**SPECIAL SPECIFICATIONS FOR PREFABRICATED BRIDGE**

# 1.0 GENERAL

1.1 Scope

These specifications are for a fully engineered clear span bridge(s) of steel construction and shall be regarded as minimum standards for design and construction. These specifications are based on products designed and manufactured by CONTECH Engineered Solutions, LLC AASHTO Express series.

1.2 Qualified Suppliers

Each bidder is required to identify their intended bridge supplier as part of the bid submittal. Qualified suppliers must have at least 10 years of experience fabricating these type structures.

Pre-approved Manufacturers:

**CONTECH Engineered Solutions, LLC**

8301 State Highway 29 North
Alexandria, Minnesota 56308
1-800-328-2047

4021 Gault Avenue South
Fort Payne, Alabama 35967
1-800-749-7515

Suppliers other than those listed above may be used provided the engineer or owner's agent evaluates the proposed supplier and approves the supplier 5 days prior to bid.

The contractor must provide the following documentation, for any proposed supplier who is not pre-approved, at least 10 days prior to bid:

1. Product Literature

2. All documentation to insure the proposed substitution will be in compliance with these specifications. This shall include:

   - Representative design calculations
   - Representative drawings
   - Splicing and erection procedures
   - Warranty information
   - Inspection and Maintenance procedures
   - AISC Shop Certification
   - AWS Certified Fabricator Certification
   - Welder Qualifications
   - Evidence of 2 Certified Weld Inspectors (CWI's) on staff

3. Proposed suppliers must have at least ten (10) years of experience designing and fabricating these type of structures and a minimum of ten (10) successful bridge projects, of similar construction, each of which has been in service at least seven (7) years. List the location, bridge size, owner, and a contact for reference for each project.

The engineer will evaluate and verify the accuracy of the submittal prior to bid. If the engineer determines that the qualifying criteria have not been met, the contractor's proposed supplier shall be rejected. The engineer's ruling shall be final.

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**SPECIAL SPECIFICATIONS FOR PREFABRICATED BRIDGE**

## 2.0 GENERAL FEATURES OF DESIGN

2.1 Span

Bridge span shall be 130'-0" (straight line dimension) and shall be as measured from each end of the bridge structure (out to out dimension).

2.2 Width

Bridge width shall be 8'-0" clear and shall be as measured from the inside face of the elements comprising the safety system or truss structural members (chords and verticals)

2.3 Bridge System Type

Bridge(s) shall be designed as a Connector® (Half-Thru Pratt truss) (or equal), that has one diagonal per truss panel and plumb end vertical members. Interior vertical members shall be perpendicular to the chord faces.

2.3.1 Bridge(s) shall be designed utilizing an H-Section configuration where the floor beams are placed up inside the trusses and attached to the truss verticals.

2.3.2 The bridge manufacturer shall determine the distance from the top of the deck to the top and bottom truss members based upon structural and/or shipping requirements.

2.3.3 The top of the top chord shall not be less than 48 inches above the deck (measured from the high point of the riding surface) on bike path structures.

2.4 Member Components

All members of the vertical trusses (top and bottom chords, verticals, and diagonals) shall be fabricated from square and/or rectangular structural steel tubing. Other structural members and bracing shall be fabricated from structural steel shapes or square and rectangular structural steel tubing.

Unless the floor and fastenings are specifically designed to provide adequate lateral support to the top flange of open shape stringers (w-shapes or channels), a minimum of one stiffener shall be provided in each stringer at every floor beam location.

2.5 Attachments

2.5.1 Safety Rails – Horizontal system

Safety rails will consist only of horizontal steel tubes. Horizontal tube safety rails shall be placed on the structure up to a minimum height of 3′-6″ above the deck surface. Steel tubing shall be placed so as to prevent a 4″ sphere from passing through the truss up to 3'-6" and an 8" sphere from 3'-6" to 4'-6" above deck surface. Safety rails shall be placed on the inside of the structure. Safety rails placed on the inside of the truss, flush with interior verticals and shall have their ends sealed and ground smooth so as to produce no sharp edges.

The safety rail system shall be designed for an infill loading of 200 pounds, applied horizontally at right angles, to a one square foot area at any point in the system.

2.5.2 Toe Rail

The bridge shall be supplied with a steel channel toe rail with radiused edges mounted to the inside face of both trusses. The toe rail shall be a minimum of 4 inches high. Toe rail shall be

welded to the truss members at a height adequate to provide a 2″ gap between the bottom of the rail and the top of the deck.

2.5.3 Rub Rails

The bridge shall be supplied with a steel channel rub rail with radiused edges. The steel channel shall be a minimum of 4" high. Ends of each piece shall have their ends sealed and ground smooth so as to produce no sharp edges.

Rub rails shall be welded flush to the inside face of the bridge truss verticals at each support location.

The top of the rub rail shall be 3'-6" above the top of the deck (measured at the outside edge of the deck).

2.6 Camber

The bridge shall have a vertical camber dimension at mid-span equal to 100% of the full dead load deflection plus 1% of the full length of the bridge.

2.7 Elevation Difference

The bridge abutments shall be constructed at the same elevation on both ends of the bridge.

## 3.0. ENGINEERING

Structural design of the bridge structure(s) shall be performed by or under the direct supervision of a licensed professional engineer and done in accordance with recognized engineering practices and principles. The Licensed Professional Engineer is to hold a current P.E. or S.E. license (where required) in the state where the bridge will be erected.

3.1 Design Loads

In considering design and fabrication issues, this structure shall be assumed to be statically loaded. No dynamic analysis shall be required nor shall fabrication issues typically considered for dynamically loaded structures be considered for this bridge. The Fracture Critical requirements have been waived, including article 8.2.3 of the AASHTO LRFD Guide Specification for Design of Pedestrian Bridges, December 2009.

3.1.1 Dead Load

The bridge structure design shall consider its own dead load (superstructure and original decking), as well as the additional loads listed below.

3.1.2 Uniform Live Load

3.1.2.1 Pedestrian Live Load

Main Members: Main supporting members shall be designed for a pedestrian live load of 90 pounds per square foot of bridge walkway area. The pedestrian live load shall be applied to those areas of the walkway so as to produce maximum factored load in the member being designed.

3.1.3 Concentrated Loads

The bridge superstructure, floor system and decking shall be designed for each of the following point load conditions:

A four wheeled vehicle with the appropriate wheelbase, tire track and tire print area shall be applied. The vehicle load shall be designed for an H-5 vehicle load. H-5 loads shall be considered with an 80% rear wheel distribution.
A vehicle impact allowance is not required.

3.1.4 Wind Load

3.1.4.1 Horizontal Forces

The bridge(s) shall be designed for a minimum wind load of 35 pounds per square foot on the full vertical projected area of the bridge as if enclosed. Wind load shall be considered in accordance with AASHTO Signs and Luminaires, but in no case will the wind load be taken as less than 35 pounds per square foot. The wind load shall be applied horizontally at right angles to the longitudinal axis of the structure.

The wind loading shall be considered both in the design of the lateral load bracing system and in the design of the truss vertical members, floor beams and their connections.

3.1.4.2 Overturning Forces

The effect of forces tending to overturn structures shall be calculated assuming that the wind direction is at right angles to the longitudinal axis of the structure. In addition, an upward force shall be applied at the windward quarter point of the transverse superstructure width. This force shall be 20 pounds per square foot of deck.

3.1.5 Top Chord/Railing Loads

The top chord, truss verticals, and floor beams shall be designed for lateral wind loads (per section 3.1.4.1) and for any loads required to provide top chord stability as outlined in Section 3.3.6; however, in no case shall the load be less than 50 pounds per lineal foot or a 200 pound point load, whichever produces greater stresses, applied in any direction at any point along the top chord or at the top of the safety system (42" or 54" above deck level), if higher than the top chord.

3.1.6 Load Combinations

The load combinations shall follow AASHTO LRFD “Standard Specifications for Highway Bridges” latest edition.

It shall be the responsibility of the foundation engineer to determine any additional loads (i.e. earth pressure, stream force on abutments, wind loads other than those applied perpendicular to the long axis of the bridge, etc.) and load combinations required for design of the abutments.

3.2 Design Limitations

3.2.1 Deflection

3.2.1.1 Vertical Deflection

The vertical deflection of the main trusses due to service pedestrian live load shall not exceed 1/360 of the span.

The deflection of the floor system members (floor beams and stringers) due to service pedestrian live load shall not exceed 1/360 of their respective spans.

Deflection limits due to occasional vehicular traffic shall not be considered.

3.2.1.2 Horizontal Deflection

The horizontal deflection of the structure due to lateral wind loads shall not exceed 1/360 of the span under design wind load.

3.2.2 Vibration

Vibration of the structure shall not cause discomfort or concern to users. Except as specified herein, the fundamental frequency in a vertical mode without live load shall be greater than 3.0 hertz. In the lateral direction, the fundamental frequency of the bridge shall be greater than 1.3 hertz. If the bridge cannot satisfy these limitations in the vertical direction, the bridge may be proportioned to satisfy the following criteria:

$$f \geq 2.86 \ln\left(\frac{180}{W}\right)$$

Where:

$f$ = the fundamental frequency in the vertical direction (Hz)

W = the weight of the supported structure, including only dead load (kips)

From bridge design and fabrication experience, bridges with spans between 90 and 110 feet with concrete decks have exhibited vibration problems. To address this issue, the previous equation is limited and a fundamental frequency of at least 2.6 hertz must be met in the vertical direction when the bridge has a span in the 90 to 110 feet range and a concrete deck.

3.2.3 Minimum Thickness of Metal

The minimum thickness of all structural steel members shall be 1/4" nominal and be in accordance with the AISC Manual of Steel Constructions' "Standard Mill Practice Guidelines". For ASTM A500 and ASTM A847 tubing, the section properties used for design shall be per the Steel Tube Institute of North America's Hollow Structural Sections "Dimensions and Section Properties".

3.3 Governing Design Codes / References

Structural members shall be designed in accordance with recognized engineering practices and principles as follows:

3.3.1 Structural Steel

American Association of State Highway and Transportation Officials (AASHTO).
Shall be in accordance with "LRFD Guide Specification for the Design of Pedestrian Bridges" latest edition (AASHTO).

3.3.2 Welded Tubular Connections

American Association of State Highway and Transportation Officials / American Welding Society (AASHTO/AWS) and the American Institute of Steel Construction (AISC).

All welded tubular connections shall be checked, when within applicable limits, for the limiting failure modes outlined in AASHTO or in accordance with the "Manual of Steel Construction: LRFD; (Load Resistance Factor Design)" as published by the American Institute of Steel Construction (AISC).

3.3.3 Wood

American Institute of Timber Construction (AITC), the U.S. Forest Products Laboratory, and the American Forest & Paper Association (AF&PA).

Sawn lumber shall be designed in accordance with the ANSI/AF&PA NDS, "National Design Standard for Wood Construction", as published by the American Forest & Paper Association or the "Timber Construction Manual" as published by the American Institute of Timber Construction (AITC). Design properties for naturally durable hardwoods shall be in accordance with "Tropical Timbers of the World", as published by the U.S. Forest Products Laboratory.

3.3.4 Top Chord Stability

Structural Stability Research Council (SSRC), formerly Column Research Council.

The top chord shall be considered as a column with elastic lateral supports at the panel points. The critical buckling force of the column, so determined, shall exceed the maximum force from dead load and live load (uniform or vehicular) in any panel of the top chord by not less than 50 percent for parallel chord truss bridges or 100 percent for bowstring bridges. The design approach to prevent top chord buckling shall be as outlined by E.C. Holt's research work in conjunction with the Column Research Council on the stability of the top chord of a half-through truss. See Appendix A for the calculation of the spring constant C and the determination of an appropriate K factor for out-of-plane buckling.

In addition, for the dead load plus vehicle load combination, the spring constant "C" furnished by the transverse "U-Frames" shall not be less than "C" required as defined by:

$$C\ required = \frac{1.46\ P_c}{L}$$

where $P_c$ is the maximum top chord compression due to dead load plus the vehicle load times the appropriate safety factor (1.5 for parallel chord truss bridges or 2.0 for bowstring bridges) and L is the length in inches of one truss panel or bay.

For uniformly loaded bridges, the vertical truss members, the floor beams and their connections (transverse frames) shall be proportioned to resist a lateral force of not less than 1/100k times the top chord compressive load, but not less than .004 times that top chord load, applied at the top chord panel points of each truss. The top chord load is determined by using the larger top chord axial force in the members on either side of the "U-frame" being analyzed. For end frames, the same concept applies except the transverse force is 1% of the axial load in the end post member.

For bridges with vehicle loads, the lateral force applied at the top chord elevation for design of the transverse frames shall not be less than 1% of the top chord compression due to dead load plus any vehicle loading.

The bending forces in the transverse frames, as determined above, act in conjunction with all forces produced by the actual bridge loads as determined by an appropriate analysis which assumes that the floor beams are "fixed" to the trusses at each end.

NOTE: The effects of three dimensional loading (including "U-frame" requirements) shall be considered in the design of the structure. The "U-frame" forces shall be added to the forces derived from a three dimensional analysis of the bridge.

## 4.0 MATERIALS

### 4.1 Steel

#### 4.1.1 Unpainted Weathering Steel

Bridges shall be fabricated from high strength, low alloy, atmospheric corrosion resistant ASTM A847 cold-formed welded square and rectangular tubing and/or ASTM A588, or ASTM A242, ASTM A606 plate and structural steel shapes (Fy = 50,000 psi). The minimum corrosion index of atmospheric corrosion resistant steel, as determined in accordance with ASTM G101, shall be 6.0.

### 4.2 Decking

#### 4.2.1 Treated Fir Decking

Wood decking shall be Nominal 3x12 Select Structural Fir planks (Minimum Fb=1,450 psi). Decking to be treated to AWPA standards. Preservative utilized shall be Alkaline Copper Quaternary (ACQ). Decking shall be treated to a total absorption of 0.40 pounds per cubic foot of wood or to refusal.

#### 4.2.2 Wood Decking Attachment

* At time of installation, planks are to be placed tight together with no gaps.

* Every plank must be attached with at least one fastener at each end.

* All fasteners to be zinc plated. Self-tapping screws or hex-head bolts, with a steel plank hold down, are to be used at the ends of planks. Self-tapping screws or carriage bolts are to be used as interior connection fasteners when required. Power actuated fasteners will not be allowed.

* Planks are to be drilled prior to installation of bolts and/or screws.

* In addition to at least one fastener at each end of every plank (typical for all installations), planks for bridges shall be attached with a minimum of two fasteners at a location approximately near the center of the bridge width. Bridges wider than 143″ are to have two fasteners located at a minimum of two interior stringer locations, approximately at the third points of the bridge width.

NOTE: Attachments at the ends of the planks may be modified as required when obstructions, such as interior safety system elements, prevent installation of the specified hold down system.

## 5.0 WELDING

### 5.1 Welding

Welding and weld procedure qualification tests shall conform to the provisions of ANSI/AWS D1.1 "Structural Welding Code", latest edition. Filler metal shall be in accordance with the applicable AWS Filler Metal Specification. For exposed, bare, unpainted applications of corrosion resistant steels (i.e. ASTM A588 and A847), the filler metal shall be in accordance with AWS D1.1.

5.2 Welders

Welders shall be properly certified, each of whom shall submit certification of satisfactorily passing AWS standard qualification tests for all positions with unlimited thickness of base metal, have a minimum of 6 months experience in welding tubular structures and have demonstrated the ability to make uniform sound welds of the type required.

