Wheeler

SPECIAL PROVISION SPECIFICATIONS FOR PREFABRICATED TUBULAR STEEL TRUSS BRIDGE

NOTES AND INSTRUCTIONS TO SPECIFICATION WRITER:

OPTIONS ARE HIGHLIGHTED IN BOLD FACE ITALICS (As thus). DELETE THOSE OPTIONS THAT DO NOT APPLY.

NOTES AND RECOMMENDATIONS ARE PROVIDED, IN PARENTHESIS, ITALICIZED *(As thus).* ***ALL SUCH TEXT IS TO BE DELETED BEFORE USAGE OF THESE SPECIFICATIONS.***

SPECIFICATIONS LAST UPDATED 01/07/14. PLEASE VERIFY THAT THE LATEST VERSION IS USED FOR EACH NEW PROJECT.

ANY INDIVIDUAL PROVISION APPEARING HEREIN MAY INSTEAD APPEAR IN THE PLANS. *However, to avoid conflicts it is recommended provisions not be repeated in both. Profile grades, waterway or underpass cross-sections and survey information are generally the only items needed in the plan. Sample plans and other sketches can create confusion. They should only be used with great care to identify mandatory and conceptual aspects. To further avoid conflicts, it is recommended, and these specifications have been drafted as such, that provisions in design codes not be repeated but instead referred to, except where modifications or clarifications are deemed necessary.*

IN THESE SPECIFICATIONS, AASHTO GOVERNS THE DESIGN. *Design of outdoor bridges generally is not governed by the building code. Likewise, substructures should generally be governed by AASHTO. The Owner should determine and specify what measures are necessary to meet ADA or any other requirements not covered herein, rather than specifying the ADA or other standards as part of the design constraints.*

THESE SPECIFICATIONS ARE FOR THE BRIDGE SUPERSTRUCTURE ONLY. *The substructure design and specifications should be detailed in the plans and/or other special provisions. The substructures can be specified as design/build. Appropriate special provisions are available.*

CALL TO DISCUSS HOW SPECIFIC OPTIONS WILL AFFECT COST. *Any architectural requirements more specific and detailed than as covered by this draft must be thoroughly specified. When OTHER BRIDGE TYPES will be allowed, such as TIMBER TRUSS or TIMBER PANEL-LAM, etc., call to discuss and receive specifications.*

WHEELER WILL DRAFT SPECIFICATIONS UPON REQUEST.
WEBSITE: www.wheeler-con.com EMAIL: info@wheeler-con.con
PHONE: (952) 929-7854, (800) 328-3986

SPECIFICATIONS BEGIN BELOW THIS POINT:

PREFABRICATED STEEL TRUSS BRIDGE

1. Scope

The work included under this item shall consist of furnishing, fully engineering, fabricating, transporting, and erecting steel truss bridge superstructure(s) including bearings, as shown in the plans and described herein. The intended usage is ***(CHOOSE ALL THAT APPLY):***

pedestrian;
bicycle;
snowmobile;
occasional slow moving maintenance or emergency vehicles;
as a vehicular bridge serving as an entrance facility, service road, or similar facility, where vehicle size, specified hereinafter, can be regulated, and where less than 20,000 cycles are expected;
as a vehicular bridge serving legal highway loads, where less than 20,000 truck cycles are expected;
other.

*(**Note:** It is important to carefully determine the intended usage, as this paragraph will affect many aspects of the bridge.)*

These specifications shall be regarded as minimum standards for design and construction.

Substructures are not included in this item.

2. Definitions

Owner - The actual owner, or the engineer, person, or firm designated by the owner to represent the owner.

Plans - Any drawings included in the bid documents related to the specified work.

Contractor - The firm contracting and responsible for the specified work.

Bridge Manufacturer - The firm acting on behalf of the Contractor to manufacture the prefabricated steel truss bridge superstructure.

3. Qualifications

The Bridge Manufacturer shall be currently certified by the American Institute of Steel Construction to have the personnel, organization, experience, capability, and commitment to produce fabricated structural steel for Major Steel Bridges as set forth in the AISC Certification Program.

Pre-approved Bridge Manufacturers:

Wheeler
9330 James Avenue South
Bloomington MN 55431
(800) 328-3986
email: info@wheeler-con.com

Written request by the Contractor for acceptance of any proposed Bridge Manufacturer who is not pre-approved must be presented to the Owner at least 10 days prior to the bid. To insure the proposed substitution will comply with these specifications, the following documentation must be included:

- Proof of AISC certification

- Representative design calculations
- Representative drawings
- Splicing and erection procedures
- Welding process
- References and list of projects

The Owner will evaluate and verify the accuracy of the submittal. If the Owner determines that the qualifying criteria have not been met, the Contractor's proposed Bridge Manufacturer shall be rejected. Bridge Manufacturers other than those listed above may only be used if the Owner provides written approval of the proposed Bridge Manufacturer 5 days prior to the bid. The Owner's ruling shall be final.

4. Product Description

A. Plans and Calculations Certification

The Bridge Manufacturer shall design the prefabricated bridges and prepare shop drawings in accordance with these minimum requirements. All calculations and shop drawings shall be sealed by a Professional Engineer licensed in the State of ***(FILL IN THE STATE).***

B. Applicable Codes and Design

Design shall be governed by the LRFD design specifications of the American Association of State Highway and Transportation Officials (AASHTO), supplemented with the American Institute of Steel Construction (AISC) Steel Construction Manual, further supplemented with the American Welding Society (AWS) D1.1 Structural Welding Code, as modified and further supplemented herein. Structural members shall be designed in accordance with recognized engineering practices and principles.

Welded tubular truss connections shall meet the provisions of AISC Chapter K2: HSS-to-HSS Truss Connections.

If non-tubular floor beams are used, the floor beam to vertical connections shall be analyzed by treating the floor beam flanges as a pair of transverse plates and ignoring the floor beam web. The connections shall meet the applicable provisions of AISC Chapter K1: Concentrated Forces on HSS.

All welded tubular moment connections shall meet the provisions of AISC Chapter K3: HSS-to-HSS Moment Connections.

Unique connection types that are not directly addressed by the governing codes, such as unreinforced connections to the side of a beam web, shall be proven by finite element analysis or other rational design methods.

C. Truss Style

*(**Note:** See "Example Truss Styles", appended. It is not necessary to include a visual depiction of the truss style, the following language establishes a full description. If more specific architectural requirements exist, they must be specified. Some styles may be more expensive than others. A parallel chord bridge with Vierendeel style webs is relatively more expensive and span lengths are more limited.)*

The truss type shall be ***(CHOOSE ONE):***
as determined by the Bridge Manufacturer;
parallel chord with vertical ends;
parallel chord with sloped ends;
bow truss (bowstring truss, truss arch);
bowstring arch (tied arch, with vertical hangers only);
lenticular;
other

with a web member style ***(CHOOSE ONE):***
of Pratt; of Howe; of Vierendeel;
of Warren, (with verticals / without verticals / with or without verticals);
of crossed diagonals, (with verticals / without verticals / with or without verticals);
as determined by the Bridge Manufacturer;
as depicted in the Plans.

Pratt or Howe style trusses with an odd number of bays shall have crossed diagonals in the middle bay. Any crossed diagonals shall be of equal dimension. Unless specified otherwise, multiple spans or bridges within a project shall have a consistent style, multi-span bridges shall maintain a constant depth, and any bridge depiction shown in the Plans is conceptual only.

Overhead (portal) bracing is ***(CHOOSE ONE): prohibited; required; allowed.***
*(**Note:** Overhead bracing will add to the cost of short spans, may save on long spans, and will be required for bridges nearing the max span length. If overhead bracing is required or allowed, minimum vertical clearance as measured from the top of bridge deck to bottom of overhead bracing must be specified, considering the bridge usage. The AASHTO Guide For the Development of Bicycle Facilities notes a minimum of 8'-4". Generally 10'-0" can be readily achieved, with some additional expense. Further additional height will add considerable cost.)*

D. Span Lengths(s)

Span length(s) = __ ***(FILL IN SPAN LENGTH(S) AND CHOOSE ONE):***
measured as the horizontal clearance between abutment backwalls;
measured out-to-out of bridge superstructure, and abutment locations will later be positioned to accommodate the Bridge Manufacturer specific bearing details;
Span length(s) will be determined by the Bridge Manufacturer such that grades, clearance envelopes, and sides slopes detailed in the Plans and described hereinafter, and allowable number and location of substructures specified hereinafter, are maintained

