**MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS**

ENGINEERING BRANCH, TIMBER OPERATIONS, PRICING AND FIRST NATIONS DIVISION

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**TIMBER DECK BRIDGE STANDARDS**

**DRAWING SCHEDULE**

<table>
<thead>
<tr>
<th>DRAWING No.</th>
<th>DESCRIPTION</th>
<th>REV.</th>
<th>DATE</th>
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</thead>
<tbody>
<tr>
<td>STD-EC-020-01</td>
<td>Timber Deck Bridges, General Notes – Sheet 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STD-EC-020-02</td>
<td>Timber Deck Bridges, General Notes – Sheet 2</td>
<td></td>
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<tr>
<td>STD-EC-020-03</td>
<td>Permanent, Continuous Timber Deck Bridge – General Arrangement</td>
<td></td>
<td></td>
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<tr>
<td>STD-EC-020-04</td>
<td>Portable, Continuous Timber Deck Bridge – General Arrangement</td>
<td></td>
<td></td>
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<tr>
<td>STD-EC-020-05</td>
<td>Modular Timber Deck Bridge, General Arrangement &amp; Details</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STD-EC-020-06</td>
<td>Modular Timber Bridge Deck, Attachment Details - New Bridges</td>
<td></td>
<td></td>
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<tr>
<td>STD-EC-020-07</td>
<td>Modular Timber Bridge Deck, Attachment Details – Field Retrofit to Existing Bridges</td>
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</tbody>
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1. GENERAL

1.1 THESE STANDARD DRAWINGS APPLY TO THE DESIGN AND SUPPLY OF SIMPLE SPAN SINGLE LANE STEEL GIRDER BRIDGES WITH TIMBER DECKS. THE STANDARD DRAWINGS PROVIDE DESIGN GUIDELINES AND STANDARD DETAILS.

1.2 VARIATIONS FROM THE STANDARD DESIGN REQUIREMENTS MAY BE ACCEPTABLE IN CERTAIN SPECIAL SITUATIONS. ALL SUCH VARIATIONS SHALL BE DOCUMENTED AND REQUIRE APPROVAL FROM THE MINISTRY PRIOR TO USE.

1.3 A PROFESSIONAL ENGINEER REGISTERED TO PRACTICE IN THE PROVINCE OF BRITISH COLUMBIA SHALL DESIGN ALL BRIDGE GIRDER ELEMENTS.

1.4 DEFINITIONS
- ENGINEER: A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF BRITISH COLUMBIA EXPERIENCED IN THE DESIGN OF TIMBER DECK ON STEEL GIRDER BRIDGES, WHO IS RESPONSIBLE FOR THE DETAILED STRUCTURAL DESIGN OF A BRIDGE IN CONFORMANCE WITH THESE DRAWINGS.
- MINISTRY ENGINEER: A PROFESSIONAL ENGINEER DESIGNATED BY THE MINISTRY.

1.5 APPLICABLE OVERALL BRIDGE GIRDER LENGTH (OUT-TO-OUT): OVERALL BRIDGE GIRDER LENGTHS GREATER THAN 30.48 M OR CONTINUOUS MULTI-SPAN BRIDGE IDENTIFICATION STANDARD

1.6 STANDARD DECK WIDTHS - THE FOLLOWING TABLE SPECIFIES STANDARD DECK WIDTHS FOR THE DESIGNATED DESIGN VEHICLES

<table>
<thead>
<tr>
<th>Load Type</th>
<th>Tie Size</th>
<th>Maximum Tie Spacing</th>
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<tbody>
<tr>
<td>BCL-625</td>
<td>3600</td>
<td>406</td>
</tr>
<tr>
<td>L-150</td>
<td>3600</td>
<td>406</td>
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1.7 STANDARD GIRDER SPACINGS - THE FOLLOWING TABLE SPECIFIES STANDARD GIRDER SPACINGS FOR SEVERAL DECK WIDTHS

1.8 TIMBER DECK CROSS TIE DIMENSIONS:
- PER MINISTRY BRIDGE IDENTIFICATION STANDARD

1.9 SUPERSTRUCTURE IDENTIFICATION MARKING:
- AS PER PROJECT SPECIFICATIONS
- FOR SDS USE L500 FOR FATIGUE DESIGN LOAD
- FATIGUE DESIGN VEHICLE TO BE CENTERED ON BRIDGE
- LATERAL WHEEL LOAD DISTRIBUTION: 50% - 50%
- FATIGUE STRESS RANGE
- R = THE CALCULATED STRESS RANGE AT THE DETAIL DUE TO THE PASSAGE OF THE DESIGN VEHICLE

2.5 DYNAMIC LOAD ALLOWANCE:
- DYNAMIC LOAD ALLOWANCE SHALL BE APPLIED IN ACCORDANCE WITH CAN/CSA-S6.

2.4 MULTI-LANE LOADING:
- WHERE A BRIDGE IS ABLE TO SIMULTANEOUSLY SUPPORT MORE THAN ONE LANE OF TRAFFIC, THE ENGINEER SHOULD SEEK CLARIFICATION FROM THE MINISTRY ON HOW TO ACCOUNT FOR MULTI-LANE LOADING.

2.3 DESIGN VEHICLES:
- REFER TO MINISTRY STANDARD DRAWING STD-EC-000-01 TO STC-EC-002-02
- THE DESIGN DRAWINGS SHALL CLEARLY SPECIFY THE DESIGN VEHICLE THAT WAS USED FOR THE BRIDGE DESIGN.

2.2 DESIGN CODE AND THE MINISTRY REFERENCE STANDARDS:
- DESIGN IN ACCORDANCE WITH CAN/CSA-S6 & VARIATIONS TO COMPENSATE FOR PECULIARITIES OF LOGGING TRUCK LOADS
- ENGINEER MUST CONSIDER THE WEIGHT OF MATERIALS, WORK CREWS AND EQUIPMENT SUPPORTED DURING CONSTRUCTION WHEN DESIGNING THE BRIDGE.
- ENGINEER MUST SPECIFY MAXIMUM PERMISSIBLE CONSTRUCTION EQUIPMENT LOADS ON THE DRAWINGS.
- WHERE A BRIDGE WILL BE INSTALLED UNDER A SEPARATE CONTRACT FROM THE DESIGN/SUPPLY CONTRACT FOR THE MAIN BRIDGE COMPONENTS, AS A MINIMUM, UNLESS OTHERWISE SPECIFIED BY THE MINISTRY, THE DESIGNER SHALL CONSIDER THE FOLLOWING MINIMUM CONSTRUCTION LOADS:
- SELF WEIGHT OF THE STRUCTURE, SUPPORTED AT THE BEARINGS, INCLUDING DECK
- A VERTICAL LIVE LOAD OF 445 KN (40 TON EQUIPMENT + 10 TON LOAD) DISTRIBUTED OVER A LENGTH OF 4 m, POSITIONED ON THE BRIDGE TO PRODUCE THE MAXIMUM EFFECT;
- ECCENTRICITY = 100 mm
- LOAD FACTORS IN ACCORDANCE WITH CAN/CSA-S6-08
- MIN DIA + 10% (ASSUMED DESIGN SPEED = 10 km/hr)

2.1 DESIGN LIFE: BRIDGE DESIGN LIFE: 45 YEARS

2.0 CONSTRUCTION LOAD:
- ENGINEER MUST CONSIDER THE WEIGHT OF MATERIALS, WORK CREWS AND EQUIPMENT SUPPORTED DURING CONSTRUCTION WHEN DESIGNING THE BRIDGE.
- ENGINEER MUST SPECIFY MAXIMUM PERMISSIBLE CONSTRUCTION EQUIPMENT LOADS ON THE DRAWINGS.

1.10 BOLTED GIRDER FIELD SPACES:
- PROVIDE BOLTED FIELD SPACES ON ALL GIRDER SPANS PRODUCED THROUGH A DESIGN/SUPPLY CONTRACT FOR GIRDERS WITH AN OVERALL LENGTH (OUT-TO-OUT) LENGTH > 24.384 m (80 FEET) UNLESS APPROVED BY THE MINISTRY
- WHERE THE CONTRACT IS DESIGN/SUPPLY AND INSTALL, BOLTED FIELD SPACES SHALL BE PROVIDED AT THE DISCRETION OF THE ENGINEER

1.11 DIAPHRAGMS:
- PROVIDE DIAPHRAGMS AT BEARING LOCATIONS
- PROVIDE INTERNAL DIAPHRAGMS AS REQUIRED. MAXIMUM SPACING OF INTERNAL DIAPHRAGMS NOT TO EXCEED 8.0 m

1.12 PLAN BRACING:
- PROVIDE CONTINUOUS PLAN BRACING ON ALL BRIDGES.

1.13 COMPONENT WEIGHTS:
- THE FOLLOWING COMPONENT WEIGHTS SHALL BE SPECIFIED ON THE DESIGN DRAWING:
- GIRDER WEIGHT – SINGLE GIRDER
- ASSEMBLED STEEL GIRDER PLUS BRACING, DIAPHRAGMS AND BEARING/SKID PLATES – TOTAL WEIGHT
- TIMBER COMPONENT WEIGHTS (DECK, BALLAST WALL, CAPS AND FOOTINGS)