## 6.0 SUBMITTALS

6.1 Submittal Drawings

Schematic drawings and diagrams shall be submitted to the customer for their review after receipt of order. Submittal drawings shall be unique drawings, prepared to illustrate the specific portion of the work to be done. All relative design information such as member sizes, bridge reactions, and general notes shall be clearly specified on the drawings. Drawings shall have cross referenced details and sheet numbers. All drawings shall be signed and sealed by a Professional Engineer who is licensed in accordance with Section 3.0.

6.2 Structural Calculations

Structural calculations for the bridge superstructure shall be submitted by the bridge manufacturer and reviewed by the approving engineer. All calculations shall be signed and sealed by a Professional Engineer who is licensed in accordance with Section 3.0. The calculations shall include all design information necessary to determine the structural adequacy of the bridge. The calculations shall include the following:

* All AASHTO LRFD checks for axial, bending and shear forces in the critical member of each truss member type (i.e. top chord, bottom chord, floor beam, vertical, etc.).

* Checks for the critical connection failure modes for each truss member type (i.e. vertical, diagonal, floor beam, etc.). Special attention shall be given to all welded tube on tube connections.

* All bolted splice connections.

* Main truss deflection checks.

* U-Frame stiffness checks (used to determine K factors for out-of-plane buckling of the top chord) .

* Deck design.

NOTE: The analysis and design of triangulated truss bridges shall account for moments induced in members due to joint fixity where applicable. Moments due to both truss deflection and joint eccentricity must be considered.

6.3 Welder certifications in compliance with AWS standard qualification tests.

6.4 Welding procedures in compliance with Section 5.1.

## 7.0 FABRICATION

### 7.1 General Requirements

#### 7.1.1 Drain Holes

When the collection of water inside a structural tube is a possibility, either during construction or during service, the tube shall be provided with a drain hole at its lowest point to let water out.

#### 7.1.2 Welds

Special attention shall be given to developing sufficient weld throats on tubular members. Fillet weld details shall be in accordance with AWS D1.1, Section 3.9.2. Unless determined otherwise by testing, the loss factor "Z" for heel welds shall be in accordance with AWS Table 2.9. Fillet welds which run onto the radius of a tube shall be built up to obtain the full throat thickness. The maximum root openings of fillet welds shall not exceed 3/16" in conformance with AWS D1.1, Section 5.22. Weld size or effective throat dimensions shall be increased in accordance with this same section when applicable (i.e. fit-up gaps> 1/16").

### 7.2 Quality Certification

Bridge(s) shall be fabricated by a fabricator who is currently certified by the American Institute of Steel Construction to have the personnel, organization, experience, capability, and commitment to produce fabricated structural steel for the category Intermediate "Major Steel Bridges" as set forth in the AISC Certification Program with Fracture Critical Endorsement. Bridge fabricator shall also be currently certified by the American Welding Society (AWS) as an AWS Certified Fabricator. Quality control shall be in accordance with procedures outlined for AISC certification.

### 7.3 Weld Testing

All weld testing shall be done by a person qualified in accordance with ASNT SNT-TC-1A. All full penetration welds in the chords are to be ultrasonically tested in accordance with AWS specifications. All fillet and partial penetration groove welds shall be 100 percent visually inspected with 10 percent also being magnetic particle tested in accordance with AWS specifications. A written testing report shall be submitted upon completion.

## 8.0 FINISHING

### 8.1 Blast Cleaning

#### 8.1.1 Bare applications of enhanced corrosion resistant steels.

All Blast Cleaning shall be done in a dedicated OSHA approved indoor facility. Blast operations shall use Best Management Practices and exercise environmentally friendly blast media recovery systems.

To aid in providing a uniformly "weathered" appearance, all exposed surfaces of steel shall be blast cleaned in accordance with Steel Structures Painting Council Surface Preparation Specifications No. 7 Brush-Off Blast Cleaning, SSPC-SP7 latest edition.
Exposed surfaces of steel shall be defined as those surfaces seen from the deck and from outside of the structure. Stringers, floor beams, lower brace diagonals and the inside face of the truss below deck and bottom face of the bottom chord need not be blasted.