*(**Note:** Option 1 should be used when abutments are fully designed in advance and their position cannot be slightly adjusted. Typical trail bridges are available up to 200 to 250 feet depending on deck type and width; costs begin to climb substantially for spans above these limits and should only be considered for landmark class bridges or when piers are essentially impossible; true arch and bowstring arch bridges are available at considerably longer spans. For vehicular bridges, preliminary designs are recommended when deck area exceeds 2500 ft^2. Skew angles are virtually unlimited, however it is generally less expensive to increase the bridge length such that ends are square. Limited horizontal curvature is possible, but preliminary designs are required.)*

E. Camber

The bridge shall be cambered to offset the calculated dead load deflection ***(CHOOSE ONE):***
plus ___% of the bridge length;
and exactly match the profile specified in the Plans;
other.
Multiple span bridges shall follow a smooth continuous profile after dead load deflection, and when a percentage camber is specified, the camber is computed as a percentage of the total bridge length and applied at the midpoint of the entire bridge. Unless indicated otherwise in the Plans, both abutments will be constructed at equal elevations.

*(**Note:** 1% is generally recommended as a minimum for parallel chord bridges unless a flatter profile grade must be followed. With arches, covered bridges, and where a nearly flat appearance is otherwise desired, 0.2% is recommended. When a bridge is part of an accessible route per ADA, consider that 1.25% camber translates to a 5% instantaneous slope at bridge ends. The Owner is generally responsible to make sure ADA requirements are met. Also consult the AASHTO Guide For the Development of Bicycle Facilities when applicable; this manual states grades greater than 5% are undesirable, and when necessary should be restricted to short sections.)*

F. Deck Width

Bridge clear deck width = _____ as measured between railing elements other than handrails. ***(FILL IN DECK WIDTH)***

*(**Note:** Without further analysis of lateral stiffness, deck widths should generally not be less than:*
span length / 22 -- no overhead bracing
span length / 30 -- with overhead bracing
At least 10 feet is recommended for passage of trucks or emergency vehicles when applicable. Deck width can be anything, but is most economical as a whole even number for transverse plank type decks. Deck widths of 14 ft or more may require delivery with the bridge spliced longitudinally and transverse deck plank shipped loose.)

G. Geometry Limitations

Abutment backwall height = _____
Abutment bridge seat width = _____
Abutment length = _____
Pier width = _____
Pier length = _____
Top of deck elevation (at abutment) = _____
Low steel elevation (floor beam or chord) = _____
Station at midpoint of bridge = _____

Dimensions shall be ***(DELETE WHEN UNNECESSARY OR REDUNDANT. FILL IN THE DIMENSIONS WHEN KNOWN, AND CHOOSE ONE):***

plus or minus _____ ;
exact;
maximum;
minimum;
as determined by the Bridge Manufacturer

*(**Note:** This information could instead appear in the Plans. It is recommended the backwall height be roughly 20" min to 30" max for spans 70 ft or less, and roughly 32" min to 96" max for 200 ft+ spans, interpolate. Use the minimum value for arch type bridges. Use roughly 20" for bridges of any span with overhead bracing. Structure depth (top of deck to low steel) is roughly equal to backwall height minus 4" to 6". Further fine-tuning is possible at the preliminary stage, call to discuss. Additional height adds economy which must be balanced with abutment cost and under-clearance requirements, also consider that a higher backwall will translate to a shorter span for a given profile grade. It is recommended that the abutment bridge seat width be no less than 16" for all bridges, 18" for 150 ft + spans, and 20" for 200 ft + spans. Double the above number for pier width. Abutment and pier length should generally be at least equal to clear bridge width plus 24" for spans 50 feet or less, and clear width plus 50" for 200 ft+ spans, interpolate.)*

H. Superstructure Loading

In addition to dead loads as specified by AASHTO, the bridge shall be designed to accommodate the following loads:

Pedestrian Live Load = 90 psf with no reductions.
Point Load = 1000 lbs plus 33% impact, applied at a single point.
Vehicle Load = ***(CHOOSE ONE): none; AASHTO H__ vehicle; other***.
Lateral Wind Load = 35 psf on the full height of the bridge as if enclosed.
Uplift Wind Load = 20 psf applied at the windward quarter point of the bridge width.

