CONCRETE FORMING AND ACCESSORIES

Part 1 General

1.1 RELATED SECTIONS

.1 32 00 00 – Concrete Reinforcement

.2 33 00 00 – Cast-in-Place Concrete.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.

Part 2 Products

2.1 MATERIALS

.1 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121.

.2 Form ties:

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

.3 Form release agent: non-toxic.

Part 3 Execution

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

.3 Align form joints and make watertight.

.1 Keep form joints to minimum.

.4 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

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

.6 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.7 Line forms for following surfaces:

.1 Exposed exterior faces of clarifiers. Secure lining taut to formwork to prevent folds.

.2 Pull down lining over edges of formwork panels.

.3 Ensure lining is new and not reused material.

.4 Ensure lining is dry and free of oil when concrete is poured.

.5 Application of form release agents on formwork surface is prohibited where drainage lining is used.

.6 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.

.7 Cost of textile lining is included in price of concrete for corresponding portion of Work.

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

3.2 REMOVAL

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

.1 3 days for walls and sides of beams.

.2 Remove formwork when concrete has reached 50% of its design strength or minimum period noted above, whichever comes later.

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

END OF SECTION

CONCRETE REINFORCING

Part 1 General

1.1 RELATED SECTIONS

.1 03 10 00 – Concrete Forming

.2 03 30 00 – Cast-in-Place Concrete

1.2 REFERENCES

.1 American Concrete Institute (ACI)

.1 SP-66-04, ACI Detailing Manual 2004.

ACI 315-99, Details and Detailing of Concrete Reinforcement.

ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.

.2 Canadian Standards Association (CSA International)

.1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-A23.3-04, Design of Concrete Structures.

.3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement, A National Standard of Canada.

.4 CSA W186-M1990(R2002), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.3 Reinforcing Steel Institute of Canada (RSIC)

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

1.3 SUBMITTALS

.1 Submittals in accordance with CWSCS.

.2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315.

.3 Submit shop drawings including placing of reinforcement and indicate:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

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

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

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

Part 2 Products

2.1 MATERIALS

.1 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.

.2 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-G30.18.

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

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 ACI 315 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.

Part 3 Execution

3.1 FIELD BENDING

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

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

.3 Replace bars, which develop cracks or splits.

3.2 PLACING REINFORCEMENT

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

.2 Prior to placing concrete, obtain Departmental Representative's / Contract Administrator's approval of reinforcing material and placement.

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 31 00 00 Concrete Forming.

.2 32 00 00 – Concrete Reinforcing

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C260-01, Standard Specification for Air-Entraining Admixtures for Concrete.

.2 Canadian Standards Association (CSA International)

.1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A283-00(R2003), Qualification Code for Concrete Testing Laboratories.

.3 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

CSA-A3001-03, Cementitious Materials for Use in Concrete.

1.3 ACRONYMS AND TYPES

.1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).

.1 Type GU or GUb - General use cement.

.2 Type MS or MSb - Moderate sulphate-resistant cement.

.3 Type MH or MHb - Moderate heat of hydration cement.

.4 Type HE or Heb - High early-strength cement.

.5 Type LH or LHb - Low heat of hydration cement.

.6 Type HS or HSb - High sulphate-resistant cement.

.2 Fly ash:

.1 Type F - with CaO content less than 8%.

.2 Type CI - with CaO content ranging from 8 to 20%.

.3 Type CH - with CaO greater than 20%.

.3 GGBFS - Ground, granulated blast-furnace slag.

1.4 DESIGN REQUIREMENTS

.1 Alternative 2 - Prescription in accordance with CSA-A23.1/A23.2, and as described in Mixes of PART 2 - PRODUCTS.

.2 Concrete pours: submit 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: submit for review by Contract Administrator deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

1.5 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with CWSCS.

.2 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures for review by Contract Administrator on following items:

.1 Hot weather concrete.
.2 Cold weather concrete.
.3 Curing.
.4 Finishes.
.5 Formwork removal.
.6 Joints.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.

.1 Modifications to maximum time limit must be agreed to Contract Administrator and concrete producer as described in CSA A23.1/A23.2.
.2 Deviations to be submitted for review by Contract Administrator.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 Products

2.1 MATERIALS

.1 Cement: to CAN/CSA-A3001, Type MS.

.2 Water: to CSA-A23.1.

.3 Aggregates: to CAN/CSA-A23.1/A23.2.

.4 Admixtures:

.1 Air entraining admixture: to ASTM C260.
.2 Chemical admixture: to ASTM C494, ASTM C1017. Contract Administrator to approve accelerating or set retarding admixtures during cold and hot weather placing.
.3 Compressive strength: 35 MPa at 28 days.

2.2 MIXES

.1 Alternative 2 - Prescriptive Method for specifying concrete: The City's concrete mix in accordance with CAN/CSA-A23.1.

.1 Ensure materials to be used in concrete mix have been submitted for testing.

.2 Co-ordinate construction methods to suit Contract Administrator concrete mix proportions and parameters.

.3 Identify and report immediately to Contract Administrator when concrete mix design and parameters pose anticipated problems or deficiencies related to construction.

.4 Contract Administrator to proportion concrete mix for normal including:

Class of exposure: C-1.

Intended application: Clarifier Tanks.

Aggregate: normal-density.

Admixture: air-entraining

Maximum W/CM ratio: 37

Air content category: 1.

Slump: at time and point of discharge 60 to 100 mm.

Part 3 Execution

3.1 PREPARATION

.1 Obtain Contract Administrator's approval before placing concrete.

.1 Provide 24 hours notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing

.3 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.4 Pumping of concrete is permitted only after approval of equipment and mix.

.5 Ensure reinforcement and inserts are not disturbed during concrete placement.

.6 Prior to placing of concrete obtain Contract Administrator's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Protect previous Work from staining.

.8 Clean and remove stains prior to application for concrete finishes.

.9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.

.1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.

.11 Do not place load upon new concrete until authorized by Contract Administrator

3.2 CONSTRUCTION

.1 Do cast-in-place concrete work in accordance with CSA-A23.1/A23.2.

.2 Sleeves and inserts:

.1 Where approved by Contract Administrator, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.

.2 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Contract Administrator.

.3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Contract Administrator placing of concrete.

.4 Check locations and sizes of sleeves and openings shown on drawings.

.5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete. Anchor bolts:

.6 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

.7 With approval of Contract Administrator, grout anchor bolts in preformed holes or holes drilled after concrete has set to manufacturers' recommendations.

3.3 FIELD QUALITY CONTROL

.1 Site tests: conduct testing in accordance with CWSCS.

3.4 VERIFICATION

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - Products, by Contract Administrator.

3.5 CLARIFIER EFFLUENT LAUNDER

.1 When flow to a clarifier is stopped and the clarifier is emptied a residual water level remains in the effluent launder. Provide a sandbag or other means of closing off the effluent launder from the rest of the plant. Remove residual water to provide a dry working area to accommodate concrete works and weir replacement work.

.2 On completion of all work in each clarifier remove all debris in the launders and the sandbags or other means used to close off plant water level in the launder.

END OF SECTION