations will be chosen by the Contract Administrator.
 - .1 Test locations will be chosen by the Contract Administrator which will correspond to locations which appear sound as determined by hammer and chain drag soundings.
 - .2 After demolition, minimum three (3) tests will be completed.

- .1 Where possible, test locations will be completed within a 5'-0" radius of the pre-demolition samples for comparison. Otherwise, test locations will be chosen by the Contract Administrator.
- .3 The tensile strength after completion of the surface preparation must be within 70% of the tests prior to demolition but not less than 1.0 MPa.
- .4 The Contract Administrator reserves the right to take additional tests if concrete substrate is suspect.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 The top surface of slabs exhibiting extensive spalling and/or delamination are to be repaired by mechanical removal of the deteriorated concrete and infilling with ready-mix concrete.
- .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 30 00 – Cast-in-Place Concrete.
- .3 Section 03 93 30 – Form And Pour Repairs

1.3 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 309R-96, Guide for the Consolidation of Concrete.
 - .2 ACI 546-04, Concrete Repair Guide.
 - .3 ACI RAP-7, Spall Repair of Horizontal Concrete Surfaces.
- .2 Canadian Standards Association (CSA)
 - .1 CSA-A3000-08, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .2 CSA-A3001-03, Cementitious Materials for Use in Concrete.
 - .3 CSA-A23.1/A23.1-09, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .4 CSA- S448.1-10, Repair of Reinforced Concrete in Buildings.
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM C260/C260M-10a, Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-07, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M-10a, Standard Specification for Chemical Admixtures for Concrete.
- .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 unit price submitted will apply to removal depths of up to a 3 inches and at no point less than 2 inches in depth into the structural slab. A second unit price must also be submitted which will apply to removal depths of up to a 6 inch depth and at no point less than 3 inches in depth.
- .4 Minimum payment for repair areas will be 1 square foot.
- .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 SUBMITTALS

- .1 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA-A23.1. Certification letter to be sealed by an engineer registered in the Province of Manitoba.
- .2 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1. Certification letter to be sealed by an engineer registered in the Province of Manitoba.

1.6 QUALITY ASSURANCE

- .1 Contractor Qualifications:
 - .1 Minimum of 10 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 (Upon Request Of Contract Administrator):
 - .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.

1.7 PROJECT CONDITIONS

- .1 Environmental Requirements:
 - .1 Ensure that substrate temperature is minimum of 10°C and remains above 10°C for entire curing period. 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.

1.8 ABBREVIATIONS

- .1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).
 - .1 Type GU or GUb - General use cement.
 - .2 Type CI - with CaO content ranging from 8 to 20%.
- .2 SCM – Supplemental cementing materials.
- .3 SSD - Saturated surface dry.
- .4 WRA – Water reducing agent.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to Site of Work and discharged not to exceed 120 minutes after batching.
 - .1 Modifications to maximum time limit must be agreed to Contract Administrator and concrete producer as described in CSA A23.1/A23.2. Deviations to be submitted for review by Contract Administrator.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 Products

2.1 MATERIALS

- .1 The concrete constituents shall comply with the following standards:
 - .1 Hydraulic cement: to CAN/CSA-A3001.
 - .2 Blended Hydraulic cement: to CAN/CSA-A3001.
 - .3 Supplementary cementing materials: to CAN/CSA-A3001.
 - .4 Water: To CSA-A23.1.
 - .5 Aggregates: to CSA-A23.1. Coarse aggregates to be normal density.
 - .6 Air entraining admixture: ASTM C260.
 - .7 Chemical admixtures: ASTM C494/C494M. Contract Administrator to approve accelerating or set retarding admixtures during cold and hot weather.

