

SUPERSTRUCTURE INSTALLATION, SLIDE-IN

Description

This work shall include the installation of the superstructure onto the permanent substructure units in accordance with 105.03. The superstructure shall be built in a temporary location and moved into its permanent position using a Horizontal Jacking System in accordance with these specifications.

Definitions

1. Horizontal Jacking System: The system used to slide the superstructure from its temporary location to its permanent location. This system shall include, but not limited to, the sliding surface, hydraulic actuator's and pumps and the longitudinal restraining system which is used to keep the sliding superstructure centered over the supports.
2. Temporary Supports: Any structure used to provide temporary support to a bridge or bridge superstructure which will be removed after the structure is removed.
3. Temporary Sheeting and Shoring: Any temporary system to support either a structural component or soil slope.
4. Monitoring: The act of measuring, recording and quantifying changes in the geometry and condition of bridge superstructures as a result of temporary support conditions and moving operations.
5. Superstructure: Bridge elements above the bearings including but not limited to girders, deck, and barriers.
6. Twist: The condition where a corner of a superstructure deflects up or down relative to the plane defined by the other three corners of the supported bridge span due to uneven jacking.

Design Data

Any temporary temporary supports, falsework, sheeting or shoring required to perform the work listed in this provision shall be in accordance with the following specifications:

1. AASHTO Guide Design Specifications for Bridge Temporary Works
2. AASHTO LRFD Bridge Construction Specifications
3. AASHTO LRFD Bridge Design Specifications

Qualifications

The Horizontal Jacking System Supervisor/Foreman shall have experience with one or more projects within the last ten years, of similar scope, in the area of heavy duty jacking, including both vertical and horizontal translation. Jacking experience can include work on bridges, buildings, ships or other sizeable structures.

Submit proof that the Horizontal Jacking System Supervisor/Foreman's qualifications have been met including a list of similar projects completed within the last ten years with names and phone numbers of owner's representatives who can verify the Horizontal Jacking System Supervisor/Foreman's participation in those projects with the Working Drawings.

Submittals

Detailed Working Drawings of all equipment and material used for sliding and/or jacking the bridge superstructure for approval. The Working Drawings shall include the following:

1. Details of the Horizontal Jacking System and operational techniques, including the capacity of the Horizontal Jacking System.
 - a. Include locations of all equipment during the superstructure move.

- b. Include anticipated required static and kinetic horizontal jacking force.
 - c. Include details regarding how the hydraulic jacks at each jacking point will be regulated to ensure uniform movement.
 - d. Include horizontal jacking capacity of the selected system
 - e. Include QC/QA procedures to be followed during the superstructure move.
 - f. Include any temporary falsework or supports needed for the superstructure installation.
2. Details of the Contingency Plan
- a. Discussion of potential equipment problems such as insufficient equipment or equipment breakdowns.
 - b. Discussion of methods to mitigate and correct longitudinal movement of the superstructure during installation.
 - c. Discussion of potential problems with inclement weather.
 - d. Identification of individuals involved in the superstructure installation and their risks and responsibilities.
 - e. Identification of the use of manual overrides of electronic or hydraulic equipment.
 - f. Identification of additional equipment to have on hand such as repair items.
 - g. Public notice of extended delays.
 - h. Identification of a detour route for extended closures.
 - i. Corrective actions if problems occur.
3. Details of the Safety Plan
- a. Ensures the protection of public, spectators, and workers.
 - b. Protects property during the movement of the superstructure.
 - c. Addresses nighttime operations including lighting.
 - d. Addresses OSHA requirements.
4. Details of any temporary sheeting or shoring required to install or complete the installation of the superstructure. This includes any sheeting or shoring required to open the roadway to traffic prior to other permanent earth retaining being installed.
5. 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.
 - c. Include a geometry control procedure for monitoring longitudinal movement and twist before, during installation, and after installation of the superstructure in the permanent position.
 - d. Establish and maintain a record of key vertical elevations along the main longitudinal elements at the ends and midspan.
 - e. Maintain records in good condition so that they may be used for reference during erection and transportation.
 - f. Include a monitoring plan for movement and twist distortion during installation.
6. Provide repair methodology and supporting calculations for procedures for repairing damage and injecting and sealing cracks.
7. Other items not covered above to be submitted for approval.
- a. Provide Overall schedule of the timing and sequence of superstructure fabrication, erection, and installation. Submit an hour by hour schedule of the bridge installation 21 calendar days prior to the scheduled move date for review.
 - b. Provide Step-by-Step Installation procedures.

