

PROJECT TITLE

LaSalle Causeway Concrete Repairs  
EQ754-2221279/A

**Amendment No.5, dated 2021-10-27**QUESTIONS AND ANSWERS

1. Item 32 Concrete in parapet quantity of 4m3 appears incorrect considering Item 16 Concrete in Barrier OPSD 911.130 -17m covers all the barrier required for this job except the parapet portion.

**Answer:** The quantities for items 16 and 32 are correct.

2. Item 34 Concrete patch Repairs Deck Soffit and Fascia Qty 1m2 is for the full depth bridge overhang replacement drawing S03 and is not for other areas of repairs on the soffit or fascia.

**Answer:** Item 34, relates to the work identified on Drawing S03.

3. Please confirm payment item for stainless steel reinforcing found in the parapet walls.

**Answer:** Unit Price Item 28 includes the tonnage of both Stainless and Black Steel. Tonnage of Stainless Steel is 2.6 t.

4. Updates to the followings specifications as attached.

**Section 02 41 13 Selective Site Demolition**  
**Section 03 30 00 Cast in Place Concrete**  
**Section 31 23 33.01 Excavating, Trenching and Backfilling**  
**Section 32 16 15 Concrete Walks, Curbs and Gutters**  
**Section 34 71 13.01 Vehicle Concrete Barriers**

5. Update to Appendix 1 - R.101343.040 Combined Price Table as attached

**Answer:** Changed description of item 16. **NO** changes to estimated quantities

6. Fisheries and Oceans Canada (DFO) – As attached

**Answer:** Approval to conduct in-water work prior to March 15, 2022.

**Part 1 General**

**1.1 PRICE AND PAYMENT PROCEDURES**

- .1 There will be no measurement for work associated with this section.
- .2 Payment for work associated with this section is included in the Lump Sum Price.

**1.2 SUMMARY**

- .1 Elements to demolish or remove are shown on the contract drawings. They include but are not limited to:
  - .1 Excess concrete/blockage in cast iron pipe between CB5 and CB6.
  - .2 Post anchorage at the east end of the south roadside barrier of the Bascule Bridge.
  - ~~.3 Full depth concrete removal of the east approach slab of the Bascule Bridge and granular fill beneath slab.~~
  - ~~.4 Full depth concrete removal of sections of concrete slab at west Bascule Bridge approach.~~
  - ~~.5 Removal of sidewalk and curb east of CB6.~~
  - ~~.6 Removal of sidewalk and curb at south end of east Bascule Bridge approach.~~
  - ~~.7 Partial depth concrete removals of concrete stairs and slab around control room and machine room slab soffit.~~
  - ~~.8 Railing around control room.~~
  - ~~.9 Steel beam guiderails at Bascule Bridge approaches.~~
  - ~~.10 Partial depth concrete removals of the sidewalk and south deck soffit fascia and cantilever at East Bridge.~~
  - ~~.11 Partial depth concrete removals of the concrete apron at West Wharf.~~
  - .12 Full depth concrete removal of sections of concrete slab at West Wharf and granular fill beneath slab.
  - .13 Core through footing at West Wharf.
  - .14 Full depth removal of sections of asphalt and granular base at West Wharf.**
  - .15 Removal of granular fill beneath east and west approach slabs of Bascule Bridge.
  - ~~.16 Removal of concrete curb at west side of East Wharf entrance.~~

**1.3 RELATED REQUIREMENTS**

- .1 Section 02 81 00 – Hazardous Materials

**1.4 REFERENCES**

- .1 Definitions:
  - .1 Demolition: selective removal of components following removal of hazardous materials.

- .2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly.
- .3 Waste Audit (WA): detailed inventory of materials in building. Indicates quantities of reuse, recycling and landfill.
- .4 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.
- .2 Reference Standards:
  - .1 Canadian Environmental Protection Act (CEPA) 1999
  - .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
    - .1 Safety Data Sheets (SDS).
  - .3 OPSS.PROV 928 April 2012, Construction Specification for Structure Rehabilitation – Concrete Removal
  - .4 Transport Canada (TC)
    - .1 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

## **1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Hazardous Materials:
  - .1 Provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.
- .3 Waste Reduction Workplan:
  - .1 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 19 and indicate:
    - .1 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.
    - .2 Schedule of selective demolition.
    - .3 Number and location of dumpsters.
    - .4 Anticipated frequency of tippage.
    - .5 Name and address of haulers, waste facilities, waste receiving organizations.
- .4 Certificates:
  - .1 Submit certified bills of lading, receipts from authorized disposal sites and reuse and recycling facilities for material removed from site upon request of Departmental Representative.
  - .2 Written authorization from Departmental Representative is required to deviate from receiving organizations listed in Waste Reduction Workplan.

## **1.6 QUALITY ASSURANCE**

- .1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, TDGA and applicable Provincial regulations.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Store and manage hazardous materials in accordance with Section 01 35 43.
- .2 Storage and Protection.
  - .1 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to Departmental Representative.
  - .2 Remove and store materials to be salvaged, in manner to prevent damage.
  - .3 Store and protect in accordance with requirements for maximum preservation of material.
  - .4 Handle salvaged materials as new materials.
- .3 Develop Waste Reduction Workplan related to Work of this Section
- .4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 19.

## **1.8 SITE CONDITIONS**

- .1 Site Environmental Requirements.
  - .1 Perform Work in accordance with Section 01 35 43.
  - .2 Ensure Work does not adversely affect adjacent mechanical/electrical systems, watercourses, or contribute to excess air and noise pollution.
  - .3 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum-based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
    - .1 Ensure proper disposal procedures are maintained throughout the project.
  - .4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
  - .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities and as directed by Departmental Representative.
  - .6 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .2 Existing Conditions.
  - .1 Should materials resembling spray or trowel applied asbestos or other designated substance listed as hazardous be encountered in unexpected areas during deconstruction, stop work, take preventative measures, and notify Departmental Representative immediately. Do not proceed until written instructions have been received.
  - .2 Remove contaminated or hazardous materials as defined by authorities having jurisdiction and as directed by Departmental Representative from site, prior to

start of demolition Work, and dispose of at designated disposal facilities in safe manner in accordance with TDGA and other applicable regulatory requirements.

- .3 List of hazardous materials:
  - .1 Bird droppings (possible).
  - .2 Silica presumed to be present in all existing concrete.
  - .3 Asbestos may be present in embedded utility ducts in sidewalks.
- .3 List items to be salvaged for reuse:
  - .1 Frame and grate cover at CB6.
  - .2 Timber sidewalk planks at the east end of the Bascule Bridge.
  - .3 Pedestrian railing at the south end of the east approach of the Bascule Bridge.
  - .4 South sidewalk expansion joint cover plate of the East Bridge.
  - .5 Steel stairway and anchorages at the southeast corner of the Control Room.

## **Part 2 Products**

### **2.1 EQUIPMENT**

- .1 Equipment and heavy machinery used to meet or exceed all applicable emission requirements.
- .2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.
- .3 Air hammers shall be hand-held and meet the following requirements:
  - .1 Chipping hammers shall have a maximum weight of 9.0 kg prior to any handle modification and a maximum piston stroke of 102 mm.
  - .2 Jack hammers shall have a maximum weight of 14.0 kg.
  - .3 All hammers shall have the manufacturer's name and part or model number engraved on them by the manufacturer. All information must be clearly legible.
- .4 The manufacturer's published specifications shall be the sole basis for determining weight and piston stroke.

## **Part 3 Execution**

### **3.1 DECONSTRUCTION**

- .1 Reuse of Structural Elements: this project has been designed to result in end of project rates for reuse of structural elements as follows: Do not demolish structural elements beyond what is indicated on drawings without approval by Departmental Representative.

### **3.2 SITE VERIFICATION OF CONDITIONS**

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

- .2 Investigate site and structure to determine dismantling, processing and storage logistics required prior to beginning of Work.
- .3 Develop strategy for deconstruction to facilitate optimum salvage of reusable and recyclable materials.

### **3.3 PREPARATION**

- .1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Disconnect and re-route if necessary electrical, telephone and communication service lines entering elements to be deconstructed. Post warning signs on electrical lines and equipment which will remain energized to serve other products during period of demolition.
- .3 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
  - .1 There are utilities immediately to the north and south of the Bascule Bridge for the full length of the bridge and in the abutments.
  - .2 There are utilities embedded in the south sidewalks of the East Bridge and West Bridge and the approach sidewalks of the Bascule Bridge.
- .4 Notify and obtain approval of utility companies before starting demolition.

### **3.4 REMOVAL OF HAZARDOUS WASTES**

- .1 Prior to start of deconstruction work remove contaminated or hazardous materials listed from site and dispose of at designated disposal facilities in safe manner in accordance with TDGA and other applicable regulatory requirements, in accordance with Section 02 81 00.

### **3.5 REMOVAL OPERATIONS**

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
  - .1 There is currently a post-tensioned tie-back rod installed along the top of the east abutment and approximately 1.7 m beneath the east approach slab of the Bascule Bridge that is to remain in place during the Work. Take necessary precautions during removal of granular fill in the vicinity of the tie-back rod and anchorage recess.
    - .1 Contractor Superintendent to supervise the removal work at the Bascule Bridge east approach on a full-time basis to ensure that no damage is caused to the post-tensioned anchorage as a result of the Contractor's removal operations.
    - .2 There are tie-back rods located within the West Wharf. Contractor to locate and protect tie-back rods from damage during all stages of the work.
- .3 Concrete demolition to be performed according to OPSS.PROV 928. Saw cut perimeter to 25mm depth.

- .1 Follow OPSS.PROV 928 requirements for Concrete Removal – Full Depth for the:
  - .1 east approach slab of Bascule Bridge;
  - .2 sections of concrete slab at west approach of Bascule Bridge
  - .3 sidewalk and curb east of CB6;
  - .4 sidewalk and curb adjacent to the east approach slab of Bascule Bridge; and
  - .5 concrete slab of West Wharf.
- .2 Follow OPSS.PROV 928 requirements for Concrete Removal – Partial Depth - Type A for the:
  - .1 concrete slab over CB6;
  - .2 concrete stairs and slab around the control room; and
  - .3 East Bridge south sidewalk.
- .3 Follow OPSS.PROV 928 requirements for Concrete Removal – Partial Depth - Type B for the:
  - .1 Bascule Bridge machine room slab soffit; and
  - .2 East Bridge south deck soffit fascia and cantilever.
- .4 Follow OPSS.PROV 928 requirements for Concrete Removal – Partial Depth Type C for the concrete apron below the masonry retaining wall at the West Wharf.
- .5 Take necessary precautions during removal of concrete above embedded utility ducts in sidewalks. Concrete removal equipment shall be limited to chipping hammers (i.e., no jack hammers) and hand tools when removing concrete near utility ducts.
- .6 The existing joint seal and armouring angles at the East Bridge are to remain in place during the Work. Concrete removal equipment in the vicinity of the expansion joint over the pier is to be limited to chipping hammers (i.e., no jack hammers) and hand tools.
- .4 Disposal of Material:
  - .1 Dispose of materials not designated for salvage or reuse on site at authorized facilities approved in Waste Reduction Workplan and as instructed by Departmental Representative.
- .5 Provide adequate access to facilitate, determine location and extent of repair, performance of the work and inspection of the work by the Departmental Representative.

### **3.6 RESTORATION**

- .1 Restore areas and existing works outside areas of demolition to conditions that existed prior to beginning of Work.
- .2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

**3.7 CLEANING**

- .1 Progress Cleaning:
  - .1 Clean in accordance with Sections 01 74 00 and 01 77 00.
  - .2 Leave Work area clean at end of each day.
  - .3 Remove debris, trim surfaces and leave work site clean, upon completion of Work
  - .4 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 77 00.
- .3 Waste Management: separate waste materials for reuse, recycling in accordance with Section 01 74 19.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 03 10 00 – Concrete Forming and Accessories.
- .2 Section 03 20 00 – Concrete Reinforcing.
- .3 Section 03 37 26 – Underwater Placed Concrete.
- .4 Section 34 71 13.01 – Vehicle Concrete Barriers.

**1.2 PRICE AND PAYMENT PROCEDURES**

- .1 All work relating to the following items will be paid based on the actual quantities measured on site and unit price quoted in the Bid and Acceptance Form and include all costs to complete the work as detailed on the contract documents.
  - .1 Measure the following cast-in-place concrete items in cubic metres calculated from neat dimensions as indicated. Concrete placed beyond dimensions indicated not measured.
    - .1 Concrete in Sidewalks.
    - ~~.2 Concrete in Barrier Walls.~~
    - .3 Concrete in Parapet Walls.
    - .4 Concrete in Barrier and Parapet Wall Footings.
    - ~~.5 Concrete Patch Repairs (Deck Soffit & Fascias).~~
    - .6 Concrete in Control Room Stairs & Base Slab.
    - .7 Concrete in Approach Slabs.
    - ~~.8 Tremie concrete.~~
  - .2 Measure the following cast-in-place concrete items in square metres calculated from neat dimensions as indicated. Concrete placed beyond dimensions indicated not measured.
    - .1 Concrete Patch Repairs (East bridge Sidewalk).
    - .2 Concrete Refacing (Machine Room Slab Soffit).
    - .3 Concrete Patch Repairs (Concrete Apron)**
    - .4 Concrete Patch Repairs (Deck Soffit & Fascias).**
  - .3 Measure the following cast-in-place concrete items in linear metres calculated from neat dimensions as indicated. Concrete placed beyond dimensions indicated not measured.
    - .1 Concrete Semi Mountable Curb per OPSD 600.090.
    - .2 Concrete Barrier Curb per OPSD 600.110.
    - .3 Concrete Barrier ~~per OPSD 911.130.~~
- .2 No deductions made for volume of concrete displaced by reinforcing steel, structural steel, or piles.

- .3 No deductions made for volume of concrete less than 0.1 m<sup>3</sup> in volume displaced by individual drainage openings.
- .4 Supply and installation of anchor bolts, nuts and washers and bolt grouting not measured but considered incidental to work.

### 1.3 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
  - .1 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.
  - .2 ASTM C309-19, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - .3 ASTM C494/C494M-19, Standard Specification for Chemical Admixtures for Concrete.
  - .4 ASTM C881/C881M-20a, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
  - .5 ASTM C1017/C1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
  - .6 ASTM C1059/C1059M-21, Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete.
  - .7 ASTM D412-16(2021), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
  - .8 ASTM D624-00(2020), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
  - .9 ASTM D1751-18, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
  - .10 ASTM D1752-18, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 CSA Group (CSA)
  - .1 CSA A23.1:19/A23.2:19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A283:19, Qualification Code for Concrete Testing Laboratories.
  - .3 CSA A3000-18, Cementitious Materials Compendium, Includes Update No.1 (2021).
- .4 Ministry of Transportation, Ontario:
  - .1 Ontario Provincial Standard Specifications (OPSS)
    - .1 OPSS.PROV 904 November 2019, Construction Specification for Concrete Structures.

- .2 OPSS.PROV 920 November 2016, Construction Specification for Deck Joint Assemblies, Preformed Seals, Joint Fillers, Joint Seals, Joint Sealing Compounds, and Waterstops – Structures
- .3 OPSS.PROV 1350 November 2019, Material Specification for Concrete – Materials and Production.
- .2 Designated Sources of Materials (DSM) List.
- .5 U.S. Army Corp of Engineers:
  - .1 CRD-C48-92, Standard Test Method for Water Permeability of Concrete

#### **1.4 ABBREVIATIONS AND ACRONYMS**

- .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement types:
  - .1 GU, GUb and GUL - General use cement.
  - .2 MS and MSb - Moderate sulphate-resistant cement.
  - .3 MH, MHb and MHL - Moderate heat of hydration cement.
  - .4 HE, HEb and HEL - High early-strength cement.
  - .5 LH, LHb and LHL - Low heat of hydration cement.
  - .6 HS and HSb - High sulphate-resistant cement.
- .2 Fly ash types:
  - .1 F - with CaO content maximum 8%.
  - .2 CI - with CaO content 15 to 20%.
  - .3 CH - with CaO minimum 20%.
- .3 GGBFS - Ground, granulated blast-furnace slag.

#### **1.5 DEFINITIONS**

- .1 Cold Weather: means those conditions when the ambient air temperature is at or below 5 °C. It is also considered to exist when the ambient air temperature is at or is likely to fall below 5 °C within 96 hours after completion of concrete placement. Temperature refers to shade temperature.
- .2 Hot Weather: when the air temperature is at or above 27°C or is likely to raise above 27°C within 24 hours of concrete placement.

#### **1.6 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-installation Meetings: in accordance with Section 01 31 19, convene pre-installation meeting one week prior to beginning concrete works.
  - .1 Ensure key personnel, site supervisor, Departmental Representative, specialty contractor - finishing, forming, concrete producer and testing laboratories attend.
    - .1 Verify project requirements.

#### **1.7 ACTION AND INFORMATIONAL SUBMITTALS**

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

- .2 Provide mix designs for each class of concrete to be used for review by Departmental Representative. Do not pour concrete until written approval of mix design has been obtained.
  - .1 Along with the mix designs, provide product data sheets and WHMIS sheets for any chemical admixtures to be used in the concrete
- .3 Provide copy of ticket for each truck load of concrete to Departmental Representative.
- .4 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06.
- .5 Provide Temperature Control Plan to Departmental Representative a minimum of one week prior to commencement of placing concrete that requires temperature control.
- .6 Plan to include methods for monitoring and controlling concrete temperature and the temperature difference prior to, during, and after placement for concrete subject to cold weather, bridge decks and large concrete components where the smallest dimension is 1.5 metres.
  - .1 For concrete subject to cold weather, include the type of insulation, R value and number of layers, including test data verifying the R value in the temperature control plan.
  - .2 For concrete subject to cold weather, include the type and layout of heaters and extent of housing.
- .7 Site Quality Control Submittals:
  - .1 Provide testing results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters found. Provide accurate records of poured concrete indicating date, time and location of pour, ambient air temperature, number and location of test samples.
  - .2 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
  - .3 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete delivered to site of Work and discharged after batching.
- .8 Provide Departmental Representative, a minimum of one week before intended application, with product data and WHMIS sheets for any curing agents used, including recommended rate of application, description of equipment to be used, and a statement from the manufacturer approving the equipment.
- .9 Provide Departmental Representative with product data for concrete sealer prior to the start of sealer application.
- .10 Samples:

- .1 Minimum 4 weeks prior to beginning Work, submit 2 samples for review and acceptance of materials proposed for use as follows:
  - .1 5 L of curing compound.
  - .2 1 m length of each type of joint filler.
- .2 Samples returned for inclusion into work.

