PART 1 – GENERAL

1.1 Related Requirements

.1 Section 03 20 00 – Concrete Reinforcing.

.2 Section 03 30 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.
.3 CSA O121-M1978(R2003), Douglas Fir Plywood.
.4 CSA O151-04, Canadian Softwood Plywood.
.5 CSA O153-M1980(R2003), Poplar Plywood.
.6 CAN/CSA-O325.0-92(R2003), Construction Sheathing.
.7 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
.8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
.9 CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada.

1.3 Action and Informational Submittals

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

.2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawings.

.3 Indicate sequence of erection and removal of formwork/falsework as directed by Department Representative.

PART 2 - PRODUCTS

2.1 Materials

.1 Form liner:
.1 Plywood: Canadian Softwood Plywood to CSA O151.

PART 3 - EXECUTION

3.1 Fabrication and Erection

.1 Fabricate and erect falsework in accordance with CSA S269.1.

.2 Fabricate and erect formwork in accordance with CAN/CSA-

S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

.3 Align form joints and make watertight.
.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 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 Removal and Reshoring

.1 Leave formwork in place for following minimum periods of time after placing concrete.
.1 7 days for columns.

.2 Remove formwork when concrete has reached 80% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

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

END OF SECTION

PART 1 – GENERAL

1.1 Related Requirements

.1 Section 03 30 00 – Cast In-Place Concrete.

.2 Section 03 10 00 – Concrete forming and accessories.

1.2 Price and Payment Procedures

.1 Measurement and Payment:
.1 No measurement will be made under this Section;
.1 Include reinforcement costs in items of concrete work in Section 03 30 00 - Cast-In-Place Concrete.

1.3 References

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

.2 Reinforcing Steel Institute of Canada (RSIC)
.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 Action and Informational Submittals

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

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

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario of Canada.
.1 Indicate placing of reinforcement and:
.1 Bar bending details;
.2 Lists;
.3 Quantities of reinforcement;
.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Department Representative, with identifying code marks to permit correct placement without reference to structural drawings.

1.5 Quality Assurance

.1 Submit in accordance with Section 01 00 10 – General Information and as described in PART 2 - SOURCE QUALITY CONTROL.
.1 Mill Test Report: upon request, provide Department Representative with certified copy of mill test report of reinforcing steel, minimum 2 weeks prior to beginning reinforcing work.
.2 Upon request submit in writing to Department Representative proposed source of reinforcement material to be supplied.

1.6 Delivery,Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions and 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 indoors in dry location 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 Substitute different size bars only if permitted in writing by Department Representative.

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

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

.4 Cold-drawn annealed steel wire ties: to ASTM A 82/A 82M.

2.2 Fabrication

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

2.3 Source Quality Control

.1 Upon request, provide Department Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 2 weeks prior to beginning reinforcing work.

PART 3 - EXECUTION

3.1 Field Bending

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Department Representative.

.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 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 Department Representative's approval of reinforcing material and placement.

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

3.3 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.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 - Cleaning.

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.

1.2 Price and Payment Procedures

.1 Measurement and Payment:
.1 Cast-in-place concrete will not be measured but will paid for as fixed price item.
.2 Supply and installation of anchor bolts, nuts and washers and bolt grouting will not be measured but considered incidental to work.

1.3 References

.1 Abbreviations and Acronyms:
.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.

.2 Reference Standards:
.1 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 A283-06, Qualification Code for Concrete Testing Laboratories.
.3 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.4 Action and Informational Submittals

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

.2 Provide testing results for review by Department Representative and do not proceed without written approval when deviations from mix design or parameters are found.

.3 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.

.4 Concrete hauling time: provide for review by Department Representative 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 Section 01 00 10 – General Instructions.

.2 Provide Department Representative, minimum 2 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 will meet specified requirements.

1.6 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 Do not modify maximum time limit without receipt of prior written agreement from Department Representative, laboratory representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Department Representative.

.2 Packaging Waste Management: remove for reuse by manufacturer of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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 Department Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 Materials

.1 Cement: to CSA A3001, Type GU.

.2 Blended hydraulic cement: Type GUb to CSA A3001.

.3 Water: to CSA A23.1.

.4 Aggregates: to CSA A23.1/A23.2.

.5 Admixtures:
.1 Air entraining admixture: to ASTM C 260;
.2 Chemical admixture: to ASTM C 494 Department Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.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 35 MPa at 28 days.

.7 Curing compound: to CSA A23.1/A23.2 white.

2.4 Mixes

.1 Alternative 1 - Performance Method for specifying concrete: to meet Department 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 Provide concrete mix to meet following hard state requirements:
.1 Durability and class of exposure: refer to plan notes.
.2 Compressive strength at 28 days: 35 Mpa minimum.
.3 Aggregate size 20 mm maximum.

PART 3 - EXECUTION

3.1 Preparation

.1 Obtain Department 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 - 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 Department Representative'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 shrinkage compensating grout epoxy grout to anchor and hold dowels in positions as indicated.

.11 Do not place load upon new concrete until authorized by Department Representative.

3.2 Installation/Application

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

.2 Anchor bolts:
.1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete;
.2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Department Representative;
.1 Drilled holes: to manufacturers' recommendations;
.3 Protect anchor bolt holes from water accumulations, snow and ice build-ups;
.4 Set bolts and fill holes with shrinkage compensating grout;
.5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.

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

.4 Finishing and curing:
.1 Finish concrete to CSA A23.1/A23.2.
.2 Use procedures as noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.

.3 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.

3.3 Field Quality Control

.1 Site tests: conduct tests as follows in accordance with Section 01 00 10 – General Instruction 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 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Department Representative for review to CSA A23.1/A23.2.
- .1 Ensure testing laboratory is certified to CSA A283.

.3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Department Representative.

.4 Departmental Representative will pay for costs of tests.

.5 Inspection or testing by Department Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.4 Cleaning

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION