

**B919 - FORMWORK AND FALSEWORK - (OPSS 919)****919.1 GENERAL**

The work under these items consists of the design and construction of formwork, falsework, and temporary supports used in the construction and rehabilitation of structures.

**919.2 REFERENCES**

Ministry of Transportation Publications - Structural Manual;  
Ministry of Transportation Publications - Structure Rehabilitation Manual;  
Ministry of Transportation Publications - Bridge Clearance and Load Restriction Manual;  
MTO Bridge Management System (BMS);  
MTO Design Supplement for TAC Geometric Design Guide (GDG) for Canadian Roads;  
TAC Geometric Design Guide for Canadian Roads (2017);  
Falsework and Formwork, CSA S269.1;  
Canadian Highway Bridge Design Code (CHBDC), CSA-S6;

**919.3 TENDER ITEMS**

0919-0010 Temporary Support (Normal, Lump Sum)

**919.4 SPECIFICATIONS**

The requirements for the tender items above are contained in OPSS 919.

**919.5 SPECIAL PROVISIONS**

- None.

**919.6 STANDARD DRAWINGS**

Drawings for formwork and falsework are contained in the 3000 series of the Standard Drawings (Ontario Provincial Standards Drawings (OPSD) and Ministry of Transportation Ontario Drawings (MTOD)).

Structural Standard Drawings (SSD) for formwork and falsework are contained in the SSD Complete Manual.

**919.7 DESIGN****919.7.1 General**

The design of the falsework and formwork is the responsibility of the contractor.

### **919.7.2 Clearances**

The structure design shall consider the constructability of the future rehabilitation of new structures or the rehabilitation of the existing structure, as applicable, to account for required falsework clearances and depth. The profile of new structures shall take into account required falsework clearances and depth.

### **919.7.3 Screed Rails**

The designer may need to verify and design screed rails where:

- a) There are staged screeds. Such as:
  - i. Screeds located on the outside girder, e.g., in staged construction where the deck is only 1-lane wide, and rails need to be placed on the edge of the cantilever overhangs.
  - ii. Where one screed rail may be located on the existing deck.
- b) The requirement to finish the deck with a screed machine (for a finished width of greater than 3m) is at odds with the width obtained when screed rails are placed over the girders.
- c) Structures use box girders. The stirrup which the rail is normally fastened to is not found over the centre of the web.
- d) Screeds are placed on the outside bulkhead. The girder support will need to be checked and the overhang will need to be designed to support the screed loads.

Placing the screed rails on the cantilever overhangs substantially increases the bracing requirements of concrete girders and increases the bracing requirements of steel girders. When designs anticipate screed rail supports will not be positioned directly over the flange of the exterior girders within 100 mm of the centreline of the web, permanent and/or temporary bracing shall be designed to meet the loading requirements. Overall stresses in girders due to the combined effects of longitudinal stresses, transverse stresses, and torsion introduced by having the screed rails on the deck shall be checked with a model of the full bridge.

## **919.8 COMPUTATION**

### **919.8.1 Item Payment Basis**

The formwork and falsework are included in each directly associated concrete tender item.

Temporary support is a Lump Sum item. The unit of measure is each.

## 919.8.2 Sources of Information

The main source of information for the tender items above is the Regional Structural Section.

Vertical clearances for structures are prescribed in the publications TAC Geometric Design Guide for Canadian Roads (2017) in conjunction with the MTO Design Supplement for TAC Geometric Design Guide (GDG) for Canadian Roads. Vertical clearances of existing structures are in the MTO Bridge Management System (BMS), MTO Bridge Clearance and Load Restriction Manual, and Ontario Structural Clearance and Load Information System (OSCLIS).

Note: as of the publication date of this document, the OSCLIS system has been incorporated in BMS and will be decommissioned after completion of quality control checks.

## 919.9 DOCUMENTATION

### 919.9.1 Contract Drawings

Contract drawings shall be prepared as required by MTO's Structural Manual and Structure Rehabilitation Manual.

Where there is a post-tensioning operation, the owner's engineer shall specify the magnitude and extent of the post-tensioning loads on the design drawings as a horizontal or vertical load, or both, applied at a specified location.

Where Temporary Support is required, the proposed system concept, location, loads, and removal shall be indicated on the contract drawings.

Where a design requires a different class of concrete finish to that described in the specifications, the contract drawings shall specify the Class for the specific concrete face. The typical class of concrete surface is "C". Examples for use of concrete surface classes are:

- a) **Class A:** for surfaces prominently exposed to public view where appearance is of special importance. E.g., architectural features such as the Ontario coat of arms.
- b) **Class B:** for coarse-textured, concrete-formed surfaces typically intended to receive plaster, stucco, or wainscotting. The tolerance may be useful for some joints and expansion joints.
- c) **Class C:** which is the general standard for permanently exposed surfaces where other finishes are not specified (typical condition).
- d) **Class D:** which is the minimum quality surface where roughness is not objectionable; usually applied where surfaces will be concealed. E.g., the underside of deck when viewed from a distance or any faces against backfills.

Where a design requires enhanced aesthetics, an architectural concrete surface may be specified. Architectural concrete surfaces should be limited to high visibility areas within close proximity to the travelling public, such as the traffic side of concrete barrier adjacent to sidewalks. The limits of the architectural concrete surface shall be identified on the contract drawings, as well as any specific details required, e.g., patterns, rustications, recesses, joints, etc. Examples of concrete barrier architectural finish may be found in the structural standard drawings.

**919.9.2 Quantity Sheets**

Temporary Support shall be indicated on a Structure Quantity Sheet with the structure site number and location.

**919.9.3 Documentation Accuracy**

The quantity sheet unit of measurement for Temporary Support is Lump Sum and does not require a unit of measurement.

Formwork and Falsework is included in the applicable concrete item and does not have an item or unit of measurement.

**919.9.5 Non-Standard Special Provisions (NSSP)**

Non-standard special provisions (NSSPs) shall be created to address project specific situations which are not covered under applicable standards. The designer should determine the need for a NSSP to address the specific situations for the completion of the work.

An item specific NSSP shall be created to identify the structure site number, location within the structure, and scope of the temporary supports.

B/B plywood veneer grade, while available in the OPSS, is not recommended unless there are special colour or texture requirements for an architectural finish. If the colour of a concrete face is important, HDO should be specified for its higher resin content and B grade veneer. E.g., HDO – Concrete form, B/B.

An item specific NSSP shall be created to permit screed rails to be supported on the cantilever overhang, when required. The impacts to design shall be considered as above.

An item specific NSSP is required to permit form liners, except those for SS110-71, SS10-72, SS110-73, and SS110-74.