



CONSTRUCTION SPECIFICATION FOR MODULAR BRIDGE STRUCTURES FOR TEMPORARY INSTALLATIONS

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918.01 SCOPE

This specification covers the requirements for the design, supply, construction, maintenance, and removal of modular bridge structures used for temporary installations, including substructure elements, approach guiderail connection, ramps, bank seats, decking, sidewalks, and railings.

918.02 REFERENCES

This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 501	Compacting
OPSS 721	Steel Beam Guiderail System
OPSS 904	Concrete Structures
OPSS 905	Steel Reinforcement for Concrete
OPSS 906	Structural Steel for Bridges
OPSS 907	Structural Wood Systems
OPSS 908	Metal Traffic Barriers and Metal Railings for Structures
OPSS 916	Precast Concrete Bridge Elements

Ontario Provincial Standard Specifications, Material

OPSS 1010	Aggregates - Base, Subbase, Select Subgrade, and Backfill Material
OPSS 1350	Concrete - Materials and Production
OPSS 1355	Precast Concrete - Materials and Production
OPSS 1440	Steel Reinforcement For Concrete
OPSS 1504	Steel Beam Guide Rail
OPSS 1505	Channel Components for Steel Beam Guide Rail
OPSS 1601	Wood, Preservative Treatment, and Shop Fabrication

Ontario Ministry of Transportation Publications

Structural Manual

MTO Forms:

PH-CC-701	Request to Proceed
PH-CC-702	Notice to Proceed
PH-CC-811	Certification of the Component
PH-CC-822	Certificate of Conformance

CSA Standards

S6-25	Canadian Highway Bridge Design Code
W47.1:19 (R2024)	Certification of Companies for Fusion Welding of Steel

918.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Bank Seats means mud sills, timber matting and other components to support the base plates and ramps.

Design Service Life means the service life planned and specified in the Contract Documents at the time of design.

Modular Bridge means a superstructure comprised of commercially available standard proprietary prefabricated components that can be assembled and disassembled on site.

Modular Bridge Structure means a structure comprised of modular bridge and supporting substructure elements.

Substructure Elements means footings or deep foundations constructed or reused to support the modular bridge for the duration of construction or for the duration of a particular construction stage.

Temporary Installation means an installation that maintains traffic at a construction site for a length of time not exceeding 3 years.

918.04 DESIGN AND SUBMISSION REQUIREMENTS

918.04.01 Design Requirements

918.04.01.01 Modular Bridge Structure

The modular bridge structure, including the substructure elements and embankments, shall be designed according to the Contract Documents, CSA S6 and the Structural Manual except that:

- a) The following requirements of CSA S6 are not mandatory:
 - i. Traffic lane widths, side clearance, and sidewalks;
 - ii. Deck crossfall and drain outlets;
 - iii. Limitation of maximum deflection;
 - iv. Provision of a protective coating;
 - v. Fatigue;
 - vi. Accessibility for inspection and coating, the avoidance of pockets, and the provision of drain holes in pockets and their filling with waterproofing;
 - vii. Camber;
 - viii. Provision of two bolts at the end of bracing members; and
 - ix. Nuts with safety pins or snap rings may be used instead of hexagonal recessed nuts or hexagonal solid nuts with washers.
- b) In addition to the requirements of CSA S6, a minimum of three girders or two pairs of trusses shall be used to form the main load carrying system of the bridge.
- c) Modular Bridge shall have traffic barriers satisfy, as a minimum, National Cooperative Highway Research Program Report 350 (NCHRP 350) and preferably American Association of State Highway and Transportation Officials Manual for Assessing Safety Hardware 2016 (MASH-16) requirements for Test Level (TL). Calculations demonstrating equivalency of the temporary modular bridge barrier to one that has been crash tested may be submitted for approval. For single lane bridges Test Level 2 or higher and for two lane bridges Test Level 3 or higher shall be used in accordance with CSA S6.

The design of the substructure elements and embankments shall satisfy the substructure elements design requirements specified in the Contract Documents. The design shall include all relevant details to ensure structural stability and performance throughout the intended design service life of the modular bridge.

Reuse of existing substructure elements shall meet the requirements specified in the Contract Documents. Any repairs, rehabilitation, or strengthening required to achieve the required structural capacity shall be completed as specified in the Contract Documents prior to installation of the temporary bridge superstructure.

Unless otherwise specified in the Contract Documents, the modular bridge, including substructure elements, ramps, bank seats, decking, sidewalks, and metal railings shall be designed and satisfy the requirements of the Contract Documents.

