CONSTRUCTION SPECIFICATION FOR THE JACKING OF BRIDGE SUPERSTRUCTURE

TABLE OF CONTENTS

1.0 SCOPE
2.0 REFERENCES
3.0 DEFINITIONS
4.0 DESIGN AND SUBMISSION REQUIREMENTS
5.0 MATERIALS
6.0 EQUIPMENT - Not Used
7.0 CONSTRUCTION
8.0 QUALITY ASSURANCE - Not Used
9.0 MEASUREMENT FOR PAYMENT - Not Used
10.0 BASIS OF PAYMENT

1.0 SCOPE

This specification covers the requirements for raising and lowering a bridge superstructure by the use of jacks.

2.0 REFERENCES

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

Ontario Provincial Standard Specifications, Construction

OPSS 906  Structural Steel for Bridges
OPSS 919  Formwork and Falsework
OPSS 922  Installation of Bearings

Ontario Ministry of Transportation Publications

Structural Manual
Designated Sources for Materials (DSM) Manual
CSA Standards

G40.20-04/G40.21-04 (R2009) General Requirements for rolled or welded structural quality steel/Structural quality steel.

S6-06 Canadian Highway Bridge Design Code

ASTM International

A 325M-07 Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength [Metric]

A 563M-07 Standard Specification for Carbon and Alloy Steel Nuts

F 436M-11 Standard Specification for Hardened Steel Washers

3.0 DEFINITIONS

For the purpose of this specification the following definitions apply:

Certificate of Conformance means a document issued by the Quality Verification Engineer confirming that the specified components of the Work are in general conformance with the requirements of the Contract Documents.

Quality Verification Engineer (QVE) means an Engineer retained by the Contractor qualified to provide the services specified in the Contract Documents.

4.0 DESIGN AND SUBMISSION REQUIREMENTS

4.01 Design Requirements

4.01.01 General

Unless a detailed jacking system design is provided in the Contract Documents, the Contractor shall be responsible for the design of the jacking system.

Where the replacement of bearings is called for in the Contract Documents, the design shall take into account the possible difference in bearings size between the new and the original and insure that the placement of the temporary supports does not interfere with the proper placing of bearings.

Where necessary, the design of temporary supports shall account for articulation of the superstructure.

The design shall account for the condition of the structure at the time of jacking. It shall take into account any deterioration and/or removals prior to and during the duration of the jacking and remedial work.

4.02 Submission Requirements

4.02.01 Jacking Drawings and Calculations

The Contractor shall submit 3 sets of the jacking drawings and calculations to the Contract Administrator 7 Days prior to the commencement of the jacking operations, for information purposes only. Submissions shall bear the seals and signatures of a design Engineer and a design checking Engineer.

The jacking drawings and calculations shall include the following:
a) Jacking methodology and sequence.
b) Location, number, type and capacity of the jacks to be used.
c) Description of the control system, complete with all design, schematics and equipment to be used.
d) Location and material to be used for temporary blocking and shimming.
e) Schematic showing the configuration of all jacks, stop valves, gauges, manifolds and hydraulic pumps.
f) Current calibration certificates for all jacks and gauges.
g) Full details of the temporary support system including forces to be transmitted and method of transferring the loads to the substructure or founding strata.
h) Strengthening of the existing structure where necessary.
i) Restrictions on traffic and construction traffic.

The Contractor shall have a copy of the signed and sealed jacking drawings at the site during jacking setup and operations.

4.02.02 Revised Submissions

When jacking design considerations or field conditions necessitate amendments to the jacking drawings, revised jacking drawings shall be submitted according to the Jacking Drawings clause.

5.0 MATERIALS

5.01 Structural Steel

All structural steel shall be according to CAN/CSA G40.20/G40.21.

5.02 High Strength Bolts, Nuts and Washers

High strength bolts shall be according to ASTM A 325M.

High strength nuts, and hardened washers shall be suitable for use with the types of bolts being specified and shall be according to ASTM A 563M, and ASTM F 436M.

The nuts, bolts, and washers shall be shipped together as an assembly from the manufacturer. The requirements outlined in the Test Reports for Fasteners clause found in OPSS 906 shall apply.

5.03 Mechanical and/or Adhesive Anchors

Mechanical and/or adhesive anchors shall be suitable for dynamic loads and shall be installed according to the manufacturer’s recommendations.
5.04 Grout

Cement based non-shrink grout shall be supplied from sources named in the DSM manual.

7.0 CONSTRUCTION

7.01 Pre-Construction Survey

Prior to the start of any work related to the jacking operation, the Contractor shall carry out field measurements of all components of the existing structure that might impact the installation of the temporary supports and ensure that the jacking drawings and calculations are adjusted accordingly. The design Engineer and the checking Engineer shall determine whether any adjustments based on field measurements will have an impact on the bridge structure. If it is determined that the adjustments will have an impact on the bridge structure, the jacking drawings and calculations shall be submitted to the Contract Administrator along with a request for approval.

The Contractor shall also carry out a survey to establish the elevations of the existing bridge deck along the existing bridge deck joints and the elevations of the underside of deck or girders at bearing locations prior to jacking the structure. The survey results shall be submitted to the Contract Administrator prior to jacking for information purposes only.