Allow the Engineer 14 calendar days to review and approve working drawings and supporting calculations. The Engineer may grant an increase in the number of working days for the project when that time is exceeded. This review period applies each time the drawings and calculations are submitted.

Do not deviate from the approved drawings unless authorized in writing by the Engineer of Record. Assume the responsibility for costs incurred due to faulty detailing or fabrication.

Do not begin work until receiving approval of the Working Drawings. The Department will reject units fabricated before Working Drawings approval.

Costs incurred due to faulty design or detailing are the Contractor's responsibility.

Within the Working Drawings, include revisions to the concepts and to the detailed descriptions of materials, components, erection methods, and sequencing indicated on the Contract Plans. This includes, but is not limited to, changes to locations of permanent support conditions, cross section component sizes or connectivity, construction joints in any plane, and splice location, sizes, or types as required.

Construction Requirements

(a) General Requirements

Use methods and procedures to provide adequate safety to the general public from all construction activities, superstructure installation, and falsework placed over or adjacent to traveled roadways or any existing commercial, industrial or other facilities.

(b) Meetings

The following meetings shall be held between the Contractor, Engineer and other representatives of the Owner.

(1) Superstructure Installation Meeting

The meeting shall be held a minimum of two weeks prior to the Superstructure Installation. This meeting shall discuss pertinent items of the working drawings, including the Contingency Plan and Safety Plan.

(2) Final Walk through Pre-installation Meeting

Immediately prior to installing the bridge, conduct a final walk through pre-installation meeting at the bridge site for the bridge installation. Verify that all items identified in the Working Drawings have been completed and verify all work has been completed for the installation.

(c) Horizontal Jacking System

Each jack shall be equipped with either a pressure gage or a load cell for determining the jacking force. Pressure gages shall have an accurate reading dial at least 6 inches in diameter. Each jack shall be calibrated by a private laboratory within 6 months prior to use and after each repair. Certification shall be provided to the Engineer prior to its use. Each jack and its gage shall be calibrated as a unit with the cylinder extension in the approximate position that it will be at final jacking force and shall be accompanied by a certified calibration chart. Load cells shall be calibrated and provided with an indicator by which the jacking force is determined.

The Horizontal Jacking System shall be able to push and pull the

superstructure during installation to remedy any complication encountered during installation.

The Horizontal Jacking System shall also have a system in place to prevent longitudinal movement of the bridge during installation.

(d) Age at Installation

Do not jack or attempt to install the superstructure until it has attained a minimum age of 28 days since the last casting operation, unless otherwise approved by the Engineer or the requirements of 702.24 are met. For the purpose of this provision, installation of the structure shall be considered a "traffic load".

(e) Preparation for Installation of Superstructure

1. Verify the temporary and permanent bridge seats will accommodate the bridge installation based on their horizontal and vertical geometry. Any discrepancy shall be identified prior to sliding the structure. Proposed mitigation measures shall be submitted to the Engineer for approval.
2. Verify that adequate horizontal and vertical clearances exist to safely move the bridge.
3. If required, carefully jack-up and /or jack-down superstructure in an incremental or differential fashion as required by the amount necessary to install the superstructure to the required elevation.
4. Operate the Horizontal Jacking System with care and within anticipated stroke limits of the jacking systems. Follow limitations on Working Drawings or Manuals for all incremental and differential jacking with due regard to corresponding stability conditions for the Horizontal Jacking System and falsework.
5. Implement checking (QC/QA) procedures prior to an installation operation in order to ensure satisfactory completion.
6. Implement contingency plans in the event of a major breakdown or equipment malfunction.

(f) Installation of Superstructure

1. The intent during installation is to ensure that the structure is delivered to the Owner, 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.
2. Exercise care and precaution 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.
3. Twist Control During Vertical Jacking
 - a. The Contractor is responsible for ensuring the superstructure span does not deflect or twist beyond the allowable tolerances and is responsible for ensuring the superstructure is not damaged during installation.
 - b. Maintain twist distortion of superstructure within maximum allowable tolerance at all times during installation.
 - c. Immediately prior to setting the span down in final bridge location, check that twist distortion of the superstructure span is less than that allowed described herein.