For occasional slow moving maintenance or emergency vehicles, impact is not required. Impact is required for trucks when structures are serving as vehicular bridges and exceed 12’ in width.

As per AASHTO, bridge structural members that support or serve as railing members, shall be designed for the simultaneous application of rail load plus dead load plus live load.

*(**Note:** For trail and foot bridges, when a specific agency designated vehicle does not exist, it is recommended that the H5 (5 ton) vehicle be designated for bridges 8 ft or more in width unless access is physically prevented. Other AASHTO vehicles can be specified if required. The H# corresponds to the total vehicle weight in tons. Bridges designated to serve legal highway loads as previously specified shall be designed for no less than the AASHTO specified truck, tandem, and lane loads (HS20). When consideration of snow load is required, specify the load and whether or not the snow load must be considered simultaneously with any other transient loads. When the bridge superstructure (or piers when applicable) will be at all submerged during a 100 year flood event, all pertinent hydraulic information will be required if the Bridge Manufacturer is to design for this situation. Of particular concern are water surface elevation, velocity, and debris or ice potential. Stream flow acting against a debris pile is the most likely cause of a superstructure washing out (not considering substructure failures). The Project Engineer or another familiar with the site must specify the dimensions of a design debris pile, any increase in water surface elevation due to debris, and thickness and strength of ice at breakup when applicable.)*

I. Vibration

When pedestrian usage is specified, the following shall apply: ***(CHOOSE ONE):***

the frequency of the first harmonic for the unloaded bridge shall be no less than 3.0 Hz except when the weight of the structure with no live load exceeds 180 x exp(-0.35xFreq). The peak acceleration of the deck systems shall be limited to 5% gravity. Peak acceleration shall be computed based on a constant force of 92 pounds, and a damping ratio of 0.01. Peak acceleration in deck systems shall be computed with consideration of the combined effect of longitudinal components and floor beams;

other.

*(**Note:** The above criteria is consistent with the current AASHTO provisions which are generally considered adequate for lightly used trail bridges. Other criteria exist that will provide more stringent limits on vibrations. These criteria include AISC recommendations for outdoor foot bridges, indoor foot bridges (such as within shopping malls), and for offices and residences. Specifying stricter vibration limits may raise the cost of the bridge. Consult your Wheeler salesperson to discuss what vibration limits are applicable for the bridge in question, and the cost implications of such a specification.)*

J. Deflection

Wind deflections of the truss, as measured at deck level, shall be limited to L/500. Deflections in planks due to point or truck load shall be limited to L/300 or 0.1". Impact shall be included in deflection checks as applicable.

Deflection of the truss due to uniform live load shall be limited to L/500. The load may be reduced based on loaded area for the purpose of calculating truss deflection only to no less than 65 psf. Deflections in longitudinal deck members due to uniform live load shall be limited to L/500.

No other service deflection limits need be considered.

*(**Note:** Deflection and vibration limits are always Owner defined and may be changed (or deleted) at the Owner's discretion, call to discuss the effect on cost. For vehicular bridges, the traditional AASHTO deflection criteria may be imposed at the Owner's discretion and then must be clearly specified as to how and where the limit is applied. AASHTO no longer encourages use of those deflection limits. When trucks and pedestrians may be on a bridge at the same time, such as with cantilevered sidewalks, special consideration is required.)*

K. Truss Material

All members of the truss and deck system shall be fabricated from square/rectangular hollow structural sections (HSS), with the exception that floor beams may be wide flange (W) shapes. Open ends of end posts and floor beams shall be capped. Open shaped (non-tubular) stringers will be allowed only if adequate lateral or torsional bracing is provided. The timber deck and its attachments shall not be considered to brace the stringers.

Steel material shall be corrosion resistant high-strength low-alloy material meeting ASTM A242, A588, A606, or A847 with a minimum corrosion index of 5.8 per ASTM G101.