## **1.8 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00.
- .2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
  - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture meet specified requirements.
- .3 At least 4 weeks prior to beginning Work, inform Departmental Representative of source of fly ash.
  - .1 Changing source of fly ash without written approval of Departmental Representative is prohibited.
- .4 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
  - .1 Falsework erection.
  - .2 Hot weather concrete.
  - .3 Cold weather concrete.
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
  - .7 Joints.
- .5 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

## **1.9 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements:
  - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
    - .1 Modifying maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2. is prohibited.
    - .2 Deviations submitted for review by Departmental Representative.
    - .3 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

- .2 All materials to be delivered to site in original sealed containers, clearly marked with the manufacturer's name, brand name, type of materials, batch number and date of manufacture.
- .3 Deliver, store, handle, and apply products in accordance with the manufacturer's written instructions.
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19.
- .3 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, the Cataraqui River, onto ground or in other location where it will pose health or environmental hazard.
- .4 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial and Federal regulations.

#### **1.10 SITE CONDITIONS**

- .1 Placing concrete during rain or weather events that could damage concrete is prohibited.
- .2 Protect newly placed concrete from rain or weather events in accordance with CSA A23.1/A23.2.
- .3 Cold weather protection:
  - .1 Maintain protection equipment, in readiness on Site.
  - .2 Use such equipment when ambient temperature below 5°C, or when temperature may fall below 5°C before concrete cured.
  - .3 Placing concrete upon or against surface at temperature below 5°C is prohibited.
- .4 Hot weather protection:
  - .1 Protect concrete from direct sunlight when ambient temperature above 27°C.
  - .2 Prevent forms of getting too hot before concrete placed. Apply accepted methods of cooling not to affect concrete adversely.
- .5 Protect from drying.

### **Part 2 Products**

#### **2.1 DESIGN CRITERIA**

- .1 Alternative 1 - Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

#### **2.2 PERFORMANCE CRITERIA**

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

## 2.3 MATERIALS

- .1 Portland Cement: Use Portland cement to CSA A3001, Type GU, for concrete.
  - .1 Supplementary cementing materials: a portion of the Portland cement may be replaced with supplementary cementing materials. Supplementary cementing materials to be fly ash and/or silica fume. The Departmental Representative reserves the right to limit their proportions to 20% and 10% respectively in the mix.
  - .2 Supplementary cementing materials: Other supplementary materials may include Type F fly ash and or Type S ground blast furnace slag to the requirements of CSA A3001. Set retarding admixtures may be used as ambient and site conditions warrant.
- .2 Water:
  - .1 To CSA A23.1/A23.2.
  - .2 For high performance concrete: water to be clean and free from injurious amounts of oil, acid, alkali soluble chlorides, organic matter, sediment or any deleterious substances.
- .3 Aggregates: to CSA A23.1/A23.2.
- .4 Admixtures:
  - .1 Air entraining admixture: to ASTM C260/C260M.
  - .2 Chemical admixture: to ASTM C494/C494M and ASTM C1017/C1017M. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
  - .3 Store admixtures above freezing temperatures at all times and in accordance with the manufacturer's recommendations.
  - .4 Calcium chloride or any admixtures containing chlorides are not permitted.
  - .5 The mass of Type S silica fume, if added as a separate component to the mixture during the batching process, to consist of full packages of the silica fume, rounded up to the next full package as required by the batch volume.
- .5 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.
  - .1 Compressive strength: 40 MPa at 28 days.
- .6 Non premixed dry pack grout: composition of non-metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 40 MPa at 28 days.
- .7 Curing compound: White pigmented Type 2 curing compound, meeting the requirements of ASTM C309.
- .8 Moisture vapour barrier: White opaque polyethylene film 100 microns thickness to ASTM C171.
- .9 Premoulded joint fillers:
  - .1 Bituminous impregnated fibre board: to ASTM D1751.

- .10 Proprietary patch materials for horizontal and vertical applications:
  - .1 Must be an approved product from the MTO DSM list.
- .11 Proprietary bag mix concrete: to meet the performance requirements described in SECTION 2.5 – MIXES.
  - .1 Proposed products are subject to approval from the Departmental Representative.
- .12 Concrete Bonding Agent: a cementitious epoxy resin compensated 3-component, solvent-free, coating material with corrosion inhibitor, used as bonding primer for placing fresh, plastic concrete to existing hardened concrete and reinforcement corrosion protection.

## **2.4 EQUIPMENT**

- .1 Concrete pump: Reciprocating pump equipped to fit a pipeline at least 100 mm in diameter.
- .2 Internal vibrators: High frequency type with 8,000 minimum to 12,000 maximum vibrations per minute when immersed in concrete.
- .3 External vibrators: Minimum frequency of 3,600 vibrations per minute.
- .4 Hand finishing tools: Floats to be made of magnesium or wood. Magnesium bull floats to be commercially made.
- .5 Straight edges: Use two straight edges commercially made of metal, one 3 metres and one 500 mm long.
- .6 Compressor – Air blasting: Compressor to have minimum capacity of 3.5 m<sup>3</sup>/minute. Compressed air to be free of oil or other contaminants.
- .7 Mixer for bonding agents: mixer to be a stationary mixer, power driven, and capable of uniformly mixing the materials.
- .8 Produce concrete at a batching plant. The use of mobile mixers is not permitted.
- .9 Apply curing compound by means of motorized spraying equipment approved by the manufacturer of the curing compound. The equipment to include a mechanical agitator.
- .10 Equipment made of aluminium to not come in contact with the plastic concrete.
- .11 Deck Screed Machine: maximum wheel load not to exceed 15kN.

## **2.5 MIXES**

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
  - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
  - .2 All concrete to be air entrained.
  - .3 Provide concrete mix to meet following plastic state requirements:
    - .1 For general use:
      - .1 Compressive strength at 28 days: 35 MPa.
      - .2 Aggregate size: 19.0 mm maximum.

- .3 Air content: 5.0 – 8.0%
- .4 Slump:  $80 \pm 20$  mm.
- .5 Exposure Class: C-1.
- .2 For footing of parapet wall **and barrier wall** at the Bascule Bridge West Approach:
  - .1 Compressive strength at 28 days: 30 MPa.
  - .2 Aggregate size: 19.0 mm maximum.
  - .3 Air content: 5.0 – 8.0%
  - .4 Slump:  $80 \pm 20$  mm.
  - .5 Exposure Class: C-1.
- .3 Non-structural sidewalks and curbs:
  - .1 Compressive strength at 28 days: 32 MPa minimum.
  - .2 Aggregate size: 20 mm.
  - .3 Maximum water/cementing material ratio: 0.45
  - .4 Minimum cementitious content: 350 kg/m<sup>3</sup>
  - .5 Air content: 5.0 – 8.0 %.
  - .6 Slump:  $80 \pm 20$  mm
- .4 Provide quality management plan to ensure verification of concrete quality to specified performance.
- .5 Concrete supplier's certification: both batch plant and materials meet CSA A23.1/A23.2 requirements.

### **Part 3 Execution**

#### **3.1 PREPARATION**

- .1 Obtain Departmental Representative's written approval before placing concrete.
  - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00.
- .3 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitate placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete permitted only after approval of equipment and mix.
- .5 Disturbing reinforcement and inserts during concrete placement is prohibited.
- .6 Maintain all concrete surfaces to receive new concrete in a wet condition for a period of 1 hour prior to placing any new concrete. Remove all dust and loose material prior to wetting the concrete surface using compressed air. Remove all excess water using compressed air prior to pouring concrete.

- .7 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .8 Protect previous Work from staining.
- .9 Clean and remove stains prior to application for concrete finishes.
- .10 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, workability, air content, temperature and test samples taken.
- .11 In locations where new concrete dowelled to existing work, drill holes in existing concrete.
  - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with shrinkage compensating grout or epoxy grout to anchor and hold dowels in positions as indicated.
- .12 Remove all sawdust, chips, construction debris and other deleterious materials from the interior of forms.
- .13 Remove all snow and ice from any surface against which new concrete is to be placed.
- .14 Do not place load upon new concrete until authorized by Departmental Representative.

### **3.2 SLEEVES AND INSERTS**

- .1 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
- .2 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.
- .3 Confirm locations and sizes of sleeves and openings shown on drawings.

### **3.3 JOINT FILLER**

- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.
- .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

### **3.4 BONDING AGENTS**

- .1 Prepare and apply bonding agent as per the manufacturer's written recommendations prior to casting concrete. Discard bonding agent not used within 30 minutes of mixing. Bonding agent that has dried shall be removed and replaced prior to placing concrete against it. Use a bonding agent for the following applications:
  - .1 Exposed vertical surfaces of concrete, less than 300 mm in height, against which new concrete is to be placed.
  - .2 Machine room slab soffit where new concrete is to be placed.

### **3.5 CONCRETE PLACEMENT**

- .1 Place concrete in accordance with CSA A23.1/A23.2.

- .2 Do not place any concrete before receiving approval by the Departmental Representative.
- .3 Provide 24 hours minimum notice prior to placing of concrete.
- .4 Do not place any concrete until all curing materials and all cold weather protection materials have been delivered to the site.
- .5 Select methods of transporting, mixing, placing and consolidating concrete to prevent segregation or damage to the mix.
- .6 Keep forms dry during concrete placement.
- .7 Do not support concrete placing and transporting devices on the steel reinforcing.
- .8 Deposit concrete at point of final deposit using means and equipment that prevent segregation or loss of material.
- .9 Size and section to be placed in one continuous operation as noted on the drawings or as directed by the Departmental Representative.
- .10 Deposit concrete into forms in lifts of 500 mm and in layers that are approximately horizontal and as close as practicable to its final position. Do not move concrete horizontally with vibrators or other methods that could cause segregation.
- .11 Keep conveying equipment free from deleterious materials and clean equipment at frequent intervals.
- .12 Provide suitable protection during adverse weather conditions.
- .13 Do not impart harmful vibrations to concrete or misalign forms if conveying equipment is supported on formwork.
- .14 Consolidate thoroughly and uniformly by means of hand tamping, vibrators or finishing machines to obtain a dense, homogeneous structure, free from cold joints, voids and honeycomb.
- .15 During concreting operations:
  - .1 Development of cold joints is not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to the existing work.
- .16 Chutes to have sufficient slope to deliver concrete of the approved consistency and have a maximum length of 15 metres.
- .17 A sufficient number of vibrators are to be employed to adequately handle the anticipated rate of placement. The size and frequency of vibrators to be as specified in CSA A23.1/A23.2.
- .18 Use internal vibrators wherever practicable. External type vibrators may be used where surfaces cannot be properly consolidated with the internal type alone.
- .19 Vibrate each layer of concrete. Extend vibrators into the previous layer to produce a homogeneous mixture at the layer interface.
- .20 Do not use vibration to make the concrete flow or spread more than 1.5 metres from the point of deposit.
- .21 Do not disturb reinforcing steel with vibrators.