2.8 MAXIMUM LIVE LOAD DEFLECTION OF STEEL GIRDERS:
- BRIDGES MUST BE DESIGNED SO THAT LIVE LOAD DEFORMATION (CALCULATED AS THAT CAUSED BY ONE TRUCK ONLY, PLACED AT THE CENTRE LINE OF THE TRAVELLED ROADWAY, DYNAMIC LOAD ALLOWANCE INCLUDED) DOES NOT EXCEED L/450. WHERE USING THE L165 DESIGN VEHICLE, THE DEFORMATION SHALL BE CALCULATED USING THE L150 DESIGN VEHICLE.

2.7 LOAD FACTORS:
- SEISMIC DESIGN NOT REQUIRED UNLESS OTHERWISE SPECIFIED.

2.6 FATIGUE DESIGN FOR STEEL GIRDERS:
- FATIGUE DESIGN TO BE COMPLETED IN ACCORDANCE WITH CAN/CSA-S6 WITH THE FOLLOWING MODIFICATIONS:
- DESIGN VEHICLE:
- AS PER PROJECT SPECIFICATIONS
- FOR L500 USE L500 FOR FATIGUE DESIGN LOAD
- FATIGUE DESIGN VEHICLE TO BE CENTERED ON BRIDGE
- LATERAL WHEEL LOAD DISTRIBUTION: 50% - 50%
- FATIGUE STRESS RANGE
- R = THE CALCULATED STRESS RANGE AT THE DETAIL DUE TO THE PASSAGE OF THE DESIGN VEHICLE

2.5 FATIGUE DESIGN:
- FATIGUE LOAD ALLOWANCE TO BE APPLIED IN ACCORDANCE WITH CAN/CSA-S6.

2.4 SEISMIC LOAD:
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3. MATERIALS AND FABRICATION

3.1 ALL MATERIALS UTILIZED IN FABRICATION SHALL BE NEW, NOT PREVIOUSLY USED IN ANY APPLICATION

3.2 STRUCTURAL STEEL
   - TO CAN/CSA-G40.21M
   - STEEL GIRDER FLANGES AND WEB PLATES GRADE 350 AT CATEGORY 3
   - OTHER STEEL PLATE: 350A
   - BRACING (DIAPHRAGMS AND PLAN BRACING): GRADE 350A
   - ANY REQUIRED VARIATIONS REQUIRE MINISTRY APPROVAL. IF NON WEATHERING STEEL IS APPROVED BY THE MINISTRY, A CORROSION PROTECTION SYSTEM APPROVED BY THE MINISTRY WILL BE REQUIRED
   - COMPLETE ALL WELDS IN ACCORDANCE WITH CSA W59. WELD METAL OF PRIMARY TENSION MEMBERS AND FRACRTURE CRITICAL MEMBERS SHALL MEET THE CVN TOUGHNESS REQUIREMENTS OF TABLE 10.14 OF CAN/CSA S6
   - INSPECT ALL BUTT WELDS BY ULTRASONIC OR X-RAY EXAMINATION IN ACCORDANCE WITH CSA W59
   - FABRICATOR TO BE CERTIFIED FOR DIVISION 1 OR 2 IN ACCORDANCE WITH CSA W47.1 THROUGHOUT THE DURATION OF THE PROJECT
   - FABRICATION BY COMPANY CERTIFIED TO CSA W47.1 DIVISION 1, 2 OR 3
   - FABRICATE GIRDER AS FRACRTURE CRITICAL MEMBERS IN ACCORDANCE WITH CAN/CSA-S6-06, AS NOTED ON DESIGN DRAWINGS. STEEL PLATES FOR BOTTOM FLANGES AND WEBBS SHALL CONFORM TO THE REQUIREMENTS FOR FRACRTURE CRITICAL IN ACCORDANCE WITH CAN/CSA-S6, EXCEPT THAT CHARPY V-NOTCH TESTING RESULTS ARE ONLY REQUIRED ON A PER HEAT FREQUENCY
   - MAKE ALL GIRDER FLANGE TO WEB WELDS USING SUBMERGED ARC WELDING
   - SHOP TRIAL FIT ALL FIELD SPLICES UNLESS CNC EQUIPMENT IS USED

3.3 STRUCTURAL BOLTS:
   - ALL BOLTS INCORPORATED INTO STEEL GIRDER CONNECTIONS (BOLTED FIELD SPLICES, DIAPHRAGMS AND BRACING) TO BE ASTM A325 TYPE 3 M22 U.N.O. INSTALLED IN ACCORDANCE WITH CAN/CSA-S6