## 9.0 DELIVERY AND ERECTION

### 9.1 Delivery

Delivery is made to a location nearest the site which is easily accessible to normal over-the-road tractor/trailer equipment. All trucks delivering bridge materials will need to be unloaded at the time of arrival.

### 9.2 Installation

The manufacturer will provide detailed, written instruction in the proper lifting procedures and splicing procedures (if required). The method and sequence of erection shall be the responsibility of others.

### 9.3 Splicing

Chord splices shall have loose splice plates that are inserted into the tubular chord members. The splice plates shall have a splice nut retention device consisting of a capture plate(s) with hexagonal holes held in place by either an angle on each side of the capture plate(s) or C channel(s). Tack welding of splice nuts to splice plates is not acceptable unless an approved Weld Procedure Specification (WPS) can be provided. The sections are then bolted together by bolting through the wall of the tube, nut capture assembly and nut.

### 9.4 Maintenance

The bridge manufacturer shall provide written inspection and maintenance procedures to be followed by the bridge owner.

## 10.0 BEARINGS

### 10.1 Bearing Devices

Bridge bearings shall consist of a steel setting or slide plate placed on the abutment or grout pad and a fabric reinforced elastomeric pad with Teflon on top of the setting plate. The bridge bearing plate which is welded to the bridge structure shall will have a stainless steel plate welded to bottom side acting as a slide surface and shall bear on bearing pad and setting plate. One end of the bridge will be fixed and will have fully tightened nuts on the anchor bolts. The expansion end will have finger tight only nuts to allow movement under thermal expansion or contraction. Both ends of bridge shall have slotted holes to facilitate installation tolerance.

### 10.2 Elastomeric Bearings

Bridge shall be supplied with a fabric reinforced elastomeric pad. The bridge bearings shall sit in a recessed pocket on the concrete abutment. Minimum 28-day strength for the abutment concrete shall be a minimum 3,000 PSI. The bearing seat shall be a minimum of 16" wide. The step height (from bottom of bearing to top-of-deck) shall be determined by the bridge manufacturer.

Bridges shall have stainless steel on teflon slide bearings placed between the bridge bearing plate and the fabric reinforced elastomeric pad. The top slide plate shall be large enough to cover the lower teflon slide surface at both temperature extremes.

## 11.0 COVER PLATES

Bridges in excess of 100 feet will be provided with two cover plates (one on each end of bridge). Cover plates shall be hot dipped galvanized and must extend past the gap between the foundation backwall and the end of the bridge.

## 12.0 FOUNDATIONS

Unless specified otherwise, the bridge manufacturer shall determine the number, diameter, minimum grade and finish of all anchor bolts. The anchor bolts shall be designed to resist all horizontal and uplift forces to be transferred by the superstructure to the supporting foundations. Engineering design of the bridge supporting foundations (abutment, pier, bracket and/or footings), including design of anchor bolt embedment length, shall be the responsibility of the foundation engineer. **The contractor shall provide all materials for (including anchor bolts) and construction of the bridge supporting foundations**. The contractor shall install the anchor bolts in accordance with the manufacturer's anchor bolt spacing dimensions.

Information as to bridge support reactions and anchor bolt locations will be furnished by the bridge manufacturer after receipt of order and after the bridge design is complete.

## 13.0 PAYMENT

A partial payment or "deposit" for the prefabricated bridge shall be made upon order and storage as required by the terms of the manufacturer.

## 14.0 WARRANTY

The bridge manufacturer shall warrant their steel structure(s) are free of design, material and workmanship defects for a period of ten years from the date of delivery.

This warranty shall not cover defects in the bridge caused by abuse, misuse, overloading, accident, improper installation, maintenance, alteration or any other cause not the result of defective materials or workmanship. This warranty does not cover damage resulting from or relating to the use of any kind of de-icing material. This warranty shall be void unless owner’s records can be supplied which shall indicate compliance with the minimum guidelines specified in the inspection and maintenance procedures.