- .22 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

### **3.6 OPERATIONAL CONSTRAINTS**

- .1 All activities related to concrete placement will have to be performed in three stages to accommodate one lane of traffic to remain open at all times.

### **3.7 CONSTRUCTION JOINTS**

- .1 Locations of construction joints as indicated on the contract drawings. Submit locations and details for construction joints not indicated on contract drawings for approval from the Departmental Representative.
- .2 Form a straight 20 mm V-groove at the exposed face of the concrete at all construction joints. Do not use V-grooves on bridge deck surfaces.
- .3 Use a bulkhead to form vertical or inclined construction joints.

### **3.8 FINISHING**

- .1 Finish concrete surface while it is sufficiently plastic to achieve the desired grades, elevations and texture. Ensure that excessive fines and water are not drawn to the surface.
- .2 Do not apply material to the concrete surface or finishing tools to aid in the finishing.
- .3 Produce a surface which is smooth, free from open-texturing, undulations, projections and ridges. Hand finish with a float, except for bridge deck placement.
- .4 Ensure the finished surface conforms to the lines, grades and elevations shown on the contract drawings.
- .5 Sidewalks:
  - .1 Round sidewalk expansion joints using a 6 mm radius edging tool.
  - .2 Sidewalk surfaces to be struck-off with a strike board and floated.
  - .3 Finished surface to not vary more than 3 mm under a 3 metre straight edge and be lightly broomed transversely to produce a textured, non-slip surface.

### **3.9 CURING**

- .1 Protect and cure in accordance with CSA A23.1/A23.2.
- .2 Begin curing immediately after concrete finishing without damaging the surface. For continuing operations, such as barrier wall or sidewalk, apply curing within 2 to 4 metres of the finishing operation.
- .3 The minimum curing period for HPC, concrete subject to cold weather and concrete cured with a curing compound is 7 days. For all other concrete the curing period of 4 days.
- .4 Cure to be achieved by one or more of the following:
  - .1 Burlap:
    - .1 Pre-soak burlap by immersing it in water for a period of at least 24 hours prior to placing concrete.

- .2 Prevent burlap from freezing during cold weather.
- .3 Carefully lay 2 layers of burlap on the surface as soon as the concrete has sufficiently set to support the burlap.
- .4 Do not allow water to drip, flow or puddle on the concrete surface.
- .5 Strips to be overlapped 150 mm, secured to the surface and kept continuously wet during the curing period.
- .6 Cover with a moisture vapour barrier immediately following the placement of the burlap.
- .7 Water used for curing to be clean and free from any material which could cause staining or discoloration of the concrete.
- .8 Burlap to be free from holes, clay or other substances which would have a deleterious effect on concrete.
- .2 Moisture vapour barrier:
  - .1 Provide an effective vapour barrier and prevent any flow of air between it and the concrete surface.
  - .2 Overlap sheets by 150 mm and secure the vapour barrier to the surface without damaging the concrete.
- .3 Curing compound:
  - .1 Curing compound may be approved by the Departmental Representative in circumstances where it is impracticable to wet cure and where curing compounds will not affect the appearance of the concrete.
  - .2 Curing compound only permitted on non-structural elements.
  - .3 Do not use curing compound where a bond is required for additional concrete.
  - .4 Apply curing compounds as per the manufacturer's recommended rate.
  - .5 Do not apply curing compounds on construction joints, surfaces requiring waterproofing sealants or deck sections.
- .5 Curing formed surfaces:
  - .1 Remove forms for barrier walls and curb on deck no later than 24 hours after concrete placement and cure concrete with burlap and water for the remainder of the curing period.
  - .2 When ambient temperature 5°C or less, forms for barrier walls and curb on deck may be left in place for the duration of the curing period for all concrete other than HPC.
  - .3 Other formed surfaces require no additional curing where the formwork is left in place for the minimum specified curing period. Where the formwork is removed prior to the curing period is completed, formed surfaces are to be cured with burlap and water for the remainder of the minimum curing period.
- .6 Protect all freshly placed concrete from the elements and from defacement due to construction operations, traffic and vandals.

### 3.10 HOT WEATHER CONCRETING

- .1 Employ special measures detailed in CSA A23.1/A23.2 to protect the concrete from hot or drying weather conditions when the air temperature is at or above 27°C or is likely to raise above 27°C within 24 hours of concrete placement.
- .2 Temperature of the formwork, reinforcing steel or the material on which the concrete is to be placed to not exceed 27°C.
- .3 Do not exceed the concrete temperatures specified in CSA A23.1/A23.2.

### **3.11 COLD WEATHER CONCRETING**

- .1 Cold weather: conditions when the ambient air temperature is at or below 5 °C. It is also considered to exist when the ambient air temperature is at or is likely to fall below 5 °C within 96 hours after completion of concrete placement. Temperature refers to shade temperature.
- .2 Employ special measures detailed in CSA A23.1/A23.2 and this specification when temperature is at or below 5°C or is likely to fall below 5°C within 24 hours of concrete placement.
- .3 Do not place concrete against any surface which is at a temperature less than 5°C.
- .4 Do not use calcium chloride or other de-icing chemicals as a de-icing agent in the forms.
- .5 If heating of the mix water and/or aggregates is specified, alter the charging cycle to prevent flash setting of the concrete. Do not heat water or aggregates above 80°C. Water and/or aggregates heated to a temperature in excess of 40°C, to be batched in the mixer first to reduce the temperature of the combination below 40°C, prior to the addition of the cementing materials.
- .6 Provide the following methods of protection, depending on the outside temperature. Heating of the mix water and/or aggregates is required for all classes of protection.
  - .1 Special protection:
    - .1 When the outside temperature is below 5°C and above 0°C, provide adequate covering of all surfaces with tarpaulins or polyethylene sheets.
  - .2 Special protection with insulation:
    - .1 When the outside temperature is below 0°C and above -5°C, cover all surfaces with an approved insulating material, over which tarpaulins or polyethylene sheets are placed.
  - .3 Complete housing with heat:
    - .1 When the outside temperature during placing or during the protection period may fall below -5°C, a complete housing of the concrete, together with supplementary heat, is to be provided.
    - .2 Ensure heat is uniformly supplied to the concrete.
    - .3 For mass concrete, defined as minimum section dimension in excess of 2 metres, the temperature gradient is to not exceed 20°C/m from the interior of the element to the exterior face.
    - .4 In thin sections, less than 2 m, the temperature differential from the interior to the exterior is not exceed 20°C.

- .5 Steam or hot air blowers may be used, but a means of maintaining relative humidity of not less than 95% is to be provided.
- .6 When dry heat is used, hot air is not be permitted to flow directly onto the concrete surface.
- .7 Vent exhaust fumes.
- .4 Maintain the concrete above 10°C for 5 consecutive days after placing concrete. Maintain the concrete above 0°C for a total period of 14 days.

**3.12 CONTROL OF TEMPERATURE AND TEMPERATURE DIFFERENCE**

- .1 Ensure that during the curing period the concrete temperature does not fall below 10°C or exceed 70°C.
- .2 If monitoring is required, install thermocouple wires and associated instrumentation with a combined accuracy of ±1°C capable of recording and displaying temperature. The instrumentation is to include data loggers capable of recording at hourly intervals or less and allow direct reading of temperature.
- .3 Thermocouples for concrete temperature measurement during cold weather to be installed as per Table 1.

**Table 1: Minimum Number of Thermocouple Sets for Concrete Temperature Measurement**

	<b>Concrete Elements Requiring Temperature Monitoring</b>			
<b>Concrete Elements Requiring Temperature Monitoring</b>	Each concrete element.	Minimum of 3 per element or stages thereof.	2	At locations where the concrete is expected to reach the highest temperature and at the surface of concrete

Notes: N/A

- .4 Begin recording temperatures at the start of the concrete placement.
- .5 Automatically record temperatures at intervals no greater than one hour until the end of the monitoring period. Monitor for a minimum of seven days or until withdrawal of protection is permitted as described under Cold Weather Concreting.
- .6 Physically monitor and verify concrete and ambient air temperature readings every 6 hours, or more frequently, for the first 3 Days and every 12 hours for the remainder of the monitoring period. Take the necessary measures to maintain the temperature within the specified limits.