3.4 GALVANIZING:
   - ALL ITEMS SPECIFIED AS GALVANIZED ARE TO BE GALVANIZED TO CSA G164

3.5 BEARINGS:
   - TO CAN/CSA-S6: OZONE RESISTING NATURAL RUBBER (NATURAL POLYISOPRENE)
   - WHERE EXPANSION JOINTS ARE USED, ENGINEER TO INCLUDE SUFFICIENT INFORMATION TO FACILITATE INSTALLATION AT VARIOUS TEMPERATURES

3.6 TIMBER DECK MATERIALS:
   - ALLENWABLE WOOD SPECIES, LUMBER GRADES, GRADING CRITERIA AND REQUIRED DOCUMENTATION SHALL BE AS PER MINISTRY: BRIDGE TIMBER AND LUMBER MATERIAL STANDARD

3.7 TIMBER DECK HARDWARE:
   - LAG SCREWS, BOLTS, NUTS, WASHERS TO BE ASTM A307 (GALVANIZED)
   - DECK NAILING PATTERN TO BE AS SHOWN ON DRAWINGS

3.9 TIMBER PRESERVATIVE TREATMENT:
   - ALL TREATED WOOD SHALL BE COASTAL DOUGLAS-FIR, TREATED USING CHROMATE COPPER ARSENATE (CCA) TREATMENT, AND THIRD PARTY INSPECTED, IN ACCORDANCE WITH THE MINISTRY PROCESS SPECIFICATION FOR CCA TREATMENT OF COASTAL DOUGLAS-FIR WOOD

4. TRANSPORTATION AND ERECTION OF BRIDGES

4.1 SUPPORT STEEL GIRDERS IN SUCH A WAY THAT THEY SUSTAIN NO DAMAGE DURING TRANSPORTATION. WHEN TRANSPORTING STEEL GIRDERS ON THE FLAT, PROVIDE A TRANSPORTATION PLAN PREPARED BY A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF BRITISH COLUMBIA.

5. STEEL CERTIFICATION AND QUALITY CONTROL

5.1 PROVIDE MILL CERTIFICATES FOR ALL STEEL MATERIAL.

ASSUME NOT TO SCALE
A 125x125 channel on curb rails @ ends of bridge only.

Wear planks nailing pattern:
- Wear planks to deck planks
- 150 mm galv. common spikes
- 2 spikes @ 150 apart, 300 from ends
- 2 spikes @ 150 apart @ +/- 600 mm G/C

Deck planks nailing pattern:
- Deck planks to cross-ties
- 200 mm galv. common spikes
- 1 spike every tie, staggered side to side
- Ø160 apart
- Pre-drill (8 mm) plank end spikes to prevent splitting

Optional 150x150x3048 stiffening timbers (2)

Alternate tie arrangement:
Continuously laid wear planks

Alternate tie arrangement permitted only if random length wear planks crossing panel joints are laid after deck modules placed on bridge and all wear planks to extend minimum of 500 mm over deck panel joints.

Optional 150x150x3048 stiffening timbers (2) C/W 3-154 bolts per timber countersunk into deck planks & maleable iron washers

Notes:
- See drawing STD-EC-020-02 for timber cross tie sizes and spacings.
- See drawing STD-EC-020-06 for new bridge deck module connection details.
- See drawing STD-EC-020-07 for retrofit deck module connection details.
- When treated module specified, all timbers shall be treated except for wear planks.

MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS
ENGINEERING BRANCH
STANDARD BRIDGE DRAWING
MODULAR TIMBER DECK PANEL
GENERAL ARRANGEMENT & DETAILS

ASSUME NOT TO SCALE
DECK PANEL TO GIRDER ATTACHMENT (NEW CONSTRUCTION)

ALTERNATE LAG SCREW INSTALLATION NOTES:
- LAG SCREWS SHALL 19mm dia x 200mm long (6 REQUIRED)
- PRE-DRILLING FOR LAG SCREW HOLE S SHALL BE AS FOLLOWS:
  - 19 mm dia hole for shank penetration length into girder only
  - 22.5 mm dia hole for full penetration length into girder only
- A NON-PETROLEUM LUBRICANT (IE. SOAP) MAY BE USED TO FACILITATE INSTALLATION
- IF LAG SCREWS HAVE BEEN INSTALLED MORE THAN TWO TIMES OR IF LAG SCREWS ARE STRIPPED, USE BOLT THROUGH OPTION

ASSUME NOT TO SCALE