918.04.02 Submission Requirements

918.04.02.01 Working Drawings, Procedures and Certifications

The following documents, bearing the seal and signature of a design Engineer and a design-checking Engineer, shall be submitted to the Contract Administrator at least 14 Days prior to commencement of the installation of the modular bridge or any substructure elements for information purposes only:

- a) Design and working Drawings of the modular bridge and all associated elements, such as bank seats, substructure elements, decking, sidewalks, and guiderail;
- b) Assembling, launching, installation procedures including torque for bolting material and equipment used during these processes;
- c) Removal procedure including material and equipment used during these processes;
- d) A letter and design calculations certifying that the modular bridge and substructure elements have been designed as specified in the Contract Documents Where substructure elements are reused, a letter confirming that the Modular bridge loading complies with the design capacity shown on the contract drawings;
- e) Where previously used components are utilized in the modular bridge, an inspection report along with a letter certifying that all used components are in good structural condition and free from any damage or

defects that could adversely affect their load carrying capacity and performance. The inspection report shall confirm that the components are:

- i. Free from damage or defects affecting structural integrity or load-carrying capacity;
- ii. Free from excessive wear, distortion, cracking, or significant corrosion;
- iii. Suitable for the intended design loads and service conditions; and
- iv. Fit for continued service in the temporary bridge structure.

f) Checklist of items to be monitored during use of modular bridge

- g) Where modular bridge components are fabricated outside of Canada, a letter shall be submitted certifying that the materials used, and the fabrication of the modular bridge components are as specified in the Contract Documents and
- h) Where the load carrying capacity of the modular bridge or any of its components has been established by testing, the load test reports provided by the manufacturer of the modular bridge shall be submitted confirming the bridge satisfies the requirements of the Evaluation Section of CSA S6, using a Target Reliability Index (β) not less than 3.75.

i) Documentations of traffic barriers including but not limited to:

- i. Fabrication drawings of barrier, including barrier components and attachment to the deck/transom, including materials used;
- ii. Identification of United States Federal Highway Administration (FHWA) approved barrier system upon which the traffic barrier is based;
- iii. Crash test results or calculations supporting the equivalency of the barrier system to the respective crash test level;
- iv. List of other Departments of Transportation (DOTs) of Provincial Transportation Agencies that have used the barriers;
- v. Photographs of existing barrier installations; and
- vi. Details of transition treatment from temporary modular bridge traffic barrier to roadside barrier, being either steel beam guiderail, three Beam, or temporary concrete barrier as specified in the contract documents.

When other authorities are involved in the approval of the design or construction of the modular bridge, submissions shall be made at least 5 weeks prior to commencement of the work and one additional copy of the submission shall be provided for each authority.

The requirements of each authority shall be satisfied prior to commencement of the work.

918.04.02.02 Modular Bridge Superintendent

Name of the superintendent along with documents providing the qualification of the superintendent verifying the requirements as specified in the Modular Bridge Superintendent subsection shall be submitted to the Contract Administrator a minimum of 7 Days prior to the commencement of modular bridge work.

918.04.02.03 Notice of Installation

The Contract Administrator shall be given written notice at least 7 Days prior to the installation of the modular bridge superstructure.

918.05 MATERIALS

918.05.01 General

All materials and components shall be according to the Working Drawings and as specified in the Contract Documents.

918.05.02 Bank Seats Material

The bank seat material shall be in accordance with OPSS 1010 or as specified in the Contract Documents.

The nominal maximum aggregate size for bank seats shall not exceed 26.5 mm in diameter

918.05.03 Concrete

Cast-in-place concrete shall be according to OPSS 1350. Precast concrete shall be according to OPSS 1355. Except that the quality assurance testing for concrete and precast concrete durability is not required for temporary construction.

918.05.04 Hardware

The hardware used in the assembly and installation of the modular bridge shall be according to the modular bridge manufacturer's requirements and shall include the fasteners required to mount the steel beam guide rail onto the modular bridge.

918.05.05 Metal Railings

Railings for structures shall be according to OPSS 908 or an equivalent modular bridge manufacturer railing system.

918.05.06 Modular Bridge Components

All modular bridge steel components shall be fabricated according to the requirements of OPSS 906. The fabricator shall be certified in according to CSA W47.1, Division 1 or 2, for steel fabrication.

The use of previously used modular bridge components is permitted, provided a satisfactory inspection report signed and sealed by an Engineer is submitted to and accepted by the Contract Administrator prior to installation.

The use of modular bridge components shall be free from damages or defects that could adversely affect their load carrying capacity and performance.

918.05.07 Steel Beam Guide Rail

Steel beam guide rail shall be according to OPSS 1504 and channel components for steel beam guide rails shall be according to OPSS 1505.

Non-proprietary steel beam guide rail and proprietary steel beam guide rail shall be according to OPSS 721.

918.05.08 Steel Reinforcement

All steel reinforcement shall be according to OPSS 1440.

