

PART 1 - GENERAL

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| <u>1.1 RELATED WORK</u> | .1 | Refer to other Specification Sections for related information. |
| | .2 | Refer to Section 01 33 00 for Shop Drawing/ Submissions requirements. |
| <u>1.2 REFERENCE STANDARDS</u> | .1 | Do concrete formwork and falsework in accordance with CSA standard A23.1-94 (latest edition), Concrete Materials and Methods of Concrete Construction, except where stricter standards specify otherwise. |
| | .2 | CSA S269.1-1975 (latest edition), Falsework for Construction Purposes |
| <u>1.3 SUBMISSIONS</u> | .1 | Shop Drawings:
.1 Upon request, submit to Departmental Representative for review four (4) sets of formwork and falsework shop drawings, in accordance with Section 01 33 00, at least three (3) weeks prior to erection. All such drawings to be stamped and signed by a Professional Engineer registered in the Province of Newfoundland and Labrador.
.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- Submittal Procedures. |
| <u>1.4 MEASUREMENT FOR PAYMENT</u> | .1 | No measurement to be made under this section. |

PART 2 - PRODUCTS

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| <u>2.1 MATERIALS</u> | .1 | Formwork lumber: plywood and wood formwork materials to CSA A23.1 |
| | .2 | Falsework 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 24 mm ² /s at 40°C, flash-point minimum 150°C, 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 50 mm from the surface of the concrete. |

PART 3 - EXECUTION

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| <u>3.1 ERECTION</u> | .1 | Verify lines, levels and centres 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/A23.2. |
| | .3 | Line forms with material only as approved by 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. |
| | .7 | Clean formwork in accordance with CSA A23.1/A23.2 before placing concrete. |
| | .8 | Leave formwork in place for at least seven (7) days, exclusive for days when temperature falls below 5°C, unless otherwise directed by Departmental Representative. Formwork is not to be removed until the concrete has reached |

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| 3.1 ERECTION
(Cont'd) | .8 (Cont'd)
70% of design strength as determined by field
cured cylinders. |
| | .9 Re-use of formwork and falsework subject to
requirements of CSA A23.1/A23.2. |
| | .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 50 mm from the surface of the
concrete. |

PART 1 - GENERAL

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| <u>1.1 RELATED WORK
SPECIFIED ELSEWHERE</u> | .1 | Concrete Forms and Accessories: Section 03 10 00. |
| | .2 | Cast-in -place Concrete: Section 03 30 00. |
| <u>1.2 REFERENCE
STANDARDS</u> | .1 | Do concrete reinforcement work in accordance with CAN/CSA A23.1-M90. |
| <u>1.3 SOURCE SAMPLING</u> | .1 | If requested by Departmental Representative provide certified copy of mill test of steel supplied showing physical and chemical analysis. |
| <u>1.4 SHOP DRAWINGS</u> | .1 | Submit shop drawings and bar list of rebar to the Departmental Representative in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Clearly indicate bar sizes, spacing, location and quantities of reinforcement, mechanical splices, chairs, spacers and hangers with identifying code marks to permit correct placement without reference to structural drawings; to ACI 315R Manual of Engineering and Placing Drawings for Reinforced Concrete Structures. |
| <u>1.5 DELIVERY AND
STORAGE</u> | .1 | To CSA A23.1. |
| <u>1.6 MESUREMENT
FOR PAYMENT</u> | .1 | No measurement to be made under this section. |
| <u>1.7 SUBSTITUTES</u> | .1 | Substitution of different size bars permitted only upon written approval of Departmental Representative. |
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PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Reinforcing Steel - to CSA G30.12 billet steel, deformed bars having yield stress of 400 MPa.
 - .2 Wire Ties - to CSA G30.3, plain, cold drawn annealed steel wire.
 - .3 Supports - to CSA A23.1.
- 2.2 FABRICATION
- .1 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending detail and list.