2.2 MIX REQUIREMENTS

- .1 Proportion normal density concrete in accordance with CSA-A23.1, Table 5, Alternative 1 to obtain the following performance:
 - .1 Minimum compressive strength at 28 days: 35 MPa.
 - .2 Class of exposure: C-1
 - .3 Air category: 1 (5 to 8%)

- .4 Supplemental Cementing Materials (SCM): Class CI Fly-Ash.
 - .5 Volume of SCM: Normal (less than 30% replacement).
 - .6 Nominal size of coarse aggregate: 20 mm.
 - .7 Slump at point of discharge: consistent with placement and consolidation methods, equipment, and Site conditions and as approved by Contract Administrator.
- .2 Bonding Slurry:
- .1 The bonding slurry shall consist of a cement/b grout mixed in a 1:1 ratio by weight to a maximum water/cement ratio of 0.40 in accordance with CSA-A23.1 and as follows:
 - .1 1.0 kg Type GU to CSA A3001.
 - .2 1.0 kg SSD concrete sand to CSA A23.1.
 - .3 0.40 kg Water to CSA A23.1.
 - .4 MRWRA or HRWRA to ASTM C494/C494M as required and approved by Contract Administrator.
 - .5 Volume batching will be permitted provided the volumes are calibrated by weight prior to batching. The measuring containers shall be clearly labeled, indicating material type, calibrated weight of material, and calibrated volume. The Contract Administrator reserves the right to randomly check batch weights.
 - .6 Shovel batching is strictly prohibited.
 - .2 Alternative Method: Plastic concrete from same mix utilized for overlying concrete. Scrub plastic concrete. Scrub plastic concrete into substrate with stiff bristled broom or brush to produce a uniform thickness of 1/8" over entire area. Collect and remove all coarse aggregate prior to placement of the overlay.

2.3 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, 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.
- .6 Forming:
 - .1 Unless otherwise indicated provide plywood formwork to match existing profiles.
 - .2 Install chamfers at outside corners and filets at inside corners in accordance to match existing profiles.
 - .3 Design formwork to accommodate the mass and pressure of the repair material and construction live loads.
 - .4 Securely anchor formwork to substrate. Anchors to be sized and space to prevent deflection of the forms during 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 same grout mixed to dry pack consistency. Completely fill all anchor holes.
 - .7 A minimum of 30 mm concrete cover over the primary reinforcing steel will be required, thus, an adjustment of the formwork such as a notch may be required to ensure sufficient cover.
 - .8 Use form-release agent to facilitate removal of forms from cast material.
 - .9 Test formwork for leaks. 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 Concrete to be mixed, delivered and placed in accordance with CSA-A23.1.
- .4 Transport and place concrete by pump or trolley. Note that regard to load limitations on the deck must be maintained to avoid overstressing the structural members.
- .5 Bonding Slurry Application:
 - .1 Apply the specified bonding slurry 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. Collect and remove all coarse aggregate prior to placement of the concrete.
 - .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 repair material, 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.

- .6 When concrete is placed by pump, the initial slurry used to prime the pump shall not be incorporated into the topping. The slurry shall be trapped and disposed off-Site.
- .7 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.
- .8 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.
- .9 The addition of water to increase slump is strictly prohibited. The use of a high range water reducing agent (HRWRA) may be required to aid in placement of the concrete and obtain adequate consolidation in heavily reinforced sections. Site addition HRWRA will be the responsibility of the concrete supplier.
- .10 Pour concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur. Install a construction dam or bulkhead in case of a delay longer than 60 minutes. During delays between 5 and 60 minutes, protect the end of the placement with damp burlap.
- .11 The concrete must be internally vibrated by means of standard immersion "pencil" vibrators meeting the requirements of ACI 309R. Pencil vibrators must be used in all delamination areas.
- .12 Vibrate repair material to ensure proper consolidation.
- .13 Continuously consolidate and finish to matching elevations, ensuring patch thickness and required elevations are maintained.
- .14 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 floated to close and smooth the surface to required finish.
- .2 Provide a smooth textured surface to match existing free of trowel marks.
- .3 Apply evaporation retardant at manufacturers recommended coverage rate immediately following final finishing. Do not apply evaporation retardant during any finishing operation nor should it be worked into the surface.
- .4 Protect freshly placed concrete from exposure to dust, debris and precipitation.