918.05.09 Structural Steel

Any structural steel components that are not part of the modular bridge shall be designed and constructed according to OPSS 906.

918.05.10 Wood

Wood shall be according to OPSS 1601. Preservative treatment of wood is not required. Fasteners and hardware for wood construction shall be according to OPSS 907.

918.07 CONSTRUCTION

918.07.01 General

Modular bridge components that do not meet the requirements specified in the Contract Documents shall not be incorporated into the Work.

918.07.02 Modular Bridge Superintendent

The modular bridge Superintendent employed to supervise the assembly, installation and removal of modular bridges shall have:

- a) Working knowledge of the type of modular bridge to be used;
- b) Working knowledge of assembly, installation and removal of modular bridges; and
- c) Supervision experience of at least three similar modular bridges.

918.07.03 Concrete

Cast-in-place concrete shall be constructed according to OPSS 904.

Precast bridge elements shall be constructed according to OPSS 916.

918.07.04 Steel Reinforcement

Steel reinforcement shall be placed according to OPSS 905.

918.07.05 Bank Seats

Fill under bank seats shall be compacted according to OPSS 501 to a minimum of 95% of the maximum dry density.

918.07.06 Installation

The modular bridge shall be assembled according to the Working Drawings and procedures. Modular bridge including bank seats shall be installed according to the Working Drawings and procedures at the location and elevations specified in the Contract Documents.

918.07.07 Modular Bridge Survey Prior to Opening to Traffic

The top of the deck at the four corners of the structure, at the centreline of abutments, and at the ends of the approach ramps shall be surveyed before opening the modular bridge to traffic. The survey elevations shall be reported on MTO form PH-CC-811, Certification of the Component and submitted the Contract Administrator.

918.07.08 Inspection after the Completion of the Construction of the Modular Bridge Structure

Prior to opening the bridge to traffic, the following activities shall be completed including but not limited to:

- a) Survey the bridge as specified in the Modular Bridge Survey subsection.
- b) Any defects and deficiency shall be reported to the Contractor Administrator immediately in writing.
- c) If repairs are required, a repair proposal as specified in the Repair Proposal Clause shall be submitted to Contract Administrator for acceptance.
- d) Inspect all modular bridge components, including bolts and bracing clamps to ensure all the bolts are tightened to the torque specified on the Working Drawings, and all bridge components are free from defects and deficiencies.

A MTO Form PH-CC-822, Certificate of Conformance and PH-CC-701, Request to Proceed shall be submitted to the Contract Administrator upon the completion of construction of the modular bridge structure and after all repairs and adjustments of elevations are complete.

The Contract Administrator shall be granted access to inspect the modular bridge structure.

The modular bridge structure shall not be opened to the traffic until a MTO form PH-CC-702, Notice to Proceed has been received from the Contract Administrator.

918.07.09 Modular Bridge Survey after Opening to Traffic

The top of the deck at the four corners of the structure, at the centreline of abutments, and at the ends of the approach ramps shall be surveyed and the elevations recorded, immediately upon opening the modular bridge to traffic and at least once per Day thereafter for 7 Days. The frequency of recorded surveys shall be increased if needed at the request of the Contract Administrator. The survey elevations along with MTO form PH-CC-811, Certification of the Components shall be submitted to the Contract Administrator.

Any discrepancies or changes in survey elevations from the elevations specified on Contract Drawings shall be immediately reported to the Contractor Administrator.

918.07.10 Defects, Deficiencies, and Repairs

918.07.10.01 Inspection

For the duration of the Contract, excluding seasonal shutdown, the modular bridge, including bearings, bank seats, ramps, decking, sidewalks, railing, approaches, and substructure elements shall be routinely inspected to ensure its structural integrity, safety and performance are not compromised. The Contract Administrator shall be notified immediately in writing if any defects or deficiencies are observed. Inspection shall occur at least once per week and during and after storm events.

Any type of repair to the modular bridge requires a repair proposal, as specified in the Repair Proposal clause, to be submitted to the Contract Administrator. Repairs shall not be carried out until the repair proposal is accepted by the Owner. Repairs shall be completed at no additional cost to the Owner.

918.07.10.02 Documentation of Inspection and Repairs

918.07.10.02.01 General

Documentation of repairs shall include the following for each defect or deficiency and repair:

- a) The type of defect or deficiency, location, size, and frequency;
- b) Causes of the defect or deficiency;
- c) Preventative actions taken to address the causes for future production;

d) Details of repairs, including:

- i. Type of defect or deficiency that is repaired;
- ii. Identification of the limits of repair for each area;
- iii. Repair method and materials used; and
- iv. Colour photographs, with date, of the defect or deficiency prior to and after the repair.

