

BRIDGE SLIDE SPECIFICATION

1 Scope of Work

The work consists of furnishing bridge slide equipment (mechanical devices, jacks, tracks and other components), performing the bridge slide, removal of bridge slide equipment, performing pre-move and post-move inspections, and any necessary remedial actions. The work shall include furnishing, installing, and demolishing all temporary works.

The work consists of preparing and submitting working drawings, with working load capacities, for horizontal slide equipment and temporary works.

2 Definitions

The following definitions apply to these special provisions.

A. Bridge Slide

Bridge Slide shall refer to all components including, but not limited to, the jacks, tracks, pumps and processes including, but not limited to, submittal preparation, execution of the bridge movement, pre-move and post-event inspections, and remedial action related to moving the newly erected superstructure from the temporary works onto the permanent substructure.

B. Temporary Works

Temporary Works shall refer to all components of the structure, erected adjacent to the existing bridge, which supports all the construction activities to erect the complete superstructure including, but not limited to, the bents, lateral bracing, foundations, work platforms and all personnel safety systems.

C. Contractor

Contractor shall refer to the prime design-build Contractor, its subconsultants and subcontractors.

D. Working Drawings

Design sheets that the Contractor is required to submit to MnDOT, such as shop drawings, erection plans, and temporary works plans, or any other supplementary plans or similar data which illustrate the construction of the Work required in this provision to supplement the design documents.

E. Superstructure

Bridge elements above the bearings including but not limited to girders, deck, and barriers.

F. Engineer

Engineer, as used herein, shall mean the Contractor's Design-Build Engineer.

3 References

- A. MnDOT LRFD Bridge Design Manual
- B. MnDOT Standard Specifications for Construction
- C. AASHTO Guide Design Specifications for Bridge Temporary Works
- D. AASHTO Construction Handbook for Bridge Temporary Works
- E. AASHTO LRFD Bridge Construction Specifications

4 Materials

- A. Steel and hardware for temporary shoring shall be in accordance with the Working Drawings. Used materials will be allowed. If the Contractor proposes to construct with used materials, the Contractor shall submit with the plans the method for documenting that all primary member material meets the physical properties required by the design.

5 Construction Requirements

A. General

1. All fabrication shall conform to the AASHTO Guide Design Specifications for Bridge Temporary Works, AASHTO Construction Handbook for Bridge Temporary Works or AASHTO LRFD Bridge Construction Specifications, except as modified herein.
2. Construction requirements for the Temporary Works shall meet the requirements of MnDOT and the AASHTO Guide Design Specifications for Bridge Temporary Works.
3. Use the AASHTO Guide Design Specifications for Bridge Temporary Works, and Section 5-393.200 of the MnDOT Bridge Construction Manual to guide the design of the temporary falsework.

B. Horizontal Slide and Temporary Shoring – Submittal Process

1. Submittal Requirements and Process

Provide details necessary to move the new bridge into its final position using horizontal slide methods. Key information required is summarized below.

- i. The Contractor shall design any modifications to the permanent bridge details and/or bridge materials indicated on the Contract Plans as may be needed. Include calculations prepared by the Engineer.
- ii. Provide details of the bridge slide components including, but not limited to, submittal preparation, execution of the bridge movement, pre-move and post-move inspections and remedial action.

- iii. Provide details of the temporary falsework components including, but not limited to, the bents, lateral bracing, foundations, work platforms and any required safety systems.

2. Submittals

i. Working Drawings

1. The Contractor shall design all elements of the temporary works and bridge slide system. Design shall be done in conformance with the current edition of the AASHTO Guide Design Specifications for Bridge Temporary Works and AASHTO LRFD Bridge Construction Specifications. Alternatively, the design shall be in conformance with the current edition of the AASHTO Standard Specifications for Highway Bridges, Division II.
2. Submit detailed Working Drawings including equipment, materials and processes required for the bridge slide and temporary shoring in accordance with the AASHTO Guide Design Specifications for Bridge Temporary Works.
3. Working drawings for the bridge slide shall be submitted to MnDOT for acceptance at least 10 working days prior to performing the horizontal slide.
4. Working drawings for the temporary works shall be submitted to MnDOT at least 10 calendar days prior to the beginning of temporary works erection.
5. If the Contractor chooses to deviate from use of previously approved materials, components, Working Drawings or Procedures, the Contractor shall resubmit revised Working Drawings to MnDOT for acceptance.

