SP-150696
(New)

SPECIAL PROVISIONS
FOR
PREFABRICATED BRIDGE SUPERSTRUCTURE MOVE

Mahaska County
BRF-092-7(45)--38-62

Effective Date
November 17, 2020

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

150696.01 DESCRIPTION.

A. Furnish, erect and install a prefabricated bridge superstructure move system including temporary works. Move the prefabricated bridge superstructure constructed off of the existing alignment into its final position.

B. Bridge Staging Area (BSA) – a suggested BSA off of the existing alignment and within the Right-of-Way and temporary easement for constructing the prefabricated bridge superstructure is shown in the plans.

C. Temporary works (falsework) for supporting and moving the prefabricated bridge superstructure shall be designed in accordance with the AASHTO LRFD Bridge Construction Specifications, 8th Edition 2017 by a Professional Engineer licensed in the State of Iowa. The falsework design shall consider effects of downdrag force on the foundations.

D. Prefabricated bridge superstructure move system shall be designed by a Professional Engineer licensed in the State of Iowa.

E. This specification is written assuming the Contractor will use a system to move the prefabricated bridge superstructure into its final position such as a guided slide of the bridge superstructure using temporary bearings and sliding track or a guided roll of the prefabricated bridge superstructure using heavy duty rollers and rolling track.

150696.02 MATERIALS.

Apply the requirements of the contract documents.

150696.03 CONSTRUCTION.

A. Submittals.

1. **Temporary Works (Falsework).**
   - **a.** Include detailed plans for items such as temporary support structures, falsework, cofferdams, shoring and temporary bridges.
     - **1)** Show temporary supports for the superstructure. Include bents or ground beams, foundations and temporary piling.
     - **2)** Show elevations and dimensions of temporary bearings, as necessary, to match the relative positions of the final permanent bearings at the bridge site.
     - **3)** If attachment of the temporary system to the bridge substructure is required, submit detailed calculations and plans for the proposed attachment and patching after the move.
   - **b.** Include design calculations and supporting data for all temporary works including settlement analysis.
   - **c.** After field verification, submit a letter of acceptance for the completed temporary works (falsework) for supporting and moving the prefabricated bridge superstructure signed by the Contractor's Temporary Works Design Engineer.

2. **Prefabricated Bridge Superstructure Move.**
   Detailed shop and/or working drawings, and/or cut sheets of all equipment and material used for sliding and/or lifting/lowering the prefabricated bridge superstructure are to be submitted. Include the following:
   - **a.** Details of the move system, components, mechanical devices, jacks, temporary blocking, guides, and operational techniques.
     - **1)** Include locations of all equipment during the structure move.
     - **2)** Include calculated superstructure weight for the move based on actual, known dimensions of components and known densities of materials.
     - **3)** Include weight capacities of the move system and limitations necessary for stability during all jacking, raising or lowering, and moving operations.
     - **4)** Include QC/QA procedures to be followed during the prefabricated bridge superstructure move.
     - **5)** Include a contingency plan in the event of a major equipment breakdown or other major delays.
     - **6)** Include operational details for the control of the movement (forward and reverse), braking, lifting and lowering. Include a system of check off items for the Operators and for safety purposes.
   - **b.** Revisions to the concepts and to the detailed descriptions of materials, components, erection methods, and sequencing indicated on the plans. Include changes to locations of permanent support conditions, cross section component sizes and/or connectivity, construction joints in any plane, and splice location, sizes and/or types.
   - **c.** Details of the BSA and travel path.
     - **1)** Provide details of the BSA, general layout, surface grading, surface material, drainage, environmental protection, material storage area, concrete delivery methods, shelters, prefabricated superstructure move path, accesses, fences, gates, barriers, offices, and workshops.
     - **2)** Include foundations and details of temporary bents or abutment seats to support the span under construction, including piling, spread footings, or other foundations.
     - **3)** Include clearances, utilities, details of construction, and intended access under the completed superstructure.
   - **d.** Geotechnical report and calculations for the temporary works, BSA, prefabricated bridge superstructure move system and travel path.
     - **1)** Verify that the BSA and travel path have suitable foundations for all proposed construction operations.
     - **2)** Include the means for mitigating unacceptably high or concentrated loads and differential deflections and settlements between the temporary works and the permanent substructure.
     - **3)** Include calculations for actual and allowable bearing pressures along the travel path, and actual pile loads, design bearing, and predicted settlement for temporary works'