918.07.10.02.02 Repair Proposal

The proposal for repairs shall include the following as a minimum, and shall be signed and sealed by an Engineer:

- a) Identification of the element and description of the defect(s) or deficiencies, including the cause of the defect or deficiency;
- b) High resolution photographs and detailed sketches showing the width, length, depth, location, nature, and frequency of any defect(s) or deficiencies;
- c) An assessment of any impact of the repaired defect(s) or deficiencies on durability, structural adequacy, and integrity of the element or on the structure;
- d) A detailed repair plan, including materials, method, and equipment to be used;
- e) Verification that the repair plan complies with the applicable standards for the type of work;
- f) All relevant supporting information, including material test results, field measurements and observations, production records, photographs, and structural analysis calculations, used for determining that the performance and function originally expected from the element shall be met; and
- g) Cause(s) of the defect or deficiency and corrective action to be taken to prevent recurrence of the defect in future production, delivery, or installation.

If the repair proposal is deemed acceptable by the Owner, the element shall be repaired according to the proposal. Repairs shall not be carried out without the prior written acceptance of the proposal by the Contract Administrator.

918.07.10.02.03 Assessment of Repair

At the discretion of the Owner, additional visual inspection or other investigative measures may be required to assess the acceptability of the repair.

918.07.11 Modular Bridge Maintenance

918.07.11.01 General

During the time the detour bridge is open to traffic, the modular bridge, including bearings, ramps, decking, railing, approaches, and steel beam guide rail shall be maintained in a safe and usable condition, and the substructure shall be kept clear of debris and ice. No additional cost shall be charged to the Owner due to maintenance work.

918.07.11.02 Monitoring of Modular Bridge Structure

The Contractor shall conduct monitoring of the TMB substructure elements and ramps on a weekly basis. All modular bridge components, including bolts and bracing clamps, shall be checked on a weekly basis to ensure that they are tightened to the torque as specified on the Working Drawings. This check shall also include monitoring items listed in the checklist submitted by the modular bridge suppliers and shall be performed at least once per Day for the first week after opening the modular bridge to traffic and once a week thereafter and shall be increased if needed at the request of the Contract Administrator. A monitoring report of daily and weekly occurrence containing details of monitoring, name of item and monitoring results shall be submitted to

Contract Administrator on the same day when monitoring is performed. Any loose components shall be reported immediately in writing to the Contract Administrator and shall be tightened to the requirements specified on Working Drawings and to the satisfaction of the Contract Administrator.

If required, repairs shall be conducted and reported to Contract Administrator as specified in the Documentation of Inspection and Repairs for acceptance.

Modular Bridge shall not remain opened if the bridge is reported to have unsafe condition.

918.07.11.03 Jacking of Modular Bridge

The Contractor shall jack the structure as needed, at the request of the Contract Administrator or Design Engineer, to restore the original deck elevations and maintain a smooth ride across the structure.

For bidding purposes, the Contractor shall assume that the TMB will be jacked on two (2) occasions at each abutment

918.07.12 Removal of Modular Bridge

Removal of the modular bridge shall be according to the Working Drawings, removal procedure and as specified in the Contract Documents.

918.07.13 Management of Excess Material

Management of excess material shall be as specified in the Contract Documents.

918.08 QUALITY ASSURANCE

918.08.01 Inspection of Installation

Upon completion of construction of the modular bridge and prior to opening to traffic, the Contract Administrator shall conduct a quality assurance inspection of all modular bridge components including bolts and bracing clamps. Any loose components shall be tightened to the satisfaction of the Contract Administrator.

The Contractor shall notify the Contract Administrator within 24 hours of completion of modular bridge construction and minimum 7 Days before opening the bridge. Access to the bridge shall be provided to complete quality assurance inspections. For this purpose, the Contractor shall clear all debris and obstructions and provide unhindered access to the Contract Administrator.

918.08.02 Acceptance of Repair Work

Acceptance of elements shall be based on the satisfactory completion of all repairs, if applicable.

The Contract Administrator shall inspect the bridge to determine if repairs and concerns reported in the inspection have been adequately addressed in the completed work.

918.08.03 Monitoring

The Contract Administrator shall review all monitoring reports required under the Monitoring of Modular Bridge clause to assess whether the bridge remains safe for use.

918.09 MEASUREMENT OF PAYMENT

Measurement for Payment shall be Lump Sum.

918.10 BASIS OF PAYMENT

918.10.01 Temporary Modular Bridge - Item

Payment at the Contract price for the above item shall be full compensation for all labour, Equipment, and Material to do the work.

For payment purposes, the construction of the modular bridge shall constitute 50% of the work of the tender item.

Remaining 50% of the tender item shall be paid after removal of the modular bridge.