Special Specification
8000 – COSA
Pedestrian Bridge

Salado Creek Bridge

1.0 GENERAL

1.1 Scope

These specifications are for a fully engineered clear span bridge 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 Bridge Solutions a Continental Bridge brand, 8301 State Highway 29 North, Alexandria, MN 56308.
Phone: 1-800-328-2047 or (320) 852-7500 Fax: 320-852-7067
E-mail: akaman@contech-cpi.com

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 5 years experience fabricating these type structures. Qualified suppliers must attend the pre-bid meeting and be prepared to answer project related questions.

Pre-approved Manufacturers:
CONTECH Bridge Solutions Inc.
8301 State Highway 29 North
Alexandria, Minnesota 56308
1-800-328-2047

* Product Literature

* 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
- Welder Qualifications

* Proposed suppliers must have at least five (5) years experience designing and fabricating these type structures and a minimum of five (5) successful bridge projects, of similar construction, each of which has been in service at least three (3) 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.

2.0 GENERAL FEATURES OF DESIGN

2.1 Span

Bridge span shall be 120'-0" (straight line dimension) and shall be as measured from each end of the bridge structure.

2.2 Width

Bridge width shall be 12'-0" and shall be as measured from the inside face of structural elements at deck level.

2.3 Bridge System Type

Bridge(s) shall be designed as a Continental Connector Truss (P1-SQ) (or equal), that has one (1) diagonal per panel and plumb end vertical members. Interior vertical members may be either plumb or 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 54 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 safety rails shall be placed on the structure up to a minimum height of x′-xx″ above the deck surface. Safety rails shall be placed so as to prevent a 4″ sphere from passing through the truss. Safety rails shall be placed on the inside or outside of the structure at the bridge fabricator's option. Safety rails placed on the inside of the truss 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.

2.5.5 Rubrails

The bridge will be supplied with a 1"x 5-1/2" (actual size) naturally durable hardwood Ipe (Tabebuia Spp Lapacho Group) rubrail. Rubrail shall be partially air dried to a moisture content of 15% to 20%, shall be supplied S4S (surfaced four sides), E4E (eased four edges), with the edges eased to a radius of 1/8″. Measured at 30% moisture content, the width and thickness shall not vary from specified dimensions by more than ± 0.04 inches. Ends of each piece shall be sealed with "Anchorseal" Mobil CER-M or an equal aquious wax log sealer.

Rubrails shall be attached flush to the inside face of the bridge truss verticals and fastened with two carriage bolts at each support location. The span of the rubrail from centerline to centerline of support shall not exceed 6′-6″.

The top of the rubrail 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 midspan 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 engineer shall be licensed to practice in ***The State of Texas***.

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.

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, including girders, trusses and arches shall be designed for a pedestrian live load of 85 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 stress in the member being designed. If the bridge walkway area to which the pedestrian live load is applied (deck influence area) exceeds 400 square feet, the pedestrian live load may be reduced by the following equation:

$$w = 85\,[0.25 + \frac{15}{\sqrt{A_I}})]$$

Where w is the design pedestrian load (psf) and A_I is the deck influence area in square feet.

The reduced design live load shall not be less than 65 pounds per square foot of bridge walkway area.

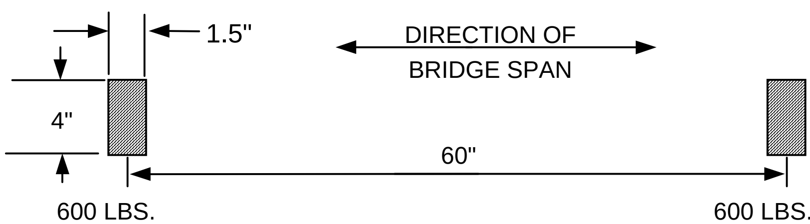
Secondary Members: Bridge decks and supporting floor systems, including secondary stringers, floor beams and their connections to main supporting members shall be designed for a live load of 85 pounds per square foot, with no reduction allowed.

