

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 13 46 00

1.2 PRICE AND PAYMENT PROCEDURES

- .1 Measurement and Payment:
 - .1 No measurement will be made under this Section. Include reinforcement costs in items of overall cost of supplying the buildings.

1.3 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 SP-66, ACI Detailing Manual 2004.
- .2 ASTM International
 - .1 ASTM A 82/A 82M, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - .2 ASTM A 143/A 143M, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - .3 ASTM A 185/A 185M, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .4 ASTM A 775/A 775M, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .3 CSA International
 - .1 CSA-A23.1-/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/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.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in BC Province 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 Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.

- .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3,
- .1 Provide tension lap splices where indicated.

1.5 QUALITY ASSURANCE

- .1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
 - .1 Mill Test Report: upon request provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
 - .2 Upon request submit in writing to Departmental 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 61 00 - Common Product Requirements.
- .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 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan Waste Reduction Workplan related to Work of this Section.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Departmental 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.
- .5 Deformed steel wire for concrete reinforcement: to ASTM A 82/A 82M.
- .6 Welded steel wire fabric: to ASTM A 185/A 185M.
 - .1 Provide in flat sheets only.
- .7 Welded deformed steel wire fabric: to ASTM A 82/A 82M.
 - .1 Provide in flat sheets only.
- .8 Epoxy Coating of non-prestressed reinforcement: to ASTM A 775/A 775M.
- .9 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/m².
 - .1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.

- .2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.
 - .1 Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.
- .3 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.
 - .1 In this case, no restriction applies to temperature of solution.
- .4 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.
- .10 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .11 Mechanical splices: subject to approval of Departmental Representative.
- .12 Plain round bars: to CSA-G40.20/G40.21.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 SP-66 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
 - .1 SP-66 unless indicated otherwise.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

- .1 Upon request provide Departmental Representative 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 Departmental Representative of proposed source of material to be supplied.

Part 3 EXECUTION

3.1 PREPARATION

- .1 Galvanizing to include chromate treatment.
 - .1 Duration of treatment to be 1 hour per 25 mm of bar diameter.
- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A 143/A 143M.

3.2 FIELD BENDING

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

3.3 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 Departmental Representative's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.

3.4 FIELD TOUCH-UP

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 55- 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 11 55- Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

Part 1 GENERAL**1.1 RELATED REQUIREMENTS**

- .1 Section 13 46 00

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM D 260, Standard Specification for Boiled Linseed Oil.
 - .2 ASTM D 1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.24 Multicomponent, Chemical-Curing Sealing Compound.
- .3 Canada Green Building Council (CaGBC)
 - .1 Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).
 - .2 LEED Canada-CI Version 1.0, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .4 CSA International
 - .1 CSA-A23.1/A23.2- Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .3 CAN/CSA-G30.18 Billet-Steel Bars for Concrete Reinforcement.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with- Construction Progress Schedule ,
convene pre-installation meeting one week prior to beginning concrete works.
 - .1 Ensure Departmental Representative attend.
 - .2 Verify project requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and necessary details of reinforcing.
 - .2 Submit drawings showing formwork and falsework design to: CSA A23.1/A23.2.
 - .3 Submit drawings stamped and signed by professional engineer registered or licensed in Province of BC Canada.
- .3 At least 3 weeks prior to beginning Work, inform Departmental Representative of source of fly ash.
 - .1 Do not change source of fly ash without written approval of Departmental Representative.
- .4 At least 3 weeks prior to beginning Work, submit to Departmental Representative sample following materials proposed for use:[curing compound.

- .5 Provide testing results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .6 Concrete hauling time: provide for review by Departmental 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 Provide to Departmental Representative 3 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
 - .1 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements.
 - .2 Sustainability Standards Certification:
 - .1 Construction Waste Management: provide copy of plan.
 - .2 Recycled Content:
 - .1 Provide listing of recycled content products used.

