October 28-29, 2025
Orlando, FL

TRANSPORTATION SYMPOSIUM

Prefabricated Steel Truss Pedestrian Bridges: Criteria and Updates

Dennis Golabek, PE

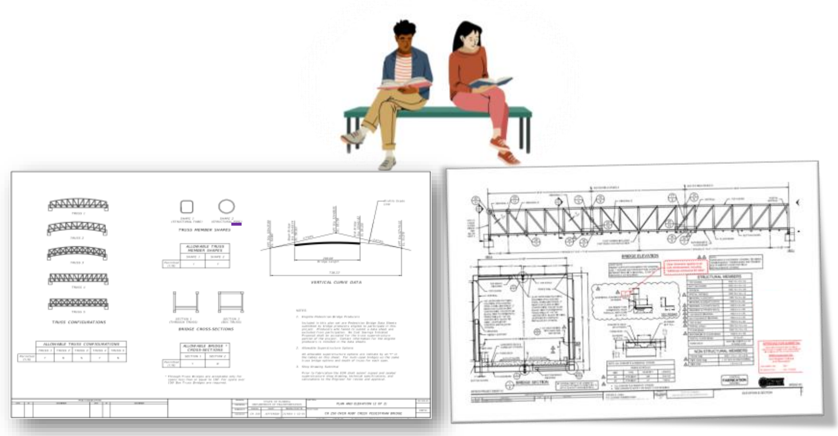
Transportation Symposium Website

SCAN ME

1

Agenda

- ❖Introduction
- ❖Background
- ❖Plans Production (Design too)
- ❖Shop Drawing Review



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2

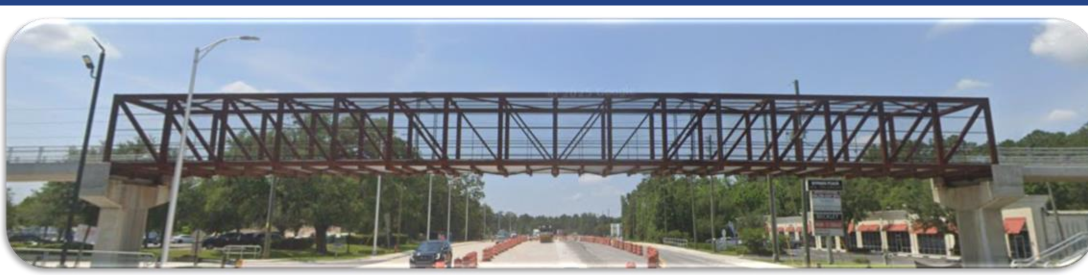
2

Introduction

SDG 10 Pedestrian Bridges
10.2.B Design pedestrian bridges with two or more concrete I-beam, steel I-girders, or prefabricated steel truss lines

TRANSPORTATION SYMPOSIUM

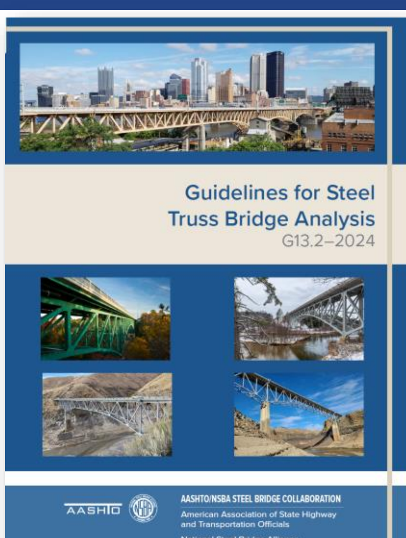
Introduction

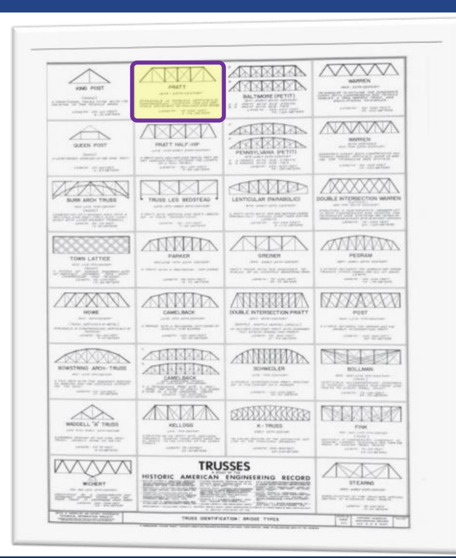


Introduction

TRANSPORTATION
SYMPOSIUM

Introduction





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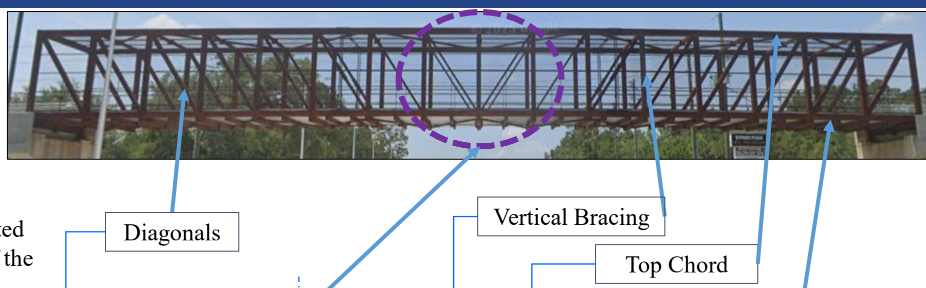
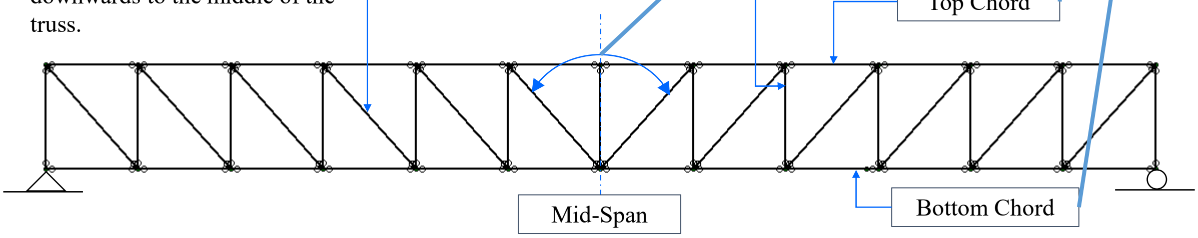
Introduction

Pratt Truss

- Top and bottom chords
- Vertical bracings
- Diagonal bracings are oriented downwards to the middle of the truss.





Elevation of a Pratt Truss

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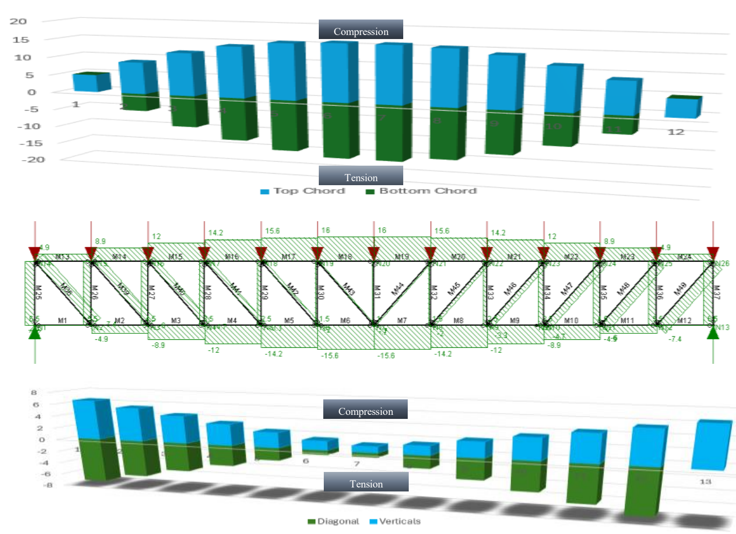
Introduction

Pratt Truss (simple span)

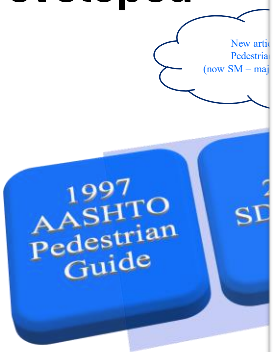
Under gravity loads:

- Top chords in compression
- Bottom chords in tension
- Verticals are in compression
- Diagonals are in tension



Background

How FDOT Pro Developed



TRANSPORTATION SYMPOSIUM

9

9

Background

SDB C11-07 >> PPM 8 >> FDM 266.4.4

Figure 266.4.2 Prefabricated Pedestrian Bridge Standard Truss Configurations

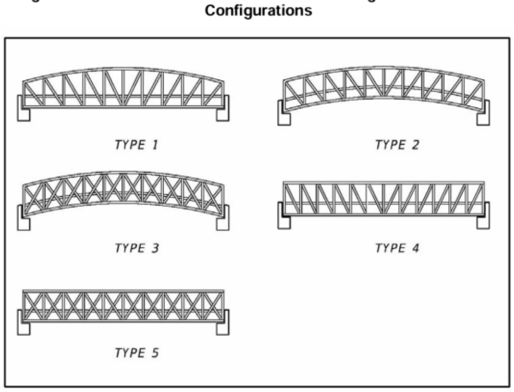
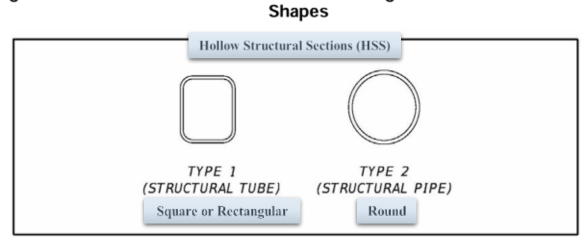
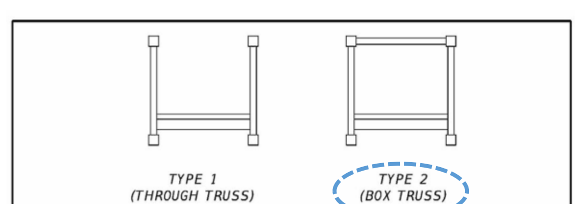


Figure 266.4.3 Prefabricated Pedestrian Bridge Standard Truss Member Shapes



SDG 10.4.C and Specifications 962 – Tubing per ASTM A500 with CVN as applicable

Figure 266.4.4 Prefabricated Pedestrian Standard Bridge Cross-Sections



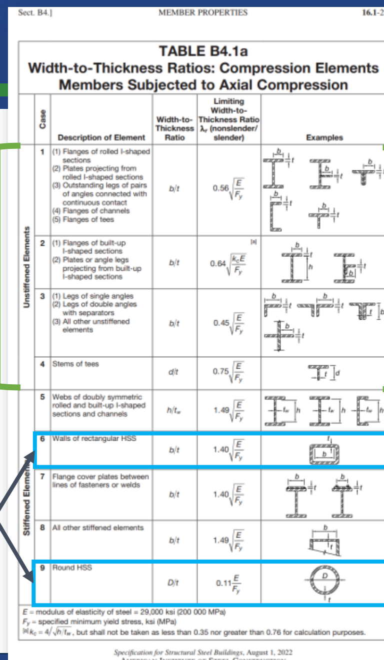
A box truss bridge cross section is required for spans greater than 150 feet.