3.1.3 Concentrated Loads

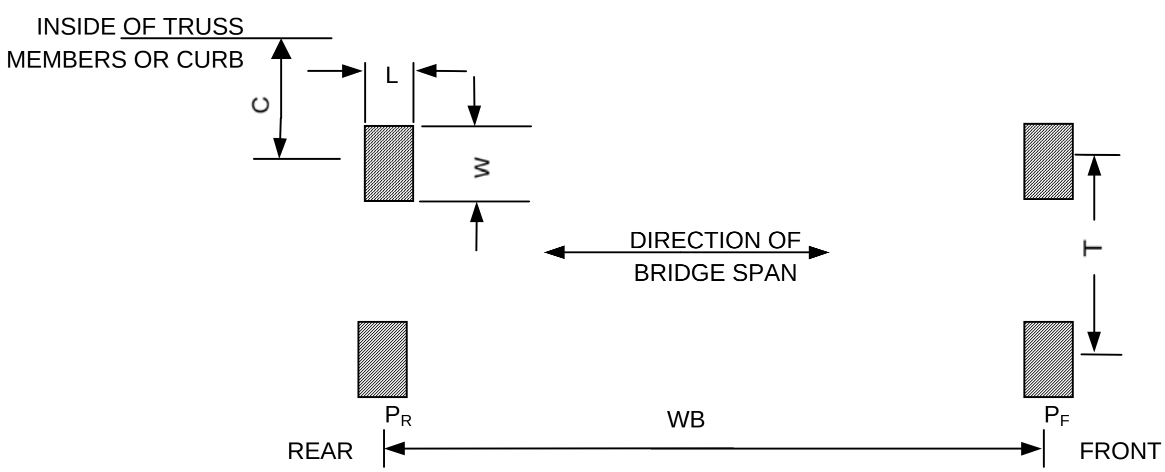
The bridge superstructure, floor system and decking shall be designed for each of the following point load conditions:

3.1.3.1 A concentrated load of 1000 pounds placed on any area 2.5 ft x 2.5 ft square.

3.1.3.2 A 1200 pound two wheel vehicle with a wheelbase and tire print area as shown in the following diagram:



3.1.3.3 A 10,000 pound four wheeled vehicle with the appropriate wheelbase, tire track and tire print area as shown in the following diagram: (See Table I for the values corresponding to the selected vehicle.)



Vehicle	Axle and Wheel Spacings		Front Wheels			Rear Wheels			
Weight	WB	T	P_F	L	W	P_R	L	W	C*
4,000#	48"	32"	1,000#	2.0"	5.0"	1,000#	2.0"	5.0"	9"
6,000#	66"	48"	1,500#	2.5"	6.0"	1,500#	2.5"	6.0"	12"
8,000#	102"	60"	1,600#	3.0"	8.0"	2,400#	3.0"	8.0"	15"
10,000#	120"	72"	2,000#	3.5"	8.5"	3,000#	3.5"	8.5"	18"

(*C is the minimum dimension from center of wheel to the inside face of truss or curb.)

TABLE I

All of the concentrated or wheel loads shall be placed so as to produce the maximum stress in each member being analyzed. Critical stresses need be calculated assuming there is only one vehicle on the bridge at any given time. Assumptions that vehicles only travel down the center of the bridge or that the vehicle load is a uniform line load will not be allowed.

Each four wheeled vehicle load listed in Table I, up to and including the maximum weight vehicle selected, must be used in determining critical deck stresses. The wheel distribution for deck design shall be as specified in Section 4.3.1. Stringers shall be designed for the applied wheel loads assuming no lateral load distribution to adjacent stringers.

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 wind load of 25 pounds per square foot on the full vertical projected area of the bridge as if enclosed. 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 Stream Load

The bridge will be subjected to a stream loading for which the bridge must be designed to withstand. The maximum velocity of the stream will be 6fps. The bridge will be totally submerged at the peak velocity of the stream loading condition.

3.1.7 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 (54" above deck level), if higher than the top chord.

3.1.9 Load Combinations

The loads listed herein shall be considered to act in the following combinations, whichever produce the most unfavorable effects on the bridge superstructure or structural member concerned. [DL=Dead Load; LL = Live Load; WL = Wind Load; VEH = Vehicle Load]

DL + LL
DL + VEH
DL+WL
DL+LL+WL
DL+VEH+.3WL

> NOTE: Allowable stresses may be increased 1/3 above the values otherwise provided when produced by wind loading, acting alone or in combination with the design dead and live loads.

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 1/400 of the span.

The vertical deflection of cantilever spans of the structure due to service pedestrian live load shall not exceed 1/300 of the cantilever arm length.

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.

The service pedestrian live load shall be 85 PSF, reduced in accordance with Section 3.1.2.1, but should in no case be less than 65 PSF for deflection checks.