3.4 CURING

- .1 Concrete repairs to be cured for a minimum of 7 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.
- .7 Upon removal of forms, apply two coats curing compound in accordance with manufacturer's specifications. Apply the first coat immediately upon removal of forms. Apply the second coat about 24 hours later.

3.5 JOINTS

- .1 Tool in or "Soff-Cut" joints at locations match existing. Upon minimum 28 day cure, re cut joints to match existing but not less than 1/4" wide x 1/4" deep, prepare surface, prime, install bond breaker or backing rod, and continuous bead of sealant. Refer to Section 07 92 10.
- .2 Following a minimum 28 day cure, re cut perimeter joints to 1/8" wide x 1/8" deep. Clean joints, and infill with approved epoxy resin in accordance with manufacturer's recommendations.

3.6 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 The Contractor will pay for costs of tests via the testing cash allowance as per Section 01 2 10 - Allowances.
- .3 Not less than one test per 50 square feet of patching material placed and not less than one test for each day of placement.
- .4 Direct pull-out tensile tests to determine bond strength will be completed upon Contract Administrator request throughout the course of the work.
- .5 Testing agency to submit copies of concrete test reports directly to Contract Administrator and Contract Administrator.
- .6 Inspection or testing by Contract Administrator will not augment or replace Contractor quality control nor relieve Contractual responsibility.

3.7 DEFECTIVE CONCRETE

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

- .2 Repair or replacement of defective concrete will be determined by the Contract Administrator, based on the specifications and the above guidelines.
- .3 Do not patch, fill, touch up, repair or replace exposed concrete except upon express direction of 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.
- .3 Section 03 92 10 – Concrete Top Surface Repairs With Ready Mix Concrete.
- .4 Section 07 92 10 – Concrete Joint Sealants.

1.3 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 546-04, Concrete Repair Guide.
 - .2 ACI RAP-4, Surface Repair Using Form-and-Pour Techniques.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM C109/C109M-08, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. (50-mm) Cube Specimens).
 - .1 ASTM C309-03, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .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 unit price submitted will apply to removal depths of up to a 3 inches and at no point less than 2 inches in depth. A second unit price must also be submitted which will apply to removal depths of up to a 6 inch depth and at no point less than 2 inches in depth.
- .4 The minimum area of payment will be one (1) square foot.
- .5 The fix price submitted will apply to all removal and replacement areas 1 foot beyond the perimeter of the trench drain in place.
- .6 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:
 - .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 (Upon Request Of Contract Administrator):
 - .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 concrete constituents shall comply with the following standards:
 - .1 Hydraulic cement: to CAN/CSA-A3001.
 - .2 Blended Hydraulic cement: to CAN/CSA-A3001.
 - .3 Supplementary cementing materials: to CAN/CSA-A3001.
 - .4 Water: To CSA-A23.1.
 - .5 Aggregates: to CSA-A23.1. Coarse aggregates to be normal density.
 - .6 Air entraining admixture: ASTM C260.
 - .7 Chemical admixtures: ASTM C494/C494M. Contract Administrator to approve accelerating or set retarding admixtures during cold and hot weather.

2.2 MIX REQUIREMENTS

- .1 Proportion normal density concrete in accordance with CSA-A23.1, Table 5, Alternative 1 to obtain the following performance:
 - .1 Minimum compressive strength at 28 days: 35 MPa.
 - .2 Class of exposure: C-1
 - .3 Air category: 1 (5 to 8%)
 - .4 Nominal size of coarse aggregate: 20 mm.
 - .5 Slump at point of discharge: consistent with placement and consolidation methods, equipment, and Site conditions and as approved by Contract Administrator.
- .2 Bonding Slurry:
 - .1 The bonding slurry shall consist of a cement/sand grout mixed in a 1:1 ratio by weight to a maximum water/cement ratio of 0.40 in accordance with CSA-A23.1 and as follows:
 - .1 1.0 kg Type GUbSF to CSA A3001.
 - .2 1.0 kg SSD concrete sand to CSA A23.1.
 - .3 0.40 kg Water to CSA A23.1.
 - .4 MRWRA or HRWRA to ASTM C494/C494M as required and approved by Contract Administrator.
 - .5 Volume batching will be permitted provided the volumes are calibrated by weight prior to batching. The measuring containers shall be clearly labeled, indicating material type, calibrated weight of material, and

calibrated volume. The Contract Administrator reserves the right to randomly check batch weights.