TRANSPORTATION SYMPOSIUM

10

10

Background



Sect. B4.] MEMBER PROPERTIES 16.1-21

TABLE B4.1a
Width-to-Thickness Ratios: Compression Elements
Members Subjected to Axial Compression

	Case	Description of Element	Width-to-Thickness Ratio	Limiting Width-to-Thickness Ratio λ_r (nonslender/slender)	Examples
Unstiffened Elements	1	(1) Flanges of rolled I-shaped sections (2) Plates projecting from rolled I-shaped sections (3) Outstanding legs of pairs of angles connected with continuous contact (4) Flanges of channels (5) Flanges of tees	b/t	$0.56\sqrt{\frac{E}{F_y}}$	
	2	(1) Flanges of built-up I-shaped sections (2) Plates or angle legs projecting from built-up I-shaped sections	b/t	$0.64\sqrt{\frac{k_c E}{F_y}}$ [a]	
	3	(1) Legs of single angles (2) Legs of double angles with separators (3) All other unstiffened elements	b/t	$0.45\sqrt{\frac{E}{F_y}}$	
	4	Stems of tees	d/t	$0.75\sqrt{\frac{E}{F_y}}$	
Stiffened Elements	5	Webs of doubly symmetric rolled and built-up I-shaped sections and channels	h/t_w	$1.49\sqrt{\frac{E}{F_y}}$	
	6	Walls of rectangular HSS	b/t	$1.40\sqrt{\frac{E}{F_y}}$	
	7	Flange cover plates between lines of fasteners or welds	b/t	$1.40\sqrt{\frac{E}{F_y}}$	
	8	All other stiffened elements	b/t	$1.49\sqrt{\frac{E}{F_y}}$	
	9	Round HSS	D/t	$0.11\frac{E}{F_y}$	

E = modulus of elasticity of steel = 29,000 ksi (200 000 MPa)
F_y = specified minimum yield stress, ksi (MPa)
[a] $k_c = 4/\sqrt{h/t_w}$, but shall not be taken as less than 0.35 nor greater than 0.76 for calculation purposes.

Specification for Structural Steel Buildings, August 1, 2022
AMERICAN INSTITUTE OF STEEL CONSTRUCTION

Open Shapes

Smarter. Stronger. Steel.

Closed Shapes

STEEL TUBE INSTITUTE

Hollow Structural Sections (HSS)

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11

11

My TOP 10 Notable HSS Milestones

1930 Steel Tube Institute was founded

1952 Rectangular Hollow Sections developed

1962 CIDECT was founded

1963 Structural Tubing included in AISC Steel Construction Manual 6th Ed.

1970 ASTM A500 included in AISC Steel Construction Manual 7th Ed.

1981 AWS D.1.1 included Structural Tubing Specifications*

1990(s) Industry adopted the term Hollow Structural Sections (HSS)

1997 AISC *Specifications for the Design of Steel HSS* and corresponding *Connections Manual*

2000 AISC *LRFD Specifications for Steel Hollow Structural Sections*

2000-2025 AWS D1.1 Clause 2 to Clause 10 Tubular Structures

CIDECT (English translation) International Committee for the Development and Study of Tubular Structures

**Tubular Steel Structure Theory and Design* Appendix A, Blodgett, O.

1997 AASHTO Pedestrian Bridge 1st Ed

2009 AASHTO LRFD Pedestrian Bridge 1st Ed.

1975 AASHTO Signs 1st Ed.

up to 3rd ed. Fatigue Tubular members
4th ed. New fatigue criteria for cantilever structures
5th ed. New fatigue criteria for non-cantilever structures

2001 AASHTO Signs 4th Ed.

2009 AASHTO Signs 5th Ed.

2013 AASHTO Signs 6th Ed.

2015 LRFD Signs 1st Ed.

2005 FDOT TDB C05-06 PPM 8.7 (in plans)

2006 FDOT TDB C06-07 SDG Chapter 10 (tubing)

2010 FDOT SDB C10-07 LRFD Pedestrian Bridge

12

Background

10.4 MATERIALS

A. Require that all materials be in compliance with the applicable ***Specifications***.

B. Careful attention shall be given in selecting combinations of metal components that do not promote dissimilar metals corrosion.

C. Specify ASTM A500 Grade B or C ~~or ASTM A847~~ for structural tubing: Minimum thickness shall be 1/4-inch for primary members and 3/16-inch for verticals and diagonals.

ASTM SPECIFICATIONS FOR TUBES

	HSS SPECS				NON-HSS SPECS		
	A500	A1065	A1085	~~A847~~	A252	A53	A513
Structural Specification	✓	✓	✓	✓	-	-	-
Mechanical Specification	-	-	-	-	-	✓	✓
Foundation Piles	-	-	-	-	✓	-	-
Reduced Design Thickness	✓	-	-	✓	✓	✓	-
Full Nominal Design Thickness	-	✓	✓	-	-	-	✓
Weathering Steel Available *	-	✓	-	✓	-	-	-

STI Steel Tube Institute *Understanding HSS Material Specifications: Which ASTM Should I Specify for HSS?*

Pipe
vs
HSS Round

TABLE A3.1
Listed Materials

Standard Designation	Permissible Grades/Strengths	Other Limitations
(a) Hot-Rolled Shapes		
ASTM A36/A36M	–	–
ASTM A529/A529M	Gr. 50 [345] or Gr. 55 [380]	–
ASTM A572/A572M	Gr. 42 [290], Gr. 50 [345], Gr. 55 [380], Gr. 60 [415], or Gr. 65 [450]	Type 1, 2, or 3
ASTM A588/A588M	–	–
ASTM A709/A709M	Gr. 36 [250], Gr. 50 [345], Gr. 50S [345S], Gr. 50W [345W], QST 50 [QST345], QST 50S [QST345S], QST 65 [QST450], or QST 70 [QST485]	–
ASTM A913/A913M	Gr. 50 [345], Gr. 60 [415], Gr. 65 [450], Gr. 70 [485], or Gr. 80 [550]	–
ASTM A992/A992M	–	–
ASTM A1043/A1043M	Gr. 36 [250] or Gr. 50 [345]	–
(b) Hollow Structural Sections (HSS)		
ASTM A53/A53M	Gr. B	–
ASTM A500/A500M	Gr. B, Gr. C, or Gr. D	–
ASTM A501/A501M	Gr. B	ERW or seamless
ASTM A618/A618M	Gr. Ia, Gr. Ib, Gr. II, or Gr. III	ERW or seamless
~~ASTM A847/A847M~~	~~–~~	~~–~~
ASTM A1065/A1065M	Gr. 50 [345] or Gr. 50W [345W]	A572, A588, or A709 HPS 50W [345W]
ASTM A1085/A1085M[a]	Gr. A	–

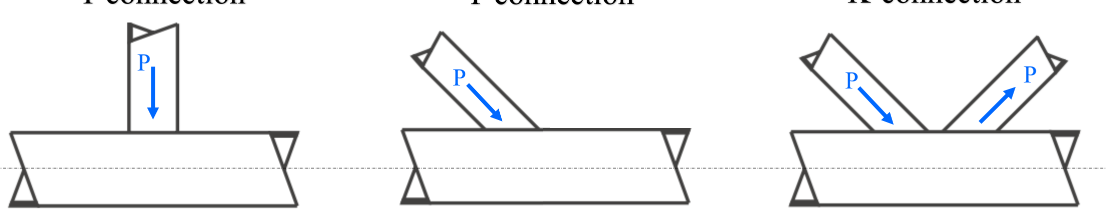
Specification for Structural Steel Buildings, August 1, 2022
AMERICAN INSTITUTE OF STEEL CONSTRUCTION

HSS (hollow structural section). Square, rectangular, or round hollow structural steel section produced in accordance with one of the product specifications in Section A3.1a(b).

Pipe. See *HSS*.

Background

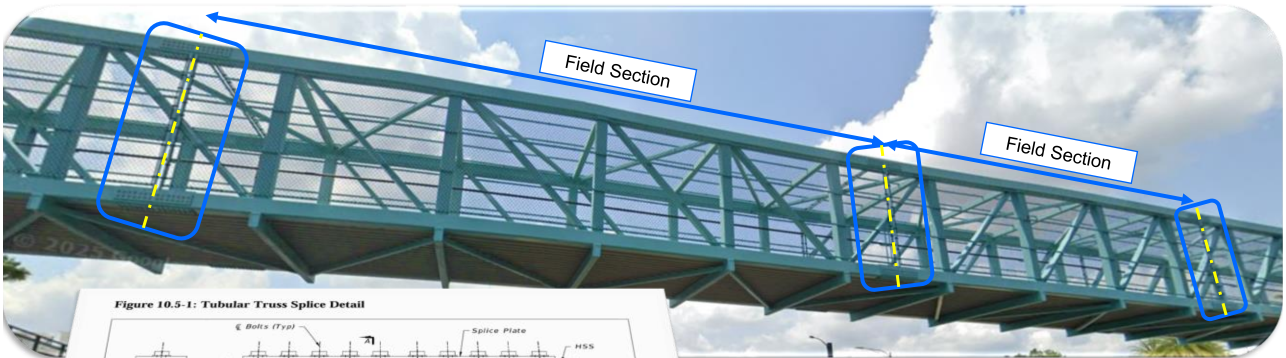
T-connection Y-connection K-connection

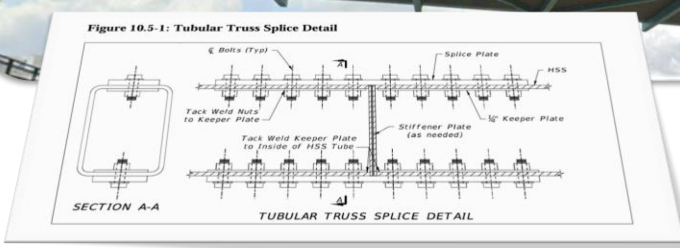


Square and Rectangular Hollow Sections

Design Guide 8 For Circular and Rectangular Hollow Section Welded Joints Under Fatigue Loading (CIDECT)