Minimum thickness of tubular steel members shall be ***(CHOOSE ONE): 3/16"; 1/4"; other.*** Minimum thickness for other rolled sections shall be 5/16", except the web thickness of rolled beams or channel shall not be less than ¼" as per AASHTO. Railing members are not subject to minimum thickness requirements.
*(**Note:** The required minimum steel thickness is somewhat controversial. 3/16" is considered adequate by many, and results in lesser expense. Based on ASTM G 101, the corrosion loss for boldly exposed weathering steel in a rural environment is predicted to be roughly 0.012" in 50 years. Traditionally, section loss generally has not been considered in design; if the Owner requires any amount of loss to be considered, it must be specified; this should be considered for bridges expected to have a very long service life.)*

Where water collection inside of structural tubing is possible during construction or service, weep holes shall be provided at low points.

L. Steel Finish

*(**Note:** Unpainted square/rectangular tubing is most economical. Weathering steel is specified for painted bridges because of added protection and negligible cost difference (some savings could be realized for large bridges). Painting is recommended when deicing salts or other corrosive chemicals can in any way contact the bridge -- also consider treated timber bridges with galvanized hardware for this circumstance.)*

All steel shall be ***(CHOOSE ONE):***

unpainted and self-weathering. All exposed surfaces, defined as those surfaces seen from the deck and from along side the structure, shall be blast cleaned in accordance with Steel Structures Painting Council Surface Preparation Specifications No. 7, latest edition, (SSPC-SP7) Brush Off Blast Cleaning.

painted. The paint system shall be a three coat system suitable for the intended use as recommended by the paint manufacturer and approved by the Owner. Application shall be in accordance with the recommendations of the paint manufacturer. Applicator shall be certified by the paint manufacturer for the approved paint system. Color of the finish coat shall be determined by the Owner. All painted surfaces shall be blast cleaned in accordance with Steel Structures Painting Council Surface Preparation Specifications No. 7, latest edition, (SSPC-SP10) Near White Blast Cleaning. Painted bridges shall be configured such that all surfaces and connections are either fully sealed or allow access for adequate paint coverage. Sealing shall be accomplished by welding except that long continuous seams may be sealed with caulk prior to painting. All surfaces shall be painted, with the exception of expansion joint cover plates, teflon surfaces, bolted connections, and faying surfaces. Touch up paint shall be provided to paint outer surfaces of bolted splices and areas of damaged paint.

M. Field Splice

Field splices shall be fully bolted slip critical connections, utilizing tension indicating washers. Tack welding of high strength hardware is prohibited.

Splices not immediately at or adjacent to panel points shall be designed for 100% of the member bending moment capacity for primary compression members, and 75% for bracing members or tension members subject to load reversal, including slip resistance, and slip resistance shall further meet the same AASHTO required strength as with other failure modes.

Splices for truss members, bracing, and floor beams, when used, shall be made with ASTM A325 or A490 high strength bolts. Type 3 bolts shall be used when the truss is required to be of weathering steel. Other splices shall be made with the above mentioned material or ASTM A307.

N. Railings

The minimum rail height shall be ***(CHOOSE ONE):***
42";
54";
other. Anticipated future wear courses, when mentioned, shall be considered.
*(**Note:** The current AASHTO height requirements are 42" minimum for both pedestrian and bicycle railings. Some states require a minimum of a 54" high rail for bridges with bicycle traffic. For bridges expecting equestrian usage, a taller railing may be considered. However, there is little guidance available on the height for equestrian rails, and the rail height should be owner-specified.)*

The safety system shall be ***(CHOOSE ONE):***
horizontal safety rails;
vertical pickets; other
and shall prevent a sphere with a diameter ***(CHOOSE ONE):***
of 4";
per AASHTO;
other
from passing through. Safety systems shall be placed on the inside of the truss and shall be designed to carry a horizontal or vertical 200 lb point load each.
*(**Note:** Horizontal rails are the least expensive safety system. The AASHTO spacing requirement is 6" sphere up to 27", and 8" above 27". Some agencies have adopted a policy of 4" up to 27" and 6" above. Safety rails are generally more attractive when attached to the inside of the truss and help to avoid pinch points between truss and deck elements. When necessary, rails can be set back any required distance from the face of toe or rub rails - must specify, but generally not considered necessary. Steel tubes may be specified as the required safety rail type for improved appearance, at some additional cost. Chain link and vinyl coated chain link fencing is also available. Specify height, material, and the need for overhead vs. sides only. Should allow fencing at either inside or outside of truss.)*

Bridges designated for use by pedestrians, bicycles, or snowmobiles shall be equipped with 4" minimum steel toe rails, located no more than 2" clear above the bridge deck. Toe rails shall be designed per AASHTO as horizontal rails.