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 1/500 of the span under an 85 MPH (25 PSF) wind load.

3.2.2 Minimum Thickness of Metal

The minimum thickness of all structural steel members shall be 3/16" 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 Allowable Stresses

American Institute of Steel Construction (AISC).

Structural steel design shall be in accordance with those sections of the "Manual of Steel Construction: Allowable Stress Design" related to design requirements and allowable stresses.

3.3.2 Welded Tubular Connections

American National Standards Institute / American Welding Society (ANSI/AWS) and the Canadian Institute of Steel Construction (CISC).

All welded tubular connections shall be checked, when within applicable limits, for the limiting failure modes outlined in the ANSI/AWS D1.1 Structural Welding Code or in accordance with the "Design Guide for Hollow Structural Section Connections" as published by the Canadian Institute of Steel Construction (CISC).

When outside the "validity range" defined in these design guidelines, the following limit states or failure modes must be checked:

* Chord face plastification
* Punching shear (through main member face)
* Material failure
    - Tension failure of the web member
    - Local buckling of a compression web member
* Weld failure
    - Allowable stress based on "effective lengths"
    - "Ultimate" capacity
* Local buckling of a main member face
* Main member failure:
    - Web or sidewall yielding
    - Web or sidewall crippling
    - Web or sidewall buckling
    - Overall shear failure

All tubular joints shall be plain unstiffened joints (made without the use of reinforcing plates) except as follows:

* Floor beams hung beneath the lower chord of the structure may be constructed with or

without stiffener (or gusset) plates, as required by design.

* Floor beams which frame directly into the truss verticals (H-Section bridges) may be designed with or without end stiffening plates as required by design.

* Where chords, end floor beams and in high profiles the top end struts weld to the end verticals, the end verticals (or connections) may require stiffening to transfer the forces from these members into the end vertical.

* Truss vertical to chord connections.

NOTE: The effects of fabrication tolerances shall be accounted for in the design of the structure. Special attention shall be given to the actual fit-up gap at welded truss joints.

3.3.4 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.

3.3.5 Concrete

American Concrete Institute (ACI)

Reinforced concrete shall be designed in accordance with the "Building Code Requirements for Structural Concrete" (ACI 318).

3.3.6 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 which are not to be painted 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.

4.3 Decking

4.3.1 Concrete Deck

The bridge shall be furnished with a stay-in-place galvanized steel form deck suitable for pouring a reinforced concrete slab. The form deck shall be designed to carry the dead load of the wet concrete, weight of the form decking, plus a construction load of 20 PSF uniform load or a 150 pound concentrated load on a 1′-0″ wide section of deck. When edge supports are used, deflection is limited to 1/180 of the span or 3/4″, whichever is less. Without edge supports, deflection shall be limited to 1/180 of the span or 3/8″, whichever is less.

The form deck shall be either smooth or composite. Composite decking shall not be used as reinforcing when designing for vehicular wheel loads. The form deck material shall be supplied in accordance with ASTM A653 and galvanized to a minimum G90 coating weight.
The deck slab shall be constructed using concrete with a minimum 28-day strength (f_c') of ***4000*** PSI. Use Normal weight concrete (145 PCF).

Concrete deck design shall be performed by the bridge manufacturer. Concrete decks shall be designed for concentrated loads as specified in Section 3.1.3. The wheel loads used for deck design shall be distributed per the Structural Engineering Handbook, 4th Ed., by Gaylord, Gaylord and Stallmeyer. The load distribution width is equal to the tire width plus 0.6 times the slab span but in no case will it be greater than the smallest of the following values:

1. 1/2 the deck width,
2. 75% of the wheel track spacing, or
3. 4′ + 0.06S, per AASHTO, where S = slab span in feet

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", 1996 Edition. Filler metal shall be in accordance with the applicable AWS Filler Metal Specification (i.e. AWS A 5.28 for the GMAW Process). 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, Section 3.7.3.

5.2 Welders

Welders shall be properly accredited operators, 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 AISC allowable stress 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 (see section 3.3.2 for design check requirements).

* 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) for all half through or "pony" truss bridges.

* 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 (See AWS Figure 3.2). Unless determined otherwise by testing, the loss factor "Z" for heel welds shall be in accordance with AWS Table 2.8. Fillet welds which run onto the radius of a tube shall be built up to obtain the full throat thickness (See Figure 7.1). 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").

