

SECTION 909

TIMBER STRUCTURES

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909.01 SCOPE

This specification covers the supply of timber and all necessary fastenings, as well as the fabrication, placement, and backfilling of timber crib bridge abutments. It also includes the supply and installation of filter fabric, timber chesses, timber wheel guards, and timber raceways for timber decked bridges.

909.02 GENERAL

909.02.01 Dimensions

The Contractor shall construct and install timber crib bridge abutments, timber chesses, wheel guards, and timber raceways in accordance with the dimensions specified in the contract drawings. All site dimensions must be verified before commencing work, and any discrepancies shall be reported in writing to the Owner's Representative.

909.02.02 Protection

The Contractor shall protect completed work from damage caused by other construction activities or environmental conditions. Any damaged portions of timber construction shall be repaired or replaced as determined by the Owner's Representative at no additional cost to the Department.

909.03 MATERIALS

909.03.01 Timber

All timber materials shall be graded and stamped in accordance with applicable grading rules and standards set by associations or agencies that have been approved to grade timber by the Canadian Lumber Standards Administration Board of CSA. All lumber and timber shall be sawn.

Only Douglas Fir shall be used for timber crib bridge abutments and timber chesses; grade shall be SPF Number 1 Grade.

Douglas Fir or Eastern Hemlock shall be used for timber wheel guards and timber raceways; grade shall be SPF Number 1 Grade.

909.03.02 Grading Authority

National Lumber Grades Authority (N.L.G.A.)

909.03.03 Connections

All steel connections shall be medium structural steel conforming to CSA G40.21, "Structural Quality Steels", or the latest edition thereof. All steel connections shall be hot dip galvanized in accordance with Section 909.03.04.

- a) All nails and spikes shall be in accordance with CSA B111-1974 "Wire Nails, Spikes and Staples" latest edition.
- b) All bolts and nuts shall be in accordance with ASTM F3125, Grade A325M. High strength nuts and hardened washers shall be suitable for use with the types of bolts specified on the contract drawings and shall be in accordance with ASTM A563 and ASTM F436.
- c) Bolts, nuts, and washers specified in the Contract Documents shall be Type 1 and shall be hot dip galvanized.
- d) All drift bolts shall be made from round stock, have a diamond or wedge pointed and a button head. The length of the drift bolts shall equal to the total thickness of the timbers being fastened, minus 50mm.
- e) Lag screws shall conform to CSA B34-1967 "Miscellaneous Bolts and Screws" – Table 18.
- f) All lag screw washers shall conform to the CSA B19.1 "Plain Washers", for Class 2 - Common Punched Washers with wide rims.
- g) Round plate washers for 13mm and 16mm diameter machine bolts shall be 6.4mm thick x 76.2mm diameter and have a hole diameter of 15mm and 18mm respectively.
- h) Round plate washers for 19mm, 22mm and 25mm diameter machine bolts shall be 7.9mm thick x 76.2mm diameter and have a hole diameter of 21mm, 24mm and 27mm respectively.
- i) The use of square washers is not permitted.
- j) Two (2) washers shall be used with each machine bolt.

909.03.04 Galvanizing

Galvanizing shall conform to the latest edition of CSA G164-18 "Hot Dip Galvanizing of Irregularly Shaped Articles". Unless otherwise specified, the minimum weight of zinc coating shall be as stated in Table 1 of this Standard.

909.03.05 Filter Fabric

Non-woven geotextile filter fabric shall have the following minimum mechanical properties: thickness of 3.0mm, mass of 270 g/m², tensile strength of 550 Newtons, 100% elongation at rupture, Mullen Burst strength of 1700 kPa, Ball Burst strength of 1350 Newtons, and tear strength of 290 Newtons. These typical properties shall be as defined by CGSB CAN2 4.2.

909.03.06 Backfill

All backfill used for timber crib bridge abutments shall be in accordance with Section 902 "Select Material Compacted – Rock" unless otherwise specified.

909.03.07 Wood Preservation

All timber materials used for timber crib bridge abutments, timber chesses, and timber wheel guards shall be pressure treated in accordance with Section 590.

Timber planks used for timber raceways shall be non-treated.

909.04 CONSTRUCTION AND FABRICATION

909.04.01 Timber Crib Bridge Abutments

Timber crib bridge abutments shall be constructed as shown on the contract drawings. In general, the procedure below shall be followed:

- a) **Levelling Pieces:** Place levelling pieces beneath bottom timbers in such a manner that they will conform to the shape of the ground. Place levelling pieces horizontally so that succeeding pieces will be solidly secured at intersections of bottom timbers and vertical posts and other levelling pieces by means of machine bolts of proper lengths.
- b) **Bottom Timbers:** Place bottom timbers lengthwise and crosswise to form the bottom three courses of the cribs. Crosswise and lengthwise bottom timbers shall

be of one piece and spaced as shown on the drawings. Secure three courses of bottom timbers together with machine bolts at every intersection with each other and vertical posts.

