Prefabricated Steel Bridges

Applications & Loadings

Prefabricated Steel Bridges are ideal for recreation and low volume vehicular bridge applications. They are used for regional hiking/biking/equestrian trails, community parks, pedestrian overpasses, snowmobile routes, golf courses, single lane residential access, etc. Typical loads may include pedestrian, equestrian and maintenance vehicles. Utility dead loads are not uncommon.

Prefabricated

Spans 20' - 250'

Widths 6' - 14'

Custom Engineered

Detailed plans are generated by our staff of engineers and drafters. Wheeler can provide sealed plans for projects nationwide.

Facilities & Qualifications

Wheeler maintains approved status as a AISC Quality Certified Simple and Major Bridge Fabricator with Fracture Critical Endorsement. Our plant certification has been reviewed and approved annually by the AISC since 1998. This certification confirms that Wheeler has "...the personnel, organization, experience, capability and commitment…" to handle these types of projects.

As a member of the American Welding Society, Wheeler employs AWS Certified Welders.

Inspectors form state and independent agencies across the country have visited our facilities and confirmed our ability to produce quality bridges.

Typical Truss Styles

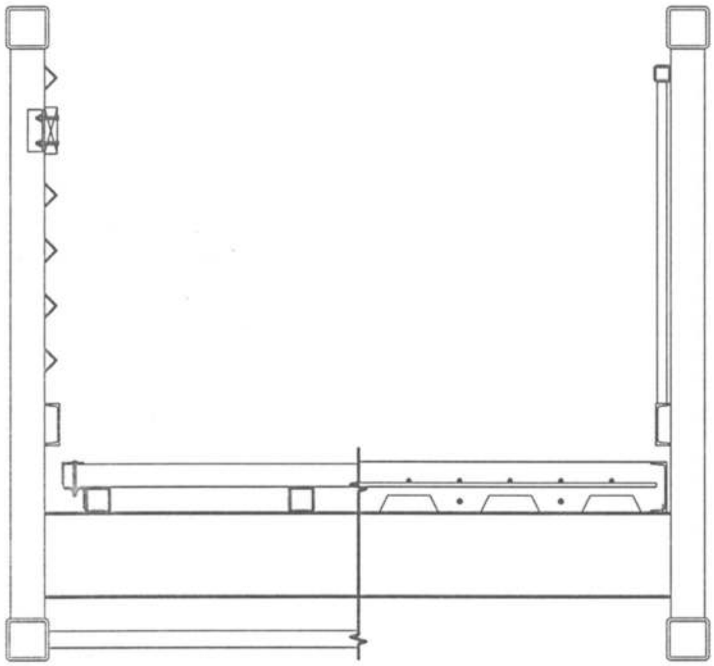
Warren

Pratt

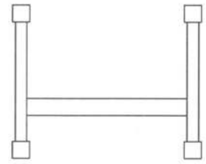
Bowstring

Additional truss styles are available. Please inquire with the specific requirements of your project.

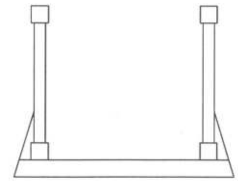
Typical Cross-Section



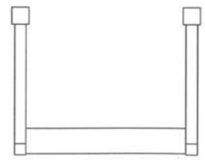
Floor Beam Configuration



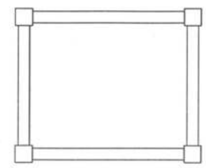
H-section



Underhung



U-section



Overhead Braced

Accessories

Please review your specific requirements with a Wheeler representative prior to requesting price estimates.

Lighting

Lighting design by others. Field installed by locally licensed electrician.

Utility Hangers

All utility design and installation by others.

Fencing

Shop or field installed.

Signs

State-of-the-art plasma table available for cutting images provided in CAD format.

Shipping

The bridges are shop manufactured and shipped to the site ready for installation.

Bridge spans less than 80 feet in length are often shipped as one piece without a field splice.

Spans between 80 and 100 feet will be reviewed to determine if they can be shipped without a splice.

Spans greater than 100 feet will be shipped in sections and require field bolted splice connections.

***Bridges are shipped via independent carrier. Delivery is made to a location nearest the site, which is easily accessible to normal over-the-road tractor/trailer equipment. Oversized loads warrant additional consideration and providing suitable access shall be the responsibility of others. All trucks delivering materials will need to be unloaded at the time of arrival.*

Installation

Prefabricated bridges install in minimal time.

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

All unloading, field erection and installation is the responsibility of others.

Wheeler

9330 James Ave S

Bloomington, MN 55431

800.328.3986

info@wheeler-con.com

www.wheeler-con.com

American Institute of Steel Construction

is proud to recognize

Wheeler

Shakopee, MN

for successfully meeting the quality certification requirements for

Major Steel Bridges

Fracture Critical Endorsement

Roger E. Ferch

2302-2012
Certificate Number

Certification valid through: **June 2013**

Wheeler

REFERENCES

PREFABRICATED STEEL RECREATION BRIDGES

State	Owner	Contact	Phone Number	Project	Year	Description
MN	Minnesota DNR	Paul Ouren	218-833-8674	Floodwood	2003	220x10
		Kim Waldoff	651-772-7989	Gateway Trail	2004	140-100-140-10
				Buffalo River	2004	80x10
				Gitchi-Gami #16521	2004	160x12
				Gitchi-Gami #38530	2005	175x12
				Sand Creek	2005	2@20x12
				Shooting Star Trail	2002	120x12
				West Bridge Roseau	2002	120x12
				Blazing Star Trail	2004	140x12
				Root River	1998	160-180-160x10
				Moose Lake	2000	115x11'6"
				Pioneer Trail	2001	200x12 & 187x10
				Dunton Locks	2001	45x13
				Casey Jones Trail	2007	63x12
				Cascade Lake	2008	80x10
				East Baptism River	2009	80x12
				Beaver River	2009	60x12
				West Baptism River	2009	100x12
				Shallow River	2009	140x12
				Sand Creek	2009	90x12
				Casey Jones Trail	2010	140x12
				Akeley	2010	160x12
				Sakatah Trail	2010	155x12
				Luce Line Trail	2011	65x12, 90x12, 75x12
				Mountain Bike Trail	2011	65x6
				Douglas Trail	2011	200x12, 140x12
				Crooked Creek	2012	80x12
				Casey Jones Trail	2012	130x12
WI	Univ. Wisconsin- Platteville	Pete Davis	(608) 342-1177	South Residence Hall Walk	2007	240'x10'
IL	Illinois DOT			Confluence Bike Trail	2000	169'x10'
				Constitution Bike Trail	2000	167'x10' & 151'x10'
				Sullivan Woods	1998	140'x12' & 110'-50'x12'
				Interurban Trail	2001	52'x10'
				Mahomet Bike Path	1999	165'x10'
				Illinois Prairie Path Extension	1998	69'x10'
				Rochelle Area Cycling Connection	1999	45'x12' & 52'x12'

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REFERENCES

PREFABRICATED STEEL RECREATION BRIDGES

State	Owner	Contact	Phone Number	Project	Year	Description
				Bike Trail over Farm Creek	2000	60'-89'-60'x10'
				York Road / Harger Road	2003	2 at 189'x13'
				Wooddale Bike Path	2003	120'x12' & 75'x12'
				American Discovery Trail	2004	84'-3 at 75'-84'-67'-75'-65'x10'
				31st Street Bike Path	2004	120'-120'x12'
				Wheaton Ped/Bike Path	2006	142'x13.5'
				Cal-Union Drainage Ditch	2008	64x8
				Cedar Creek Linear Park	2008	2 @ 80x12
				Oak Street Pedestrian Bridge	2009	100x12
				George Rogers Trail	2010	2 @ 210x11 & 237x11
				Dupage River Trail	2011	152x14
OK	City of Oklahoma City	John Rhodes	405-297-3596	Canadian River Maintenance Trail	2003	65x10, 2@80x10, 85x10 95x10, 3@100x10, 105x10 110x10, 125x10, 130x10 135X10, 185x10
				Tinker / Lake Draper	2012	193x16
				Oklahoma City Christian Center	2012	90x14
TX	Williamson County	Jim Rodgers	512-260-4284	Champion Park	2006	122x10
				Lake Creek	2007	110x10
				Bagdad Heritage Trail	2006	110x10
				Brushy Creek	2005	50, 60, 70x10
CO	City of Colorado Springs	Sue Podczervinski	719-385-5287	Sand Creek Trail	2002	120 X 10
				Sand Creek Trail - Ridgeview Crossing	2007	113 x 10
				Midland Trail	2011	2 @ 85x10
				Sand Creek Trail	2011	2 @ 90x10
				Midland Trail	2012	2 @ 55x10
				Pikes Peak	2012	80x10
CO	City of Arvada	Jeff Simmons	720-898-7391	Ralston Creek Trail	2003	45 x 10
				Lake Arbor	2006	3 @ 30X10
				Ralston Creek Trail	2006	30X10, 15x10
				Ralston Creek Trail	2001	2 @ 30x10, 45x10
				Ralston Creek Trail	2001	2 @ 50x10, 60x10
MO	City of Indepedence	Tom Garland	816-325-7089	Hill Park Bridge	2005	68 x 10
				Country Club Park Bridge	2005	40 x 10

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REFERENCES

PREFABRICATED STEEL RECREATION BRIDGES

State	Owner	Contact	Phone Number	Project	Year	Description
				Park Trail Bridges	2007	2@37 x 10 & 2@65 x 10
MO	Great Rivers Greenway District	Nancy Thompson	314-436-7009 x104	Sunset Park Trail	2005	70 x 12
				Truman Park Trail	2005	70 x 12
				Deer Creek Park	2008	114 x 10
UT	UDOT	Bethany Shingleton	801-383-3107	Jordan River	2005	142x10
				Legacy Parkway	2007	50x12, 42x12, 33x12

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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 12/22/09. 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, these 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 Lumber, LLC
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 current design specifications of the American Association of State Highway and Transportation Officials (AASHTO), supplemented with the current edition of American Institute of Steel Construction (AISC), further supplemented with the current edition of 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 = 85 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.

In addition to the load combinations specified by AASHTO, when bridge structural members support or serve as railing members, the bridge shall be designed for the simultaneous application of rail load plus dead load plus 50% of 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. 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 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 actual plank thickness multiplied by 50. 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 adazing, 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

Self-tapping and self-drilling screws are not acceptable for any portion of the structure, except where specified otherwise.

Wood members shall be attached with carriage bolts. All wood connections shall be made with locking hardware. The Owner will be responsible for tightening loose hardware after initial acceptance.

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

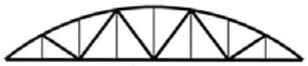
PARALLEL CHORD WITH VERTICAL ENDS

(WEBS CAN VARY)

PARALLEL CHORD WITH SLOPED ENDS

(WEBS CAN VARY)

BOW TRUSS (TRUSS ARCH)

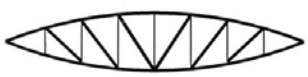


(WEBS CAN VARY)

BOW STRING (TIED ARCH)

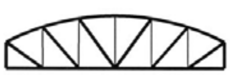
(VERTICAL HANGERS ONLY)

LENTICULAR



(WEBS CAN VARY)

OTHER UNDEFINED STYLES –



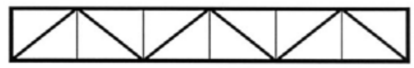
SPECIFY THE DESIRED ATTRIBUTES.
FOR THIS EXAMPLE SPECIFY: "PARALLEL CHORD WITH VERTICAL ENDS EXCEPT THAT THE TOP CHORD SHALL BE CAMBERED ____ % AND BOTTOM CHORD ____ %.