C. Design Criteria and Standards

1. General

It is the intention that all design necessary for the bridge slide and temporary works shall be carried out to the latest industry criteria and standards applicable to the particular item and work involved.

2. Design Criteria and Standards

- i. Meet the requirements of AASHTO LRFD Bridge Design Specifications for modifications to the permanent bridge superstructure necessitated by the Contractor's elected bridge slide system.
- ii. Meet the requirements of AASHTO Guide Design Specifications for Bridge Temporary Works.

- iii. In the absence of any other stated referenced national code based criteria, for the design and use of the bridge slide system and temporary shoring structure, use as a minimum the requirements of AASHTO Guide Design Specifications for Bridge Temporary Works.

D. Horizontal Slide and Temporary Works (Working Drawings)

1. General

- i. It is the overall responsibility of the Contractor to coordinate all planned activities and submittals.
- ii. In general, specify all materials, details and procedures related to the construction and implementation of the proposed bridge slide system and temporary works.

2. Bridge Staging Area (BSA) Layout:

Show site plans and details of the Bridge Staging Area including, but not limited to, the location and general layout of the site with existing, temporary and permanent structures indicated. Provide locations of utilities that affect the installation of the temporary works. Provide controlling temporary vertical clearances for portions of the temporary works over traffic lanes. Provide proposed locations of benchmarks or other reference locations for geometry control and survey purposes.

3. Bridge Staging Area (BSA) Geotechnical Requirements:

The Contractor shall verify that the Bridge Staging Area is suitable for all proposed construction operations and shall develop/design methods to stabilize all excavations and to support the temporary works.

- i. Provide design calculations and details for all temporary foundation systems.
- ii. Provide calculations demonstrating the temporary foundations' anticipated settlements.

4. Temporary Works

Provide calculations for all temporary works and working drawings showing the location and details of temporary bents used to support the construction activities for permanent superstructure. Include bents, bracing, foundations, work platforms, personnel safety details, elevations of temporary beam seats, details of connections to the proposed substructures and support of sliding track. Indicate the type and grade for all materials.

The Contractor shall take responsibility for the overall design, engineering and construction of temporary support structures. The Engineer, a registered P.E. in the State of Minnesota, shall sign and take responsibility of all Working Drawings and calculations for the design of the temporary works.

It is not permitted to set beams for superstructure until (1) plans and specifications meeting the above requirements have been provided to MnDOT; (2) the Engineer who has certified plans and specifications for the falsework and forms has inspected the falsework after erection; and (3) the Engineer inspecting the as-constructed falsework certifies in writing that all details are approved.

5. Welding

i. General

Welding of the steel shall conform to the Structural Welding Code, D1.5 of the American Welding Society. All welders shall be certified. Surfaces and edges to be welded shall be smooth, uniform, and free from fins, tears, cracks, or other defects, which would adversely affect the quality or strength of the weld.

ii. Weld Inspection

- a. All areas of welding shall be made available for inspection. Access to weld areas shall be provided by Contractor. All welds shall be visually inspected by the Contractor for cracks, undercutting, excessive weld metal, improper weld contours, etc. Weld sizes, types and other welding parameters defined by the working drawing for the falsework shall be verified by the Engineer.
- b. Magnetic Particle Testing (MT) shall be performed by the Contractor on 100% of all fillet welds between the vertical piling and the bottom of the cap plate, 100% of all fillet welds between the top of the cap plate and the bottom of the subcap. MT shall be performed on 25% of all other fillet welds. The weld inspection shall document and report the locations and amount of inspection performed in lineal feet, as well as the results of the testing including the location and length of any defects. If rejectable discontinuities are found, 100% of the repaired weld is to be inspected by magnetic particle testing. Lengths of weld with rejectable indications shall be evaluated by the Engineer and repaired by the Contractor, if necessary. Welds requiring repair shall be re-tested for 100% of the weld length after repairs are made.
- c. Ultrasonic Testing (UT) shall be performed by the Contractor on 100% of all full penetration welds. The weld inspection shall document and report the locations and amount of inspection performed in lineal feet, as well as the results of the testing including the location and length of any defects. Lengths of weld with rejectable indications shall be evaluated by the Engineer and repaired by the Contractor, if necessary. Welds requiring repair shall be re-tested for 100% of the weld length after repairs are made.
- d. Personnel performing Non-Destructive Testing (NDT) shall be qualified in accordance with the American Society for Non-Destructive Testing Level II.