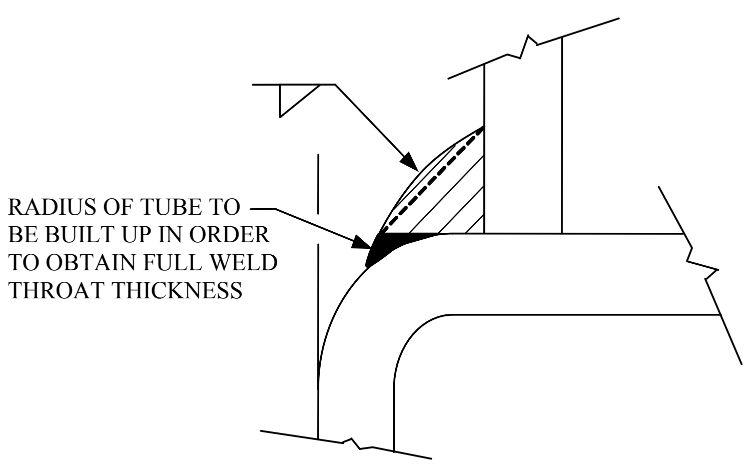


FIGURE 7.1
BUILD UP RADIUS WELD

The fabricator shall have verified that the throat thickness of partial joint penetration groove welds (primarily matched edge welds or the flare-bevel-groove welds on underhung floor beams) shall be obtainable with their fit-up and weld procedures. Matched edge welds shall be “flushed” out when required to obtain the full throat or branch member wall thickness.

For full penetration butt welds of tubular members, the backing material shall be fabricated prior to installation in the tube so as to be continuous around the full tube perimeter, including corners. Backing may be of four types:

* A “box” welded up from four (4) plates.

* Two “channel” sections, bent to fit the inside radius of the tube, welded together with full penetration welds.

* A smaller tube section which slides inside the spliced tube.

* A solid plate cut to fit the inside radius of the tube.

Corners of the “box” backing, made from four plates, shall be welded and ground to match the inside corner radii of the chords. The solid plate option shall require a weep hole either in the chord wall above the “high side” of the plate or in the plate itself. In all types of backing, the minimum fit-up tolerances for backing must be maintained at the corners of the tubes as well as across the “flats”.

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 “Major Steel Bridges” as set forth in the AISC Certification Program with Fracture Critical Endorsement. Quality control shall be in accordance with procedures outlined for AISC certification. For painted structures, the fabricator must hold a "Sophisticated Paint Endorsement" as set forth in the AISC certification program. Furthermore, the bridge(s) shall be fabricated in a facility owned and/or leased by the corporate owner of the manufacturer, and fully dedicated to bridge manufacturing.

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 owned and operated by the bridge fabricator. 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 shall not be blasted.

9.0 DELIVERY AND ERECTION

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.

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.

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. The bridge bearing plate which is welded to the bridge structure shall bear on this setting plate. One end of the bridge will be fixed by fully tightening the nuts on the anchor bolts at that end. The opposite end will have finger tight only nuts to allow movement under thermal expansion or contraction.

The bridge bearings shall sit in a recessed pocket on the concrete abutment. Minimum 28-day strength for the abutment concrete shall be 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 in excess of 100 feet in length or bridges with dead load reactions of 15,000 pounds or more (at each bearing location) shall have teflon on teflon or stainless steel on teflon slide bearings placed between the bridge bearing plate and the setting plate. The top slide plate shall be large enough to cover the lower teflon slide surface at both temperature extremes.

11.0 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 embedments, 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.

12.0 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.

13.0 WARRANTY

The bridge manufacturer shall warrant that it can convey good title to the goods, that they are free of liens and encumbrances and that their steel structure(s) are free of design, material and workmanship defects for a period of ten years from the date of delivery. Durable hardwood decking and hardwood attachments shall carry a ten-year warranty against rot, termite damage or fungal decay. Other types of wood and decking material such as Southern Yellow Pine, Douglas Fir and composites carry no warranty. There are no warranties, expressed or implied with respect to structures sold hereunder which are used, supplied for use or made available for use in any nuclear application of which bridge manufacturer has not been notified in writing at the time of order of the structure(s).