Rub rails shall be ***(CHOOSE ONE):***
steel;
Ipe wood;
other;
are not required.
The rub rail shall be ___ inch minimum nominal height, centered at ___ inches plus or minus 2" above the initial and future deck surface. Rub rails shall be designed per AASHTO as horizontal rails. ***(Fill in rail size and location)***
*(**Note:** Delete if not required. According to AASHTO, the need for rub rails is considered controversial among bicyclists, and when deemed necessary, the rail location and size should cover a wide range of handlebar heights. Steel is the most economical and durable. When wood is desired, Ipe wood is the preferred material. Use of handrails and rub rails together is not recommended.)*

Handrails shall be ***(CHOOSE ALL THAT WILL BE ALLOWED):***
painted steel;
galvanized steel;
aluminum;
other;
are not required.
Actual outside diameter shall be 1-1/4" minimum, 2" maximum. The top of the handrail shall be 36" plus or minus 2" above the initial and future deck surface. The handrail shall have a minimum 1-1/2" knuckle space, shall not rotate within fittings. Handrails shall be designed per AASHTO as horizontal rails.
*(**Note:** Delete if not required. Per ADA, any part of an accessible route with a slope greater than 5% is considered a ramp, and handrails are then required, otherwise handrails are generally not required. Use of handrails and rub rails together is not recommended.)*

When the ends of the truss are not vertical, railings ***(CHOOSE ONE): shall; need not*** extend full height to the end of the bridge.
*(**Note:** Delete if not required.)*

Bridges designated as vehicular bridges shall be equipped with traffic rails conforming to AASHTO Test Level 1 (TL-1).
*(**Note:** Delete if not required.)*

When the bottom of the top chord is higher than 54" and there is no rub rail or hand rail, a rail designed per AASHTO as a horizontal rail shall be provided no higher than 54".

All rails shall be of a smooth, continuous nature that prevents snagging and scraping.

O. Decking

*(**Note:** Of the mentioned choices, treated timber planks is least expensive. Lightweight concrete is discouraged for lesser durability and abrasion resistance as compared to normal weight concrete. Panel-lam decks can be used with an asphalt wear course as an economical and faster alternate to concrete decks. Plastic composite decking is structurally inadequate for bridges requiring wheel loads, but may be considered as a wear course. Ipe wood is preferred for Owner's requesting a premium surface. Galvanized steel grating, extruded T-bar aluminum grating, FRP grating and FRP panels are available. Please call to review applications and specifications. Please choose the allowed type and delete the remaining.)*

The bridge deck shall be ***(CHOOSE ONE):***

transverse treated timber planks. Planks shall be nominal 3" (minimum). The species and grade are to be determined by the designer. Decking shall be treated in accordance with American Wood Preservers Association (AWPA) UC3B & U1. Planks shall be placed tight together with no gaps. To resist warping forces, deck tie-down systems shall be designed to resist an uplift force of 500 lbs per plank per tie-down location, assuming wet service conditions. Deck tie-downs shall be provided at plank ends and intermediate points as required such that tie-down spacing does not exceed 48". Edge tie-downs shall be made with a continuous steel angle member above the planks. A wear course ***(CHOOSE ONE):***

of 2" (treated/untreated) S4S Southern Pine No. 2 timber planking placed at __ degrees, shall be included. Plank lengths shall be sufficient to span the entire width of the bridge as one piece at the specified angle;
will be installed at a later time by others;
is not anticipated now or in the future;
other.