piling. The allowable design bearing capacity of the temporary works and the predicted settlement shall minimize differential settlement between the temporary works and the permanent substructure during all phases of the Superstructure Move. The Contractor is responsible for providing adequate means and methods to mitigate and manage the effects of any differential settlement that occurs.

e. A step-by-step sequence of prefabricated bridge superstructure move operations.

f. Design calculations and supporting data to demonstrate that the bridge will not have any permanent overstress or deflection from the bridge move and that an adequate factor of safety is used to support any construction loads on the bridge up until the bridge is in service.

3. Geometry Control Plan.

a. The geometry control plan can be submitted in the form of working drawings or a manual.

b. Include measuring equipment, procedures and locations of geometry control reference points on the superstructure and in the BSA. Establish longitudinal and lateral location reference points on the prefabricated superstructure that correspond to, or can be referenced to, appropriate longitudinal and lateral reference points at the erection site.

c. Include locations and values of permanent benchmarks and reference points in the BSA and the bridge site.

d. Include a geometry control procedure for monitoring deflection change and twist before, during the move and after setting the superstructure in the permanent position.

e. Establish and maintain records of key vertical elevations along the main longitudinal elements at the ends, proposed lifting supports, and mid-span.

f. Include a monitoring plan for deflections and twist distortion during the move.

4. Submittal Review Period.

Allow the Engineer 30 calendar days to review submittals.

B. Prefabricated Bridge Superstructure Construction.

1. Temporary Support Structures.

a. The Temporary Works Design Engineer shall field verify that temporary support structures are built according to the plans for temporary works and document the date and time of acceptance in the submittal letter.

b. The Temporary Works Design Engineer shall field verify that support surfaces are built to the required elevations and tolerances with sufficient clearances to accommodate the prefabricated bridge superstructure move system. Document the date and time of acceptance in the submittal letter.

c. The Contractor's Temporary Works Design Engineer shall inspect and accept the temporary works (falsework) prior to the beginning of Superstructure construction. The letter of acceptance of the temporary support structure must be submitted to the owner 7 calendar days prior to any casting of concrete for the superstructure.

d. Within the ROW, falsework shall be removed to a minimum of 1 foot below finished grade. Within the temporary easement and outside of the ROW, falsework shall be completely removed.

2. Embedded Items.

a. Embedded items include scuppers, hand holes, anchor bolts or fixtures for bearings, barriers, and similar appurtenances. Where post-tensioning is used, embedded items also include associated post-tensioning components, whether permanent or for temporary purposes.

b. Ensure all embedded items are in their correction locations and elevations.

3. Age at Prefabricated Bridge Superstructure Move.

a. Do not lift or move the prefabricated bridge superstructure until the concrete has attained the concrete design strength specified in the plans and has cured the minimum number of calendar days per Article 2412.03, E of the Standard Specifications.
b. The concrete design strength shall be verified in accordance with Article 2403.03, N, 2 of the Standard Specifications.

C. Substructure Strength Maturity.
All concrete pours on the critical path during the critical closure period shall require the use of Maturity Method as described in Article 2403.03, N, 2 of the Standard Specifications and Materials I.M. 383. The Maturity Method will be used to determine the minimum age for loading based on strength requirements only, the 7 day minimum curing time does not apply. All cost associated with implementing the Maturity Method will not be paid for separately but will be incidental to the Structural Concrete or Precast bid items as required.