- .6 Shovel batching is strictly prohibited.
- .2 Alternative Method: Plastic concrete from same mix utilized for overlying concrete. Scrub plastic concrete. Scrub plastic concrete into substrate with stiff bristled broom or brush to produce a uniform thickness of 1/8" over entire area. Collect and remove all coarse aggregate prior to placement of the overlay.

2.3 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.
- .2 Sealants: to Section 07 91 20.

2.4 FINISHES

- .1 Materials
 - .1 Paint materials for each coating formulae to be products of a single manufacturer.
 - .2 Provide specified, approved paint, finish materials.
 - .3 Provide linseed oils, shellacs, turpentine, etc. of pure grade, highest quality.
- .2 Acceptable Products
 - .1 Specified manufacture: Sherwin Williams.
 - .2 Acceptable manufacturers, using equal quality, performance products subject to Contract Administrator approval:
 - .1 Pratt & Lambert Inc.
 - .2 Glidden Paint Co.
 - .3 Canadian Pittsburgh Industries.
- .3 Acceptable Systems
 - .1 Surface preparation: in accordance with manufacturer's recommendations.
 - .2 Acceptable materials: S-W Duration Exterior Latex Acrylic Satin Coating
- .4 Colour by: to match existing.

Part 3 Execution

3.1 PREPARATION

- .1 Protection: Protect adjacent Work areas and finish surfaces from damage during repair mortar application.
- .2 Surface Preparation:
 - .1 Complete concrete delamination repairs to 03 91 10 – Surface Preparation for Concrete Delamination Repairs.

- .3 The repair area must be thoroughly cleaned and well soaked prior to infilling. The surface should be thoroughly wetted for a period of not less than two (2) hours. The repair areas shall be kept continuously wet until just before infilling. Any standing water must be removed prior to grouting.
- .4 Maintain the substrate in a saturated, surface-dry (SSD) condition with no surface water, and concrete that is turning from dark to light.
- .5 Forming:
 - .1 Unless otherwise indicated provide plywood formwork to match existing profiles.
 - .2 Install chamfers at outside corners and filets at inside corners in accordance with Section 03 10 00 or to match existing profiles.
 - .3 Design formwork to accommodate the mass and pressure of the repair material.
 - .4 Securely anchor formwork to substrate. Anchors to be sized and space to prevent deflection of the forms placement and curing.
 - .5 Construct forms to fit tightly against existing concrete surfaces. Seal around edge of formwork with sealant to prevent leakage during grouting.
 - .6 Anchors shall be completely removable. All anchor holes shall be patched with grout mixed to dry pack consistency. Completely fill all anchor holes.
 - .7 Placement openings or chutes are required to place the repair material behind vertical forms. Chutes should be constructed to permit development of a hydraulic head above the prepared upper edges of the concrete surface. This will provide for repair material supply into these upper horizontal zones after concrete is consolidated.
 - .8 For large, vertical surfaces exceeding 10 ft (3 m) in height, multiple lifts should be considered to reduce free-fall segregation and excessive formwork pressures.
 - .9 Formwork for overhead surfaces does not require openings for placement of repair materials. Place repair materials through openings in the slab from above. Size and location of openings to be approved by Contract Administrator. Do not remove or cause damage to existing reinforcing steel in order to install placement openings.
 - .10 A minimum of 30 mm concrete cover over the primary reinforcing steel will be required, thus, an adjustment of the formwork such as a notch may be required to ensure sufficient cover.
 - .11 Provide drainage outlets in formwork for presoaking and, if beneath a soffit, provide air venting. Provide suitable access points to pour mixed repair mortar into place.
 - .12 Use form-release agent to facilitate removal of forms from cast material.
 - .13 Within two (2) hours immediately prior to placement of repair material, test formwork to determine watertightness. Completely fill formwork with clean water and let stand for not less than 15 minutes. Any areas of leakage are to be sealed prior to placement of repair material. Re-test as required.