Background



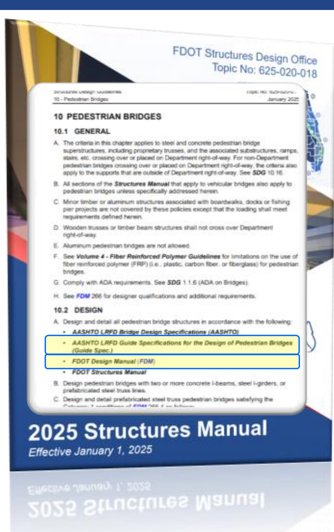


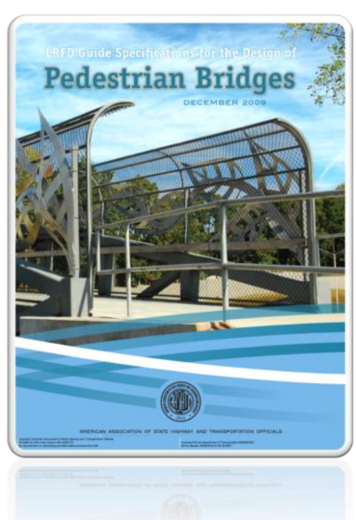
Shipping lengths generally limited to ~70'

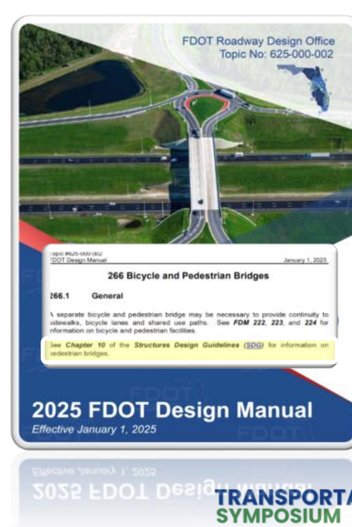
TRANSPORTATION SYMPOSIUM

15

Background



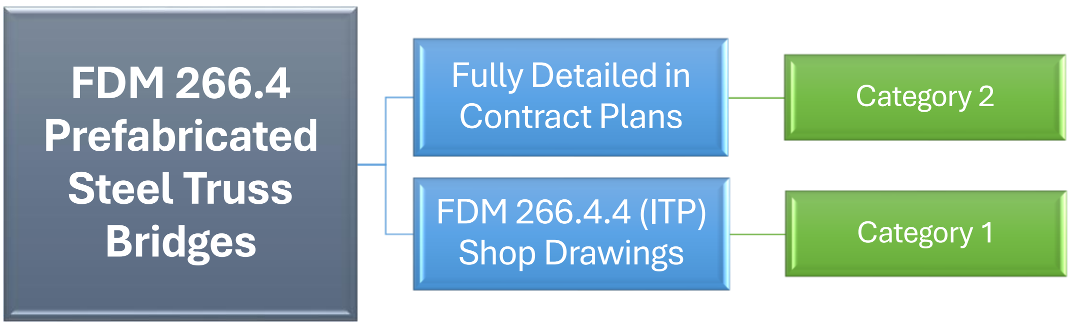




TRANSPORTATION SYMPOSIUM

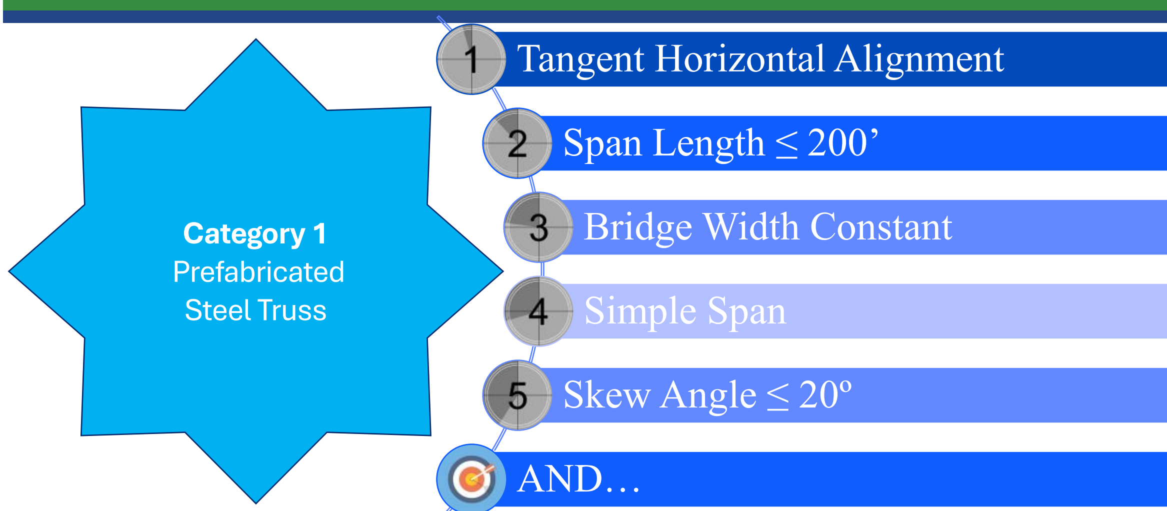
16

Plans Production



TRANSPORTATION SYMPOSIUM

Plans Production



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Plans Production

… FDM 266.4.4

Figure 266.4.2 Prefabricated Pedestrian Bridge Standard Truss Configurations

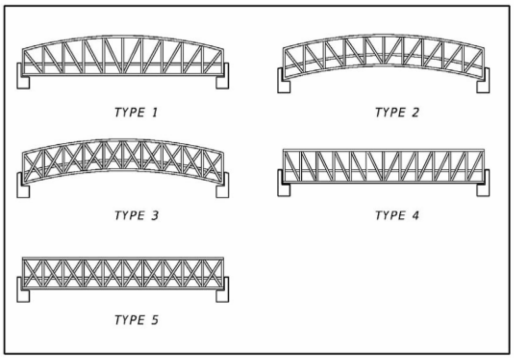
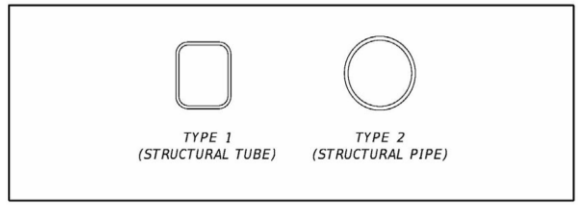
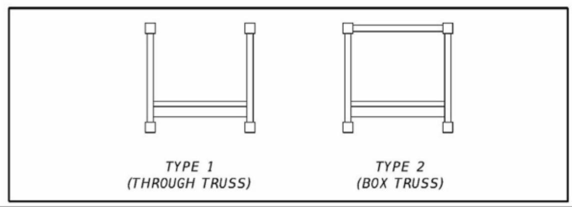


Figure 266.4.3 Prefabricated Pedestrian Bridge Standard Truss Member Shapes



SDG 10.4.C and Specifications 962 – Tubing per ASTM A500 with CVN as applicable

Figure 266.4.4 Prefabricated Pedestrian Standard Bridge Cross-Sections



A box truss bridge cross section is required for spans greater than 150 feet.

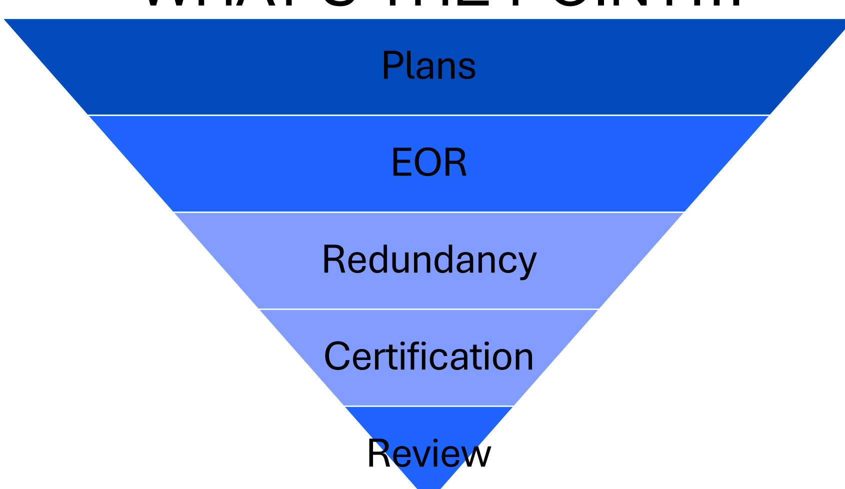
TRANSPORTATION SYMPOSIUM

19

19

Plans Production

WHAT'S THE POINT…



TRANSPORTATION SYMPOSIUM

20

20

Plans Production

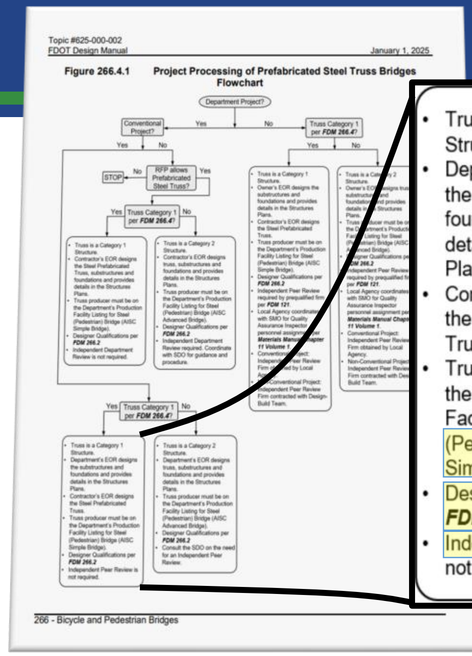
Topic #625-000-002
FDOT Design Manual
January 1, 2025

Table 266.2.1 Designer Qualifications for Prefabricated Steel Truss Pedestrian Bridges

