

SECTION 437 – PREFABRICATED PEDESTRIAN BRIDGE

437.01 DESCRIPTION

This work consists of furnishings and placing a prefabricated pedestrian bridge of a width and span designated in this Contract Document. 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 Continental Bridge but are not intended to preclude the use of another system. The Contractor's submitted bridge designs and specifications must meet or exceed those contained within this Contract Document.

437.02 MATERIALS

437.02.01 Unpainted Weathering Steel. Bridges shall be fabricated from high strength, low alloy, atmospheric corrosion resistant ASTM A847 cold-formed welded square and rectangular tubing and/or ASTM A588, or ASTM A242, ASTM A606 plate and structural steel shapes (Fy = 50,000 psi). The minimum corrosion index of atmospheric corrosion resistant steel, as determined in accordance with ASTM G101, shall be 5.8.

437.02.02 Bolts. Field splices shall be fully bolted with ASTM A325 type 3 high strength bolts in accordance with the Specifications for Structural Joints Using ASTM A325 or A490 Bolts.

437.02.03 Wood Decking. Wood decking shall be naturally durable hardwood Ipe (Tabebuia Spp) Lapacho Group or Cumaru (Dipteryx Odorta). All planks shall be partially air dried to a moisture content of fifteen percent (15%) to twenty percent (20%), and shall be S4S (surfaced four sides) with one face hit or miss allowed up to ten percent (10%) of the total length, E4E (eased four edges), with the edges eased to a radius of one eighth inch (1/8"). Measured at thirty percent (30%) moisture content, the width and thickness shall not vary from specified dimensions by more than plus or minus four hundredths of an inch (± 0.04). All planks shall be supplied with the end sealed with "Achorseal" Mobil CER-M or an approved equal aqueous wax log sealer.

All planks shall be graded as FEQ-CAH (First Export Quality - Clear All Heart) or F1F (First One Face) grading rules, defined as follows:

- ◆ Lumber shall be graded both faces and both edges.
- ◆ Lumber shall be straight grained and parallel cut without heart center.
- ◆ Lumber shall be all heartwood.
- ◆ Lumber shall be in sound condition.

- ◆ Allowable imperfections are:

All faces: Natural drying checks, Discoloration caused by weathering or chemical reaction, Maximum bow or spring of eight hundredths of an inch (0.08") per six feet (6') of timber length.

On one face only: Firm sapwood, worm holes not going through to the other face, closed knots with maximum of one (1) knot per four foot (4') of timber length, Rowy grain, and Tear out.

- ◆ Imperfections Not Allowed:

Longitudinal heat cracks, Internal cracks, Soft sap wood, Splits, End splits, Ring shades, Fungi affects (blue to gray, brown to red, white to yellow, or incipient decay),

Deformation (twisting or cupping) which cannot be removed using normal installation methods and tools.

All planks shall meet or exceed the following mechanical properties [based on the two inch (2") standard as defined by the U.S. Forest Products Laboratory publications and testing data:

MC %	Modulus of Rupture	Modulus of Elasticity	if Maximum Strength	Crush
12 %	27,270 psi	3,030,000 psi	13,720 psi	

Janka side hardness is 3, 540 lbs. At 12 % moisture content.

Average air - dry density is 62 to 81 pcf.

Basic specific gravity is 0.80 - 0.91.

All planks shall be naturally fire resistant without the use of any fire resistant preservatives to meet NFPA Class A and UBC Class I.

Planks shall be supplied that meet or exceed the Static Coefficient of Friction for both Neolite and leather shoes in accordance with ASTM Test Method C 1028-89.

<u>SHOE MATERIAL</u>	FORCE IN POUNDS	
	<u>DRY</u>	<u>WET</u>
Neolite	0.73	0.69
Leather	0.55	0.79

For transverse wood decking, wheel loads shall be assumed to act on one plank only. The wheel

loads shown in Section **437.03.03(a)(3) Vehicle Loads** shall be distributed on the plank along a length equal to the tire print width (W). The plank shall be designed for shear and bending in accordance with the support conditions and spacing. For design, the following unfactored allowable values shall be used:

Allowable Bending	=	3700 psi
Allowable Shear	=	320 psi
Modulus of Elasticity	=	3,000,000 psi

437.03 **CONSTRUCTION**

437.03.01 Fabricators. Each bidder is required to identify their intended bridge fabricator as part of the bid submittal. Qualified fabricators must have at least five (5) years experience fabricating these types of structures.