D. Prefabricated Bridge Superstructure Move.

1. General.
a. The intent during lifting, transportation and placement is to ensure the structure is delivered to the Contracting Authority, in its final location, with no damage or adverse loss of strength, loss of performance or loss of long term durability. To this end, it is necessary to place certain limitations upon characteristics that can be quantified and observed or checked by careful observations or by using suitable detection methods during these operations.
b. The intent for the method of moving is to utilize synchronized and guided jacking, pushing, and / or pulling forces at all final support locations (at a minimum) including but not limited to all abutments and piers. The utilized method shall induce minimal additional lateral forces (perpendicular to the bridge's longitudinal axis) on the final substructure. This means that all support locations will be moved by directly applied forces and mechanical means and that no support locations will rely on mechanical means applied at an adjacent support location. This means that all support locations will be moved by directly applied forces and mechanical means to balance friction forces (opposite and equal).
c. The intent for the method of moving is that it utilizes a guide system by which to provide guided means of maintaining and directing the move. This is understood to mean the use of a guide track or other such construction.
d. Exercise care when placing the span into its final location on the bridge bearings and use observations to monitor and record conditions just before and just after setting the span in place.
e. The Contractor shall schedule and complete a successful test lift and move of a minimum of 6 inches prior to scheduling the Critical Closure and move day. This is required to test their systems and controls.
f. If a bearing pad slide is utilized, the bearing pads used for the slide shall be replaced with new bearing pads being supplied for the permanent, in place construction. The cost of the second set of bearing pads shall be incidental to the Prefabricated Bridge Superstructure Move bid item.
g. If a pad slide is not utilized, the Teflon coat on the bearing pads shall not be used on the bearing pads and the bearing elevations shall be adjusted for the actual thickness of the bearing pad without the Teflon.

2. Deflection and Twist Control During Prefabricated Bridge Superstructure Move.
a. The Contractor is responsible for ensuring the superstructure span does not deflect or twist beyond the allowable tolerances and are responsible for ensuring the superstructure is not damaged during lifting, transporting and setting.
b. Maintain twist distortion of superstructure within maximum allowable tolerance at all times during movement. The maximum allowable twist distortion is defined in Tolerances.

c. Immediately prior to setting the span down in the final bridge location, check that twist distortion of superstructure span is less than that allowed.
d. Immediately after setting the span in the final location on permanent bearings, check that elevations and twist distortion of superstructure span are satisfactory. Allowable permanent twist distortion is zero.
e. In the event of breakdown during transport, perform deflection and twist check as soon as possible after bringing operations to a halt. Perform intermediate checks during the period of the breakdown and again prior to moving.

3. Deflection and Twist Control Monitoring During Prefabricated Bridge Superstructure Move.

a. Using measurements of elevations, determine the Deflection Change of the ends of the span relative to mid-span as a result of the first lifting of the span. During transport, use elevation measurements or devices to monitor twist distortion (Twist) of the span itself.
b. Monitor the global rotational attitude of the span itself longitudinally and transversely in a manner independent of any self-leveling devices and monitoring systems of the move system itself.
c. By means of taking elevation readings or by using other methods approved by the Engineer, take responsibility for taking the above observations or implementing monitoring methods accordingly. As a minimum, observe, report and act upon the following to avoid exceeding these limits and tolerances:
1) Deflection Change.
a) For observation purposes, as a minimum, take elevations over the end bearings, the centers of any supplementary supports and at mid-span on the centerlines of the fascia beams and calculate the Deflection Change as the difference between the condition just before to just after the initial lifting of the span (if applicable).
b) Take the Deflection Change as the average of the four observations over each end of each fascia beam.
2) Twist.
3) Change in Longitudinal Gradient (along the beams).
4) Change in Transverse Gradient (across the beams of the span).

