



**DEVELOPMENTAL SPECIFICATIONS
FOR
GIRDER ERECTION PLAN**

**Effective Date
December 17, 2019**

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

15076.01 DESCRIPTION.

This work shall consist of developing, engineering and submitting a detailed Girder Erection Plan which shall include erection plans and procedures substantiated with appropriate erection engineering calculations.

15076.02 CERTIFICATION.

The Girder Erection Plan submittal consisting of erection plans and procedures shall be certified by a Professional Engineer licensed in the State of Iowa, known in this document as the Erection Engineer. Erection engineering calculations used in the preparation of the Girder Erection Plan shall only be submitted if requested by the Engineer. If the Engineer requests erection engineering calculations, they shall be submitted with the certification of the Erection Engineer.

15076.03 DETAILS OF GIRDER ERECTION PLAN SUBMITTAL.

A. Review.

The Engineer shall be allowed a minimum of 30 working days to review the submittal. The Engineer shall provide notification to the Contractor either indicating "No Exceptions Taken" or "Revise and Resubmit".

B. Erection Plans and Procedures Overview.

1. The term "erection plans" refers specifically to the engineering drawings prepared by the Erection Engineer describing and specifying the erection (i.e., the field-installation and member-placement) of the structural steel. Erection Plans may also refer in a more general context to the combination of engineering drawings and erection procedures describing and specifying the erection (i.e., the field-installation and member-placement) of the structural steel.
2. The term "erection procedures" refers to the documents which describe the specific sequence, methods, equipment, and other directives that the Contractor is to follow in erecting the structural steel. The terms "erection plans" and "erection procedures" are not synonymous, but the erection plans and erection procedures shall be fully integrated with each other and shall together describe and specify all aspects of how the structural steel is to

be erected, including, but not limited to, sequence of erection, methods or techniques to be used, equipment to be used, and materials to be used along with any temporary works or other devices necessary.

3. The erection plans and procedures shall address all requirements for erection of the structural steel into the final designed configuration. Any and all written review comments provided by the Engineer shall be addressed to the Engineer's satisfaction prior to the start of erection. As a minimum, the erection plans and procedures shall include consideration of all items described in Article D below.

C. Erection Engineering Calculations.

1. Appropriate erection engineering calculations to substantiate the structural adequacy and stability of the bridge system for each step of the steel erection shall be performed to substantiate the erection plans and procedures.
2. At a minimum and as appropriate, erection engineering calculations shall conform to the following guide specifications:
 - Guide Design Specifications for Bridge Temporary Works, AASHTO, 2nd Edition, 2017
 - Guide Specifications for Wind Loads on Bridges During Construction, AASHTO, 1st Edition, 2017
3. Erection engineering calculations to substantiate the structural adequacy and stability of the erected structure and any associated temporary works and/or temporary components do not need to be included in the Girder Erection Plan submittal. However, the Engineer reserves the right to request the submittal of erection engineering calculations for review and approval at any time. If requested, such calculations shall be submitted within 14 calendar days of request by the Engineer.

D. Erection Plans and Procedures.

1. Plan of Work Area.

The erection plan shall include:

- A plan of the work area showing the proposed bridge,
- The permanent support structures (piers and abutments),
- Roads,
- Railroad tracks,
- Waterways (including location and dimensions of any navigational channel(s) and any navigational clearances which must be respected during construction),
- Overhead and underground utilities,
- Structures and conditions that may limit access (consideration of clearance requirements over roadways or railroads),
- Staging or material storage areas,
- Right-of-way and property lines,
- Information, plans, etc. regarding maintenance of traffic requirements, lane or road closures, restrictions, durations, etc. necessary to protect public safety for all erection operations over or adjacent to live traffic, and
- Any other information that may be pertinent to the steel erection.

2. Erection Sequence.

The erection plans and procedures shall indicate the erection sequence for all primary members (including indication of any attached secondary members), noting the use of temporary support conditions, such as holding crane positions, temporary supports,

falsework, etc. The erection sequence shall be shown in an illustrative plan view of the bridge for each erection stage, highlighting the structural components to be erected, their weights and center of gravity locations, lifting crane locations for primary member picks, and any temporary support conditions that are necessary during the particular stage. The illustrative plan view shall be accompanied with a written narrative of the procedure to be followed by the steel erector, which shall state items such as structural components to be erected, use of temporary supports, use of temporary bracing, hold cranes, etc. Member reference marks, when reflected on the erection plans and procedures, should be the same as used on shop detail drawings.

3. Delivery Location.

The submittal shall indicate the delivery location and orientation of all primary members.

4. Crane Information.

- a. The erection plans and procedures shall show the location of each crane to be used for each primary member to pick (see Article 15076.03, D, 2), the crane type, crane pick radius, crane support methods (crane mats, barges, work trestles, etc.), and the means of attachment to the girders being lifted or supported.
- b. The erection submittal shall include capacity charts or tables that address and demonstrate the adequacy of each crane configuration, boom length, counterweight configuration, outrigger configuration, and pick weight required to do the proposed work. The erection plans and procedures shall also indicate any potential above- or below-ground obstructions or restrictions to crane operations (such as existing structures, utilities, etc.).
- c. In the event that the submitted cranes are not available at the time of construction, the Contractor can propose alternate cranes, subject to review and approval by the Engineer. The submittal package for alternate cranes shall include capacity charts or tables that address and demonstrate the adequacy of each crane configuration, boom length, counterweight configuration, outrigger configuration, and pick weight required to do the proposed work; however, resubmittal of the full Girder Erection Plan is not required.
- d. Any plans associated with crane supports (such as crane mats, barges, work trestles, etc.) shall also be included. When applicable, manufacturers' certification documents or catalog cuts for pre-engineered devices or equipment may be used to meet this requirement; these items shall be included in the submittal and shall be subject to review and approval by the Engineer. Calculations for crane supports (crane mats, barges, work trestles, etc.) do not need to be included in the submittal, but the Engineer reserves the right to request their submittal for review and approval at any time. If requested, such calculations shall be submitted within 14 calendar days of request by the Engineer.