e. Acceptance

All non-destructive tests shall be reviewed by the Engineer prior to construction of the bridge superstructure including both field and shop welds. Non-destructive test reports shall include the location of areas tested and the findings of all non-destructive tests, together with descriptions of any repairs made and re-testing results.

6. Bridge Slide

Critical activity hold points shall be conducted 10 days prior to the bridge slide and 2 days prior to the bridge slide. Critical activity points shall include a checklist of items to be verified as completed.

Prior to commencing bridge slide operations, the design compressive strength indicated on the Contract Drawings shall be achieved in the bridge deck, pier and abutment diaphragms, and in the proposed pier and abutments.

The bridge slide working drawings shall include the following:

- i. Details of proposed jacking system including, but not limited to, the jacks, tracks, pumps, and schematic hydraulic layout, used to move the bridge superstructure from the temporary structure onto the permanent bridge substructure. Indicate the distance that the superstructure is to be moved horizontally and vertically. Indicate the method and/or procedure for monitoring the position of the bridge during the bridge slide.
- ii. Clearly show on the Working Drawings the push/pull capacity of the bridge slide system and limitations during all jacking operations. Provide jacking/pulling locations. Provide the estimated weight of the superstructure to be slid.
- iii. Provide a detailed slide procedure, including but not limited to execution of the bridge slide, pre-move and post-move inspections, and remedial action. Procedures shall include checklists to support the activities prior to, during and after the bridge superstructure has been moved to its final location.
- iv. Provide checking (QC/QA) procedures prior to the horizontal movement of the superstructure.
- v. Provide contingency plans in the event of a major breakdown or equipment malfunction.
- vi. Provide operational details for the control of the movement, including any system of check-off items for the operators and for safety purposes. The operational details shall include the conditions under which the slide operation would be stopped, and what procedures would be followed to restore the system alignment and continue the slide operation. For a bridge slide system that utilizes guides to prevent the horizontal movement of the superstructure

from exceeding a certain dimension relative to the falsework and the proposed substructures, provide details of the guide system and provide the distance between the inside face of the guide and the face of the proposed substructure at each substructure. For a bridge slide system that does not utilize guides, provide the limits of movement that the slide shall occur within. If these limits are exceeded during the bridge slide, the bridge slide operations would be stopped and adjustments would be made to restore alignment prior to resuming the bridge slide.

No later than 10 days prior to the bridge slide, the Contractor shall submit a list of the names and cell phone numbers of the person in charge of the slide operations on the day of the bridge slide. This person shall control the slide operations and shall be responsible for starting, monitoring, and stopping the bridge slide operations.

The Engineer shall sign, seal and take responsibility of all Working Drawings, Calculations and Procedures for the design and execution of the horizontal slide.

7. Geometry Control

Prior to commencing construction of the superstructure in the Bridge Staging Area, submit proposed method of geometry control to MnDOT. The submittal is to contain actual details of the proposed temporary works and horizontal slide system, and shall be in the form of Working Drawings and should include but not necessarily be limited to items such as:

- i. Measuring equipment, procedures and locations of geometry control reference points on the superstructure, in the Bridge Staging Area and at the bridge site.
- ii. The location and values of permanent benchmarks and reference points in the staging area and at the bridge site.
- iii. During erection, as a minimum, establish and maintain a record of key vertical elevation along the main longitudinal elements (i.e. centerline of beams along the proposed horizontal slide track support). Submit all records to the Engineer.
- iv. Establish lateral and longitudinal location reference points on the erected superstructure that correspond to, or can be referenced to appropriate lateral and longitudinal reference points at the erection site.