- .7 Provide access for the Departmental Representative to verify the readings. If the datalogger does not have a digital display that allows the Departmental Representative to verify the temperature, provide the Departmental Representative with the necessary instruments to allow the Departmental Representative to verify thermocouple function and readings.
- .8 Provide weatherproof box for data logging equipment.
- .9 Prepare a record of temperatures for each day during the temperature monitoring period. At the end of the temperature monitoring period, prepare complete temperature records, including graphical plot of temperature versus time.
- .10 Withdrawal of protection and heating:
  - .1 Withdraw in such a manner as not to induce thermal shock stresses in the concrete.
  - .2 Gradually reduce the temperature of the concrete to avoid cracking due to sudden temperature changes.
  - .3 Do not completely remove the protection until the concrete has cooled to the temperature differential between concrete and air as stated in CSA A23.1/A23.2.
  - .4 For concrete subject to cold weather and for large concrete components where the smallest dimension is 1.5 metres, gradually remove or reduce the protection in such a manner that the maximum allowable drop of concrete temperature for each 24 hour period does not exceed the following:
    - .1 10°C for elements with a thickness greater than 2.0 metres.
    - .2 15°C for elements with a thickness between 1.0 and 1.99 metres.
    - .3 20°C for elements with a thickness less than 1.0 metre.

### **3.13 CONCRETE SURFACE FINISH**

- .1 Finish concrete to CSA A23.1/A23.2.
- .2 Use procedures as reviewed by Departmental Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
- .3 All formed surfaces to receive the basic treatment and all exposed surfaces to receive a smooth form finish.
- .4 Basic treatment:
  - .1 Upon removal of the forms, fill all cavities, honeycomb, surface voids, bugholes (greater than 6 mm in diameter) and other deficiencies as identified by the Departmental Representative with a sand cement mortar of the same composition as that used in the concrete or an approved proprietary patch repair product.
  - .2 Remove all bolts, ties, nails, or other metal not specifically required for construction purposes, or cut back to a depth of 25 mm from the surface of the concrete unless otherwise directed by the Departmental Representative. Fill the depressions with a grout or proprietary patch repair product.
  - .3 Fins, unsightly ridges, or other imperfections to be chipped or rubbed off flush with the surface.

- .4 Patches in excess of 25 mm to be applied in layers not exceeding 25 mm with a 30 minute interval between the placing of layers. The surface of the patch to be textured equivalent to the adjacent concrete.
- .5 Do not repair honeycomb areas or cavities exceeding 25 mm in diameter until inspected by the Departmental Representative.
- .6 Where honeycombing has occurred in non-structural elements, remove the affected area and fill with mortar or proprietary patch repair product.
- .7 Where honeycombing has occurred in structural elements, carry out the corrective method of treatment as directed by the Departmental Representative.
- .8 Maintain concrete saturated for one hour prior to the application of the repair product.
- .5 Smooth form finish:
  - .1 Smooth form finish to be high quality concrete which has been homogeneously placed and thoroughly compacted. Smooth form finish to be uniform in colour, pattern and texture.
  - .2 Elements to have smooth form finish include curbs, sidewalks, parapet walls, abutments, piers and any other surfaces designated by the Departmental Representative.
  - .3 Perform the basic treatment as previously described. Remove stains, rust marks or other blemishes.
  - .4 If the concrete, after stripping the forms and performing the basic treatment, does not exhibit a smooth form finish, perform corrective measures as directed by the Departmental Representative.
- .6 Leave concrete surfaces against which new concrete is to be placed with a rough surface finish.
- .7 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.
- .8 Do not treat concrete surface with cement slurry or paste.
- .9 Select proprietary patch repair products to achieve uniformity of colour and appearance.
- .10 Prevent contamination by oil or other deleterious substances.

### **3.14 SURFACE TOLERANCE**

- .1 Formed and unformed surfaces to be such that when tested with a 3 metre long straight edge placed anywhere in any direction on the surface, there is no gap greater than 6 mm between the bottom of the straight edge and the surface of the concrete. When the straight edge is placed across a construction joint, the gap between the straight edge and the surface of the concrete is not be greater than 3 mm.
- .2 All unformed construction joint surfaces against which sidewalks, curbs, medians, and barrier walls are to be placed to be such that when tested with a 500 mm straight edge placed anywhere in any direction on the surface, there is no gap greater than 20 mm between the bottom of the straight edge and the surface of the concrete.

- .3 The position of the inner and outer top edges of structural components to be set true to the elevations, alignment, and camber as specified on the contract drawings without visible deviation from one end of the structure to the other. All concrete items or structural components to be constructed to the specified geometry.
- .4 Variations from plumb or a specified slope to not exceed 1H:400V. Departure from specified alignment to not exceed  $\pm 25$  mm.

### **3.15 CRACK REPAIRS**

- .1 Inspect all concrete to identify and document any cracks including, their location, width, and density. Report the results of the inspection to the Departmental Representative. Continue to inspect and monitor cracks up to the date of completion of the Work.
- .2 Identify areas requiring repair or replacement and identify the limits of such repair or replacement. Provide this information to the Departmental Representative along with a proposal for remedial action to be taken. Do not perform repairs until the proposal has been accepted by the Departmental Representative in writing.
- .3 For bridge decks to be waterproofed, inspect the surface to be waterproofed after completion of the curing and prior to the application of tack coat for waterproofing. For all other concrete, inspect the concrete in a timely manner, but no later than one month following completion of curing.
- .4 Cracks 0.3 mm or greater in width to be repaired by the Contractor at no additional cost, except in high performance concrete.
- .5 For high performance concrete, cracks 0.15 mm or greater in width to be repaired by the Contractor at no additional cost.
- .6 Fine cracks are defined as less than 1 mm, medium cracks as 1 to 2 mm, and wide cracks as greater than 2 mm.
- .7 Fine crack repair:
  - .1 Fine cracks are defined as less than 1 mm in width.
  - .2 Fine cracks identified for repair to be filled with a low viscosity epoxy resin approved by the Departmental Representative.
  - .3 The resin is to be applied by pressure injection or by gravity feed into the crack and allowing the sealant to be absorbed.
  - .4 A second application may be required, depending on the absorption and crack depth. The second application, if required by the Departmental Representative, to be made as soon as possible after the first application has set.
  - .5 All use and placement of resin materials to be in accordance with the manufacturer's written instructions.
- .8 Medium and wide crack repair:
  - .1 May require a higher viscosity resin for repair.
  - .2 Submit manufacturer's data sheet for the proposed resin in this case for approval from the Departmental Representative prior to use.
  - .3 Excess resin in the vicinity of the crack will require removal by grinding and/or abrasive blast cleaning as per the Departmental Representative's direction

**3.16 FIELD QUALITY CONTROL**

- .1 Site tests: Designated testing company will conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .1 Concrete pours.
  - .2 Slump.
  - .3 Air content.
  - .4 Compressive strength at 7 and 28 days.
  - .5 Air and concrete temperature.
- .2 Cast, cure, transport and test concrete in accordance with CSA A23.1/A23.2. Ensure testing laboratory is certified to CSA A283.
- .3 Test concrete at the point of discharge as delivered to the work site.
- .4 Secure all cylinders in an approved storage medium prior to leaving the site
- .5 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .6 Cost of testing to be included in the unit price items for concrete placement.
- .7 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .8 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .9 Inspection or testing by Consultant not to augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.
- .10 As a minimum, the frequency of testing is to be in accordance with Tables 2 and 3.

**Table 2: Production Sampling and Testing Minimum Frequencies**

Construction categories (See table 3)	Quantity for each Class of Concrete (m3)	28 Day Compressive Test Cylinders	FIELD TESTS Air, Slump and Temperature Tests (Note 2)
I	< 100	1 set/day (Note 3)	One test for each load of concrete until satisfactory control (Note 1) is established; then 1 test for each 5 loads of concrete.
	100-500	2 sets/day	
	> 500	3 sets/day	
II	As above		One test for each load of concrete.
III	< 100	2 sets/day	One test for each load of concrete until satisfactory control (Note 1) is
	100-500	3 sets/day	

Construction categories (See table 3)	Quantity for each Class of Concrete (m3)	28 Day Compressive Test Cylinders	FIELD TESTS Air, Slump and Temperature Tests (Note 2)
	> 500	4 sets/day	established and rate of placement > 35 m <sup>3</sup> per hour then 1 test for each 3 loads of concrete.
IV	< 30	2 sets/day	One test for each load of concrete or one test per hour for continuous mix plants.
	> 30	3 sets/day	
V	One set for each load		One test for each load of concrete.

Note 1) Satisfactory control is considered to have been established when tests on five consecutive truckloads or batches of concrete are within specification requirements.

Note 2) Air, slump and temperature tests to also be done whenever compressive cylinders are cast.

Note 3) One Set means 3 cylinders.

**Table 3: Construction Categories**

CATEGORY	Type of Construction
I	Abutments, Catchbasins and Maintenance Holes, Columns, Culverts, Approach Slabs, Footings, Foundations, Piers, Wingwalls, Misc. Work.
II	Curb and Gutter, Slipformed Barrier Wall, Retaining Wall, Sidewalk, Barrier or Parapet, Wall (Fixed Form).
III	Structure Decks.
IV	Structure Deck Overlays.
V	Non-Structural Volume Batching.

**3.17 CLEANING**

- .1 Clean in accordance with Section 01 74 00.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19.
  - .1 Divert unused concrete materials from landfill to local facility after receipt of written approval from Departmental Representative.
  - .2 Provide appropriate area on job site where concrete trucks and be safely washed.

- .3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Departmental Representative.
- .4 Disposal of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location to pose health or environmental hazard is prohibited.
- .5 Prevent admixtures and additive materials from entering drinking water supplies or streams.
- .6 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.
- .7 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 31 05 16 – Aggregate Materials.
- .2 Section 32 91 19.13 – Topsoil Placement and Grading.
- .3 Section 33 41 00 – Storm Utility Drainage Piping.