4. Tolerances.

a. Plan Alignment: Location and Clearances.
For the final condition of the span after placement in the prefabricated bridge superstructure:
1) Do not exceed 1/4 inch maximum deviation at each end of the span from overall longitudinal alignment after setting.
2) Do not exceed 1/4 inch maximum deviation from overall transverse location (i.e. longitudinal position) at each line of bearings.
3) Maximum deviation from alignment in both primary plan directions at each end of the span being set shall not exceed 1/4 inch or that required for the accommodation of manufactured expansion joint components or bearings, whichever is the less.
4) In the absence of other constraints, keep individual elements or surfaces within 1/4 inch of location with respect to similar matching surfaces.

b. Bridge Bearings: Elevation and Location.
1) Keep the elevation of individual bridge bearings or bearing plinths for prefabricated superstructure within plus or minus 1/8 inch of required elevations, unless tighter tolerances are required according to the bearing manufacturer or as specified on the plans or Shop Drawings.
2) Keep the plan location of bridge bearings within 1/8 inch and the alignment within plus or minus 1/16 inch across the bearing, unless tighter tolerances are required according to the bearing manufacturer or as specified on the plans or Shop Drawings.
3) If tolerances are not met, submit for approval of Engineer, means to adjust elevations or to correct for or accommodate errors or unintended deviations from required

tolerances. Submit proposals and seek approval of the Engineer for the use of shims, injection of high strength grout or other methods to accommodate differences from required tolerance. Do likewise, for the accommodation of anchor bolts or similar restraining devices.

c. During Lifting, Transportation and Placement (Erection).

1) Deflection Change.

Relative to the local tangent to the vertical profile grade at mid-span, keep the anticipated downward deflection of ends of superstructure when lifted at heavy lift support locations within ± 20% of that given on the plans or Shop Drawings.

2) Twist.

a) For this purpose, twist is defined and measured as the maximum allowable upward or downward deflection of one corner relative to the plane defined concurrently by the elevations of the other three corners.

b) Twist is not allowed to exceed the lesser of W/200 or 0.25 feet when the four monitored points are over the centerlines of the permanent span support bearings. Twist is not allowed to exceed the lesser of W/300 or 0.16 feet when the four monitored points are over the centerlines of the heavy lift supports during the prefabricated bridge superstructure move. W is defined as the perpendicular width in feet between the centerlines of the fascia beams.

c) Twist must remain within the above allowable limits or as otherwise predetermined and provided on the plans or Shop Drawings in order to incur no damage (i.e. cracks), even if cracks close after setting the bridge span in place.

3) Change in Longitudinal Gradient (Along the Beams).

a) The heavy lift firm is required to provide the maximum allowable change in longitudinal gradient.

b) The change in longitudinal gradient is defined as the change in slope experienced along the fascia beams from conditions just before first lifting to any time during transportation.

c) The longitudinal gradient may be calculated from differences in elevations taken just before lifting to elevations taken at any time during transport.

4) Change in Transverse Gradient (Across the Beams of Span).

a) The heavy lift firm is required to provide the maximum allowable change in transverse gradient.

b) The change in transverse gradient is defined as the change in slope experienced along the end diaphragms from conditions just before first lifting to any time during transportation.

c) The change in transverse gradient may be calculated from differences in elevations taken just before lifting to elevations taken at any time during transport.

150696.04 METHOD OF MEASUREMENT.

Method of measurement is lump sum.

150696.05 BASIS OF PAYMENT.

A. Payment for Prefabricated Bridge Superstructure Temporary Works will be the Lump Sum contract price. Payment will be full compensation for furnishing a temporary support system for the prefabricated bridge superstructure and removal of temporary works for the support following the prefabricated bridge superstructure move. All the cost for engineering, equipment, labor and materials to complete the Prefabricated Bridge Superstructure Temporary Works shall be included in the contract price.

B. Payment for Prefabricated Bridge Superstructure Move will be the Lump Sum contract price. Payment will be full compensation for furnishing a bridge moving system, moving the prefabricated bridge superstructure into the final bridge position and removal of the moving

system. All the cost for engineering, equipment, labor and materials to complete the Prefabricated Bridge Superstructure Move shall be included in the contract price.