3.2 INFILLING PROCEDURES

- .1 Obtain 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 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.
- .3 Upon removal of forms, apply two coats curing compound in accordance with manufacturer's specifications. Apply the first coat immediately upon removal of forms. Apply the second coat about 24 hours later.

3.4 FINISHING

- .1 After stripping of formwork, any spaces not filled should be trimmed, cleaned, and dry-packed with grout to the desired profile. Do not proceed with repairs without Contract Administrators written approval.
- .2 Prepare surface and paint to match existing.

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 The Contractor will pay for costs of tests via the testing cash allowance as per Section 01 2 10 - Allowances.
- .3 Not less than one test per 50 square feet of patching material placed and not less than one test for each day of placement.
 - .1 Test samples to be prepared by a CSA certified laboratory in accordance with ASTM C109.
- .4 Direct pull-out tensile tests to determine bond strength will be completed throughout the course of the work but not less than the following:
 - .1 Not less than three (3) tests will be completed over the course of repairs.
 - .2 The Contract Administrator reserves the right to take additional bond tests if concrete or bonding system is suspect.

- .3 Infilling of the core hole will be the responsibility of the General Contractor. Unless otherwise directed by the Contract Administrator, repair in accordance with this Section or Section 03 93 10.
- .5 Testing agency to submit copies of concrete test reports directly to City Of Winnipeg and Contract Administrator.
- .6 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 Specification to detail all installation, storage & field welding of metal fabrications as appropriate. Metal fabrications to be fabricated by the City of Winnipeg.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A53/A53M-02, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A269-02, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A307-02, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-92, Ready-Mixed, Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16.1-01, Limit States Design of Steel Structures.
 - .4 CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-1989(R2001), Welded Steel Construction (Metal Arc Welding) (Imperial Version).
- .4 The Environmental Choice Program
 - .1 CCD-047a-98, Paints, Surface Coatings.
 - .2 CCD-048-98, Surface Coatings - Recycled Water-borne.

1.3 QUALITY ASSURANCE

- .1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

- .2 Storage and Protection:
 - .1 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to Site.
 - .2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

Part 2 Products

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W.
- .2 Welding materials: to CSA W59.
- .3 Welding electrodes: to CSA W48 Series.
- .4 Bolts and anchor bolts: to ASTM A307.
- .5 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Where possible, fit and shop assemble work, ready for erection.
- .3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CAN/CSA-G164.
- .2 Shop coat primer: to CAN/CGSB-1.40.
- .3 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.4 SHOP PAINTING

- .1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .3 Clean surfaces to be field welded; do not paint.

2.5 TRENCH COVERS AND FRAMES

- .1 Existing trench cover plate set in L2 ½"x2 ½"x1/4" frame. Include 18" diameter Nelson Stud anchors at 18" on centre for embedding in concrete.

- .2 Finish: galvanized.

Part 3 Execution

3.1 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .4 Provide components for building by other sections in accordance with shop drawings and schedule.
- .5 Make field connections with bolts to CAN/CSA-S16.1, or weld.
- .6 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .7 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .8 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 - General

1.1 SUMMARY

1. Section Includes:
 1. Patch waterproofing repairs of process piping trench walls and base as required.
 2. Waterproofing new drainage pit walls and base.
2. Related Sections:
 1. Section 03 30 00 – Cast-in-Place Concrete.

1.2 QUALITY ASSURANCE

1. Contractor Qualifications: Company with minimum of 5 years experience in application of specified products and systems on projects of similar size and scope, and is acceptable to product manufacturer.
 1. Successful completion of a minimum of 3 projects of similar size and complexity to specified Work.
2. Field Sample:
 1. Install at Site in sample location to demonstrate bond to existing substrate and to existing cementitious waterproofing.
 2. Apply material in strict accordance with manufacturer's written application instructions.
 3. Field sample will be standard for judging workmanship on remainder of Project.
 4. Maintain field sample during construction for workmanship comparison.