WEB CONFIGURATION

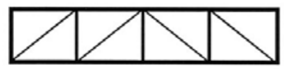
PRATT –

WARREN WITHOUT VERTICALS –

WARREN WITH VERTICALS –

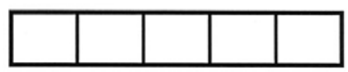


HOWE –



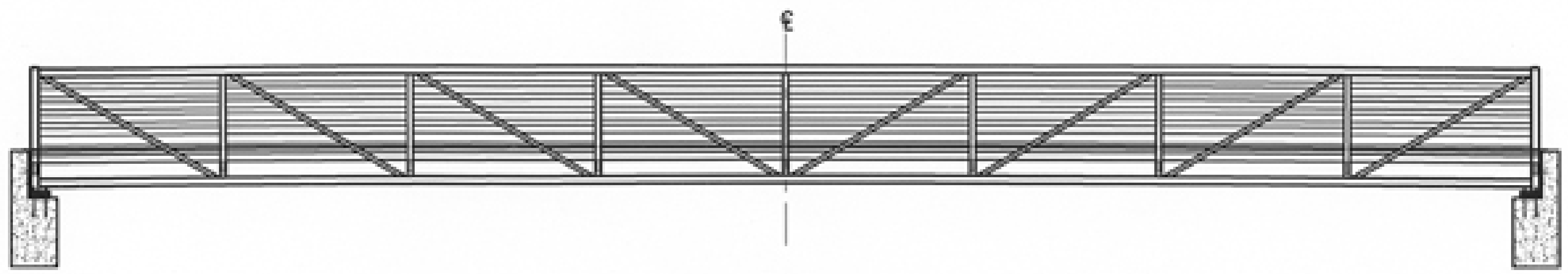
CROSSED DIAGONALS –

VIERENDEEL –

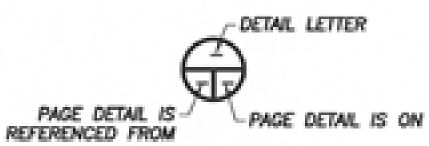


<u>DO NOT</u> INCLUDE THIS SHEET IN YOUR SPECIFICATIONS!!

BRIDGE NAME
LOCATION



ELEVATION VIEW



CALLOUT LEGEND

DESIGN DATA

1) DESIGN OF SUPERSTRUCTURE SHALL BE IN ACCORDANCE WITH AASHTO, AISC, & PROJECT SPECIFICATIONS.
2) DESIGN LOADS:

LIVE LOAD

A) A MINIMUM UNIFORM LIVE LOAD OF 85 psf APPLIED TO THE ENTIRE DECK SURFACE; OR
B) NO VEHICLE
C) 1,000 LB POINT LOAD (IN ADDITION TO THE DESIGN VEHICLE, IF ANY, BRIDGE WILL SAFELY ACCOMMODATE ANY VEHICLE WITH WHEEL LOADS LESS THAN OR EQUAL TO THE DESIGN POINT LOAD.)

WIND LOAD

A) A LATERAL WIND LOAD OF 35 psf ON THE FULL HEIGHT OF THE BRIDGE, AS IF ENCLOSED.
B) AN UPLIFT WIND LOAD OF 20 psf APPLIED AT THE WINDWARD QUARTER POINT OF THE TRANSVERSE BRIDGE WIDTH.

CONSTRUCTION & MATERIAL NOTES:

1) THE BRIDGE IS FABRICATED FROM COLD-FORMED WELDED AND SEAMLESS HIGH STRENGTH, LOW-ALLOY STRUCTURAL TUBING WITH IMPROVED ATMOSPHERIC CORROSION RESISTANCE MEETING THE REQUIREMENTS OF ASTM A847, AND PLATES AND STRUCTURAL SHAPES MEETING THE REQUIREMENTS OF ASTM A588, A606, OR A242. (FY = 50,000 PSI).
2) THE WELDING PROCESS SHALL BE THE FLUX CORE ARC WELDING PROCESS, UTILIZING E81T1-W2/W2M ELECTRODES.
3) WELDED CONNECTIONS SHALL BE AS DETAILED AND NOTED EXCEPT THAT MISCELLANEOUS MEMBERS, INCLUDING STRINGERS SUPPORTED ON TOP OF FLOOR BEAMS, RAILINGS, AND OTHER MEMBERS FOR WHICH WELDS ARE NOT SPECIFICALLY DETAILED, SHALL BE STITCH WELDED TO THE SUPPORTING MEMBER. A STITCH WELD IS DEFINED AS WELD OF APPROXIMATELY 1-1/2" TO 2" IN LENGTH, OF A SUFFICIENT NUMBER TO ADEQUATELY HOLD THE MEMBER IN PROPER POSITION.
4) TEN PERCENT OF EACH DIFFERING STRUCTURAL WELD (DIFFERING WELD TO BE DEFINED BY TYPE, SIZE, LENGTH) SHALL BE RANDOMLY TESTED (MAGNETIC PARTICLE). ALL STRUCTURAL WELDS SHALL BE VISUALLY INSPECTED AND CONFORM TO AWS D1.1.
5) SHOP SPLICES OF STRUCTURAL TUBULAR MEMBERS, WHEN NEEDED, SHALL BE FULL PENETRATION JOINTS UNLESS DETAILED OTHERWISE. JOINT DETAIL SHALL BE AS SPECIFIED IN THE APPROPRIATE WELD PROCEDURE. ALL OF THESE WELDS SHALL BE TESTED (MAGNETIC PARTICLE). SHOP SPLICE LOCATIONS SHALL BE APPROVED BY THE SEALING ENGINEER.
6) ALL EXPOSED SURFACES OF STEEL WILL BE SAND BLASTED IN ACCORDANCE WITH THE STEEL STRUCTURES PAINTING COUNCIL SURFACE PREPARATION SPECIFICATION NO. 7 BLAST CLEANING (SSPC-SP7).
7) BRIDGE TO BE FABRICATED AND DELIVERED TO THE SITE AS 1 UNIT.
8) ANY STEEL TUBING MEMBERS NOT COMPLETELY SEALED SHALL HAVE A 3/8" WEEP HOLE AT THE LOW POINTS OF THE MEMBER, OR SHALL BE OTHERWISE FREE DRAINING.
9) BRIDGE DECKING TO BE 3"x12" DOUGLAS FIR-LARCH SELECT STRUCTURAL S1S1E, ACZA TREATED. PLANKS ARE TO BE PLACED ROUGH SIDE UP.