Project Type	Category 1 per FDM 266.4?	Project EOR Design Firm – Role	Project EOR Design Firm – Prequalification	Contractor's EOR – Role	Contractor's EOR – Prequalification
Department	Yes	Substructure and/or foundation design	[T + A] Work Type 4.1.2 - Minor Bridge Design, or other necessary work group based on substructure design	Steel truss design	T (Work Type 4.2.2 - Major Bridge Design - Steel)
	No	Steel truss, substructure and/or foundation design	[T + A] Work Type 4.2.2 - Major Bridge Design - Steel and other necessary work group based on substructure design	CSIP redesign of steel truss and any associated substructure and/or foundation design	T (Work Type 4.2.2 - Major Bridge Design - Steel)
Non-Department	Yes	Substructure and/or foundation design	T Work Type 4.1.2 - Minor Bridge Design, or other necessary work group based on substructure design	Steel truss design	T (Work Type 4.2.2 - Major Bridge Design - Steel)
	No	Steel truss, substructure and/or foundation design	T Work Type 4.2.2 - Major Bridge Design - Steel and other necessary work group based on substructure design	CSIP redesign of steel truss and any associated substructure and/or foundation design	T (Work Type 4.2.2 - Major Bridge Design - Steel)

Notes:
(1) See ***FDM 266.4.2*** for definitions of Project EOR Design Firm and Contractor's EOR.
(2) "T" = Technical prequalification required in accordance with ***Rule 14-75, Florida Administrative Code***.
(3) "T + A" = Technical and Administrative (approved overhead audit) prequalification for projects greater than $500,000 total value per professional services contract in accordance with ***Rule 14-75, Florida Administrative Code***.
(4) CSIP = Cost Savings Initiative Proposal.

266 - Bicycle and Pedestrian Bridges



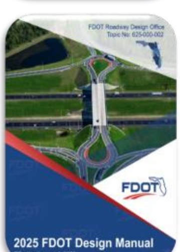
- Truss is a Category 1 Structure.
- Department's EOR designs the substructures and foundations and provides details in the Structures Plans.
- Contractor's EOR designs the Steel Prefabricated Truss.
- Truss producer must be on the Department's Production Facility Listing for Steel (Pedestrian) Bridge (AISC Simple Bridge).
- Designer Qualifications per ***FDM 266.2***
- Independent Peer Review is not required.

TRANSPORTATION SYMPOSIUM

21

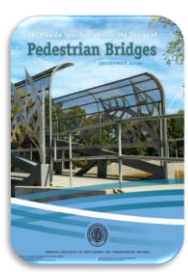
21

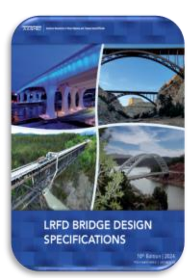
Plans Production

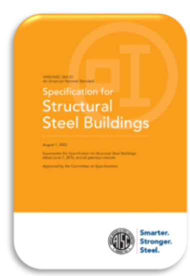


Design

- FDOT SDG Chapter 10 Pedestrian Bridges
- FDM Chapter 266 Bicycle and Pedestrian Bridges
- LRFD Guide Specifications for the Design of Pedestrian Bridges
  1. Strength
     a. HSS members - LRFD BDS
     b. HSS connections - ANSI/AISC 360 SSSB
  2. **Fatigue and Fracture**







HSS Document References
Steel Design Guide 24 Hollow Structural Section Connections (AISC)
Structural Applications (CIDECT) Wardenier, J. et al.

Inconsistencies

TRANSPORTATION SYMPOSIUM

22

22

Plans Production

Fatigue Questions:
1. Are steel pedestrian bridges required to be design for fatigue?
2. What are the fatigue loads?
3. Is Fatigue I or Fatigue II applied?
4. How is the fatigue resistance of HSS connections determined?

LRFD GUIDE SPECIFICATIONS FOR THE DESIGN OF PEDESTRIAN BRIDGES

Table of Contents

2015 Interims

3.5—FATIGUE LOAD (LL)

The fatigue loading used for the fatigue and fracture limit state (Fatigue I) shall be as specified in Section 11 of *AASHTO Signs*. The Natural Wind Gust specified in Article 11.7.3 and the Truck-Induced Gust specified in Article 11.7.4 of that specification need only be considered, as appropriate.

C3.5

Wind loads are not part of the Fatigue I load combination for vehicular bridges. This article designates wind as a live load for pedestrian bridges, via the designation LL. Wind should be considered a fatigue live load for pedestrian bridges.

Neither the pedestrian live load nor the maintenance vehicle load used for strength and serviceability is appropriate as a fatigue design loading due to the very infrequent nature of this loading. The fatigue loading specified is consistent with the treatment of sign support structures. For bridges crossing roadways, the truck-induced gust loading should be considered. The other loadings specified in *AASHTO Signs* are not applicable to pedestrian bridges due to their decreased susceptibility to galloping or vortex shedding vibrations.

Q2 and Q3

AWS D1.1-2004 had fatigue for tubular covered Section 2.20.6
AWS D1.1-2020 moved it to Clause 10 Tubular Structures.

LRFD GUIDE SPECIFICATIONS FOR THE DESIGN OF PEDESTRIAN BRIDGES

4—FATIGUE

4.1—RESISTANCE

The fatigue resistance for steel components and details shall be as specified in *AASHTO LRFD*, Article 6.6.1.2.5 for the Fatigue I load combination. For round HSS components and details not covered in *AASHTO LRFD*, the nominal fatigue resistance may be taken from Table 11.3 of *AASHTO Signs* or Figure 2.13 of AWS D1.1 *Structural Welding Code—Steel*. For square and rectangular HSS components and details, the nominal fatigue resistance may be taken from the provisions of the Design Guide 8 of the International Committee for the Development and Study of Tubular Structures (CIDECT).

C4.1

CIDECT Design Guides are a foreign specification available through the AISC. See Zhao et al., 2001.

Q1, Q3 and Q4

SECTION 7: STEEL TWIN I-GIRDER AND SINGLE TUB GIRDER SYSTEMS — 2015 INTERIM TO LRFD GUIDE SPECIFICATIONS FOR DESIGN OF PEDESTRIAN BRIDGES, SECOND EDITION

8—TYPE SPECIFIC PROVISIONS

8.1—Arches

Arches shall be designed in accordance with the provisions of *AASHTO LRFD* with guidance from Nettleton (1977).

8.2—Steel HSS Members

8.2.1—General

The capacities or resistances of connections for steel HSS members shall be in accordance with Chapter K of the specifications and commentary of AISC (2005) or *AASHTO Signs*. Resistances for fatigue design shall be in accordance with Section 2.20.6 of *Structural Welding Code—Steel* ANSI/AWS D1.1 or Section 11 of *AASHTO Signs*. All loads, load factors, and resistance factors shall be as specified by *AASHTO LRFD* and these Guide Specifications. For member design other than connections:

- Flexure resistance of steel HSS members shall be according to *AASHTO LRFD* Article 6.12 as box sections.
- Shear resistance of steel HSS members shall be according to *AASHTO LRFD* Article 6.11.9 as box sections.

C8.2.1

AISC has partnered with CIDECT to publish a set of HSS Design Guides. These guides are published internationally and have not been reviewed by AISC and are not necessarily in accordance with the AISC Specifications. However, the documents are a good resource on HSS connections and systems.

Q4

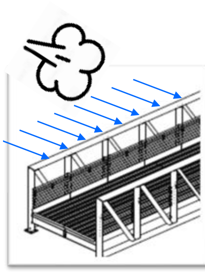
- Round HSS
  - LRFD Specifications for Structural Supports for Highway Sign, Luminaires, and Traffic Signals
  - AWS D1.1 (2020 Clause 10 Tubular Structures)
- Square/Rectangular HSS
  - Design Guide 8 For Circular and Rectangular Hollow Section Welded Joints Under Fatigue Loading (CIDECT)

TRANSPORTATION SYMPOSIUM

23

Plans Production

Fatigue loads for Steel Pedestrian Bridges



2017 INTERIM REVISIONS TO THE LRFD STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS

SECTION 11: FATIGUE DESIGN 11-9

11.7.1.2—Natural Wind Gust

Cantilevered and noncantilevered overhead sign and overhead traffic signal supports shall be designed to resist an equivalent static natural wind gust pressure range of:

$$P_{NW} = 5.2 C_d I_F \text{ (psf)} \quad (11.7.1.2\text{-}1)$$

where:

I_F = fatigue importance factor

5.2 = pressure (psf)

C_d = the appropriate drag coefficient based on the yearly mean wind velocity of 11.2 mph specified in Section 3, "Loads," for the considered element to which the pressure range is to be applied.

If Eq. C11.7.1.2-1 is used in place of Eq. 11.7.1.2-1, C_d may be based on the location-specific yearly mean wind velocity V_{mean}. The natural wind gust pressure range shall be applied in the horizontal direction to the exposed area of all support structure members, signs, traffic signals, and/or miscellaneous attachments. Designs for natural wind gusts shall consider the application of wind gusts for any direction of wind.

The design natural wind gust pressure range is based on a yearly mean wind speed of 11.2 mph. For locations with more detailed wind records, particularly sites with higher wind speeds, the natural wind gust pressure may be modified at the discretion of the Owner.

C11.7.1.2

Because of the inherent variability in the velocity and direction, natural wind gusts are the most basic wind phenomena that may induce vibrations in wind-loaded structures. The equivalent static natural wind gust pressure range specified for design was developed with data obtained from an analytical study of the response of cantilevered support structures subject to random gust loads (Kaczinski et al., 1998).

Because V_{mean} is relatively low, the largest values of C_d for the support may be used.

This parametric study was based on the 0.01 percent exceedance for a yearly mean wind velocity of 11.2 mph, which is a reasonable upper bound of yearly mean wind velocities for most locations in the country. There are locations, however, where the yearly mean wind velocity is larger than 11.2 mph. For installation sites with more detailed information regarding yearly mean wind speeds (particularly sites with higher wind speeds), the following equivalent static natural wind gust pressure range shall be used for design:

$$P_{NW} = 5.2 C_d \left(\frac{V_{mean}}{11.2\text{mph}}\right)^2 I_F \text{ (psf)} \quad (C11.7.1.2\text{-}1)$$

The largest natural wind gust loading for an arm or pole with a single arm is from a wind gust direction perpendicular to the arm. For a pole with multiple arms, such as two perpendicular arms, the critical direction for the natural wind gust is usually not normal to either arm. The design natural wind gust pressure range should be applied to the exposed surface areas seen in an elevation view orientated perpendicular to the assumed wind gust direction.