1.3 DELIVERY, STORAGE, AND HANDLING

1. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
2. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
3. Transport and store in unopened containers and keep in clean, dry condition protected from rain, dew, and humidity. If dry onSite storage of bags is unavailable or if Project is located in a very wet, humid climate zone, purchase product in manufacturer's packaged metal pails.
4. Do not stack bags more than 2 pallets high.
5. Store MasterEmaco A660 in similar conditions. Do not allow MasterEmaco to freeze.

PART 2 - Products

2.1 MATERIALS

1. Portland-cement based coating for concrete and masonry that resists both positive and negative hydrostatic pressure.
2. Performance Requirements: Provide patching material complying with the following requirements:

1. Service temperatures: Immersion, up to 140 degrees F (60 degrees C); cleaning water, up to 200 degrees F (93 degrees C); dry air, up to 220 degrees F (104 degrees C).
2. VOC: 0 lbs/gal (0 g/L) less water and exempt solvents.
3. Initial Set, minutes at 70 degree F (21 degree C), 50 percent relative humidity: 10 minutes per Lab Method.
4. Final Set, minutes at 70 degree F (21 degree C), 50 percent relative humidity: 90 minutes per Lab Method.
5. Density (cured): 129 pounds per foot (2,080 kg/m) per Lab Method.
6. Positive resistance to hydrostatic pressure, hrs, at 200 psi (1.4 MPa), 461 head feet, air cured at 70 degree F (21 degree C) 50 percent relative humidity: 752 (No leakage, no softening) per CRD C 48, modified.
7. Negative resistance to hydrostatic pressure, hours, at 200 psi (1.4 MPa), 461 head feet, air cured at 70 degree F (21 degree C) 50 percent relative humidity: 664 (Limited dampness) per CRD C 48, modified.
8. Potable water (direct contact): Suitable approved per BS6920 (British standard), NSF Standard 61.
9. Water absorption, boiling water submersion at 24 hour: 3.6 percent per ASTM C 67 (Section 7.3).
10. Compressive strength, ASTM C 109:
 - a. 7 days: 4,200 psi (29 MPa)
 - b. 28 days: 6,030 psi (42 MPa)
11. Flexural strength, ASTM C 348:
 - a. 7 days: 360 psi (2.5 MPa)
 - b. 28 days: 1,027 psi (7 MPa)
12. Tensile strength, ASTM C 190:
 - a. 7 days: 250 psi (2 MPa).
 - b. 28 days: 440 psi (3 MPa).
13. Modulus of elasticity, ASTM C 469, 28 days: 2.72×10 to the 6th psi (1.87×10 to the 4th MPa).
14. Artificial weathering, hrs:
 - a. Xenon Arc: 5,000 = No failure per ASTM G 26.
 - b. Carbon Arc: 500 = No failure per ASTM G 23.
15. Adhesion strength, Test by tensile bond: 418 psi (2.9 MPa).
16. Artificial weathering, Atlas Type DMC weatherometer: No cracking, loss of adhesion, checking or other defect.
17. Freeze/thaw resistance, 200 cycles: No change per ASTM C 666 (Procedure B).
18. Salt spray resistance, 300 hours: No defect per ASTM B 117.
19. Carbon Dioxide (CO₂), 1/16 inch (1.6 mm) per Lab Method Diffusion. Equivalent to 3/4 inch (19 mm) new concrete.
20. Permeance:
 - a. Perms: 12 (0.10698) per ASTM E 96
 - b. Metric permeability 18×10 to the 3rd resistance (water-vapor transmission) per Swedish standard SS-02-15-82.
21. Wind-driven rain, hrs: 8 = excellent per Fed. Spec. TT-P-0035 (Para 4.4.7).
22. Coefficient of thermal expansion in/in/degree F (mm/mm/degree C), at 28 days: 6.99×10 to the minus 6th (5×10 to the minus 7th) per ASTM C 531.
23. Impact strength (Gardener impact tester): No chipping per Fed. Spec. TT-P-0035 (Cement paints paragraph 3.4.8)

