

**Part 1 General**

**1.1 REFERENCES**

- .1 The City of Winnipeg (CW)
  - .1 CW 2160.
  - .2 CW 3230.
  - .3 CW 3410.
  - .4 CW 2030
- .2 Canadian Standards Association (CSA)
  - .1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
  - .2 CAN/CSA-A23.2, Methods of Test for Concrete.
  - .3 CAN/CSA-A3000-A5, Portland Cement.
  - .4 CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.

**1.2 SUBMITTALS**

- .1 Shop Drawings
  - .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and all necessary details of reinforcing.
- .2 Construction Method
  - .1 No work shall commence on construction of wastewater pumping station concrete work until after the Contract Administrator's review of the Contractor's Construction Method submission.
  - .2 The Contractor shall prepare for the Contract Administrator's review a Construction Method submission detailing:
  - .3 Construction sequence to be followed including all methods to be employed to ensure no damage occurs to existing structures or adjacent properties within or adjacent to the Works.
  - .4 Submission to include proposed method of pumping station construction, specialized equipment to be used, and any design revisions proposed to accommodate the Contractor's proposed construction method.
  - .5 The Contractor shall respond to any concerns that may be raised by the Contract Administrator after review of Construction Method submission.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Portland cement: to CAN/CSA-A3000-A5, Type HS or HSb.
- .2 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.

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- .3 Premoulded joint filler:
  - .1 Bituminous impregnated fibreboard: to ASTM D1751.
- .4 Joint sealer/filler: to CAN/CGSB-19.24, Type 1, Class B.
- .5 Sealer: proprietary poly-siloxane resin blend.
- .6 Other concrete materials: to CAN/CSA-A23.1.
- .7 Void Form: Frost Cushion as manufactured by Beaver Plastics.

## 2.2 MIXES

- .1 Proportion concrete in accordance with CAN/CSA-A23.1 and CW 2160.
- .2 Concrete: concrete design shall be in accordance with performance specification and shall have the following properties:Cement:
  - .1 Type HS or HSb.
  - .2 Minimum Compressive Strength @ 28 days: 35 MPa
  - .3 Slump: 80 +/- 20 mm
  - .4 Air Content: 5 +/- 1%
  - .5 Maximum Water/Cement Ratio = 0.45
- .3 Class of exposure: S-2 to CAN/CSA-A23.1.
- .4 Nominal maximum size of coarse aggregate: 20mm and to CAN/CSA-A23.1.
- .5 Air content: concrete to contain purposely entrained air in accordance with CAN/CSA-A23.1.
- .6 Admixtures: to CAN/CSA-A23.1.
- .7 Grout: Sika Grout 212SR or approved equal in accordance with B6.
- .8 Masonry Fill: concrete design shall be in accordance with performance specification and shall have the following properties:Cement:
  - .1 Type GU.
  - .2 Minimum Compressive Strength @ 28 days: 20 MPa
  - .3 Slump: 200 mm
  - .4 Air Content: nil
  - .5 Maximum Water/Cement Ratio = 0.49
- .9 Bonding Agent: ACRYL-STIX or approved equal in accordance with B6.

**Part 3 Execution**

**3.1 CONSTRUCTION**

- .1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1.

**3.2 FORMING**

- .1 Construct formwork and falsework in accordance with CAN/CSA-A23.1 and CSA S269.1.
- .2 Use void form under all grade beams; do not cast grade beams against ground.

**3.3 INSERTS**

- .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in. Sleeves and openings greater than 100 mm x 100 mm not indicated, must be approved by the Contract Administrator.

**3.4 FINISHES**

- .1 Formed surfaces exposed to view: sack rubbed finish in accordance with CAN/CSA-A23.1.
- .2 Interior floor slabs: initial finishing operations followed by final finishing comprising mechanical floating and steel trowelling as specified in CAN/CSA-A23.1 to produce hard, smooth, dense trowelled surface free from blemishes.
- .3 Equipment pads: provide smooth trowelled surface.
- .4 Pavements, walks, curbs and exposed site concrete:
  - .1 Screed to plane surfaces and use floats.
  - .2 Provide round edges and joint spacings using standard tools.
  - .3 Trowel smooth to provide lightly brushed non-slip finish.

**3.5 CONTROL JOINTS**

- .1 Cut form control joints in slabs on grade at locations indicated or to match existing, in accordance with CAN/CSA-A23.1 and install specified joint sealer/filler.

**3.6 EXPANSION AND ISOLATION JOINTS**

- .1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface.

### **3.7 STRUCTURE WATERPROOFING**

- .1 Install single layer of bentonite clay based geotextile waterproofing on exterior side of all buried walls and roofs of exterior below grade structures. Overlap and joint materials in accordance with manufacture's written instructions and provide form fitting intended-for-purpose materials at all corners and control joint locations.
  - .1 Construction joints shall utilize Volclay RX waterstop in two (2) layers or approved equal.
  - .2 Exterior waterproofing shall utilized Volclay Voltex bentonite geotextile waterproofing in single layer or approved equal.