PART 3 - EXECUTION

- 3.1 FIELD BENDING
- .1 Do not field bend reinforcement except where indicated or authorized by Departmental Representative.
 - .2 When authorized, bend without heat, applying a slow and steady pressure.
 - .3 Replace bars which develop cracks or splits.
- 3.2 PLACING
- .1 Accurately place the reinforcing steel as indicated on the drawings and hold firmly during placing, compacting and setting of the concrete.
 - .2 Use approved type chairs to locate the reinforcing at the proper grade.
 - .3 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.
 - .4 Reinforcements:
 - .1 Place reinforcing steel as indicated on approved placing drawings.
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- 3.2 PLACING
(Cont'd)
- .4 Reinforcements:(Cont'd)
- .2 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .3 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .4 Replace bars which develop cracks or splits.
- 3.3 CLEANING
- .1 Clean reinforcing before placing concrete to CSA A23.1.
- 3.4 INSPECTION
- .1 Do not place concrete until Departmental Representative has inspected and approved reinforcement work in place.

PART 1 - GENERAL

1.1 REFERENCES

- .1 CAN/CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practises for Concrete.
- .2 CAN/CSA-A3001-03, Cementitious Materials for Use in Concrete.
- .3 CAN/CSA-G30.18-09, Billet-Steel Bars for Concrete Reinforcement
- .4 CSA W186-M1990(R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.2 QUALITY
ASSURANCE

- .1 Submit test data and certification by concrete supplier, a minimum of 2 weeks before starting concrete work, that mix proportions selected will produce concrete quality, yield and strength as specified and will comply with CAN/CSA-A23.1.
 - .1 Indicate mix proportions and source of all materials.
- .2 Provide certification that plant, equipment and materials to be used comply with requirements of CAN/CSA-A23.1.
- .3 Testing:
 - .1 Departmental Representative will employ the services of an independant testing agency to test concrete at point of discharge for conformance with performance requirements specified.
 - .2 Notify Departmental Representative sufficiently in advance of concrete placement to arrange for testing personnel to be on site for required tests.
 - .3 A minimum of 3 concrete test cylinders will be taken at each set of concrete foundations for the ODALS located on each runway end.
 - .4 Compressive strength tests will be performed at 7 days and 28 days cure period and reports sent to Departmental Representative.
 - .5 Cooperate with Agency's test requirements and procedures.
 - .6 Costs of testing will be paid by Departmental Representative.

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| 1.2 QUALITY
ASSURANCE
(Cont'd) | .4 | Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
.1 Falsework erection.
.2 Hot weather concrete.
.3 Cold weather concrete.
.4 Curing.
.5 Finishes.
.6 Formwork removal.
.7 Joints. |
| 1.3 MESUREMENT
FOR PAYMENT | .1 | No measurement to be made under this section. |

PART 2 - PRODUCTS

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| 2.1 MATERIAL | .1 | Concrete: mix proportion method Alternative 1 to CAN/CSA-A23.1 and as follows:
.1 Cement: to CSA-A3000, type GU portland cement.
.2 Compressive strength: 30 MPa at 28 days.
.3 Exposure class: F-2.
.4 Aggregate size: 20 mm maximum size to CAN/CSA-A23.1, coarse aggregate to be normal density.
.5 Slump at time and point of discharge: 80 mm +/-20 mm.
.6 Air content: 6%.
.7 Admixtures: air entraining to ASTM C260. Calcium chloride or compounds containing calcium chloride not permitted.
.8 Water: potable. |
| | .2 | Reinforcing bars and dowels: billet steel to CAN/CSA-G30.18, grade 400W, deformed bars.
.1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada. |
| | .3 | Formwork: in accordance with CAN/CSA-A23.1.
.1 Use plywood and wood formwork materials to CAN3-086.
.2 Form stripping agent: colourless mineral oil, free of kerosene, with viscosity between 15 to 24 mm ² /s at 40°C, flashpoint minimum 150°C, open cup. |
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- 2.1 MATERIAL
(Cont'd)
- .4 Grout: non-shrink, premixed, compound of non-metallic aggregate and plasticizing agents, capable of developing a minimum compressive strength of 50 MPa at 28 hours.
 - .5 Curing and sealing compound: acrylic curing and sealing compound to ASTM C309, Type 1, Class B, maximum VOC content of 90 g/l.