11.7.1.3—Truck-Induced Gust

Cantilevered and noncantilevered overhead sign support structures shall be designed to resist an equivalent static truck gust pressure range of

$$P_{TG} = 18.8 C_d I_F \text{ (psf)} \quad (11.7.1.3\text{-}1)$$

where

I_F = fatigue importance factor

18.8 = pressure (psf)

C_d = the drag coefficient based on the truck speed of 65 mph from Section 3 for the considered element to which the pressure range is to be applied.

If Eq. C11.7.1.3-1 is used in place of Eq. 11.7.1.3-1, C_d should be based on the considered truck speed V_T. The pressure range shall be applied in the vertical direction to the horizontal support as well as the area of all signs, attachments, walkways, and/or lighting fixtures projected on a horizontal plane. This pressure range shall be applied along any 12-ft length to create the maximum stress range,

C11.7.1.3

The passage of trucks beneath support structures may induce gust loads on the attachments mounted to the horizontal support of these structures. Although loads are applied in both horizontal and vertical directions, horizontal support vibrations caused by forces in the vertical direction are most critical. Therefore, truck gust pressures are applied only to the exposed horizontal surface of the attachment and horizontal support.

A pole with multiple horizontal cantilever arms may be designed for truck gust loads applied separately to each individual arm and need not consider truck gust loads applied simultaneously to multiple arms.

Recent vibration problems on sign structures with large projected areas in the horizontal plane, such as variable message sign (VMS) enclosures, have focused attention on vertical gust pressures created by the passage of trucks beneath the sign.

The design pressure calculated from Eq. 11.7.1.3-1 is based on a truck speed of 65 mph. For structures installed at locations where the posted speed limit is much less than 65

11-10 — 2017 INTERIM REVISIONS TO THE LRFD STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS

excluding any portion of the structure not located directly above a traffic lane. The equivalent static truck pressure range may be reduced for locations where vehicle speeds are less than 65 mph.

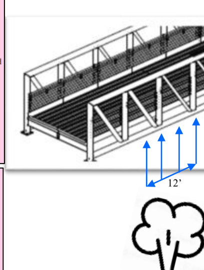
The magnitude of applied pressure range may be varied depending on the height of the horizontal support and the attachments above the traffic lane. Full pressure shall be applied for heights up to and including 20 ft, and then the pressure may be linearly reduced for heights above 20 ft to a value of zero at 33 ft.

mph, the design pressure may be recalculated based on this lower truck speed. The following equation may be used:

$$P_{TG} = 18.8 C_d \left(\frac{V_T}{65\text{mph}}\right)^2 I_F \text{ (psf)} \quad (C11.7.1.3\text{-}1)$$

where

V_T = truck speed (mph).



Reduction Factors:
- Truck Speed
- Height

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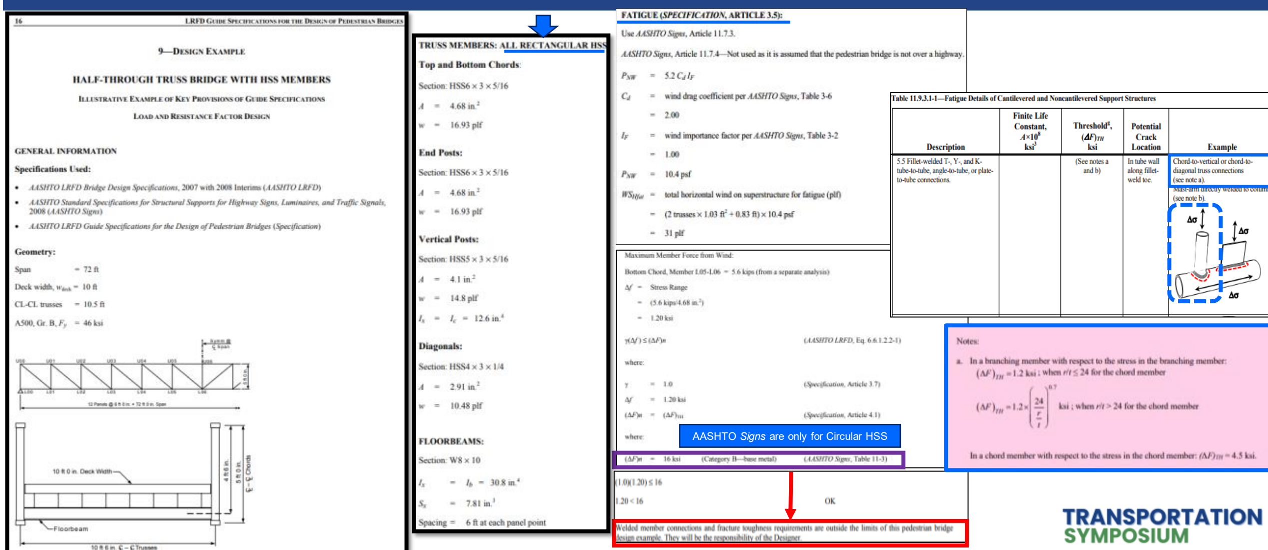

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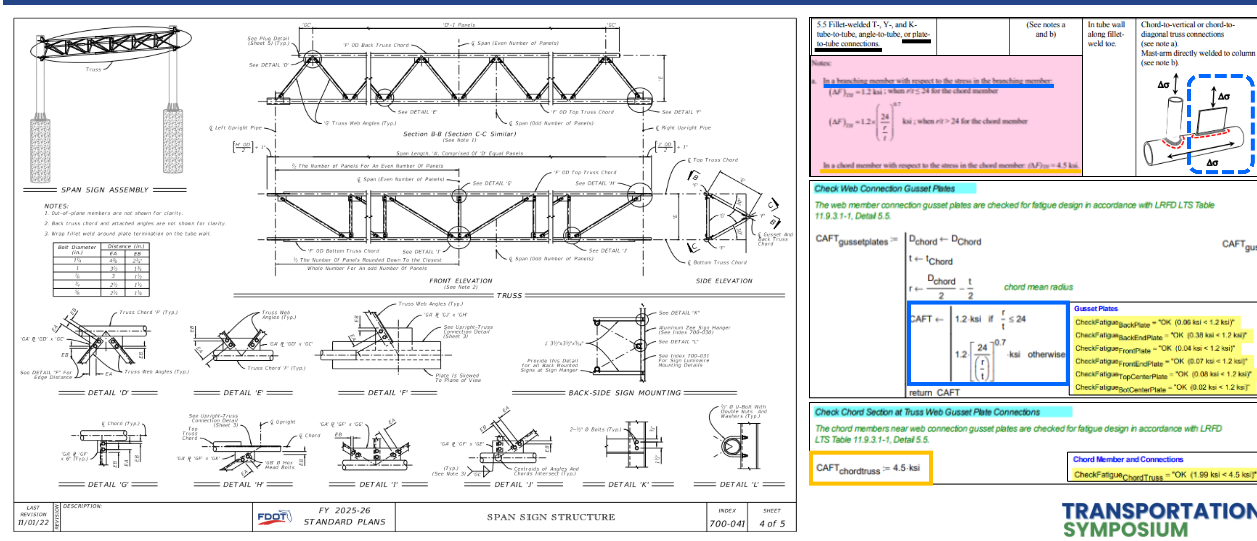

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CLAUSE 10. TUBULAR STRUCTURES — AWS D1.1/D1.1M:2025

Table 10.3
Stress Categories for Type and Location of Material for Circular Sections (see 10.2.3.2)

Stress Category	Situation	Kinds of Stress[a]
A	Plain unwelded pipe	TCBR
B	Pipe with longitudinal seam	TCBR
B	Butt splices, CJP groove welds, ground flush and inspected by RT or UT (Class R)	TCBR
B	Members with continuously welded longitudinal stiffeners	TCBR
C_1	Butt splices, CJP groove welds, as welded	TCBR
C_2	Members with transverse (ring) stiffeners	TCBR
D	Members with miscellaneous attachments such as clips, brackets, etc.	TCBR
D	Cruciform and T-joints with CJP welds (except at tubular connections)	TCBR
DT	Connections designed as a simple T-, Y-, or K-connections with CJP groove welds conforming to Figures 10.9–10.11 (including overlapping connections in which the main member at each intersection meets punching shear requirements) (see Note b)	TCBR in branch member (Note: Main member must be checked separately per category K_1 or K_2)
E	Balanced cruciform and T-joints with PJP groove welds or fillet welds (except at tubular connections)	TCBR in member; weld must also be checked per category F
E	Members where doubler wrap, cover plates, longitudinal stiffeners, gusset plates, etc., terminate (except at tubular connections)	TCBR in member; weld must also be checked per category F
ET	Simple T-, Y-, and K-connections with PJP groove welds or fillet welds; also, complex tubular connections in which the punching shear capacity of the main member cannot carry the entire load and load transfer is accomplished by overlap (negative eccentricity), gusset plates, ring stiffeners, etc. (see Note b)	TCBR in branch member (Note: Main member in simple T-, Y-, or K-connections must be checked separately per category K_1 or K_2; weld must also be checked per category FT)
F	End weld of cover plate or doubler wrap; welds on gusset plates, stiffeners, etc.	Shear in weld
F	Cruciform and T-joints, loaded in tension or bending, having fillet or PJP groove welds (except at tubular connections)	Shear in weld (regardless of direction of loading) (see 10.5)
FT	Simple T-, Y-, or K-connections loaded in tension or bending, having fillet or PJP groove welds	Shear in weld (regardless of direction of loading)
X_2	Intersecting members at simple T-, Y-, and K-connections; any connection whose adequacy is determined by testing an accurately scaled model or by theoretical analysis (e.g., finite element)	Greatest total range of hot spot stress or strain on the outside surface of intersecting members at the toe of the weld joining them—measured after shakedown in model or prototype connection or calculated with best available theory

Table 10.3 (Continued)
Stress Categories for Type and Location of Material for Circular Sections (see 10.2.3.2)

Stress Category	Situation	Kinds of Stress[a]
X_1	As for X_2, profile improved per 10.2.3.6 and 10.2.3.7	As for X_2
X_1	Unreinforced cone-cylinder intersection	Hot-spot stress at angle change; calculate per Note d
K_2	Simple T-, Y-, and K-connections in which the gamma ratio R/t_c of main member does not exceed 24 (see Note c).	Punching shear for main members; calculate per Note e
K_1	As for K_2, profile improved per 10.2.3.6 and 10.2.3.7	

[a] T = tension, C = compression, B = bending, R = reversal—i.e., total range of nominal axial and bending stress.