Suggested Fabricators:

Continental Bridge Alexandria, MN 1 800 328-2047	Steadfast Bridge Co. Ft. Payne, AL 1 800 749-7515	Bridge America Inc. Alexandria, MN 888 946-4711
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Fabricators, other than those listed above, must be submitted by the Contractor to the Commission for approval within fifteen (15) days of being identified as the apparent low bidder. The award of the Contract is contingent upon the Contractor securing approval of the bridge fabricator within thirty (30) days after notification of apparent low bidder.

The Contractor must provide the following documentation for any proposed fabricator:

- ◆ 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 types of structures, and a minimum of five (5) successful bridge projects of similar construction, each of which has been in service at least three years. List the location, bridge size, owner, and a contact for reference for each project.

- ◆ The Commission will evaluate and verify the accuracy of the submittal prior to award of the Contract. If the Contractor fails to qualify a bridge fabricator within thirty (30) days after notification of apparent low bidder, the Contractor's bid shall be rejected.

437.03.02 General Design Features.

(a) Span. The bridge span shall be as specified on the plans and in the Bid Form contained within this Contract Document. The span shall be a straight line dimension measured from each end of the bridge structure.

(b) Width. The bridge width shall be as specified on the plans and in the Bid Form contained within this Contract Document. The width shall be measured from the inside face of structural elements at deck level.

(c) Truss Type. The bridge shall be designed as a half-through Pratt truss with one (1) diagonal per panel and square end vertical members. All end vertical members, unless specified otherwise, shall be plumb. Interior vertical members shall be perpendicular to the chord faces.

(1) Bridges may be designed utilizing an underhung floor beam (top of floor beam welded to the bottom of the bottom chord) or in an H-Section configuration where the floor beams are placed up inside the trusses. The floor beam location shall be determined by the bridge fabricator.

(2) The distance from the top of the deck to the top and bottom truss members shall be determined by the bridge fabricator based upon structural and/or shipping requirements.

(3) The top of the top chord shall not be less than forty two inches (42") above the deck (measured from the high point of the riding surface).

(d) 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.

To provide lateral support for 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.

(e) Attachments.

- (1) Safety Rails.** Horizontal safety rails shall be placed on the structure up to a minimum height of four feet - six inches (4'6") above the deck surface. Safety rails shall be placed so as to prevent a four inch (4") sphere from passing through the truss. Safety rails shall be welded to the inside or outside of the structure at the bridge fabricators 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 two hundred pounds (200 lbs.), applied horizontally at right angles, to a one (1) square foot area at any point in the system.

- (2) Toe Plate.** The bridge shall be supplied with a one quarter inch by six inch (1/4" X 6") steel toe plate mounted to the inside face of both trusses. The toe plate shall be welded to the truss members at a height adequate to provide a two inch (2") gap between the bottom of the plate and the top of the deck or the top of the bottom chord, whichever is higher. The span of the toe plate (from center to center of supports) shall not exceed five feet eight inches (5'8").

- (3) Rubrails.** The bridge will be supplied with a nominal five quarter inch by six inch (5/4" X 6") naturally durable hardwood Ipe (Tabebuia Spp) Lapacho Group or Cumaru (Dipteryx Odorta) rubrail. The rubrail shall be partially air dried to a moisture content of fifteen percent (15%) to twenty percent (20%), shall be supplied S4S (surfaced four sides), E4E (eased four edges), with the edges eased to a radius of one eighth of an inch (1/8"). Measured at thirty percent (30%) moisture content, the width and thickness shall not vary from the specified dimensions by more than plus or minus four hundredths of an inch (± 0.04 "). Ends of each piece shall be sealed with "Anchorseal" Mobil CER-M or an approved equal aqueous wax log sealer. The contractor has the option of using Trex rubrails or approved equal with the approval of the Commission.

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 six feet six inches (6'6").

The top of the rubrail shall be two feet ten inches (2'10") above the

top of the deck (measured at the outside edge of the deck).