*(**Note:** A sacrificial wear course is recommended when used by snowmobiles with studded tracks, equestrian traffic, or other abusive conditions exist. Longitudinal orientation of a wear course should generally be avoided when used by bicycles or rollerbladers. With a longitudinal orientation, tires can snag between the planks, and the plank ends have the potential to lift and create an uneven surface. Specifying the wear course at an angle (typically 30-45 degrees) and that planks are long enough to span the width as one piece helps to address these issues.)*

transverse Ipe wood planks. Ipe wood (Tabebuia spp.-lapacho group) shall be nominal 2" (minimum), all heartwood (no sapwood), clear (no knots), straight grained, with no worm holes, shall be surfaced four sides and eased four edges, and be air dried to no more than 20% moisture content prior to installation. Planks shall be placed tight together with no gaps. To resist warping forces, deck tie-down systems shall be designed to resist an uplift force of 500 lbs per plank per tie-down location, assuming wet service conditions. Deck tie-downs shall be provided at plank ends and intermediate points as required such that tie-down spacing does not exceed actual plank thickness multiplied by 50. Edge tie-downs shall be made with a continuous steel angle member above the planks. Material shall be untreated.

dowel-laminated panel-lam. Panel-lams shall be nominal 4" (minimum) Coastal Region Douglas Fir. Panels shall be treated in accordance with American Wood Preservers Association

(AWPA) UC4B & U1. Preservative shall be Copper Naphthenate in AWPA P9 Type A Hydrocarbon Solvent. Unless otherwise directed by the Owner the material shall be graded prior to treatment. Material shall be accepted after treatment on the basis of its condition prior to treatment, on the basis of inspection of the treatment procedure substantiated by plant records, on the condition of the material after treatment and on absorption, penetration and visual inspection. So far as practicable all adzing, boring, chamfering, framing, gaining, mortising, surfacing and general framing, etc., shall be done prior to treatment. If cut after treatment, coat cut surfaces according to AWPA M4. All Douglas Fir and other species that are difficult to penetrate shall be incised prior to treatment. Panel-lams shall be shop fabricated with ring-shank dowels in a press capable of simultaneously driving all the dowels with equal force. Panels shall be interconnected with shiplap joints. Panels placed longitudinally shall be continuous over as many floor beams as is practical. A wear course ***(CHOOSE ONE):***

of 2" (treated/untreated) S4S Southern Pine No. 2 timber planking placed at __ degrees, shall be included. Plank lengths shall be sufficient to span the entire width of the bridge as one piece at the specified angle;

of 2" asphalt shall be included;

will be installed at a later time by others;

is not anticipated now or in the future;

other.

When there will be an asphalt wear course, the deck shall have edge strips to contain the wear course.

*(**Note:** A sacrificial wear course is recommended when used by snowmobiles with studded tracks, equestrian traffic, or other abusive conditions exist. Longitudinal orientation of a wear course should generally be avoided when used by bicycles or rollerbladers. With a longitudinal orientation, tires can snag between the planks, and the plank ends have the potential to lift and create an uneven surface. Specifying the wear course at an angle (typically 30-45 degrees) and that planks are long enough to span the width as one piece helps to address these issues. Asphalt wear surface provides improved riding conditions for bicycles and in-line skaters.)*

normal weight reinforced concrete. The Bridge Manufacturer shall provide 20 gage (minimum) stay-in-place galvanized metal decking with steel side and end dams. Concrete decks shall be rough broomed transversely. Metal decking shall be secured with fasteners or welds as recommended by the decking manufacturer. Upper and lower layers of longitudinal reinforcement are required. One layer of transverse reinforcement shall be provided when the deck thickness above ribs is less than six inches, and two layers when six inches or greater. Reinforcing bars shall be placed 2" min clear to top surface, and 1" min clear to all other surfaces or forms. Consideration of composite action from the metal form is prohibited. Concrete and reinforcement in troughs may be considered as contributing the strength of the deck when it can be shown this assumption is valid. Metal forms shall be designed for a construction live load of either 20 psf or a 200 lb point load. Dead load deflection due to wet concrete shall be limited to L/180 and 3/4". Bridge slab concrete shall be 4000 psi normal weight concrete. Aspects of concrete work, including but not limited to material properties, mix designs, plant and field quality control, and rebar placement including support and tying, shall be governed by AASHTO unless specified otherwise. Reinforcing bars, when used, shall conform to AASHTO M31, M42, or M53, grade 60.