The Contractor shall ensure that the existing elevations of the bridge deck, measured before the jacking operation or the required elevations specified in the Contract Documents are matched after the bearings are replaced and the jacking operation is completed. If the elevations of the bridge deck after the completion of the jacking operation differ from the elevations obtained in the pre-construction survey or those specified on the Contract Documents, the Contractor shall reinstate the bridge deck and girders to the original elevations or to the new elevations specified in the Contract Documents, as required.

7.02 Structural Steel

All structural steel fabrication, delivery and erection shall be according to OPSS 906.

7.03 Formwork and Falsework

All formwork and falsework shall be according to OPSS 919.

7.04 Installation of Bearings

When jacking is required for the installation, replacement or adjustment of bearings, the requirements of OPSS 922 shall also be satisfied.

7.04 Jacking

Prior to jacking, the Contractor shall ensure that all existing expansion joints are free to move vertically. Bolts securing the handrail posts to the parapet walls, if present, shall be loosened to permit jacking without damaging the handrails.

Upon completion of the fabrication and installation of the components of the temporary works and prior to jacking, the Quality Verification Engineer shall conduct an interim inspection to verify that the fabrication and installation of the temporary works has been carried out according to the jacking drawings and calculations and
issue the Contractor written permission to proceed with the jacking. A copy of the permission to proceed shall be submitted to the Contract Administrator for information purposes.

7.04.01 Jacking Points and Loads

Jacks shall only be placed at the jacking points indicated on the Contract Documents. The Contractor shall use jacks with a rated capacity of no less than 150% of the reaction loads specified on the Contract Drawings. Shims and blocking used to support the jacks shall also be designed for 150% of the reaction load specified on the Contract Drawings.

7.04.02 Jacking Operations

The Contractor shall inform the Contract Administrator in writing at least 3 Days prior to the commencement of the jacking operations.

Jacking operations shall be carried out under the direct supervision of an Engineer. Prior to the commencement of jacking operations, the Contractor shall demonstrate the accuracy of all transducer read-outs, relative to manual measurements.

The lifting or lowering of the entire width of the structure shall be carried out in one uniform and synchronized operation. Jacks shall be interconnected through a manifold system to provide a uniform lift at all jacking locations.

At no time during the lifting or lowering of the structure shall the difference between any two jacking points be greater than 3 mm as measured at the center line of the bearings.

The lift at each jacking point shall be monitored continuously during the jacking operation. The maximum lift for all jacking points shall be 3 mm above final jacking elevation, unless otherwise specified in the Contract Documents.

7.04.03 Temporary Supports

Unless specified elsewhere in the Contract Documents, traffic shall not be permitted on or below a bridge undergoing jacking. The bridge superstructure shall not be supported on hydraulic jacks for a period longer than permitted on the jacking drawings and in no case longer than 12 hours.

When the required lift for all jacking points has been achieved and the bearings have been released, temporary supports such as blocking and shimming shall be placed to support the bridge. The jacks shall then be lowered in one synchronized operation while maintaining the maximum allowable difference between any two jacking points of 3 mm.

The jacks loads shall be transferred to structural blocks and then the jacks released prior to the commencement of bearing seat reconstruction or bearing replacement work.

The superstructure shall not be left on the blocks and shims for more than 15 Days or as specified elsewhere in the Contract Documents.
7.04.04 Post-Jacking Survey

Immediately after the structure has been jacked and prior to the bearing seats being reconstructed, the underside of the superstructure that will be in contact with the new bearings shall be surveyed. The survey shall include the four corners in contact with the bearings and at least one point in the middle. Data from the survey shall be forwarded to the Contract Administrator to determine if adjustments to the design are required.

7.04.05 Lowering of the Superstructure

Where jacking of the superstructure is accompanied by rehabilitation of bearing seats, the superstructure may be jacked again for the removal of the structural blocks only after the concrete in the bearing seats has reached 75% of its design strength. The jacks shall then be lowered in one synchronized operation, while maintaining the maximum allowable difference between any two jacking points of 3 mm, and the superstructure shall be released onto the bearings.

7.04.06 Bearing Contact

The bearings shall have uniform and full contact at top and bottom. If any of the bearings are not properly seated, the bridge shall be jacked up again and remedial work performed as directed by an Engineer until all the bearings have full contact and the superstructure is uniformly supported. Details of proposed methodology, equipment/materials for the remedial work shall be submitted to the Contract Administrator for approval prior to carrying out the remedial work.

7.04.07 Reinstatement of Structure and Components

Anchor holes shall be filled with non-shrink grout finished flush with the surrounding concrete with matching color; no metal components of the jacking system shall be embedded permanently in concrete with less than 40 mm of cover.

All expansion joint and handrail components removed or loosened to facilitate jacking shall be reinstated.

7.05 Certificate of Conformance upon Completion of the Work

A completed Certificate of Conformance as specified in the Contract Documents shall be submitted to the Contract Administrator upon completion of the Work.

7.06 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

10.0 BASIS OF PAYMENT

10.01 Jacking of Superstructure- Item

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