- (f) **Camber.** The bridge shall have a vertical camber dimension at midspan equal to one hundred percent (100%) of the full dead load deflections plus one percent (1%) of the full length of the bridge.
- (g) **Elevation Difference.** The bridge abutments shall be constructed at the same elevation on both ends of the abutments.

437.03.03 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 principle. The engineer shall be licensed to practice in Maryland.

- (a) **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.
 - (1) **Dead Loads.** The bridge structure shall be designed considering its own dead load (superstructure and original decking) only. No additional dead loading need be considered.
 - (2) **Uniform Live Load.**
 - (A) **Pedestrian Live Load.**

Main Members: Main supporting members, including girders, trusses and arches shall be designed for a pedestrian live load of eighty-five pounds (85 lbs.) 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 four hundred (400) square feet, the pedestrian live load may be reduced by the following equation:

$$w = 85 [0.25 + (15 / \sqrt{A_1})]$$

Where w is the design pedestrian load (psf) and A_1 is the deck influence area in square feet.

The reduced design live load shall not be less than sixty-five pounds (65 lbs.) per square foot of bridge walkway area.

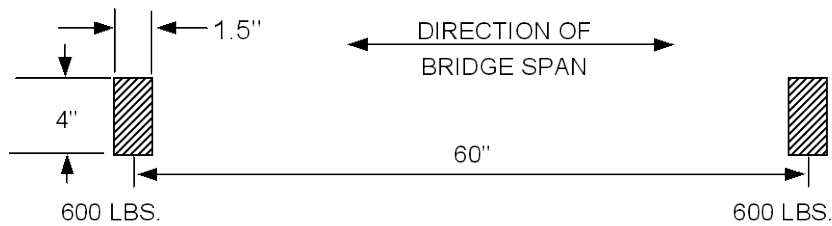
Secondary Members: Bridge decks and supporting floor

systems, including secondary stringers, floor beams and their connections to main supporting members shall be designed for a live load of eighty-five pounds (85 lbs.) per square foot, with no reduction allowed.

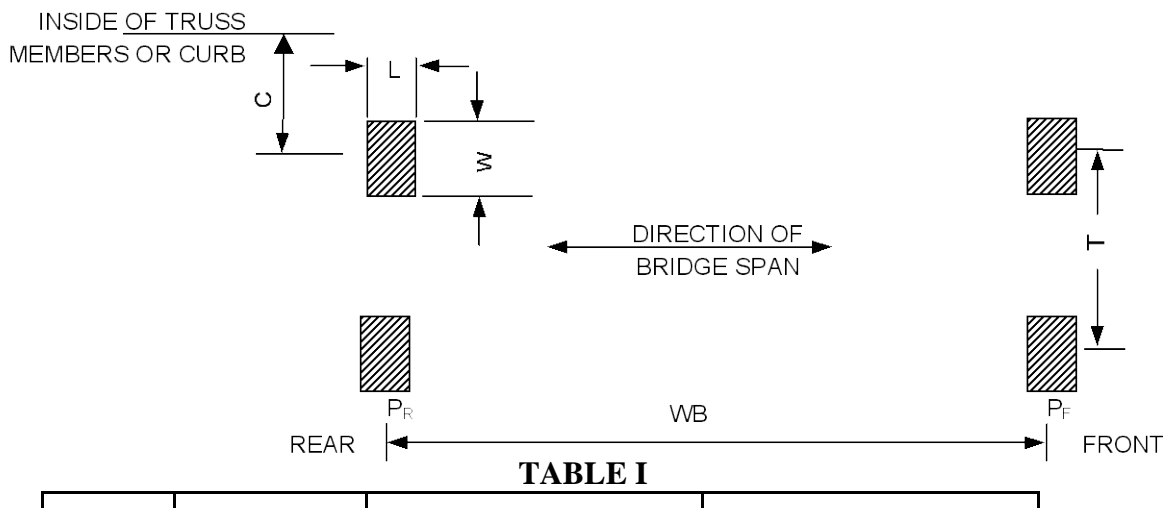
(3) **Vehicle Loads.** The bridge superstructure, floor system and decking shall be designed for each of the following point load conditions:

(A) A concentrated load of one thousand pounds (1,000 lbs) placed on any area two and one half feet by two and one half feet (2.5' X 2.5') square.