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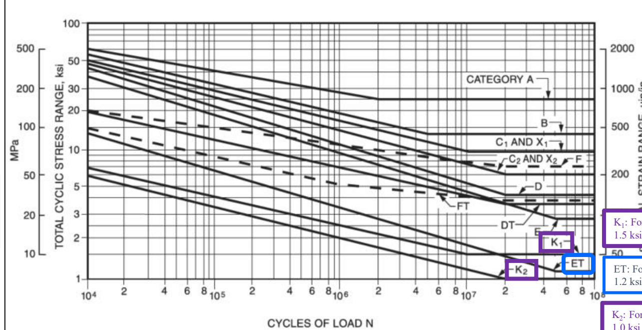


Figure 10.1—Allowable Fatigue Stress and Strain Ranges for Stress Categories (see Table 10.3), Tubular Structures for Atmospheric Service (see 10.2.3.3)

K_1: For Infinite Fatigue Life 1.5 ksi (main member)

ET: For Infinite Fatigue Life 1.2 ksi (branch member)

K_2: For Infinite Fatigue Life 1.0 ksi (main member)

27

Plans Production

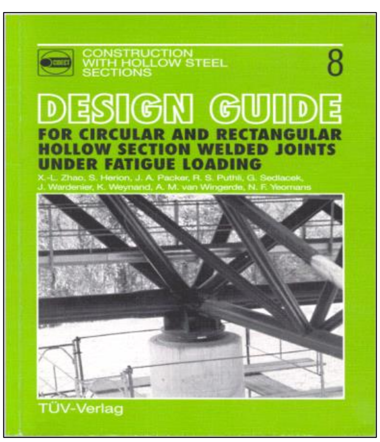


Table 1.1 – Types of joints and loading covered in this design guide

Joint type: u = uniplanar, m = multiplanar; Section type: CHS = circular hollow sections, RHS = rectangular hollow sections			Brace load: Axial force	Brace load: In-plane bending	Brace load: Out-of-plane bending	Chord load: Axial force	Chord load: In-plane bending
CHS	T/Y	u	yes	yes	yes	no	no
	X	u	yes	yes	yes	no	no
	K(gap)	u	yes	no	no	yes	yes
	XX	m	yes	yes	yes	yes	no
	KK(gap)	m	yes	no	no	yes	yes
RHS	T/X	u	yes	yes	no	yes	yes
	K(gap)	u	yes	no	no	yes	yes
	K(overlap)	u	yes	no	no	yes	yes
	KK(gap)	m	yes	no	no	yes	yes

1.4 Fatigue Resistance

Several methods have been developed to determine the fatigue resistance of welded structural hollow section joints. They include:

a) Classification method
b) Punching shear method
c) Failure criterion method
d) Static strength method
e) Hot spot stress method (also called geometric stress method)
f) Fracture mechanics method

6 Methods

Each method is described briefly below.

a) The classification method is based on structural details for different types of joints which are classified into various detail categories with about the same fatigue life. Each detail category corresponds to a nominal stress range under which a joint will fail after 2 million cycles. This method will be described in detail in Chapter 2. The classification method has been adopted by many standards (EC3 [1992], SAA [1990], JSSC [1995], AISC [1993], CSA [1994]).

2 Classification Method

2.1 General

The classification method is based on structural details for different types of joints which are classified into various detail categories. Each detail category corresponds to a nominal stress range under which a joint will fail after 2 million cycles. The classification is derived on the basis of an analysis of relevant test results, taking account of the chord to brace thickness ratio (t_0/t_1) and using a lower bound. In this method, the effects of other parameters and the thickness effects are combined to some extent (Noordhoek et al. [1980], Wardenier [1982]).

This method is simple to use. The design procedures can be summarised as follows:

- Determine the detail category from the types of joints and the detail geometry, as described in Section 2.2
- Determine the nominal stress ranges using an elastic analysis as described in Section 2.3
- Determine the permissible load cycles at this stress range, using the fatigue strength curve shown in Section 2.4 relating to the corresponding detail category

The application of this method is limited to the tubular joint types (attachments and lattice girders) and parameter ranges given in Appendix B. For lattice girders, detail categories are only available for uniplanar K- and N-joints, but parameters are very limited. A large variation in fatigue behaviour may occur for joints within the same category, which may result in a considerable variation in fatigue life (van Wingerde et al. [1997b]).

2.2 Detail Categories

The detail categories for the classification method are listed in Appendix B for both attachments and lattice girder joints. They are also given in Eurocode 3 (EC3 [1992]).

The construction details with descriptions and the corresponding detail categories are given in the tables in Appendix B. It should be noted that the arrow in the construction detail indicates the direction of the applied stress range while the thick curved line perpendicular to the arrow indicates the fatigue crack. For lattice girder joints, thickness ratio (t_0/t_1) has a great effect on the detail category.

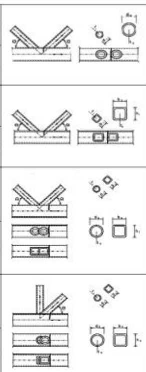
TRANSPORTATION SYMPOSIUM

28

28

Plans Production

Table B.2 – Detail Categories for Lattice Girder Joints



Detail category m = 5		Constructional detail	Description
Details loaded by nominal normal stresses			
90	$t_0/t_i = 2.0$		Joints with gap Circular hollow sections, K and N-joints
45	$t_0/t_i = 1.0$		
71	$t_0/t_i \geq 2.0$		Joints with gap Rectangular hollow sections, K and N-joints. Requirements: • $0.5(b_0 - b_i) \leq g \leq 1.1(b_0 - b_i)$ • $g \geq 2t_0$
36	$t_0/t_i = 1.0$		
71	$t_0/t_i \geq 1.4$		Joints with overlap K-joints. Requirements: • overlap between 30 and 100 %
56	$t_0/t_i = 1.0$		
71	$t_0/t_i \geq 1.4$		Joints with overlap N-joints. Requirements: • overlap between 30 and 100 %
50	$t_0/t_i = 1.0$		

General Requirements

$4 \leq t_0 \leq 8$ mm* | $4 \leq t_1 \leq 8$ mm* | $35° \leq \theta \leq 50°$
$b_0 \leq 200$ mm | $0.4 \leq b_1/b_0 \leq 1.0$ | $-0.5\,h_0 \leq e \leq 0.25h_0$ | $(b_0/t_0)\cdot(t_0/t_1) \leq 25$*
$d_0 \leq 300$ mm | $0.25 \leq d_1/d_0 \leq 1.0$ | $-0.5\,d_0 \leq e \leq 0.25d_0$ | $(d_0/t_0)\cdot(t_0/t_1) \leq 25$*

Out-of-plane eccentricity: $\leq 0.02\,b_0$ or $\leq 0.02\,d_0$
Fillet welds are permitted in braces with wall thicknesses ≤ 8 mm.

– For Intermediate t_0/t_i values, use linear interpolation between nearest Detail Categories
– Note that the braces and chords require separate fatigue assessments
* Based on actual test results. Different from Eurocode 3 where $t_0 \leq 12.5$ mm, $t_1 \leq 12.5$ mm, $b_0/t_0 \leq 25$ and $d_0/t_0 \leq 25$.

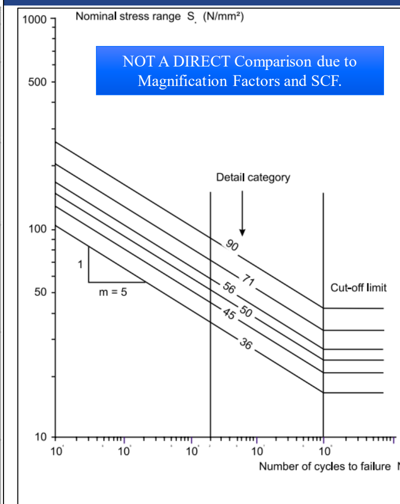


Figure 2.2 – Fatigue strength curves for tubular joints in lattice girders according to the classification method

Table 2.2 – Magnification factors to account for secondary bending moments in RHS joints of lattice girders

Type of joint		Chords	Braces (vertical members)	Braces (diagonal members)
Gap joints	K	1.5	–	1.5
	N		2.2	1.6
Overlap joints	K		–	1.3
	N		2.0	1.4

5 SCF Calculations for RHS Joints

The SCF calculations for RHS joints are described in this chapter. A summary is given in Table 5.1 where relevant tables and Figures can be found. A minimum SCF = 2.0 is recommended as explained in Appendix C.1 unless otherwise specified such as "negligible" or "no minimum SCF values required". The SCFs given in this section are valid for square hollow section braces and rectangular hollow section chords with h_0/b_0 between 0.75 and 1.5.

Table 5.1 – Summary of SCF calculations for RHS joints

Type of joints	Tables and Figures for SCF calculations
uniplanar RHS T and X-joints	Table E.1, Figures 5.2 to 5.4
uniplanar RHS K-joints with gap	Table E.2, Figures E.1 to E.8
uniplanar RHS K-joints with overlap	Table E.3, Figures E.9 to E.17
multiplanar RHS KK-joints	Table E.2 and Table 5.2

TRANSPORTATION SYMPOSIUM

Plans Production

Upcoming Structures Design Bulletin Draft Language

10.2 DESIGN

A. Design and detail all pedestrian bridge structures in accordance with the following:
- ***AASHTO LRFD Bridge Design Specifications (AASHTO)***
- ***AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges (Guide Spec.)***
- ***FDOT Design Manual (FDM)***
- ***FDOT Structures Manual***

An alternate to DG 8

K. For the fatigue resistance of structural tubing connections according to Guide Spec. Chapter 4, modify LRFDLTS-1 Fatigue Detail Category 5.5 to be applicable to square and rectangular structural tubing with fillet or CJP welded connections. For the value of "r", use the largest side dimension of the structural tubing.

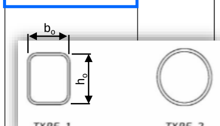
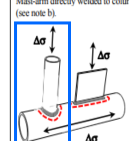
10.3 LOADING

This section supplements the ***LRFD Guide Specifications for the Design of Pedestrian Bridges***.