**1.2 MEASUREMENT AND PAYMENT PROCEDURES**

- .1 The work for the following items in this section will not be measured but will be paid as a fixed price item under the lump sum portion of the contract.
  - ~~.1 Earth Excavation.~~
  - .2 Erosion and sedimentation control.

**1.3 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C117-117, Standard Test Method for Material Finer than 0.075-Micrometer (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136/C136M-19, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D422-63 2007(e2), Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D698-12(2021), Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D1557-12(2021), Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .6 ASTM D4318-17e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
  - .7 ASTM D6938-17ae1, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
  - .8 ASTM D6939-03, Standard Practice for Brushmattressing.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
  - .1 CSA A3000-18, Cementitious Materials Compendium (Includes Update No.1 Errata 2021)).
  - .2 CSA A23.1:19/A23.2:19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

- .4 Ministry of Transportation Ontario (MTO)
  - .1 Ontario Provincial Standard Specifications (OPSS):
    - .1 OPSS.PROV 206 November 2014, Construction Specification for Grading.
    - .2 OPSS.PROV 501 November 2014, Construction Specification for Compacting.
    - .3 OPSS.PROV 805 November 2020, Construction Specification for Temporary Sediment Control.
    - .4 OPSS.PROV 1010 April 2013, Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Materials.
  - .2 Environmental Guide for Erosion and Sediment Control During Construction of Highway Projects September 2015.

#### 1.4 DEFINITIONS

- .1 Excavation classes: 2 classes of excavation will be recognized; common excavation and rock excavation.
  - .1 Rock: solid material in excess of 1.00 m<sup>3</sup> and which cannot be removed by means of heavy-duty mechanical excavating equipment with 1.15 m<sup>3</sup> bucket. Frozen material not classified as rock.
  - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Topsoil:
  - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
  - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .6 Unsuitable materials:
  - .1 Weak, chemically unstable, and compressible materials.
  - .2 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM C136/C136M and tested to ASTM D422: Sieve sizes to CAN/CGSB-8.1.

.2 Table 1:

Sieve Designation	% Passing
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2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

- .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .7 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

## 1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00.
- .2 Quality Control: in accordance with Section 01 45 00.
  - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
  - .2 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
  - .3 Submit to Departmental Representative written notice when bottom of excavation is reached.
  - .4 Submit to Departmental Representative all testing and inspection reports as described in PART 3 of this Section.
  - .5 Inform the Departmental Representative prior to any backfilling operations.
- .3 Preconstruction Submittals:
  - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
  - .2 Submit records of underground utility locates, indicating: clearance record from utility authority location plan of relocated and abandoned services, as required location plan of existing utilities as found in field.
- .4 Samples:
  - .1 Submit samples in accordance with Section 01 33 00.
  - .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
  - .3 Submit 70 kg samples of type of fill specified including representative samples of excavated material.
  - .4 Ship samples to Departmental Representative in tightly closed containers to prevent contamination and exposure to elements.

## 1.6 QUALITY CONTROL

- .1 Submit for review by Departmental Representative proposed dewatering methods as described in PART 3 of this Section and in accordance with Section 01 45 00 – Quality Control.
- .2 Hire a qualified Engineer licensed in the province of Ontario to design and inspect the shoring and temporary bracing used during execution of the work.

- .3 Prior to excavation, the Quality Verification Engineer (QVE), in accordance with Section 01 45 00 – Quality Control, shall certify that the design, layout dimensions, support locations and connection details provided in the temporary work shop drawings accurately reflects in-situ locations and elevations of existing structures based on the Contractor’s field measurements.
- .4 Submit design and supporting data at least 2 weeks prior to beginning work.
- .5 Design and supporting data submitted to bear stamp and signature of qualified professional engineer licensed in Province of Ontario.
- .6 Keep design and supporting data on site.
- .7 Submit to Departmental Representative testing and inspection results and report as described in PART 3 of this Section.
- .8 Do not use soil material until written report of soil test results are reviewed and approved by the Quality Verification Engineer (QVE) and reviewed by the Departmental Representative.
- .9 Health and Safety Requirements:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.13.

**1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19.
- .2 Divert excess aggregate materials from landfill to local quarry for reuse as directed by Departmental Representative.

**1.8 EXISTING CONDITIONS**

- .1 Buried services:
  - .1 Before commencing work verify location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .4 Prior to beginning excavation Work, notify applicable Departmental Representative establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
  - .5 Confirm locations of buried utilities by careful methods.
  - .6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
  - .7 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing. Costs for such Work to be paid by Departmental Representative.
  - .8 Record location of maintained, re-routed and abandoned underground lines.

- .9 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
  - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey benchmarks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
  - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Subbase material: Granular B Type 2, meeting the requirements of Section 31 05 16.
- .2 Base material: Granular A, meeting the requirements of Section 31 05 16.

**Part 3 Execution**

**3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with OPSS.PROV 805 and Environmental Guide for Erosion and Sediment Control During Construction of Highway Projects or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement, curb or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

**3.3 PREPARATION/PROTECTION**

- .1 Protect existing features in accordance with Section 01 56 00 and applicable local regulations
- .2 Keep excavations clean, free of standing water, and loose soil.

- .3 Remove ice and snow before any excavation and backfilling operations proceed. Do not place material over frozen ground.
- .4 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .5 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .6 Protect buried services that are required to remain undisturbed.

### 3.4 STOCKPILING

- .1 Stockpile fill materials in areas designated by Departmental Representative.
  - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

### 3.5 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Remove paving, demolished foundations and rubble, concrete, masonry and other obstructions encountered during excavation.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain.
  - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .5 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by the Departmental Representative.
- .6 Restrict vehicle operations directly adjacent to open trenches.
- .7 Dispose of surplus and unsuitable excavated material off-site.
- .8 Do not obstruct flow of surface drainage or natural watercourses.
- .9 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .10 Notify Departmental Representative when bottom of excavation is reached.
- .11 Obtain Departmental Representative approval of completed excavation.
- .12 Correct unauthorized over-excavation as follows:
  - .1 Fill under areas with Granular B Type 2 compacted to not less than 95 % of corrected Standard Proctor maximum dry density.
- .13 Hand trim make firm and remove loose material and debris from excavations.

- .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

### 3.6 COMPACTION

- .1 Compaction to OPSS.PROV 501.
- .2 When not specified, the lift thickness of earth shall not exceed 300 mm and the lift thickness for granular materials shall not exceed 150 mm.
- .3 Hand operated vibratory type compaction equipment shall be used behind all retaining structures to compact fill material within restricted zones as follows:
  - .1 Abutments and Retaining Walls:
    - .1 An area within a plane extending from the base of the back face of the wall where it contacts the footing upwards at a slope of 1H:1.5V to a maximum distance of 2.5 m from the wall.
    - .2 Wingwalls
      - .1 An area within 1.5 m from the back face of the wall.
    - .3 Place fill types as indicated on the Contract Drawings.
  - .4 Testing Equipment:
    - .1 General:
      - .1 Field density and field moisture measurements for Quality Control compaction testing of earth and granular materials shall be carried out using gauges and ancillary equipment.
      - .2 Only qualified operators using properly calibrated gauges shall conduct Quality Control compaction testing.
    - .2 Nuclear Moisture and Density Gauge Requirements:
      - .1 A copy of a valid calibration certificate, including the make, model number, and serial number for each gauge, shall be submitted to the Departmental Representative, prior to use of the gauge in compaction testing.
      - .2 In addition, the Departmental Representative may request that the operator perform a standardization procedure according to ASTM D6939.
      - .3 If the gauge does not meet the standardization requirements or exhibits malfunctions of any kind, the gauge shall be replaced.
    - .3 Operator Requirements:
      - .1 Each operator shall have been trained in the safe operation, transportation, and handling of the gauge.
      - .2 Prior to conducting Quality Control compaction testing, the operator shall provide acceptable proof of proficiency in the use of a gauge and the correct procedures to determine lot and subplot sizes, field dry density, percent relative compaction, mean, standard deviation, and the Quality Index of a compacted lot of material by submitting one of the following:

- .1 a gauge operator certification document or card from a training program acceptable to the Owner and conducted within the Province of Ontario within the last 2 years; or
- .2 a document (e.g., instruction notice or letter) signed by the Owner showing that the operator has demonstrated proficiency on a Contract either constructed or being constructed for the same Owner within the same construction year as the compaction testing being carried out for this Contract.

### **3.7 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

Place and compact granular A material for bedding and surround of underground services to OPSS.MUNI 1010.

- .1 Place bedding and surround material in unfrozen condition.

### **3.8 BACKFILLING**

- .1 The type of compaction equipment used shall be suited to the material to be compacted, degree of compaction required, and space available.
- .2 Vibratory compaction equipment: Use compaction equipment that will not damage existing structures. Use small compaction equipment when work is performed near existing structures.
- .3 Do not proceed with backfilling operations until completion of following:
  - .1 Installations inspected and approved in writing by Quality Verification Engineer and reviewed by Departmental Representative.
  - .2
  - .3 Approval in writing to proceed with construction below finished grade has been provided by Quality Verification Engineer and reviewed by Departmental Representative.
  - .4 Inspection, testing, approval, and recording location of underground utilities.
  - .5 Removal of concrete formwork.
  - .6 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .4 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .5 Do not use backfill material which is frozen or contains ice, snow or debris.
- .6 Place backfill and compact in accordance OPSS.PROV 501.
- .7 Place backfill material in uniform layers not exceeding 150 mm compacted thickness. Compact each layer before placing succeeding layer.
- .8 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 72 hours after placing of concrete.

- .3 Place layers simultaneously on both sides of installed work to equalize loading.  
Difference not to exceed 300 mm.