### **3.8 CURING**

- .1 Cure and protect concrete in accordance with CAN/CSA-A23.1.
  - .1 Do not use curing compounds where bond is required by subsequent topping or coating.

### **3.9 SEALING**

- .1 Following curing, apply poly-siloxane resin blend sealer at 4 m<sup>2</sup>/L.

### **3.10 SITE TOLERANCES**

- .1 Concrete floor slab finishing tolerance in accordance with CAN/CSA-A23.1.

### **3.11 QUALITY CONTROL**

- .1 Inspection and testing of concrete and concrete materials will be in accordance with CSA A23.1 and carried out by a Testing Laboratory designated by the Contract Administrator. Quality control tests for concrete will be used to determine the acceptability of the concrete supplied.
- .2 Provide without charge samples of concrete and constituent materials required for quality control tests and provide assistance and use of tools and construction equipment as is required.
- .3 The frequency and number of concrete quality control tests will be in accordance with the requirements of CSA A23.1.
- .4 Non-destructive methods for testing concrete will be in accordance with CSA A23.2.
- .5 An outline of the quality control testing is as follows.
  - .1 Samples of concrete for test specimens will be taken in accordance with CSA A23.2-1C.
  - .2 Slump tests will be performed in accordance with A23.2-5C. If measured slump falls outside limits specified a second test will be made. In the event of a second failure the Contract Administrator reserves right to refuse the batch of concrete represented.

- .6 Non-destructive methods for testing concrete will be in accordance with CSA A23.2. Air content test will be performed in accordance with CSA A23.2-4C. If measured air content falls outside limits specified in Table CW 2160.1 a second test will be made at any time within the specified discharge time limit for the mix. In the event of a second failure the Contract Administrator reserves the right to reject the batch of concrete represented.
- .7 Compressive strength test specimens will be taken in accordance with CSA A23.2-3C.
- .8 Compressive strength tests at 28 days will be the basis for acceptance of all concrete supplied. For each 28 day test the strength of two companion standard-cured test specimens will be determined in accordance with CSA A23.2-9C. Test result will be the average strength of both specimens.
- .9 Field Inspection: A minimum of twenty-four (24) hours notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for observation of reinforcing steel.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1    City of Winnipeg (CW)
  - .1        CW 2160
- .2    American Concrete Institute (ACI)
  - .1        SP-66, ACI Detailing Manual 2004.
    - .1            ACI 315, Details and Detailing of Concrete Reinforcement.
    - .2            ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.
- .3    CSA International
  - .1        CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2        CSA-A23.3, Design of Concrete Structures.
  - .3        CSA-G30.18, Carbon Steel Bars for Concrete Reinforcement.
  - .4        CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .5        CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .6        CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4    Reinforcing Steel Institute of Canada (RSIC)
  - .1        RSIC, Reinforcing Steel Manual of Standard Practice.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    The Contractor shall submit shop drawings for the Contract Administrator's approval two (2) weeks prior to the fabrication of any reinforcing steel.
- .2    The Contractor shall provide, without charge, the samples of reinforcing steel required for quality control tests and provide such assistance and use of tools and construction equipment as is required.
- .3    Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315.
- .4    Shop Drawings:
  - .1        Submit drawings stamped and signed by professional engineer registered in the Province of Manitoba.
    - .1            Indicate placing of reinforcement and:
      - .1                Bar bending details.
      - .2                Lists.
      - .3                Quantities of reinforcement.
  - .2        Detail lap lengths and bar development lengths to CSA-A23.3.

### **1.3 QUALITY ASSURANCE**

- .1 Submit:
  - .1 Mill Test Report: Upon request, provide the Contract Administrator with certified copy of mill test report of reinforcing steel a minimum of 4 weeks prior to beginning reinforcing work.
  - .2 Upon request submit in writing to the Contract Administrator the proposed source of reinforcement material to be supplied.

### **1.4 DELIVERY, STORAGE AND HANDLING**

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

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18.
- .2 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .3 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.
- .4 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
  - .1 Bar accessories shall be of type approved by the Contract Administrator. They shall be made from a non-corroding material, and they shall not stain, blemish, or spall the concrete surface for the life of the concrete. Bar chairs are to be PVC; galvanized bar chairs are not acceptable.
  - .2 Bar accessories shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices that may be approved by the Contract Administrator. Bar accessories are not shown on the Contract Drawings. The supply and installation of bar accessories shall be considered incidental to the supply and placing of reinforcing steel.
- .5 Plain round bars: to CSA-G40.20/G40.21.
- .6 Replace defective or damaged materials with new.

### **2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, ACI 315, CW 2160, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

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

### **2.3 SOURCE QUALITY CONTROL**

- .1 Upon request, provide the Contract Administrator with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Upon request inform the Contract Administrator of proposed source of material to be supplied.

## **Part 3 Execution**

### **3.1 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where authorized by the Contract Administrator.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

### **3.2 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.
- .2 Use plain round bars as slip dowels in concrete.
  - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
  - .2 When paint is dry, apply thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain the Contract Administrator's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.
- .5 A minimum of twenty-four (24) hours notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for observation of reinforcing steel.

### **3.3 CLEANING**

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

**END OF SECTION**