- c) Ballast Floor: Place ballast floor on all pockets of the bottom or middle course of bottom timbers. Secure each ballast floor timber to bottom timbers with drift bolts so that adjacent ballast floor timbers are not secured to same bottom timber.
- d) Longitudinals: All longitudinals for individual cribs shall be continuous (in one length) to a depth of at least 500mm below the lowest ground elevation within the footprint of the new timber crib bridge abutment. Above this elevation, where the cribs are married, the longitudinals shall be of sufficient length to span one bay of one crib and one half bay of the adjacent crib. Where they are joined, they shall be butt joined by mid bay in the middle of a 1200mm block, the block being secured to the timber below by a drift bolt in the centre and the longitudinal to the block by drift bolts in the ends of the longitudinal, for all longitudinals, butt joints shall form a staggered pattern and adjacent longitudinals directly above or below shall not be joined in the same bay. All longitudinals shall be secured to the crossties at every intersection by a drift bolt and to the vertical post by a machine bolt every third course of longitudinals.
- e) Crossties: Crossties to be in one length across cribs. Secure crossties to intersection of longitudinals by a drift bolt and to intersection of vertical posts by a machine bolt every third course of crossties. The top course shall be machine bolted as well. All machine bolts on the exterior shall be countersunk.
- f) Vertical Posts: Vertical posts are to be in one length from the bottom of the cribwork to the underside of the concrete deck. One vertical post shall be located at each corner of each crib and at the intersection of the crossties with the longitudinals. Vertical posts shall be secured to the crossties and longitudinals at every third course with machine bolts of adequate length. Where two cribs are married together, one of the adjacent vertical posts may be eliminated 500mm above high water level (with climate change) as noted on the contract drawings.
- g) Fillers: Blocking shall be placed in the cribwork as indicated on the drawings, and as directed by the Owner's Representative. It shall be the exact length to completely fill the proper spaces and shall be placed under all crossties and longitudinals which are carrying the bearing weight of the deck. It shall be of the

same size and material as the crossties or longitudinals, full length, and shall be drift-bolted with two bolts into the timber immediately below it.

- h) Holing: Bore holes for drift bolts 1.5mm smaller than the bolt diameter and for full length of bolt. Bore holes for machine bolts to same diameter as bolt. The inside of all drilled holes shall be thoroughly treated with one coat of wood preservative.
- i) Before placement of any backfill for timber crib bridge abutments, a layer of geotextile filter fabric shall be placed to encapsulate the fill as shown on contract drawings. All joins in the filter fabric shall have a minimum overlap of 200mm.
- j) Backfill: Backfill shall be placed in horizontal layers having a maximum loose lift thickness of 300 mm and each layer will be thoroughly compacted until no movement is detected, as directed by the Owner's Representative.

909.04.02 Timber Chesses

Timber chesses shall be dimensioned and installed as per contract drawings.

Timber chess sections shall be attached to a timber fastening beam at both ends with 200mm galvanized nails, two per beam. Nails shall not be placed within 50 mm of the fastening beam edge. The outer edges of all chesses shall be trimmed parallel to the bridge centre line. All cut ends and drilled holes shall be treated with two coats of wood preservative.

909.04.03 Timber Wheel Guards

Timber wheel guards shall be dimensioned and installed as per contract drawings and shall include pressure treated chocks and galvanized hardware. Timber wheel guards shall be connected to the structure and the timber fastening beams at intervals not exceeding 1500mm. Connections will be 19mm hot dip galvanized machine bolts of sufficient length including nuts and washers. All drilled holes shall be treated with two coats of wood preservative. The ends of the timber wheel guards will be tapered from top to bottom at 45 degrees. The cut ends will be treated with two coats of wood preservative.

909.04.04 Timber Raceway

Timber raceway planks shall be dimensioned and installed as per contract drawings.

Raceway planks shall be placed so that joins in adjacent runs are staggered at least 610mm. Raceway planks shall be secured to the timber chesses using 101mm

galvanized nails, two nails at each end of the timber and two nails in every second timber chess. The nailing pattern shall be staggered between adjacent runs. If required to prevent splitting of the timber, the Contractor shall pre-drill nail holes. Raceway planks shall be at least 1220mm long at the start and/or end of any run, however main run decking shall be no less than 3660mm in length. Any planing, tapering or modification of timber raceway members to accommodate bridge grades shall be considered incidental to the work.

909.05 UNASSIGNED

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909.08 MEASUREMENT FOR PAYMENT

909.08.01 Timber Crib Bridge Abutments

Timber crib bridge abutments shall be measured in cubic meters of completed work in place, rounded to the nearest one decimal place. The cubic measurements of the cribwork shall be determined by the product of the following dimensions, measured in place:

- a) The height of each crib shall be the average of the measurements taken at each vertical point, from the bottom of the lowest timber to the top of the bearing seat.
- b) The width of each crib shall be the average width measured between the outside faces of the exterior longitudinals, with each width taken from the top tier of each row of crossties.
- c) The length of each crib shall be measured at or near low water level along the center line of the crib, parallel to a level water surface, between the outside faces of the exterior crossties.

909.08.02 Timber Chesses

Timber chesses shall be measured in cubic metres, based on the volume of the newly installed timber chesses, rounded to one decimal place for payment purposes.

909.08.03 Timber Wheel Guards

Timber wheel guards shall be measured by the length of timber wheel guard installed, in metres, rounded to one decimal place for payment purposes.

909.08.04 Timber Raceway

Timber raceways shall be measured by the outer extents of the new timber raceway, in square metres, rounded to one decimal place for payment purposes.

909.09 BASIS OF PAYMENT

909.09.01 Timber Crib Bridge Abutments

Payment at the contracted unit price for timber crib bridge abutments shall include all preparation, equipment, filter fabric, materials, access, labour and incidentals necessary to perform the work as outlined herein or as shown on the contract drawings.

The supply and installation of backfill for timber crib abutments shall be as per Section 902 "Select Material Compacted – Rock" unless otherwise specified.

909.09.02 Timber Chesses

Payment at the contracted unit price shall include all equipment, materials, access, labour, and incidentals to install the timber chesses as outlined herein or as shown on the contract drawings.

909.09.03 Timber Wheel Guards

Payment at the contracted unit price shall include all equipment, materials, access, labour, and incidentals necessary to install the timber chesses as outlined herein or as shown on the contract drawings.

909.09.04 Timber Raceway

Payment at the contracted unit price shall include all equipment, materials, access, labour, and incidentals necessary to install the timber raceway as outlined herein or as shown on the contract drawings.