E. Preparation for Movement of Superstructure

1. General

- i. The Contractor has overall responsibility for the construction of temporary works and bridge slide system in accordance with the accepted Working Drawings and procedures.

- ii. Accurately calculate slide forces, including an accurate take-off weight of the total superstructure to be moved and the anticipated maximum coefficient of friction between sliding points.
- iii. Follow established QA/QC procedures and prepare a pre-operation checklist as appropriate and necessary for information and coordination purposes.

2. Pre-Move Inspection

- i. Conduct a pre-move crack survey of the deck, sidewalk and barrier within seven days prior to the bridge slide. Inspect the deck, sidewalk and barrier by walking the deck and marking cracks visible from a standing position. Measure marked cracks and identify cracks greater than 0.02 inches wide.

3. Bridge Slide System

- i. Follow accepted Working Drawings for details and sequences of procedures for positioning the jacks and track.
- ii. Carefully jack superstructure horizontally in an incremental fashion. Maintain even push strokes between all jacking points. Jacks shall be able to be controlled as groups and/or as individual units. Provide controls to reset jacks as a group and/or as individual units.
- iii. Operate horizontal slide system with care and within anticipated limitations (stroke limits) of the jacking systems. Follow limitations on Working Drawings for all incremental and differential jacking with due regard to assuring minimal differential movement between all slide locations.
- iv. Implement checking (QA/QC) procedures prior to the slide operation in order to ensure satisfactory completion.
- v. Implement contingency plans in the event of major breakdown or equipment malfunction.

F. Movement of Superstructure

1. General

- i. The intent during movement is to ensure that the structure is delivered to the Owner, in its final location, with no damage, adverse loss of strength, loss of performance or loss of long-term durability. Any damages to the permanent structure caused by the move shall be repaired at no additional cost to MnDOT.

- ii. Establish survey control points and benchmarks as necessary. Establish transverse and longitudinal reference lines- e.g. centerlines of bearings, offsets from fixed surfaces- for setting superstructure span or spans on bearings as necessary.
- iii. Prepare and submit all records of observation and operations to the Engineer. Notify Engineer in event of error and submit proposals for corrective adjustments or modifications to any permanent structure or components to the Engineer for review prior to their implementation.

2. Tolerances

- i. Final plan alignment and location shall be within 1 inch of the location shown on the RFC Plans.
- ii. During movement, the Contractor shall ensure that the superstructure remains as free as possible from harmful effects of horizontal differential movement at all sliding surfaces.

3. Execution

Follow procedures shown on the Working Drawing for the step-by-step sequence of operations for movement of the superstructure span.

4. Post-Move Inspection

- i. Conduct the post move crack survey of the deck and barrier within seven days of the bridge move. Provide both crack surveys to MnDOT. Repair all cracks greater than 0.020 inches wide.
- ii. Cracks caused by the bridge slide shall be repaired as follows:
 1. Cracks between 0.020 inches (0.51 mm) and 0.040 inches (1.50 mm) in width shall be filled by the Contractor using a MnDOT approved epoxy injection method and materials. The epoxy injection repair shall be in accordance with the material and equipment manufacturer's published recommendations. All cracks shall be filled within 14 Days of completion of the bridge slide or as soon as substrate and weather conditions meet epoxy manufacturer's recommendations.
 2. Concrete elements with cracks greater than or equal to 0.040 inches (1.50 mm) in width shall be repaired or removed and replaced by the Contractor. Repair work will only be allowed for cracks that do not compromise the integrity of the design or the fitness of use as determined by the Engineer and agreed upon by MnDOT. All proposed repair work shall be approved by the Engineer and MnDOT.

3. Repair of cracks in the deck or barrier shall be performed with materials that are compatible with the deck concrete. All injection ports, excess epoxy and sealing epoxy shall be removed from the concrete surface.