(B) A twelve hundred pound (1,200 lbs) two wheel vehicle with a wheelbase and tire print area as shown in the following diagram:



(C) A ten thousand pound (10,000 lbs) 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	Axel & Wheel Spacing		Front Wheels			Rear Wheels			
	WB	T	P	L	W	P	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"

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

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 (1) 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 **437.02.03 Wood Decking**. Stringers shall be designed for the applied wheel loads assuming no lateral load distribution to adjacent stringers.

A vehicle impact allowance is not required.

(4) Wind Load

- (A) **Horizontal Forces.** The bridge(s) shall be designed for a wind load of twenty-five pounds (25 lbs) 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.

- (B) **Overtopping 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 twenty pounds (20 lbs) per square foot of deck.

- (5) **Top Chord Railing Loads.** The top chord, truss verticals, and floor beams shall be designed for lateral wind loads [per section **437.03.03(a)(4)(A) Horizontal Forces**] and for any loads required to provide top chord stability as outlined in Section **437.03.03(c)(5) Top Chord Stability**, however, in no case shall the load be less than fifty pounds (50 lbs) per lineal foot or a two hundred pound (200 lbs) point load, whichever produces greater stresses, applied in any direction at any point along the top chord.
- (6) **Load Combinations.** The loads listed herein shall be considered to act the 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 stress may be increased one third (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 (COMMISSION) 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.

(b) Design Limitations.

(1) Deflection.

- (A) Vertical Deflection.** The vertical deflection of the main trussed due to service pedestrian live load shall not exceed one four-hundredth (1/400) of the span.

The vertical deflection of cantilever spans of the structure due to service pedestrian live load shall not exceed one three-hundredth (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 one three-hundred-sixtieth (1/360) of their respective spans.

The service pedestrian live load shall be eighty-five (85) PSF, reduced in accordance with Section **437.03.03(a)(2)(A) Pedestrian Live Load**, but should in no case be less than sixty-five (65) PSF for deflection checks.

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

(B) Horizontal Deflection. The horizontal deflection of the structure due to lateral wind loads shall not exceed one five-hundredth (1/500) of the span under an eighty-five (85) mile per hour [twenty-five (25) PSF] wind load.

(2) Minimum Thickness of Metal. The minimum thickness of all structural steel members shall be three-sixteenths of an inch (3/16") nominal and be in accordance with the AISC Manual of Steel Construction 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.

(c) Governing Design Codes / References. Structural members shall be designed in accordance with recognized engineering practices and principles as follows:

(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.

(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 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 points.

(3) Bolted Splices.

American Institute of Steel Construction (AISC) and the Research Council on Structural Connections of the Engineering Foundation (RCSC).

Bolted splice design shall be in accordance with Section J3 of the Manual of Steel Construction: Allowable Stress Design. Splices shall be designed for the actual load in the member but in no case for less than fifty percent (50%) of the effective strength of the member.

Bolted field splices shall be located on the bridge so as to produce a structure which can be economically shipped and erected. Splices along the length of the bridge (in chords and diagonals) shall be placed at the approximate mid point of a bay (between two panel points). Splices across the width of the bridge (in floor beams and wind braces) may be used, when necessary, to keep the overall structure width within reasonable limits for shipping.

(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.

(5) Top Chord Stability.

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

The top chord of a half-through truss 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 fifty percent (50%) for parallel chord truss bridges or one hundred percent (100%) for tied arch 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:

$$C \text{ required} = 1.46 P_c / L$$

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 tied arch truss 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) in half-through truss spans shall be proportioned to resist a lateral force of not less than 1/100k times the top chord compressive load, but not less than four thousandths (.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 one percent (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 one percent (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 in half-through spans shall be added to the forces derived from a three dimensional analysis of the bridge.

437.03.04 Welding.

- (a) **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.
- (b) **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 six (6) months experience in welding tubular structures and have demonstrated the ability to make uniform sound welds of the type required.