24. Hardness, (Barber Coleman Impressor) Requirement min = 30, max = 60 (para 4.4.9) Fed. Spec. TT-P-0035:
 - a. 7 days: 35.
 - b. 14 days: 47.
 - c. 21 days: 52.
 25. Abrasion resistance 3,000 L sand: Passed per Fed. Spec. TT-P-141B.
 26. Reflectance ASTM D 2244 using Hunterlab D-25 meter:
 - a. Gray Thoroseal: 64.2.
 - b. White Thoroseal: 88.1.
 27. Fungus resistance at 21 days: No growth; meets all requirements of Fed. Spec. TT-P-29B.
 28. Surface burning characteristics per ASTM E 84:
 - a. Flame Spread: 0.
 - b. Smoke developed: 5.
 29. Fire Propagation Flame spread: Index = 1.5, Class 1 per BS476: Part 6:1981, BS476: Part 7:1971.
3. Acceptable Products:
1. Cementitious Waterproofing: BASF MasterSeal 581 (formerly Thoro Thoroseal) with BASF MasterEmaco A660 (formerly Acryl 60) additive.
 2. Waterstop Material: BASF MasterSeal 590 (formerly Thoro Waterplug).

2.2 MIXING

1. Mix material per manufacturer instructions allowing material to rest 10 minutes before remixing and application.
2. Color:
 1. Standard Gray.

PART 3 - Execution

3.1 SURFACE PREPARATION

1. Ensure that substrates are sound and free of dust, dirt, laitance, paints, oils, grease, curing compounds, and other contaminants.
2. Ensure substrate has properly cured. Concrete repairs should obtain 80 percent of design strength. If efflorescence is present, mechanically remove it before proceeding. For extreme cases where this is not adequate, contact Technical Service.
3. Patch holes and cracks before installation.
4. Bush-hammering followed by waterblast all surfaces to minimum ICRI-CSP-3 profile to receive cementitious waterproof coating.

3.2 APPLICATION - GENERAL

1. Spray, back-brush, or broom applications of first coat to fill voids and achieve uniformity.
2. Completely dampen substrate with water before starting application. Do not saturate substrate. Keep substrate cool and damp throughout application.

3. Work first coat thoroughly into substrate to completely fill and cover voids, holes, and nonmoving cracks.
4. Allow to cure 24 hours, then apply second coat and finish with vertical stroke.

3.3 ABOVE GRADE WITH POSITIVE SIDE WATER PRESSURE APPLICATION

1. Typical Application:
 1. First Coat: 2 pounds per square yard (1.1 kg/sm) = 225 square feet per 50 pound bag (20.9 sm/22.7 kg bag).
 2. Second Coat: 1 pounds per square yard (0.54 kg/m²) = 450 square feet per 50 pound bag (41.8 sm/22.7 kg bag)
 3. Total: 3 pounds per square yard (1.6 kg/sm), cured nominal thickness of 1/16 inch (1.6 mm).

3.4 CLEANING

1. Clean waterproofing material from tools and equipment with water. Remove cured materials mechanically.
2. Clean up and properly dispose of debris remaining on Site related to application.
3. Remove temporary coverings and protection from adjacent Work areas.

3.5 PROTECTION

1. Protect system from damage during construction.

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 30 00 – Cast-in-Place Concrete.
- .2 Section 03 92 10 – Top Surface Repairs with Ready-Mix Concrete.
- .3 Section 03 93 30 – Form and Pour.

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.

1.4 MEASUREMENT PROCEDURES

- .1 Existing joints removed during course of repair and 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.
- .2 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 Comply with Section 01 33 00.
- .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.
- .2 Field Mock-Ups:
 - .1 Perform mock-up of required sealant Work at location identified by the Contract Administrator. Perform minimum of one mock-up for each different combination of substrates to be sealed.
 - .2 Install mock-ups and test in presence of sealant manufacturer's authorized representative and Contract Administrator to assure installation procedures are consistent with warranty requirements and Specifications.
 - .3 After sealant has achieved sufficient cure the Contract Administrator will conduct adhesion pull-tests, or non-destructive testing, at discretion of the Contract Administrator. Conduct tests per ASTM C1521.
 - .4 Leave approved mock-ups in place to establish standards and guidelines for acceptable installation of sealant Work and acceptable appearance.