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 Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by the Departmental Representative.
 - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

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 Cement: to CSA A3001, Type GU.
 - .1 Recycled content: 15%
 - .2 Reduction in cement from Base Mix to Actual Supplementary Cementing Materials (SCMs) Mix, as percentage.
- .2 Blended hydraulic cement: Type GUb to CSA A3001.
- .3 Supplementary cementing materials: with minimum 15 % fly ash replacement by mass of total cementitious materials to CSA A3001.
- .4 Water: to CSA A23.1/A23.2].
- .5 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.

- .6 Joint sealer/filler: to CAN/CGSB-19.24, Type 1, Class B.
- .7 Sealer: boiled linseed oil to ASTM D 260, mixed with mineral spirits 1:1.
- .8 Durability and Class of exposure – Footing F2; Exterior slab C1

2.4 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 described in PART 3 - VERIFICATION.
 - .2 Provide concrete mix to meet following plastic state requirements:
 - .1 Uniformity: even.
 - .2 Workability: free of surface blemishes and segregation.
 - .3 Finishability: no amount of bleeding.
 - .4 Set time: 1hr hours maximum.
 - .3 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure: .
 - .2 Compressive strength at 28 age: 30 MPa minimum.
 - .3 Intended application: footing & side walk.
 - .4 Aggregate size 20 mm maximum.
 - .5 Volume stability: acceptable volume change range zero due to shrinkage, creep and freeze thaw cycle.
 - .4 Concrete supplier's certification.
 - .5 Provide quality management plan to ensure verification of concrete quality to specified performance.

Part 3 EXECUTION

3.1 PREPARATION

- .1 Provide Departmental Representative 48 hours notice before each concrete pour.
- .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 rehandling, and without damage to existing structure or Work.
- .4 Protect previous Work from staining.
- .5 Clean and remove stains prior to application of concrete finishes.

3.2 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.
- .2 Sleeves and inserts:
 - .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in.
 - .2 Sleeves and openings greater than 100 mm x 100 mm not indicated, must be reviewed by Departmental Representative.

3.3 FINISHES

- .1 Formed surfaces exposed to view: sack rubbed finish in accordance with CSA A23.1/A23.2.
- .2 Interior footings to finish with mechanical floating and steel trowelling as specified in CSA A23.1/A23.2 to produce hard, smooth, dense trowelled surface free from blemishes.
- .3 Floor slabs is screed to correct grade to provide broomed texture.
- .4 Equipment pads: provide smooth trowelled surface.
- .5 Pavements, walks, curbs and exposed site concrete:
 - .1 Screed to plane surfaces and use magnesium floats.
 - .2 Provide round edges and joint spacings using standard tools.
 - .3 Trowel smooth to provide lightly brushed non-slip finish.

3.4 CONTROL JOINTS

- .1 Cut control joints in slabs on grade at locations indicated, to CSA A23.1/A23.2 and install specified joint sealer/filler.

3.5 EXPANSION AND ISOLATION JOINTS

- .1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA A23.1/A23.2.

3.6 CURING

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

3.7 SEALING APPLICATION

- .1 After curing is complete, apply two even coats of linseed oil mixture to clean dry surfaces, each at 8 m² /L. Allow first coat to dry before applying second coat.

3.8 SITE TOLERANCES

- .1 Concrete slab and sidewalk finishing tolerance to CSA A23.1/A23.2.

3.9 FIELD QUALITY CONTROL

- .1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated and paid for by Departmental Representative.

3.10 CLEANING

- .1 Clean in accordance with Section 01 11 55 - Cleaning.
- .2 Use trigger operated spray nozzles for water hoses.
- .3 Designate cleaning area for tools to limit water use and runoff.
- .4 Cleaning of concrete equipment to be done in accordance with Environmental Procedures.
- .5 Waste Management: separate waste materials for reuse and recycling Management and Disposal.

END OF SECTION