

PART 1 - GENERAL

- 1.1 Related Work
- .1 Refer to other Specification Sections for related information.
  - .2 Refer to Section 01 33 00 for Shop Drawing/Submissions requirements.
- 1.2 Reference Standards
- .1 Construct concrete formwork and false work in accordance with CSA standard A23.1-94 (or latest edition), Concrete Materials and Methods of Concrete Construction, except where stricter standards specify otherwise.
  - .2 CSA S269.1-1975 (or latest edition), Falsework for Construction Purposes.
  - .3 CAN/CSA-S269.3 (latest edition), Concrete Formwork.
- 1.3 Submissions
- .1 Shop Drawings:
    - .1 Upon request, submit to the Departmental Representative for review four (4) sets of formwork and falsework shop drawings, in accordance with Section 01 33 00, at least four (4) weeks prior to erection. All such drawings to be stamped and signed by a professional engineer registered in the Province of New Brunswick.
    - .2 Clearly indicate method and schedule of construction, materials, arrangement of joints, ties, shores, liners, and locations of temporary embedded parts. Comply with CSA S269.1 for falsework drawings.
  - .2 Product Data/Samples:
    - .1 Provide product data and samples for form ties.

.3 Provide submissions in accordance with Section 01 33 00.

1.4 Measurement for Payment .1 See Section 01 29 00-Payment Procedures for payment details.

## PART 2 - PRODUCTS

2.1 Materials .1 Formwork lumber: plywood and wood formwork materials to CSA A23.1.

.2 False work materials: to CSA S269.1.

.3 Form stripping agent: colourless mineral oil, free of kerosene, with viscosity between 70 and 110 s Saybolt Universal, 15 to 14 mm<sup>2</sup>/s at 40DC, flash-point minimum 150DC, open cup.

.4 Form ties: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia in concrete surface. When forms are removed, no metal will be less than 75 mm from the surface of the concrete.

## PART 3 - EXECUTION

3.1 Erection .1 Verify lines and levels before proceeding with formwork and ensure dimensions agree with drawings.

.2 Construct forms to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1.

.3 Line forms with material only as approved by the Departmental Representative.

- .4 Construct falsework in accordance with CSA S269.1.
- .5 Align form joints and make watertight. Keep form joints to minimum.
- .6 Use 25 mm chamfer strips on external corners of precast deck panels except where panels connect laterally and longitudinally. Place 25mm chamfer strips on all external corners of cast-in place concrete pile caps.
- .7 Clean formwork in accordance with CSA A23.1, before placing concrete.
- .8 Leave formwork in place for at least seven (7) days.
- .9 Re-use of formwork and falsework subject to requirements of CSA A23.1.
- .10 All holes from form ties and rods to be plugged with mortar to requirements of CSA A23.1. When forms are removed, no metal will be less than 75 mm from the surface of the concrete.
- .11 Build in anchors, sleeves, other inserts required to accommodate work specified in other sections.

PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specification Sections for related information.
- .2 Refer to Section 01 33 00 for Shop Drawing/Submission requirements.
- 1.2 Reference Standards .1 Perform concrete reinforcement work in accordance with CSA standard A23.1-94 (or latest edition), Concrete Materials and Methods of Concrete Construction, except where stricter standards specify otherwise.
- .2 Reinforcing Steel Manual of Standard Practice (Second Edition - 1995) (or latest edition) by Reinforcing Steel Institute of Ontario.
- .3 CSA G30.18 (or latest edition), Billet-Steel Bars for Concrete Reinforcement.
- .4 CSA G30.3-M1983 (R1991) (or latest edition), Cold-Drawn Steel Wire for Concrete Reinforcement.
- 1.3 Source Sampling .1 Upon request, provide the Departmental Representative with certified copy of mill test of steel supplied showing physical and chemical analysis not less than 3 weeks prior to commencement of work.
- 1.4 Submissions .1 Shop Drawings:
- .1 Clearly indicate bar sizes, spacing, location and quantities of reinforcement, mesh, chairs, spacers and hangers with identifying code marks to permit correct placement without reference to structural drawings; to Reinforcing Steel Manual of

Standard Practice.