A. Design all pedestrian bridges for wind speeds specified in ***SDG*** Table 2.4.1-1.

E. The Truck-Induced Gust pressure, P_{TG}, shall be applied to a 12' length of structure and moved to create the maximum stress range. A reduction for vehicle speed is not allowed. For prefabricated steel truss pedestrian bridges using structural tubing connections with a span length greater than 100' and not going over a travel way, the fatigue loads are to include a Truck-Induced Gust of 25% P_{TG}. When the bridge is over a travel way, the reduction factor for height shall not be less than 25%.

Table 11.9.3.1-1—Fatigue Details of Cantilevered and Noncantilevered Support Structures

Description	Finite Life Constant, $A \times 10^8$ ksi³	Threshold[c], $(\Delta F)_{TH}$ ksi	Potential Crack Location	Example
5.5 Fillet-welded T-, Y-, and K-tube-to-tube, angle-to-tube, or plate-to-tube connections. 		(See notes a and b)	In tube wall along fillet-weld toe.	Chord-to-vertical or chord-to-diagonal truss connections (see note a). Mast-arm directly welded to column (see note b). 

2017 INTERIM REVISIONS TO THE LRFD STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS
SECTION 11: FATIGUE DESIGN 11-27

Table 11.9.3.1-1—Fatigue Details of Cantilevered and Noncantilevered Support Structures (continued)

Notes:

a. In a branching member with respect to the stress in the branching member $(\Delta F)_{TH} = 1.2$ ksi ; when $r/t \leq 24$ for the chord member

$$(\Delta F)_{TH} = 1.2 \times \left(\frac{24}{\frac{r}{t}}\right)^{0.7} \text{ ksi ; when } r/t > 24 \text{ for the chord member}$$

In a chord member with respect to the stress in the chord member: $(\Delta F)_{TH} = 4.5$ ksi.

TRANSPORTATION SYMPOSIUM

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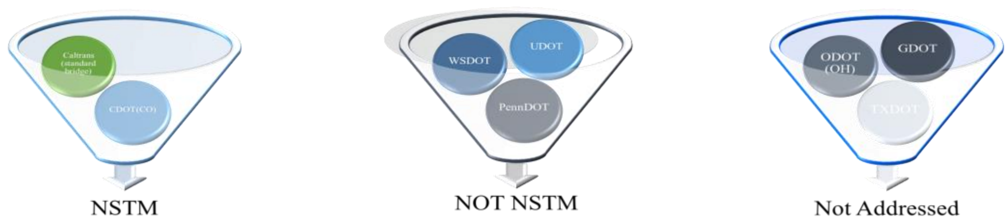
FRACTURE: NSTM (FCM) or Not?



TRANSPORTATION SYMPOSIUM

Plans Production

4.2—FRACTURE

Except as specified herein, all of the provisions specified in Article 6.6.2 of *AASHTO LRFD* relating to Charpy V-notch (CVN) fracture toughness requirements, including Fracture Critical Member (FCM) and Main Member designation, shall apply to steel pedestrian bridges. Design of tubular members shall also satisfy the provisions of Article 8.2. If supported by the characteristics of the site and application, the Owner may waive the FCM requirements, including Article 8.2.3 of these specifications.

Temporary Design Bulletin C06-07

10.8 Fracture Critical Members

A. All structural steel tension members shall receive Charpy V-Notch testing in accordance with ASTM A709. Impact testing requirements shall be as noted below:

1) Non-fracture critical tension members shall be tested in accordance with Table 9 (Zone 1) of ASTM A709 (latest version). Primary tension chords in a two truss bridge may be considered non-fracture critical due to frame action. Cross frames, transverse stiffeners, and bearing stiffeners not having bolted attachments and expansion joints do not need to be tested.

2) Fracture critical tension members shall be tested in accordance with Table 10 of ASTM A709 (latest version).

10.8 CHARPY V-NOTCH TESTING (Rev. 01/18)

Require all structural steel tension members to meet the requirements of Specification 962 for non-fracture critical members.

Structures Design Guidelines — Topic No. 625-020-018

10 - Pedestrian Bridges — January 2025

~~**10.6 CHARPY V-NOTCH TESTING**~~

~~Require all structural steel tension members to meet the requirements of Section 962 of the *Specifications* for non-fracture critical members.~~

5.3.2 Fracture (LRFD 6.6.2) 2026

C. Nonredundant Steel Tension Members (NSTM) are defined as tension members or tension components of nonredundant members whose failure would result in the collapse of the structure. This includes but is not limited to the following:

1. All tension components of two I-girder superstructures.
2. All tension components in the positive moment region of two box superstructures. Negative moment regions over the piers have four top flanges and are therefore considered redundant.
3. All tension components of straddle and integral piers.
4. All tension components of a two-truss superstructure, except those classified as Category 1 (refer to *FDM* 266.4).

TRANSPORTATION SYMPOSIUM

Plans Production

2.10 REDUNDANCY AND OPERATIONAL IMPORTANCE (LRFD 1.3.4 AND 1.3.5)

Use redundant (multiple-load-path) superstructure systems unless otherwise permitted by ***SDG*** 4.1.A or ***SDG*** 5.1.D.

A. Redundancy (LRFD 1.3.4)

Delete the Redundancy Factors for the strength limit state, η_R, in ***LRFD*** 1.3.4 and use η_R = **1.0** except as defined below:

Table 2.10-1 Redundancy Factors

Component	η_R Factor
Steel I-Girders in Two Girder Cross Sections[1]	1.20
Concrete I-Beams in Two Beam Cross Sections[2]	1.10
Truss/Arch Bridges (excluding steel trusses classified as Category 1)	1.20
Steel Floor beams with Spacing > 12-feet and Non-Continuous Deck[3]	1.20
Steel Floor beams with Spacing > 12-feet and Continuous Deck[3]	1.10
Steel Elements (Integral Caps, Non-integral Caps, Columns, C-piers, Straddle Piers, and Straddle Pier Caps)	1.20
Concrete Elements (C-piers, Integral Caps, Frame Straddle Piers, and Straddle Pier Caps)	1.10

I.6 REFERENCES

D. Other Publications

10. AWS D1.1/D1.1M: 2025 Structural Welding Code

TRANSPORTATION SYMPOSIUM

33

33

Plans Production

10.4 MATERIALS

A. Require that all materials be in compliance with the applicable ***Specifications***.

B. Careful attention shall be given in selecting combinations of metal components that do not promote dissimilar metals corrosion.

C. Specify ASTM A500 Grade B or C or ASTM A847 for structural tubing: Minimum thickness shall be 1/4-inch for top and bottom chords and 3/16-inch for verticals and diagonals. See SDG 5.3.2 for primary members, CVN testing, and NSTM requirements.

D. For steel I-girder superstructures, see ***SDG*** 5.3 ~~X~~ for the structural steel material requirements. For other superstructure types, contact the DSDE regarding whether to utilize unpainted weathering steel, galvanizing or a paint system. See ***SDG*** 10.8 if a paint system is required.

5.3 STRUCTURAL STEEL

5.3.1 Materials (LRFD 6.4)

A. Use weathering steel (ASTM A 709 Grades 50W, HPS 50W, and HPS 70W) left uncoated for all new steel I-girder and Box-girder bridges unless prohibited by site conditions or otherwise approved by the Chief Engineer of Production. Use ASTM A 709 Grades 36, 50, 50W, HPS 50W or HPS 70W steel for all new steel I-girder and Box-girder bridges that will be coated. Miscellaneous hardware, including shapes, plates, and threaded bar stock (except when used on uncoated weathering steel structures) shall conform to ASTM A709, Grade 36. Do not use ASTM A 709 Grade HPS 100W steel without prior approval of the SSDE. ***SDG*** 1.3 provides guidelines on suitable site conditions.

HSS are not allowed for vehicular bridges.

5.3.3 Fatigue (LRFD 6.6.1.2)

Use ***LRFD*** Table 6.6.1.2.3-1 to reference Detail Categories referred to below.

A. In addition to ***LRFD*** 6.6.1.2.3, components and details on longitudinal primary members having Detail Categories A, B, B', C and C' must meet the Fatigue I limit state.

B. Do not use Detail Category E or E'. Category E' welds are allowed for use in cross-frame connections.

C. For NSTM, use fatigue details classified as Detail Category C or better (except for Note D below). For steel truss bridges, submit details for SSDE approval.

D. Use Detail Category D for drain and ventilation (vent) holes required by ***SDG*** 5.6.2.

TRANSPORTATION SYMPOSIUM

34

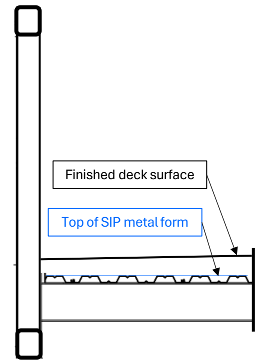
34

Plans Production

SDG 10.2 Design

J. CIP Concrete Decks

1. For SIP forms, refer to *SDG* 4.2.10. The capacity of the SIP forms must not be included in the deck design.
2. The minimum deck thickness is 6-inches with no allowance for sacrificial thickness
3. The deck design thickness is defined as the top of the SIP metal forms to the finished deck surface.
4. Use design methodology per *LRFD* 4.6.2.1 using the strip method.
5. The minimum reinforcing steel is No. 4 bars at 12-inch spacing in each direction.
6. If the deck is continuous over supports, refer to *SDG* 4.2.6, 4.2.7, or 4.2.8 for applicable criteria.
7. For drip grooves, refer to *SDG* 4.2.12.
8. For concrete deck finish see Specifications Section 400-15.2.5.2.



TRANSPORTATION SYMPOSIUM

Plans Production

FDOT

Florida Department of Transportation

RON DESANTIS
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JARED W. PERDUE, P.E.
SECRETARY

STRUCTURES DESIGN BULLETIN 25-01
ROADWAY DESIGN BULLETIN 25-01
FHWA Approved: September 8, 2025

DATE: September 9, 2025

TO: District Directors of Transportation Operations, District Directors of Transportation Development, District Design Engineers, District Construction Engineers, District Structures Design Engineers, District Maintenance Engineers, District Materials Engineers, District Consultant Project Management Engineers, FDOT Structures Manual Holders

FROM: Ben Goldsberry, P.E., State Structures Design Engineer
Derwood Sheppard, P.E., State Roadway Design Engineer

COPIES: Will Watts, Jennifer Marshall, Rudy Powell, Will Potter, Tim Lattner, Lance Grace, Christina Freeman, Alex Randell, Vickie Young, Daniel Strickland, Rafiq Darji (FHWA)

SUBJECT: ***Corrosion Protection Requirements for Steel Truss Pedestrian Bridges***

This bulletin updates corrosion protection requirements for steel truss pedestrian bridges. This bulletin affects the ***Structures Design Guidelines (SDG)*** and the ***FDOT Design Manual (FDM)***.