### **3.9 RESTORATION**

- .1 Upon completion of Work, remove waste materials and debris in accordance with Section 01 74 19 and correct defects as directed by the Departmental Representative.
- .2 Replace topsoil as directed by the Departmental Representative in accordance with Section 32 91 19.13.
- .3 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .4 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**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 30 00 – Cast-in-Place Concrete
- .4 Section 31 05 16 – Aggregate Materials

**1.2 MEASUREMENT AND PAYMENT**

- .1 Measure concrete sidewalks per ~~OPSD 310.020~~ in cubic meters of concrete actually incorporated into Work.
- .2 Measure concrete semi mountable curb per OPSD 600.090 in meters actually incorporated into Work.
- .3 Measure concrete barrier curb in meters per OPSD 600.110 actually incorporated into Work.

**1.3 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.
  - .2 ASTM D698-12(2021), Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .3 ASTM D1751-18 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB 3.3-2014 Kerosene.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Inch Series.
- .3 Canadian Standards Association (CSA International)
  - .1 CSA A23.1:19/A23.2:19, Concrete Materials and Methods Of Concrete Construction/Test Methods And Standard Practices For Concrete.
- .4 Ministry of Transportation Ontario (MTO)
  - .1 Ontario Provincial Standard Specifications (OPSS)
    - .1 OPSS.MUNI 351 November 2019, Construction Specification for Concrete Sidewalk.
    - .2 OPSS.PROV 904 November 2019, Construction Specification for Concrete Structures.

- .3 OPSS 1315 November 2008, Material Specification for White Pigmented Curing Compounds for Concrete.
- .4 OPSS.PROV 1350 November 2019, Material Specification for Concrete - Materials and Production.
- .2 Ontario Provincial Standard Drawings (OPSD)
  - .1 OPSD 310.020 November 2019, Concrete Sidewalk Adjacent to Curb with Gutter.
  - .2 OPSD 600.090 November 2012, Concrete Semi-Mountable Curb with Narrow Gutter.
  - .3 OPSD 600.110 November 2012, Concrete Barrier Curb.

#### **1.4 SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00.
- .2 Product Data: submit WHMIS SDS in accordance with Section 01 35 29.13.
- .3 Inform Departmental Representative of proposed source of materials and provide access for sampling at least 4 weeks prior to commencing work.
- .4 If materials have been tested by an accredited testing laboratory approved by Departmental Representative within previous 2 months and have passed tests equal to requirements of this specification, submit test certificates from testing laboratory showing suitability of materials for this project.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Separate waste materials in accordance with Section 01 47 19.

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Forms: to Section 03 10 00.
- .2 Concrete mixes and materials: in accordance with Section 03 30 00.
- .3 Reinforcing steel: in accordance with Section 03 20 00.
- .4 Joint filler and Curing Compound: in accordance with Section 03 30 00.
- .5 Granular base: material to Section 31 05 16.
- .6 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water-soluble soap.

- .7 Expansion joint material for sidewalks shall be asphalt impregnated fibreboard having a minimum of 12 mm thickness and shall be Type A according to ASTM D 1751-18.
- .8 Fill material: to Section 31 05 16 and the following requirements:
  - .1 "Granular A" type fill material.
- .9 Boiled linseed oil: to ASTM D260-86(2001).
- .10 Kerosene: to CAN/CGSB 3.3-2014.

**Part 3 Execution**

**3.1 GRADE PREPARATION**

- .1 Do grade preparation work in accordance with Section 31 23 33.01.

**3.2 GRANULAR BASE**

- .1 Obtain Departmental Representative's approval of subgrade before placing granular base.
- .2 Place granular base material to lines, widths, and depths as indicated.
- .3 Compact granular base in accordance with Section 32 11 23.

**3.3 CONCRETE**

- .1 Obtain Departmental Representative's approval of granular base and reinforcing steel prior to placing concrete.
- .2 Do concrete work in accordance with Section 03 30 00.
- .3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.
- .4 Provide edging as indicated with 10 mm radius edging tool.
- .5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Departmental Representative can be demonstrated. Hand finish surfaces when directed by Departmental Representative.

**3.4 TOLERANCES**

- .1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

**3.5 EXPANSION AND CONTRACTION JOINTS**

- .1 Construct Expansion and Contraction Joints to: OPSD 310.020.

- .2 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 1.5m.
- .3 Install expansion joints as indicated at intervals of 6 m.
- .4 An expansion joints shall also be constructed where the sidewalk abuts a rigid object, such as a utility pole or fire hydrant, or changes direction.
- .5 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

### **3.6 ISOLATION JOINTS**

- .1 Construct Isolation Joints to: OPSD 310.020.
- .2 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.
- .3 Install joint filler in isolation joints in accordance with Section 03 30 00.
- .4 Seal isolation joints with sealant approved by Departmental Representative.

### **3.7 PROTECTION OF SIDEWALK AND CURBS**

- .1 Vehicular traffic shall be restricted from crossing sidewalks and curbs after the concrete has been placed for a minimum period of three days or, until the concrete has reached 75% of the specified 28-day compressive strength.

### **3.8 CURING**

- .1 Cure sidewalks and curbs in accordance with Section 03 30 00 and the following:
  - .1 Cure concrete by adding moisture continuously in accordance with CSA A23.1:19/A23.2:19 to exposed finished surfaces for at least 1 day after placing or sealing moisture in by curing compound as directed by Departmental Representative.
  - .2 Apply homogeneously mixed curing compound evenly to form continuous film, in accordance with manufacturers requirements.
  - .3 Where burlap is used for moist curing, place to prewetted layers on concrete surface and keep continuously wet during curing period.

### **3.9 BACKFILL**

- .1 Allow concrete to cure for 7 days prior to backfilling or until the concrete has reached 75% of the specified 28-day compressive strength.
- .2 Backfill to designated elevations with material as directed by Departmental Representative.
  - .1 Place topsoil in accordance with Section 32 91 19.13.
  - .2 Compact and shape to required contours as indicated.

**3.10 LINSEED OIL TREATMENT**

- .1 Apply two coats of linseed oil mixture uniformly to surfaces of curbs, walks and gutters, after concrete has cured for specified curing time and when surface of concrete is clean and dry.
- .2 Linseed oil mixture to consist of 50% boiled linseed oil and 50% mineral spirits by volume.
- .3 Apply treatment when air temperature above 10 degrees C.
- .4 Apply first coat at 135 mL/m<sup>2</sup>.
- .5 Apply second coat at 90 mL/m<sup>2</sup> when first coat has dried.

**3.11 CLEANING**

- .1 Proceed in accordance with Section 01 74 00.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 03 10 00 – Concrete Forming and Accessories
- .2 Section 03 20 00 – Concrete Reinforcing
- .3 Section 03 30 00 – Cast-in-Place Concrete

**1.2 MEASUREMENT AND PAYMENT**

- .1 All work relating to the following items will be paid based on the actual quantities measured on site and unit price quoted in the Bid and Acceptance Form and include all costs to complete the work as detailed on the contract documents.
  - .1 Measure the following cast-in-place concrete items in cubic metres calculated from neat dimensions as indicated. Concrete placed beyond dimensions indicated will not be measured.
    - ~~.1 Concrete in Barrier Walls.~~
    - .2 Concrete in Parapet Walls.
    - .3 Concrete in Barrier and Parapet Wall Footings.
  - .2 **Measure the following cast-in-place concrete items in linear metres calculated from neat dimensions as indicated. Concrete placed beyond dimensions indicated will not be measured.**
    - .1 **Concrete Barrier.**

**1.3 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2 ASTM C618-19, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.2-98, Boiled Linseed Oil.
  - .2 CAN/CGSB-3.3-2014, Kerosene.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 and Section 03 30 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for concrete mixes, additives, and reinforcement, and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.13.

- .3 Samples:
  - .1 Notify Departmental Representative at least 4 weeks prior to commencing Work of proposed sources of materials.
  - .2 Submit to Departmental Representative at least 4 weeks prior to commencing Work 2 samples of following materials proposed for use
    - .1 5 L of curing compound.
    - .2 1 m length of each type of joint filler.
  - .3 Samples returned for inclusion into work.
- .4 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with OPSS.PROV 805 and Environmental Guide for Erosion and Sediment Control During Construction of Highway Projects or requirements of authorities having jurisdiction.
- .5 Construction Waste Management:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19.
  - .2 Place materials defined as hazardous or toxic in designated containers.
  - .3 Divert unused concrete materials from landfill to local facility after receipt of written approval from Departmental Representative.
  - .4 Provide appropriate area on job site where concrete trucks can be safely washed.
  - .5 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Departmental Representative.
  - .6 Disposal of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location to pose health or environmental hazard is prohibited.
  - .7 Prevent admixtures and additive materials from entering drinking water supplies or streams.
  - .8 Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal.
  - .9 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect concrete barriers from nicks, scratches, and blemishes.
- .3 Store precast concrete units in single layer.
- .4 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of crates, padding, pallets, and packaging materials in accordance with Section 01 74 19.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Reinforcement: in accordance with Section 03 20 00 with following requirements:
  - .1 Grade 400W deformed bars.
- .2 Concrete mixes and materials: in accordance with Section 03 30 00.
- .3 Curing compound: in accordance with Section 03 30 00, white pigmented Type 2.
- .4 Expansion joint filler: to ASTM D1751, Type 'A', 13mm preformed non-extruding resilient bituminous type.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with OPSS.PROV 805 and Environmental Guide for Erosion and Sediment Control During Construction of Highway Project or requirements of authorities having jurisdiction, whichever is more stringent.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Do excavation and placing of granular base in accordance with Section 31 23 33.01 and as indicated.