.2 Detail placement of reinforcing where special conditions occur.

.3 Design and detail lap lengths and bar development lengths to CSA standard A23.1, unless otherwise specified on drawings. Provide Class B tension lap splices unless otherwise indicated.

.2 Product Data/Samples:

.1 Provide product data for supports and spacers.

.3 Test Results:

.1 Provide Mill Test Certificates cross referenced to the product supplied to the site.

.4 Provide submissions in accordance with Section 01 33 00.

1.5 Storage

.1 Store reinforcing steel on racks or sills that will permit easy access for identification and handling and prevent it from becoming coated with material which would adversely affect bond.

.2 Do not store reinforcing steel in direct contact with the ground.

1.6 Measurement of Payment

.1 See Section 01 29 00-Payment Procedures for payment details.

PART 2 - PRODUCTS

2.1 Materials

.1 Reinforcing steel: to CSA G30.18; billet steel grade 400W deformed bars.

.2 Wire ties: to CSA G30.3 plain, cold drawn

annealed steel wire.

- .3 Spacers: PVC, Fabricated to suit site dimensions.

2.2 Reinforcing Steel Fabrication

- .1 Fabricated reinforcing to CSA standard A23.1.
- .2 Fabrication tolerances for reinforcing steel to Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .3 Obtain the Departmental Representative's acceptance for location of reinforcement splices other than shown on steel placing drawings.
- .4 Ship bundles of bar reinforcement clearly identified in accordance with bar list.
- .5 Do not weld reinforcing steel.

PART 3 - EXECUTION

3.1 Placing

- .1 Accurately place reinforcing in positions indicated and hold firmly during placing, compacting and setting of concrete.
- .2 Tie reinforcement where spacing in each direction is:
  - .1 Less than 300 mm: - tie at alternate intersections.
  - .2 300 mm or more: - tie at each intersection.
- .3 Ensure cover to reinforcement is maintained during concrete pour.

3.2 Field Bending

- .1 Do not field bend reinforcement except where indicated or authorized by the Departmental Representative.

- 
- .2 When authorized, bend reinforcement without heat, by applying slow and steady pressure.
  - .3 Replace bars which develop cracks or splits.
- 3.3 Cleaning .1 Clean reinforcing before placing concrete.
- 3.4 Inspection .1 Do not place concrete until the Departmental Representative has inspected and accepted reinforcement work in place.
- 3.5 Surface Conditions .1 Reinforcement, at time concrete is placed, to be free from mud, oil or other nonmetallic coatings that adversely affect bonding capacity.
- .2 Reinforcement, with rust, mill scale, or combination of both to be considered as satisfactory, provided minimum dimensions, including height of deformations, and mass of hand wire brushed test specimen are not less than specified requirements in applicable CSA Standards.

PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specification Sections for related information on aggregates, form work and false work, concrete reinforcement, paint, miscellaneous items.
- .2 Refer to Section 01 33 00 for Shop Drawing/Submission requirements.
- 1.2 Measurement Procedures .1 See Section 01 29 00-Payment Procedures for payment details.
- 1.3 Samples .1 Submit samples in accordance with Section 01 33 00 Submittal Procedures.
- .2 At least 4 weeks prior to commencing work, inform a Departmental Representative of proposed source of aggregates and provide access for sampling.
- 1.4 Certificates .1 Submit certificates in accordance with Section 01 33 00 Submittal Procedures.
- .2 Minimum 4 weeks prior to starting concrete work submit to Departmental Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
- .1 Portland cement.
- .2 Blended hydraulic cement.
- .3 Supplementary cementing materials.
- .4 Grout.
- .5 Admixtures.
- .6 Aggregates.
- .7 Water.
- .3 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA A23.1.
- .4 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA A23.1.
- .5 All epoxy shall be installed by a worker trained

and approved by the material supplier. All epoxy must be installed as per the supplier and manufacturers specification.