1.7 DELIVERY STORAGE AND HANDLING

- .1 The sealant shall be delivered to the Site in the manufacturer's original unopened
- .2 Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number. Provide Material Safety Data Sheets for each product.
- .3 Store products in a location protected from freezing, damage, construction activity, precipitation, and direct sunlight per manufacturer's recommendations.
- .4 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 to ASTM C920, Type M, Grade NS, Class 25, Use T. Acceptable products:
 - .1 Sikaflex 2C/NS by Sika Canada Inc.

- .2 SL2 (Slope Grade) by BASF Building Systems.
- .2 Type II: Two-component polyurethane joint sealant for routing and caulking of random cracks 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 Sonoguard NP2 by BASF Building Systems.
- .3 Type III: Silicone joint sealant for use in control joints: Low-modulus, one-component, non-sag, silicone 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 S, Grade NS, Class 100/25, Use T, A, M, and O.
 - .2 Acceptable product: NS Parking Structure Sealant by Dow Corning.

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.

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 Sawcut reglet along cracks and joints identified by Contract Administrator.
- .2 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.
- .3 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.
- .4 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.
- .5 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.
- .6 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.
- .7 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.
- .8 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 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.
 - .4 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.
 - .5 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.
 - .6 Do not use sealant that has started to set in its container, exceeded shelf life or installation times as stated by the manufacturer.
 - .7 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.
 - .8 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.
 - .9 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.
 - .10 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.
 - .11 Sealant bead to be free of air pockets, embedded impurities, and free of ridges, wrinkles and sags.

- .12 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 complete at the discretion of the Contract Administrator.
- .2 Field adhesion testing will be performed during the field mockup and throughout the course of the work by the Contract Administrator in the presence of and with the assistance of the Contractor and be completed throughout the course of the work. 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 A minimum three (3) field adhesion tests will be completed for each type of sealant used for the first 500 lineal feet and two (2) tests per 500 lineal feet thereafter.
- .4 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 3" long, along both sides of the joint.
 - .3 Place a 1" mark on the sealant tab.
 - .4 Grasp the 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.

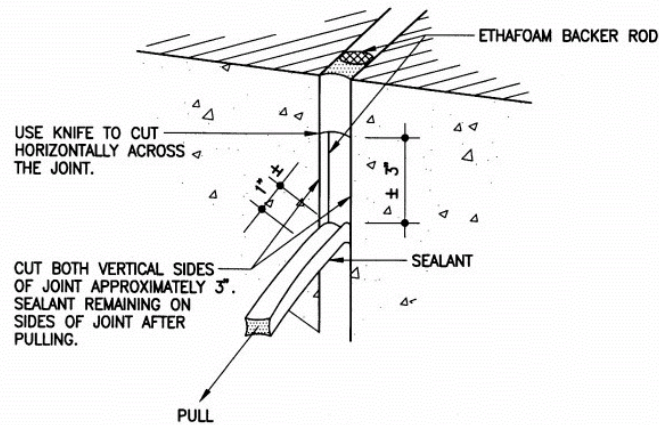


FIGURE 1.1 HAND PULL TEST

- .5 Field adhesion test criteria:
 - .1 Dow Corning NS: the sealant should tear cohesively within itself or elongate the 1" gauge length to 3" (300% extension) before releasing from either substrate adhesively.
 - .2 Urethane Sealants: the sealant should tear cohesively within itself without bond loss.
- .6 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.
- .7 This testing will be completed by the Contract Administrator in the presence of and with the assistance of the Contractor and results recorded by the Contract Administrator, retained and made available for review upon request. A sample log form has been appended with this specification.
- .8 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