10.8 PAINTING/GALVANIZING

A. Prefabricated steel trusses are required to be galvanized.
  1. Specify galvanizing in accordance with Section 962 of the *Specifications*.
  2. Galvanizers must be on the *State Materials Office Approved Materials/Producers* list.
  3. For closed members, provide drain and/or vent holes to accommodate the galvanizing process. All holes must be drilled prior to galvanizing and left open after galvanizing. See ***FDM*** 266.4 for painting over the galvanized finish for aesthetics.
  4. Welding components together after galvanizing is not allowed.

B. For steel I-girders, see ***SDG*** 5.12.

1. Replace ***SDG*** 10.4.C and 10.4.D with the following:

C. Specify ASTM A500 Grade B or C for structural tubing. The minimum thickness for structural tubing is 1/4-inch for primary members and 3/16-inch for verticals and diagonals.

D. For steel I-girder superstructures, see ***SDG*** 5.3.1 for structural steel material requirements.

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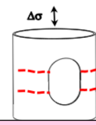
Plans Production

Rectangular HSS Fatigue

Table 11.9.3.1-1—Fatigue Details of Cantilevered and Noncantilevered Support Structures

Description	Finite Life Constant, $A \times 10^8$ ksi^3	Threshold[g], $(\Delta F)_{TH}$ ksi	Potential Crack Location	Example
SECTION 3—HOLES AND CUTOUTS				
3.1 Net section of unreinforced holes and cutouts.	250.0	24.0 (See note e)	In tube wall at edge of unreinforced handhole.	Wire outlet holes. Drainage holes. Unreinforced handholes. 

e. Reinforced and unreinforced holes and cutouts shall be detailed as shown in Figures 5.6.6.1-1, 5.6.6.1-2, and 5.6.6.1-3.

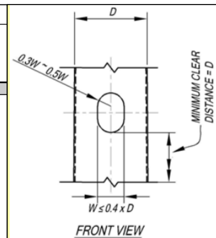


Figure 5.6.6.1-1—Details of Unreinforced Holes and Cutouts

10.8 PAINTING/GALVANIZING

A. Prefabricated steel trusses are required to be galvanized.

1. Specify galvanizing in accordance with Section 962 of the *Specifications*.
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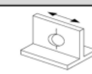
3. For closed members, provide drain and/or vent holes to accommodate the galvanizing process. All holes must be drilled prior to galvanizing and left open after galvanizing. See *FDM* 266.4 for painting over the galvanized finish for aesthetics.
4. Welding components together after galvanizing is not allowed.

B. For steel I-girders, see *SDG* 5.12.

Table 11.9.2-1–Stress Concentration Factors for Unreinforced and Reinforced Hand Holes

Structure Type	Clear Opening	Stress Concentration Factor
Sign/Signal Support Structures	Up to 0.40 × *D*	4.0
Pole-Type High-Level Luminaire Support Structures	Up to 0.45 × *D*	4.0
	Greater than 0.45 × *D* and up to 0.55 × *D*	5.7

Table 6.6.1.2.3-1—Detail Categories for Load-Induced Fatigue

Description	Category	Constant A (ksi^3)	Fatigue Growth Constant, m	Threshold $(\Delta F)_{TH}$ ksi	75-year $(ADTT)_{SL}$ Equivalent to Infinite Life (trucks per day)	Potential Crack Initiation Point	Illustrative Examples
Section 1—Plain Material away from Any Welding							
1.5 Base metal at the net section of open holes in members with a surface roughness value of 1,000 μin. or less (Brown et al. 2007), except as specified in Condition 1.6. All stresses shall be computed on the net section. (Note: See Condition 2.1 for holes with pretensioned high-strength bolts installed in standard-size holes.)	D	22×10^8	3	7	2450	In the net section originating at the side of the hole	

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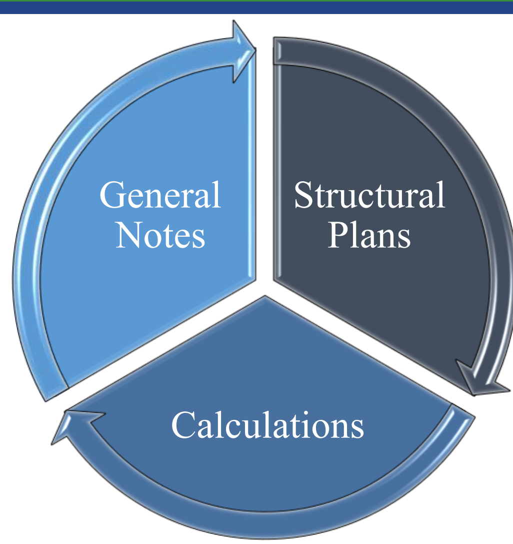
37

Shop Drawing Review



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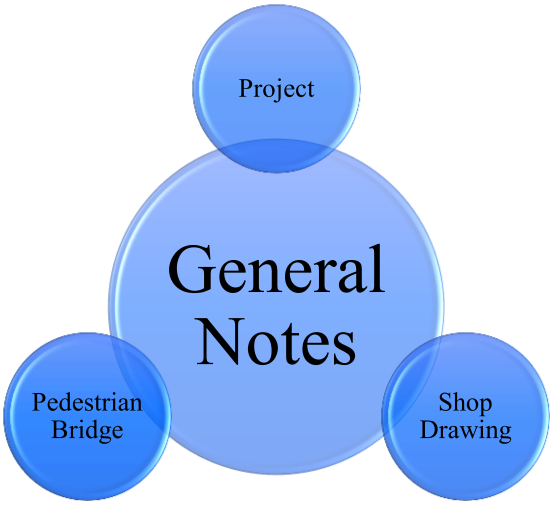
38

Shop Drawing Review



- ✓ Specifications
- ✓ Steel Material
- ✓ Corrosion Protection
- ✓ Deck Design
  Concrete Class (FDOT)
  ~~Steel Deck Institute C-2017 Standard for Composite Steel Floor Deck-Slabs~~

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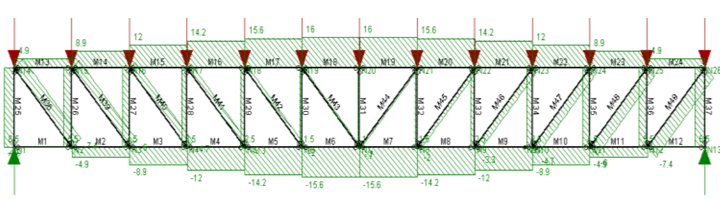
Shop Drawing Review

Structural Plans

- ✓ Primary Member identifications
- ✓ CVN Requirement
- ✓ Category 2 – NSTM designation



Under gravity loads, top chords in compression.
Do they go into tension due to fatigue loads?

MARK	SIZE	GRADE
BOTTOM CHORD **	HSS8X8X1/2	A500-GR.C CVN
BOTTOM CHORD **	HSS8X8X1/2	A500-GR.C CVN
BOTTOM CHORD **	HSS8X8X1/2	A500-GR.C CVN
END BRACING **	HSS4X4X1/4	A500-GR.C CVN
END BRACING **	HSS4X4X1/4	A500-GR.C CVN
END BRACING **	HSS4X4X1/4	A500-GR.C CVN
END BRACING **	HSS4X4X1/4	A500-GR.C CVN
END BRACING **	HSS4X4X1/4	A500-GR.C CVN
END BRACING **	HSS4X4X1/4	A500-GR.C CVN
END CAP	D1 7/8"	A500-GR.B
END CAP	D1 7/8"	A500-GR.C
END DIAGONAL **	HSS8X6X1/4	A500-GR.C CVN
END DIAGONAL **	HSS8X6X1/4	A500-GR.C CVN
END DIAGONAL **	HSS8X6X1/4	A500-GR.C CVN
END DIAGONAL **	HSS8X6X1/4	A500-GR.C CVN
END DIAGONAL **	HSS8X6X1/4	A500-GR.C CVN
END DIAGONAL **	HSS8X6X1/4	A500-GR.C CVN
END DIAGONAL **	HSS8X6X1/4	A500-GR.C CVN
TOP CHORD	HSS8X8X1/2	A500-GR.C
TOP CHORD	HSS8X8X1/2	A500-GR.C
TOP CHORD	HSS8X8X1/2	A500-GR.C
TOP CHORD	HSS8X8X1/2	A500-GR.C

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Shop Drawing Review

Calculations

- ✓ Designer Notes
- ✓ Loads and Combinations
  - Wind Load (e.g., Extreme I)
  - Natural Wind Gust
  - Truck-Induced Gust
  - Fatigue I Loading Combination
- ✓ Steel Material
- ✓ Deck Design
  - Concrete Class (FDOT)
  - Minimum Deck Thickness
  - Design Structural Thickness
  - Non-composite with SIP Forms

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Wrap-Up Quiz

1. True or False. All steel bridges are Category 2.
2. True or False. Steel 2-truss pedestrian bridges classified as Category 1 are NSTM.
3. For a Pratt truss analyzed for only gravity loads, the diagonals are in: A) tension, B) compression, C) tension or compression
4. True or False. Steel truss pedestrian bridges designated as Category 1 are not subjected to CVN testing.
5. True or False. Steel truss pedestrian bridges are required to be designed for fatigue only when vehicles can access the bridge.

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Safety Message

NATIONAL SECURE YOUR LOAD DAY IS ON JUNE 6TH! Learn More

How to Secure a Load
Securing your load is quick and easy. It only takes a few minutes and basic supplies to properly secure a load.

Follow these simple tips:

1. Place lighter items below heavier items to keep them in place. Securely fasten the heavy items directly to your vehicle.
2. Tie down items using rope, netting, straps, or chains. Securely fasten large items directly to your vehicle.
3. Add extra protection by covering the entire load with a tarp or netting. Make sure that any covering is securely tied down.
4. Don't overload vehicles or trailers.
5. Double-check to be sure the load is secure.
6. Speed, weight, and gravity are not load securing devices. Ropes, straps, and netting are load securing devices.
7. View practical tips for securing loads in videos from the King County Solid Waste Division, Washington State Department of Ecology, and the Washington State Patrol.

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October 28-29, 2025
Orlando, FL
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Detailed instructions are available on the Transportation Symposium website.
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SCAN ME

45