Repair, replacement or adjustment~~,~~ at the sole discretion of the bridge manufacturer~~,~~ shall be the exclusive remedy for defects under this warranty. The bridge manufacturer shall not be liable for any consequential or incidental damages for breach of any express or implied warranty on their structure.

Any claim under this warranty shall be made promptly and directly to CONTECH Engineered Solutions, LLC who shall have the option, at its sole discretion, to repair, replace or adjust any covered defect without charge to the original purchaser.

SELLER MAKES NO OTHER WARRANTY WHATSOEVER, EXPRESS OR IMPLIED. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND ALL IMPLIED WARRANTIES OF FITNESS FOR ANY PARTICULAR PURPOSE ARE DISCLAIMED BY SELLER AND EXCLUDED FROM THIS CONTRACT.
REV: 2/1/1

## 15.0 APPROVAL CHECKLIST

The following checklist will be used in the evaluation of all submittals to assure compliance with the Special Specifications for Prefabricated Bridge. This checklist is considered the minimum acceptable requirements for compliance with these specifications. Any deviations from this checklist shall be considered grounds for rejection of the submittal. Any costs associated with delays caused by the rejection of the submittal, due to non-compliance with this checklist, shall be fully borne by the contractor and bridge supplier.

### SUBMITTAL DRAWINGS

*Data Required to be Shown:*

- □ Bridge Elevation
- □ Bridge Cross Section
- □ All Member Sizes
- □ All Vertical Truss Members are Square or Rectangular Tubing
- □ Bridge Reactions
- □ General Notes Indicating
- □ AASHTO LRFD Conformance
- □ Material Specifications to be Followed
- □ Design Live Load
- □ Design Vehicle Load (If Applicable)
- □ Design Wind Load
- □ Other Specified Design Loads
- □ Welding Process
- □ Blast Cleaning
- □ Detailed Bolted Splices (If Applicable)
- □ Bolted Splice Location (If applicable)
- □ Signature and Seal of Professional Engineer, licensed in Accordance with Section 3.0

### DESIGN CALCULATIONS

*Data Required to be Shown:*

- □ Data Input for 3-D Analysis of Bridge
- □ Joint Coordinates & Member Incidences
- □ Joint and Member Loads
- □ Member Properties
- □ Load Combinations
- □ AASHTO LRFD Checks for Each Member Type
- □ Critical Connection Failure Mode Checks For Each Member Type
- □ Chord Face Plastification Checks
- □ Punching Shear Checks
- □ Material Failure Checks (Truss Webs)
- □ Weld Failure Checks (Effective Length)
- □ Weld Failure Checks (Ultimate)
- □ Local Buckling of the Main Member Face Checks
- □ Main Member Yielding Failure Checks
- □ Main Member Crippling Failure Checks
- □ Main Member Buckling Failure Checks
- □ Main Member Shear Failure Checks
- □ All Bolted Splice Checks (if applicable)
- □ Main Truss Deflection Checks
- □ Decking Material Checks
- □ "U-Frame" Stiffness Checks (if applicable)
- □ Interior and End Portal Design Checks (if applicable)
- □ Determination of Top Chord K Factor Based on "U-Frame" Stiffness (if applicable)
- □ Consideration of Individual Member Moments Due to Truss Deflection, Joint Fixity and Joint Eccentricity

### FABRICATION SUBMITTALS

*Data Required to be Shown:*

- □** Written Installation Instructions
- □** Written Maintenance & Inspection Instructions
- □** Welder Certifications
- □** Welding Procedures
- □ Material Certifications
- □ Structural Steel
- □ Decking (if applicable)
- □ Structural Bolts (if applicable)
- □ Weld Testing Reports

** NOTE: These items are required to be submitted along with Submittal Drawings and Design Calculations. Those Fabrication Submittal Items not marked are to be submitted prior to shipment of the bridge.