- 1.5 Waste Management and Disposal
- .1 Separate and recycle waste materials in accordance with Section 01 74 21.
  - .2 Designate a cleaning area for tools to limit water use and runoff. Designate a cleaning area for concrete trucks off site at a company owned site for such a purpose (meeting all federal and provincial requirements).
  - .3 Use trigger operated spray nozzles for water hoses.
  - .4 Carefully coordinate the specified concrete work with weather conditions.
  - .5 Prevent plasticizers, water reducing agents and air entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, non-combustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.
  - .6 Choose least harmful, appropriate cleaning method which will perform adequately.

PART 2 - PRODUCTS

- 2.1 Materials
- .1 Portland cement to CAN/CSA A5, normal Type 10.
  - .2 Supplementary cementing materials: to CAN/CSA A23.5.
  - .3 Water: to CAN/CSA A23.1.
  - .4 Aggregates: to CAN/CSA A23.1, for Class C-1 Exposure. Coarse aggregates to be normal density.
  - .5 All concrete to be a minimum compressive strength of 40 MPa at 28 days.
  - .6 Air entraining admixture: to CSA A23.5 and ASTM A26.
  - .7 Chemical admixtures: to CSA A23.6 and ASTM C494. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

- .8 All new grout to be manufactured for use in a marine environment.
- .9 All new grout to be non-shrink with a minimum compressive strength of 40 MPa at 28 days.

## 2.2 Concrete Mixes

- .1 Proportion normal density concrete in accordance with CAN/CSA A23.1, Alternative
- .2 Cement Type GU
- .3 Minimum compressive strength at 28 days: 35 MPa.
- .4 Minimum cement content: 385 kg/m<sup>3</sup> of concrete.
- .5 Class of exposure: C1.
- .6 Nominal size of coarse aggregate: 5-20 mm.
- .7 Slump at time and point of discharge: 50 to 100 mm.
- .8 Air content: 5 to 8%.
- .9 Maximum water cement ratio 0.35.

## PART 3 - EXECUTION

### 3.1 Preparation

- .1 Obtain Departmental Representative approval before placing concrete. Provide 24 hours' notice prior to placing of concrete.
- .2 Pumping of concrete is permitted only after approval of equipment and mix.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing of concrete obtain Departmental Representative approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .6 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and pack solidly with shrinkage compensating grout to anchor and hold dowels in positions as indicated.
- .7 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 Construction

- .1 All cast in place concrete work to be completed in accordance with CAN/CSA A23.1/A23.2.
- .2 Concrete placed inside new steel pipe piles to be place using a tremie pour operation as per CAN/CSA A23.1/A23.2.
- .3 Provide protection for concrete work as per CSA - A23.1 & A23.2 when temperature is less than 10°C.
- .4 All reinforcing steel to have a minimum cover of 70 mm.
- .5 Finishing.
  - .1 Finish concrete in accordance with CAN/CSA A23.1.
  - .2 Float surfaces with wood or metal floats or power finishing machines and bring surfaces to true grade or dimensions.
  - .3 Use curing compounds compatible with applied finish on concrete surfaces. Applied finish on concrete: Provide written declaration that compounds used are compatible.
  - .4 Use curing compound with sealer and apply two coats. Follow manufacturer's recommendations.
  - .5 Water cure concrete for minimum of 7 days if curing compound is not used.

3.3 Site Tolerance

- .1 Concrete tolerance in accordance with CAN/CSA A23.1/A23.2.

3.4 Field Quality Control

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Departmental Representative in accordance with CAN/CSA A23.1 and Section 01 45 00.
- .2 Departmental Representatives may take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .3 Nondestructive Methods for Testing Concrete shall be in accordance with CAN/CSA A23.2.