- d. Immediately after setting span in final location on permanent bearings, check that elevations and twist distortion of the superstructure span are satisfactory. Allowable permanent twist distortion is zero.
 - e. In the event of breakdown during installation, 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.
4. Twist Control Monitoring During Installation
- a. A minimum of 9 points shall be monitored during installation. Transverse to the centerline of the bridge, a measurement point shall be recorded at the face of each rail and one at the centerline of the structure. Parallel to the centerline of the bridge, a measurement point shall be placed at each centerline of bearing and at midspan.
 - b. Using measurements of elevations, use elevation measurements or devices to monitor twist distortion (Twist) of the span itself.
 - c. By means of taking elevation readings or by using other methods approved by the Engineer, the Contractor shall make the above observations or implementing monitoring methods accordingly. As a minimum, observe, report and act upon the amount of twist to avoid exceeding these limits and tolerances:
 - d. Halt operations immediately if the twist exceeds the allowable limits shown on the plans.
5. Longitudinal Alignment Monitoring During Installation
- a. Monitor the end bent diaphragms to ensure there is no longitudinal movement of the superstructure relative to the substructure.

(g) Tolerances

1. Plan Alignment: Location and Clearances
- a. For the final condition of the span after placement of the superstructure the maximum deviation from alignment in both primary plan directions at each end of the span being set shall not exceed 1/2 inch or that required for the accommodation of manufactured bearings, whichever is the less.
2. Bridge Bearings: Elevation and Location
- a. Keep the elevation of individual bridge bearings for the 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 Working Drawings.
 - b. Keep the plan location of bridge bearings within 1/8 inch and the alignment within plus or minus 1/8 inch across the bearing, unless tighter tolerances are required according to the bearing manufacturer or as specified on the Working Drawings.
 - c. 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 for approval by the Engineer for the use of shims, injection of high strength grout or other methods to accommodate differences from required tolerance.
3. During Lifting, Movement and Placement (Installation)
- a. Twist
 - (1) 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 Gantry supports during installation. W is defined as the perpendicular width in feet between the face of rails (clear roadway width).

- (2) Twist must remain within the above allowable limits or as otherwise predetermined and provided in the approved Working Drawings in order to incur no damage, even if cracks close after setting the bridge span in place.

b. Longitudinal Movement

- (1) If during the installation, the longitudinal movement shall be monitored and installation shall be halted at the discretion of the Engineer if the longitudinal movement presents concerns with the stability of the bridge and final placement.

(h) Superstructure Requirements

- 1. Shims may be used, if required, to correct discrepancies in the seat elevations at the substructures.
- 2. Non-shrink grout in accordance with 707.09 may be used, if required, to correct discrepancies in the seat elevations at the substructures.

(i) Corrections and Repairs

- 1. After the installation of the structure, the structure shall be inspected for cracking. Any cracks shall be repaired as follows:
 - a. Crack width less than 0.012 inches - Sealed with an epoxy penetrating sealer followed by an application of an approved sand. The sealing and sand application shall be repeated as needed to ensure that the voids remain completely filled.
 - b. Crack width greater than 0.025 - Epoxy Injection in accordance with 727.

Method of Measurement

No measurement of the work described in this provision will be made

Basis of Payment

This work shall be paid for at the contract lump sum price for the work as outlined below.

Payment will be under:

Pay Item	Pay Unit Symbol
Superstructure Installation, Slide-In, Engineering	LS
Superstructure Installation, Slide-In	LS

The cost of all material, labor and incidentals related to the preparation of the Working Drawings, including designing of the slide system shall be included in the lump sum unit price for Superstructure Installation, Slide-In, Engineering.

The cost of all other material, labor and incidentals required to perform the work described herein, including superstructure monitoring meetings, temporary sheeting and shoring, and superstructure repairs due to the installation and installation and removal of any required temporary supports shall be included in the cost of Superstructure Installation, Slide-In.

A maximum payment of 50% of the Contract Unit Price per item shall be made after the first Superstructure Installation. The remaining amount shall be made after the second Superstructure Installation.