5. Primary Member Crane Pick Information.

The submittal shall include the lifting weight of the primary member picks, including all rigging and pre-attached elements (such as cross-frames or splice plates). It shall also include the approximate center of gravity locations for the primary member picks of non-symmetric girders and assemblies.

6. Lifting Devices and Special Procedures.

- a. The erection plans and procedures shall include the details, weight, capacity, and arrangement of all rigging (beam clamps, lifting lugs, etc.) and all lifting devices (such as spreader and lifting beams) required for lifting primary members. The submittal shall also specify details for rigging or lifting devices bolted or welded to permanent members, including the method and time (shop or field) of attachment and capacity, as well as methods, time, and responsibility for removal.
- b. As necessary, the submittal shall provide special lifting/handling procedures for any primary member with potential stability or slenderness issues.

7. Bolting Requirements.

The submittal shall indicate the bolting requirements for field splices and cross-frame (or diaphragm) connections for each stage.

8. Bearing Blocking and Tie-Down Details.

The submittal shall indicate blocking and/or tie-down details for the bridge bearings, and associated force demands as necessary.

9. Load Restrictions.

Restrictions regarding wind loading, construction dead and live loadings, and any other applicable loading restrictions shall be included in the submittal, as necessary.

10. Temporary Supports.

- a. The submittal shall include the location of any temporary support structures (see Article 15076.03, D, 2) and bracing, as well as details of the temporary support structure itself. If the temporary support is to be prefabricated (selected from a supplier's catalogue), the type and capacity shall be defined in the submittal, as necessary; lateral capacity as well as vertical capacity requirements shall be considered as appropriate. If the temporary support is to be constructed by the Contractor on site, a complete design with full details, including member sizes, connections, and bracing elements shall be provided in the submittal in accordance with Article 2408.03, L of the Standard Specifications. In either case, details regarding the upper grillage and temporary bearing assembly (i.e., details of how the steel girders will bear on the temporary support), including the top of falsework (bottom of structural steel) elevations, shall also be included in the erection plans and procedures. In addition, all foundation requirements for temporary support structures shall be provided in the submittal.
- b. The submittal shall indicate the location of hold cranes that are used to provide temporary support to the steel assembly (see Article 15076.03, D, 2) and the associated crane loads. The hold crane type, capacity, boom lengths, pick radius, and means of attachment to the girders shall also be indicated in the submittal.
- c. The submittal shall include the location and details for temporary tie-downs that are required to facilitate the steel erection, as well as the associated tie-down loads. At a minimum, the details shall include the tie-down, girder attachment devices, and anchoring devices.
- d. The submittal shall clearly indicate when, and under what conditions, any temporary supports or holding cranes may be released in the erection sequence, and if they may be left in place while subsequent erection proceeds.
- e. The submittal shall clearly indicate appropriate restraint of girders from twisting and/or layover at supports. Girders should be restrained from twist and/or layover at supports unless the need for such restraint is demonstrated to be unnecessary by appropriate analysis in the erection engineering calculations.

11. Jacking Devices.

The submittal shall indicate jacking devices that will be required to complete the steel erection. Their location, type, size, and capacity shall be indicated, as well as their intended use, sequence of engagement, load level, jack pressure table, and any other key parameters of their operation.

15076.04 CONSTRUCTION.

- A. The Contractor is completely responsible for protection of the structural integrity of the bridge superstructure components from fabrication to final approved placement. Any damage sustained by

structural steel, during erection shall be repaired or replaced by the Contractor, to the satisfaction of the Engineer at no additional cost to the Contracting Authority.

- B.** Changes in the approved Girder Erection Plan will not be allowed except under one of the following three conditions:
- Changes in the Girder Erection Plan shall be approved by the Engineer, or
 - Changes in the Girder Erection Plan shall be approved by the Erection Engineer, when the Erection Engineer is present on the construction site to approve the changes. Written documentation of the changes to the Girder Erection Plan shall be certified by the Erection Engineer and submitted to the Engineer within 3 calendar days, or
 - Changes in the Girder Erection Plan shall be approved and certified by the Erection Engineer in written form to the Contractor and submitted to the Engineer prior to implementation.
- C.** Upon completion of construction operations and Engineer approval, all equipment shall be removed, and all existing ground lines and site conditions modified by the Contractor to facilitate construction activities shall be restored to undamaged existing condition unless approved otherwise by the Engineer.

15076.05 METHOD OF MEASUREMENT.

No measurement will be made.

15076.06 BASIS OF PAYMENT.

All costs of furnishing, submitting, and revising the Girder Erection Plan shall be included under contract bid item Girder Erection Plan.