437.03.05 Submittals.

- (a) **Submittal Drawings.** Schematic drawings and diagrams shall be submitted to Commission for review after the Notice-to-Proceed has been issued for the individual contract. 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 reference details and sheet numbers. All drawings shall be signed and sealed by a Professional Engineer who is licensed in Maryland.
- (b) **Structural Calculations.** Structural calculations for the bridge superstructure shall be submitted by the bridge fabricator and reviewed by Commission. All calculations shall be signed and sealed by a Professional Engineer who is licensed in Maryland. 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 **437.03.03(c)(2) Welded Tubular Connections** 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.

(c) Welder certifications in compliance with AWS standard qualifications tests.

(d) Welding procedures in compliance with Section

437.03.06 Fabrication.

(a) General Requirements.

- (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.
- (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 .06(a)(2)]. The maximum root openings of fillet welds shall not exceed three-sixteenths of an inch (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").

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 (4) 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".

(b) 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 "Simple Steel Bridges" as set forth in the AISC Certification Program. Quality control shall be in accordance with procedures outlined for AISC certification.

437.03.07 Finishing.

(a) Blast Cleaning.

(1) **Bare applications of enhanced corrosion resistant steels.**

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.

437.03.08 Wood Decking Attachment.

- ◆ At time of installation, planks are to be placed tight together with no gaps.
- ◆ Every plank must be attached to at least one support with at least one fastener.
- ◆ Fasteners shall be zinc plated bolts. Hex-head bolts, with a steel plank hold down, are to be used at the ends of planks. Carriage bolts are to be used as interior connection fasteners. Power actuated fasteners shall not be used.
- ◆ Planks are to be drilled prior to installation of bolts.
- ◆ In addition to the minimum of one fastener at either end of every plank (typical for all installations), planks for bridges with widths of seventy-two inches (72") to one hundred forty-three inches (143") are to receive a minimum of one (1) interior connection bolt at a stringer location approximately near the center of the bridge width. Bridges one hundred forty-four inches (144") or wider are to have interior connection bolts located at a minimum of two interior stringer locations, approximately located at the third points of the bridge width.

437.03.09 Bearings. Bridge bearing devices 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 twenty-eight (28) day strength for the abutment concrete shall be three thousand pounds per square inch (3,000 PSI). The bearing seat shall be a minimum of sixteen inches (16") wide. The step height (from bottom of bearing to top-of-deck) shall be determined by the bridge fabricator.

Bridges in excess of one hundred feet (100') in length or bridges with dead load reactions of fifteen thousand pounds (15,000 lbs) 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.

437.03.10 Foundation. Unless specified otherwise, the bridge fabricator 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 Commission - Design Section. 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 fabricator's anchor bolt spacing dimensions.

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

437.03.11 Shipping, Storage, and Erection. Delivery is to be 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 bridge fabricator shall provide detailed, written instructions in the proper lifting procedures and splicing procedures (if required). Erection shall conform to MSHA SECTIONS 430.03.27, 430.03.28, 430.03.29, 430.03.30, 430.03.31, 430.03.32, and 430.03.33.

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

437.03.12 Warranty. The bridge manufacturer shall warrant their steel truss structure(s) to be free of design, material, and workmanship defects for a period of fifteen (15) years from the date of delivery. Naturally durable hardwood decking and wood attachments shall carry a fifteen (15) year

warranty against rot, termite damage, or fungal decay.

This warranty shall not cover defects in the bridge caused by abuse, misuse, overloading, accident, improper maintenance, alteration or any cause not the result of defective materials or workmanship.

Repair or replacement shall be the exclusive remedy for defects under this warranty. The bridge fabricator shall not be liable for any consequential or incidental damages for breach of any express or implied warranty on their structures.

437.04 MEASUREMENT AND PAYMENT

Prefabricated Pedestrian Bridge will be measured and paid at the lump sum price in the Contract. The payment will be full compensation for the bridge structure including anchor bolts and bearing devices, transporting, storage, erection, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

437.04.01 All excavation required for the construction of the Prefabricated Pedestrian Bridge shall be measured and paid as specified in Section 200 EXCAVATION.

437.04.02 All concrete required for the construction of the Prefabricated Pedestrian Bridge shall be measured and paid as specified in Section 420 PORTLAND CEMENT CONCRETE.