### **3.2 CONSTRUCTION**

- .1 Erect concrete forms in accordance with Section 03 10 00.
- .2 Install concrete reinforcement in accordance with Section 03 20 00.
- .3 Concrete for cast-in-place units:
  - .1 Do cast-in-place concrete work in accordance with Section 03 30 00 and as follows:
    - .1 Construct expansion joints in locations and to details as indicated.

- .2 Construct control joints at spacing as indicated in Contract Drawings.
  - .1 Control joints to be formed.
  - .2 Form hardware not to be left in place.
- .3 Round edges including edges of joints, with 10 mm radius edging tool.
- .4 Finish surfaces to within 3 mm in 3 m from line, level or grade as measured with straightedge placed on surface.
- .5 Sawcuts not permitted.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

## APPENDIX 1 - COMBINED PRICE FORM

- 1) The prices per unit shall govern in establishing the Total Extended Amount. Any arithmetical errors in this Appendix will be corrected by Canada.
- 2) Canada may reject the bid if any of the prices submitted do not reasonably reflect the cost of performing the part of the work to which that price applies.

### LUMP SUM

The Lump Sum Amount designates Work to which a Lump Sum Arrangement applies.

- (a) Work included in the Lump Sum Amount represents all work not included in the unit price table.

<b>LUMP SUM AMOUNT (LSA)</b> Excluding applicable tax(es)
--

### UNIT PRICE TABLE

The Unit Price Table designates Work to which a Unit Price Arrangement applies.

- (a) Work included in each item is as described in the referenced specification section.
- (b) The Price per Unit shall not include any amounts for Work that is not included in that unit price Item.

Item	Class of Labour, Plant or Material	Unit of Measurement	Estimated Quantity (EQ)	Price per Unit applicable tax(es) extra (PU)	Extended amount (EQ x PU) applicable tax(es) extra
01	Field Office for Contract Administrator	wk	8		
02	Steel Interlocking Pedestrian Barriers	m	360		
03	Steel Beam Guiderail Removal	m	106		
04	Removal of Concrete Curbs	m	63		
05	Removal of Asphalt Pavement	m <sup>2</sup>	251		
06	Earth Excavation	m <sup>3</sup>	53		
07	Concrete Removals - Full Depth (Sidewalks)	m <sup>3</sup>	11		
08	Granular 'A'	t	152		
09	Concrete in Sidewalks	m <sup>3</sup>	11		
10	Concrete Semi Mountable Curb per OPSD 600.090	m	63		
11	Concrete Barrier Curb per OPSD 600.110	m	13		
12	Performance Graded Superpave 12.5mm FC1 Level D (PG 64-34)	t	32		
13	Performance Graded Superpave 19mm Level D (PG 64-34)	t	58		
14	Temporary Road Modifications (Asphalt Ramps)	m <sup>2</sup>	60		
15	Single Rail Steel Beam Guide Rail with Channel per OPSD 912.130	m	67		

16	Concrete Barrier per <del>OPSD 911.130</del>	m	17		
17	Topsoil	m <sup>3</sup>	6		
18	Sod	m <sup>2</sup>	62		
19	Removal and Disposal of Railings	m	13		
20	Removal, Salvage and Reinstatement of Posts and Railings	m	11		
21	Concrete Removal - Full Depth (Approach Slabs)	m <sup>3</sup>	30		
22	Concrete Removals - Partial Depth (Deck Soffit & Fascias)	m <sup>2</sup>	1		
23	Concrete Removals - Parital Depth (Machine Room Slab Soffit)	m <sup>2</sup>	23		
24	Concrete Removals - Partial Depth (Control Room Stairs & Base Slab)	m <sup>2</sup>	16		
25	Concrete Removals - Parital Depth (East Bridge Sidewalk)	m <sup>2</sup>	6		
26	Concrete Removals - Partial Depth (Concrete Apron)	m <sup>2</sup>	1		
27	Galvanized Reinforcing Steel	t	5		
28	Reinforcing Steel	t	7		
29	Dowels into Concrete - G10M	ea	342		
30	Dowels into Concrete - G15M	ea	143		
31	Dowels into Concrete - G20M	ea	34		
32	Concrete in Parapet walls	m <sup>3</sup>	4		
33	Concrete in Barrier and Parapet Wall Footings	m <sup>3</sup>	30		
34	Concrete Patch Repairs (Deck Soffit & Fascias)	m <sup>2</sup>	1		
35	Concrete Patch Repairs (Concrete Apron)	m <sup>2</sup>	1		
36	Concrete in Control Room Stairs & Base Slab	m <sup>3</sup>	2		
37	Concrete in Approach Slabs	m <sup>3</sup>	30		
38	Concrete Patch Repairs (East Bridge Sidewalk)	m <sup>2</sup>	6		
39	Concrete Refacing (Machine Room Slab Soffit)	m <sup>2</sup>	23		
40	Routing and Sealing of Cracks in Sidewalk	m	15		
41	Rock Protection	m <sup>3</sup>	54		
<b>TOTAL EXTENDED AMOUNT (TEA)</b>					
Excluding applicable tax(e)s					

**TOTAL BID AMOUNT (LSA +TEA)**

Excluding applicable tax(es)



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada

Ontario and Prairie Region  
Fish and Fish Habitat Protection Program  
867 Lakeshore Road  
Burlington, ON L7S 1A1

Région de l'Ontario et des Prairies  
Programme de la protection du poisson et de son habitat  
867 Lakeshore Road  
Burlington, ON L7S 1A1

October 25, 2021

*Our file*      *Notre référence*

21-HCAA-02211

Public Services and Procurement Canada

**Attention: Elisabeth Ohi**

4900 Yonge Street  
Toronto, ON, M2N 6A6

**Subject: LaSalle Causeway Repairs, Cataraqui River, Kingston – Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat**

Dear Elisabeth Ohi:

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your proposal on October 18, 2021. We understand that you propose to:

- Repair the West Wharf of the LaSalle Causeway, resulting in approximately 62 square meters (m<sup>2</sup>) footprint below the High Water Mark (HWM), by:
  - Installing a 4.0m by 3.6m by 13mm steel plate, flush with the existing retaining wall and embedded approximately 1m into the riverbed;
  - Installing rip rap at a 2:1 slope to protect the West Wharf (48m<sup>2</sup> footprint below the HWM);
  - Drilling two (2) 300mm holes through the existing footing to act as a conduit for the concrete pour;
  - Pouring 8m<sup>3</sup> of tremie concrete into eroded areas of West Wharf; and,
- Work in isolation of flow or open water to avoid sedimentation of the watercourse.

Our review considered the following information:

- Request for Review and supporting documents received on October 18, 2021.

Your proposal has been reviewed to determine whether it is likely to result in:

- the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat which are prohibited under subsections 34.4(1) and 35(1) of the *Fisheries Act*; and
- effects to listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act*.

Canada

The aforementioned outcomes are prohibited unless authorized under their respective legislation and regulations.

To avoid and mitigate the potential for prohibited effects to fish and fish habitat (as listed above), we recommend implementing the measures outlined in your plan(s), in addition to the following listed below:

- Plan in-water works, undertakings and activities to respect [timing windows](#) to protect fish and fish habitat (no in-water work March 15 to July 15);
- Capture, relocate and monitor for fish trapped within isolated, enclosed, or dewatered areas;
- Maintain an undisturbed vegetated riparian zone between areas of on-land activity and the High Water Mark of any water body;
- Salvage, reinstate or match habitat structure (e.g., large wood debris, boulders, instream aquatic vegetation/substrate) to its initial state;
  - If rocks, stumps or logs need to be moved on the lake or river bottom or shoreline to rebuild a shoreline wall, they should be relocated to an area of similar depth and not removed altogether from the bottom or shoreline;
  - Do not obtain rocks from below the high water mark for the purpose of shoreline armouring, unless salvaging washed out shoreline protection materials for rebuilding;
- Develop and implement a Sediment Control Plan to minimize sedimentation of the waterbody during all phases of the work, undertaking or activity;
  - Inspect and maintain regularly the erosion and sediment control measures and structures during all phases of the project;
  - Operate machinery on land, or from barges;
  - Monitor the watercourse to observe signs of sedimentation during all phases of the work, undertaking or activity and take corrective action;
- Do not deposit any deleterious substances in the water course; and,
- Develop and implement a response plan to avoid a spill of deleterious substances.

Provided that you incorporate these measures into your plans, the Program is of the view that your proposal is not likely to result in the contravention of the above mentioned prohibitions and requirements.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to remain in compliance with the *Fisheries Act*, and the *Species at Risk Act*.

It is also your *Duty to Notify* DFO if you have caused, or are about to cause, the death of fish by means other than fishing and/or the harmful alteration, disruption or destruction of fish habitat. Such notifications should be directed to [FisheriesProtection@dfo-mpo.gc.ca](mailto:FisheriesProtection@dfo-mpo.gc.ca) or 1-855-852-8320 (<http://www.dfo-mpo.gc.ca/pnw-ppe/contact-eng.html>).

We recommend that you notify this office at least 10 days before starting your project and that a copy of this letter be kept on site while the work is in progress. It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.

If you have any questions with the content of this letter, please contact Tyler Peat at (613) 213-0293 or by email at [tyler.peat@dfo-mpo.gc.ca](mailto:tyler.peat@dfo-mpo.gc.ca). Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

A handwritten signature in black ink that reads "Tyler Peat". The signature is written in a cursive style with a long horizontal stroke at the end.

Tyler Peat  
Biologist, Triage and Planning  
Fish and Fish Habitat Protection Program

CC: Tony Arej – Parsons Inc.  
Brandon Jarvis – Parsons Inc.