Concrete and asphalt surfaces shall be constructed with a cross-slope of 1% unless camber is at least 1% or longitudinal grade is at least 1%.

(***Note:*** *Delete if concrete or asphalt deck types are not allowed.*)

P. Welding

Welding and weld qualification tests shall conform to the provisions of AWS D1.1. The flux core arc welding (FCAW) process, utilizing E80 electrodes with similar weathering characteristics as the base material, shall be used. Welding operators shall be properly accredited experienced operators. Each shall have certification of satisfactorily passing AWS standard qualification test(s) for the 3G and/or 4F position(s), evidence of experience and skill in welding structural steel, and have demonstrated the ability to make acceptable welds of the type required.

Nondestructive weld testing is required. Testing will be performed by a qualified ASNT Level II Technician or greater and paid for by the Bridge Manufacturer. All welds are to be 100% visually inspected. Ten percent (10%) of all fillet and partial penetration welds shall be magnetic particle tested. For arch type bridges, 100% of end of top chord to bottom chord connections shall be tested. Full penetration shop welds shall be Ultrasonic tested in accordance with AWS D1.1; Section 6. Base material certifications are to be supplied by the material suppliers. Inspection test results shall be available on request.

Q. Other Requirements

Cover plates shall be provided to cover expansion gaps when pedestrian usage is specified. Cover plates shall fit tight to the top of the abutment backwall without any bridge weight bearing on the backwall. Consider joint size and weight of vehicles regarding plate thickness.

Anchors shall be of the drilled type, installed with a chemical adhesive system, except that when design forces exceed the strength of typical chemical systems, cast-in-place anchors may be used. Anchor systems shall be designed and supplied by the Bridge Manufacturer. Anchor bolts shall conform to ASTM A307, A193, or F1554.

All hardware (other than type 3 high strength) shall be hot-dip galvanized in accordance with ASTM A153.

Expansion bearings shall include teflon or stainless steel sliding surfaces per AASHTO or elastomeric pads. Consideration of dead load rotation is required in all cases.

Design the bridge for expansion and contraction with a temperature range of -40º F to 110º F.

Cementitious non-shrink grout, when applicable, shall meet ASTM C-1107, 7000 psi minimum.

Materials not specified shall conform to applicable ASTM or AASHTO specifications.

5. Submittals

The Bridge Manufacturer shall prepare and submit shop drawings and structural calculations for approval prior to beginning fabrication. Shop drawings shall be unique drawings prepared to illustrate the specific portion of the work to be done. All relative design information including but not limited to governing codes, design parameters, member sizes, bridge reactions, shop and field connection details, deck details, paint system, dimensions related to substructures and general notes shall be clearly specified on the drawings. Shop drawings shall be accurately prepared by skilled drafters to be complete in every respect. Drawings shall have cross-referenced details and sheet numbers.

6. Delivery

The Contractor shall coordinate with the Bridge Manufacturer in the delivery and erection schedule.

Delivery to the job site will be by trucks by means of good haul roads unless specified otherwise.

The Bridge Manufacturer shall provide detailed, written instruction procedures for proper lifting and splicing of bridge components.

(Make sure that all *italics* text has been properly incorporated into the specifications or deleted. Delete all notes)

APPENDIX: EXAMPLE TRUSS STYLES

NOTE: THIS IS NOT AN EXHAUSTIVE LIST

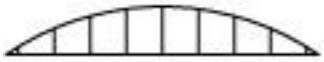
CHORD CONFIGURATION

PARALLEL CHORD WITH VERTICAL ENDS

PARALLEL CHORD WITH SLOPED ENDS

BOW TRUSS OR BOWSTRING TRUSS

TIED ARCH



MODIFIED BOW

LENTICULAR

(WEBS CAN VARY)

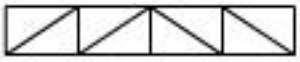
WEB CONFIGURATION

PRATT –

WARREN WITHOUT VERTICALS –

WARREN WITH VERTICALS –

HOWE –



CROSSED DIAGONALS –

VIERENDEEL –

Specify the desired attributes.

***DO NOT* INCLUDE THIS SHEET IN YOUR SPECIFICATIONS.**