This warranty shall not cover defects in the bridge caused by abuse, misuse, overloading, accident, improper installation, maintenance, alteration or any other cause not expressly warranted. 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 are supplied which show compliance with the minimum guidelines specified in the "Recommendations for the Inspection and Maintenance of Steadfast Vehicular Steel Bridges and Continental Pedestrian Steel Bridges," attached hereto and incorporated herein by this reference.

Repair, replacement or adjustment, at the sole discretion of the bridge manufacturer, shall be the exclusive remedy for defects under this warranty. Under no circumstances shall the bridge manufacturer be liable for any consequential or incidental damages.

Any claim under this warranty shall be made promptly and directly to CONTECH Bridge Solutions Inc 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: 10/07

14.0 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
  - □ AISC Stress 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
  - □ Paint System to be Used (If Applicable)
- □ Paint Color Chart (If Applicable)
- □ 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 Member Stress 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:

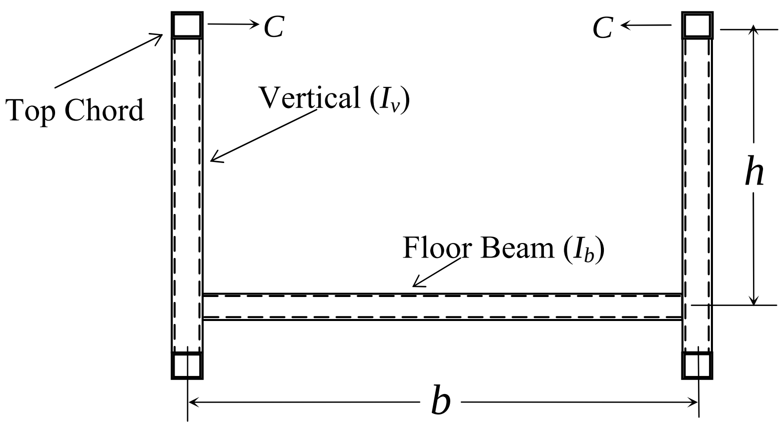
- □** Written Installation Instructions
- □** Written Splicing Instructions
- □** Written Maintenance & Inspection Instructions
- □** Welder Certifications
- □** Welding Procedures
- □ Material Certifications (if applicable)
  - □ Structural Steel (if applicable)
  - □ Decking (if applicable)
  - □ Structural Bolts (if applicable)
  - □** Quality Control Section of AISC Certification Manual (if applicable)
  - □** Painter Certifications (if applicable)
  - □ Weld Testing Reports (if applicable)

** 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.

Appendix A

1/K FOR VARIOUS VALUES OF CL/P_c and n

	n						
1/K	4	6	8	10	12	14	16
1.000	3.686	3.616	3.660	3.714	3.754	3.785	3.809
0.980		3.284	2.944	2.806	2.787	2.771	2.774
0.960		3.000	2.665	2.542	2.456	2.454	2.479
0.950			2.595				
0.940		2.754		2.303	2.252	2.254	2.282
0.920		2.643		2.146	2.094	2.101	2.121
0.900	3.352	2.593	2.263	2.045	1.951	1.968	1.981
0.850		2.460	2.013	1.794	1.709	1.681	1.694
0.800	2.961	2.313	1.889	1.629	1.480	1.456	1.465
0.750		2.147	1.750	1.501	1.344	1.273	1.262
0.700	2.448	1.955	1.595	1.359	1.200	1.111	1.088
0.650		1.739	1.442	1.236	1.087	0.988	0.940
0.600	2.035	1.639	1.338	1.133	0.985	0.878	0.808
0.550		1.517	1.211	1.007	0.860	0.768	0.708
0.500	1.750	1.362	1.047	0.847	0.750	0.668	0.600
0.450		1.158	0.829	0.714	0.624	0.537	0.500
0.400	1.232	0.886	0.627	0.555	0.454	0.428	0.383



" U - Frame"

Where: $C = \dfrac{E}{h^2\,[h/3I_v + b/2I_b]}$

$L = Length\ in\ inches\ of\ one\ truss\ panel$

$P_c = Buckling\ Load\ (= Top\ Chord\ Compression\ x\ F.S.)$

$n = Number\ of\ Panels$

Reference: Galambos, T.V. (1988) "Guide to Stability Design Criteria for Metal Structures", 4th Ed., PP 515-529. Copyright © 1988. Reprinted by permission of John Wiley and Sons, Inc.

DISCLAIMER TO SPECIFICATIONS