PART 3 - EXECUTION

- 3.1 PLACING AND
INSTALLATION
- .1 Do concrete work in accordance with CAN/CSA-A23.1.
 - .2 Reinforcements:
 - .1 Place reinforcing steel as indicated on approved placing drawings.
 - .2 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
 - .3 When field bending is authorized, bend without heat, applying a slow and steady pressure.
 - .4 Replace bars which develop cracks or splits.
 - .3 Do not pour concrete on soil which has been allowed to dry out. If soil is exposed to drying, moisten by sprinkling water before any concrete is placed.
 - .4 In no case deposit concrete against frozen material.
 - .5 Carry out the placing of concrete continuously. Placement of concrete by pumping permitted only if authorized by Departmental Representative in writing.
 - .6 Build-in items supplied by other Sections.
 - .7 Anchor bolts:
 - .1 Set anchor bolts to templates and details indicated under supervision of appropriate trade prior to placing concrete.
 - .2 With approval of Departmental Representative, grout anchor bolts in preformed holes or holes drilled after concrete has set. Drilled holes to be minimum 25 mm larger in diameter than bolts used.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

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| <u>3.1 PLACING AND
INSTALLATION
(Cont'd)</u> | .7 | Anchor bolts:(Cont'd)
.4 Set bolts and base plates with shrinkage compensating grout to 100% contact. |
| | .8 | Install pipes, conduits, ducts and sleeves intended to be encased within concrete, before the concrete is poured. Unless otherwise indicated, pipes embedded in concrete to be standard, lightweight non-corrosive. Hold or brace items rigidly during concrete placement in order to prevent their displacement. |
| | .9 | Complete work to following tolerances:
.1 Straight to 1:500.
.2 Thickness to 6 mm.
.3 Plumb to 1:600. |
| <u>3.2 DRILLING AND
GROUTING ANCHOR/
GROUT HOLES</u> | .1 | Drill all holes to a depth as indicated in the bedrock. However, Departmental Representative may increase this depth if considered necessary. |
| | .2 | Install dowels as indicated. Dowel bars may be installed before or after grout has been placed in the hole. |
| | .3 | Begin injection into the bottom of the hole using a grout without sand. If holes accept this mixture without the pressure rising, increase the quantity of sand gradually. When pressure begins to rise, gradually reduce the quantity of sand for as long as holes absorb the grout mixture at a rate of flow higher than 6 litres/minute, or as instructed by Departmental Representative. |
| | .4 | Place grout in one continuous operation to completely fill the hole with a dense homogenous mass of grout free from voids to dimensions as indicated. |
| <u>3.3 DRILLING AND
GROUTING GROUT HOLES
IN CONCRETE ONLY</u> | .1 | Flush with water under continuous pressure combined with compressed air and test primary holes prior to sealing operations. |
| | .2 | Grout primary grout holes. |
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3.3 DRILLING AND GROUTING GROUT HOLES IN CONCRETE ONLY
(Cont'd)

.3 Start by grouting the bottom of the directed hole and progress in stages, as specified or as directed by Departmental Representative.

3.4 FINISHING

.1 Finish concrete in accordance with CAN/CSA-A23.1.

.2 Steel trowel exposed surfaces to smooth dense finish. Shamfer edges

3.5 CURING

.1 Prior to concrete placement, submit to Departmental Representative proposed method for protection of concrete during placing and curing of concrete.

.2 Cure to CAN/CSA-A23.1