BRIDGE CAMBER	
SHOP CAMBER	
DEAD LOAD DEFLECTION	
RESIDUAL CAMBER	

PRELIMINARY BRIDGE WEIGHT	
ESTIMATED LIFTING WEIGHT OF BRIDGE	LBS

TEMPERATURE/LENGTH CHART

TEMPERATURE	LENGTH
-40°F	
70°F	
110°F	

BRIDGE REACTIONS

COMBINE REACTIONS AS PER LOCAL OR GOVERNING BUILDING CODES AS REQUIRED — + DOWNWARD LOAD, − UPWARD LOAD

LOAD	P lbs	H lbs	L lbs
DEAD			
UNIFORM LIVE			
VEHICLE			
WIND			
WINDWARD			
LEEWARD			
THERMAL			

"P" – VERTICAL LOAD EACH BASE PLATE (4 PER BRIDGE)
"H" – HORIZONTAL LOAD EACH FOOTING (2 PER BRIDGE)
"L" – LONGITUDINAL LOAD EACH BASE PLATE (4 PER BRIDGE)

FILLET WELD CHART

THICKNESS OF THINNEST PIECE	WELD SIZE
NON STANDARD WELDS	
NONE	

WELD PROCEDURES

FILLET	PARTIAL PEN
FC-03	FC-06
FC-04	
	FULL PEN
	FC-05
	FC-09

WELD NOTES:

DO NOT SCALE DRAWINGS

INDEX

REV.	DESCRIPTION	DATE	INT.
4			
3			
2			
1			

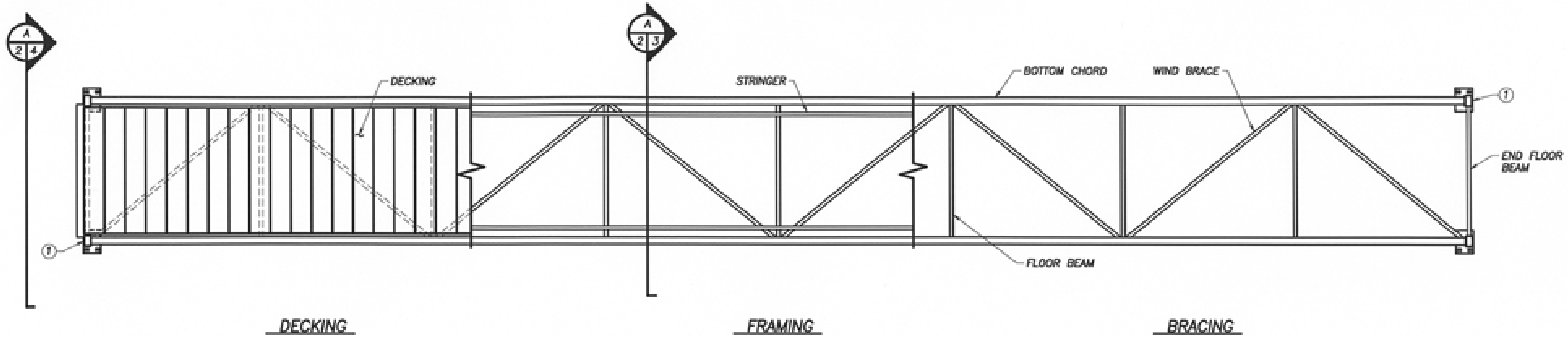
SHEET TITLE:

COVER SHEET

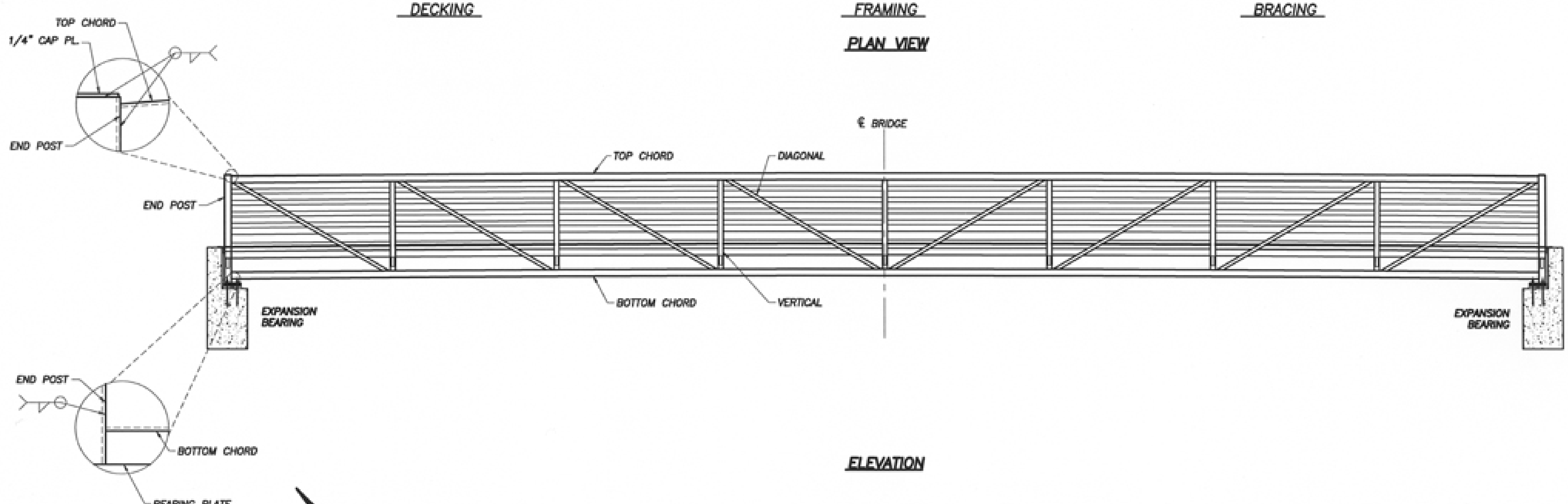
SAMPLE

Wheeler Lumber, LLC
9330 JAMES AVE. S.
BLOOMINGTON, MN 55431

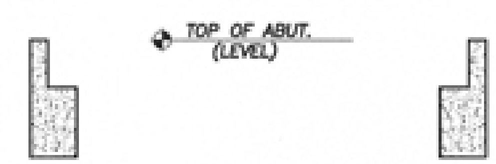
DATE:		TRACKING NO.	SHEET NO.
CHK:	DWN:	ORDER NO.	1 OF 5



PLAN VIEW



ELEVATION



SUBSTRUCTURE LAYOUT
(BY OTHERS)

KEY NOTES:

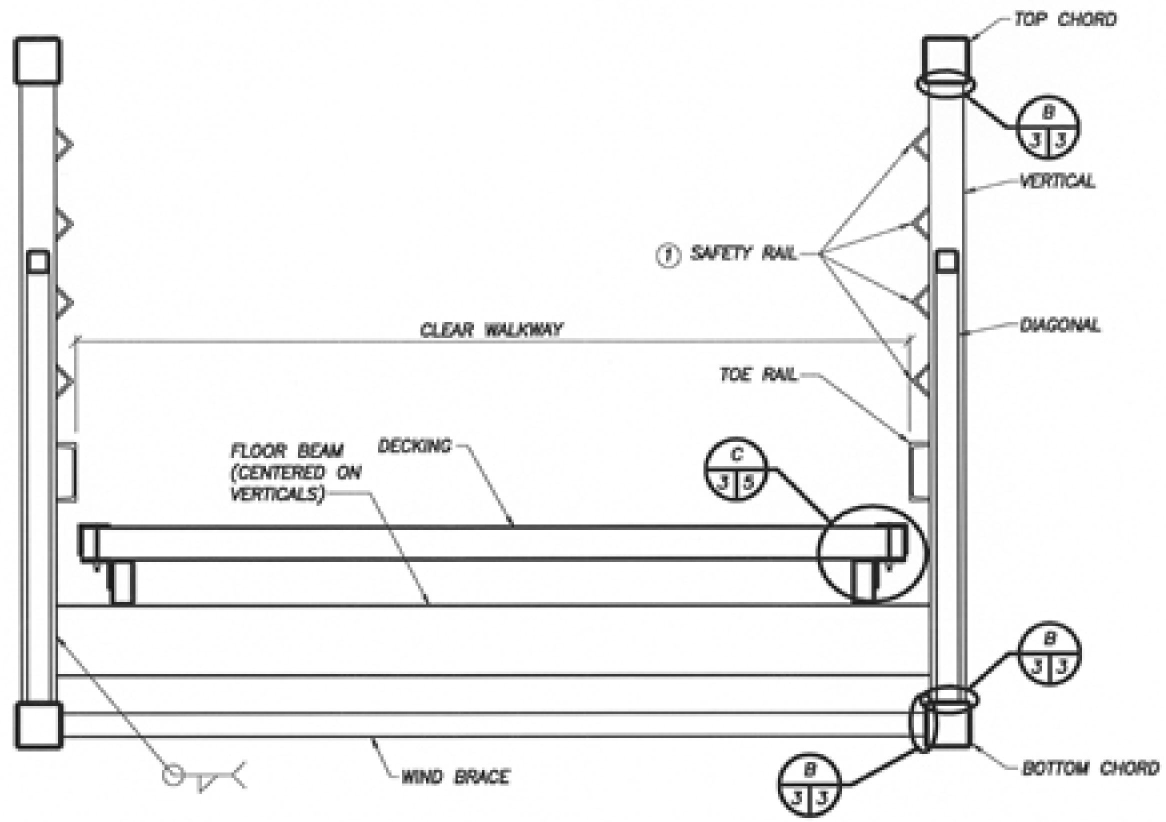
(1) BRIDGE NAME PLATE/ LOAD LIMIT PLATE EA. END. PLATE SHALL STATE, "NO VEHICLE ALLOWED" IF LOAD LIMIT PLATES ARE OBSTRUCTED, ADDITIONAL PLATES WILL BE PROVIDED UPON REQUEST TO WHEELER. THIS END POST TO RECEIVE A 3/8" WEEP HOLE.

SHEET TITLE:
GENERAL PLAN & ELEVATION

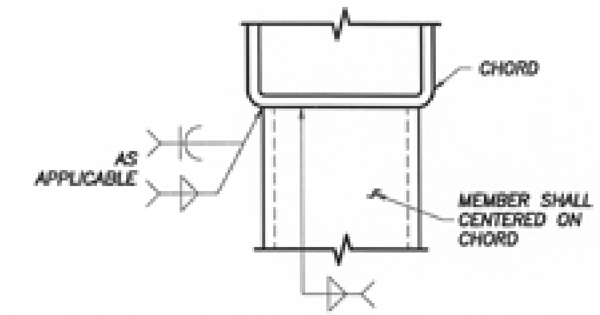
SAMPLE

Wheeler
Lumber, LLC
9330 JAMES AVE. S.
BLOOMINGTON, MN 55431

DATE:		TRACKING NO.	SHEET NO.
CHK:	DWN:	ORDER NO.	2 OF 5



A 2 3 TYPICAL SECTION VIEW

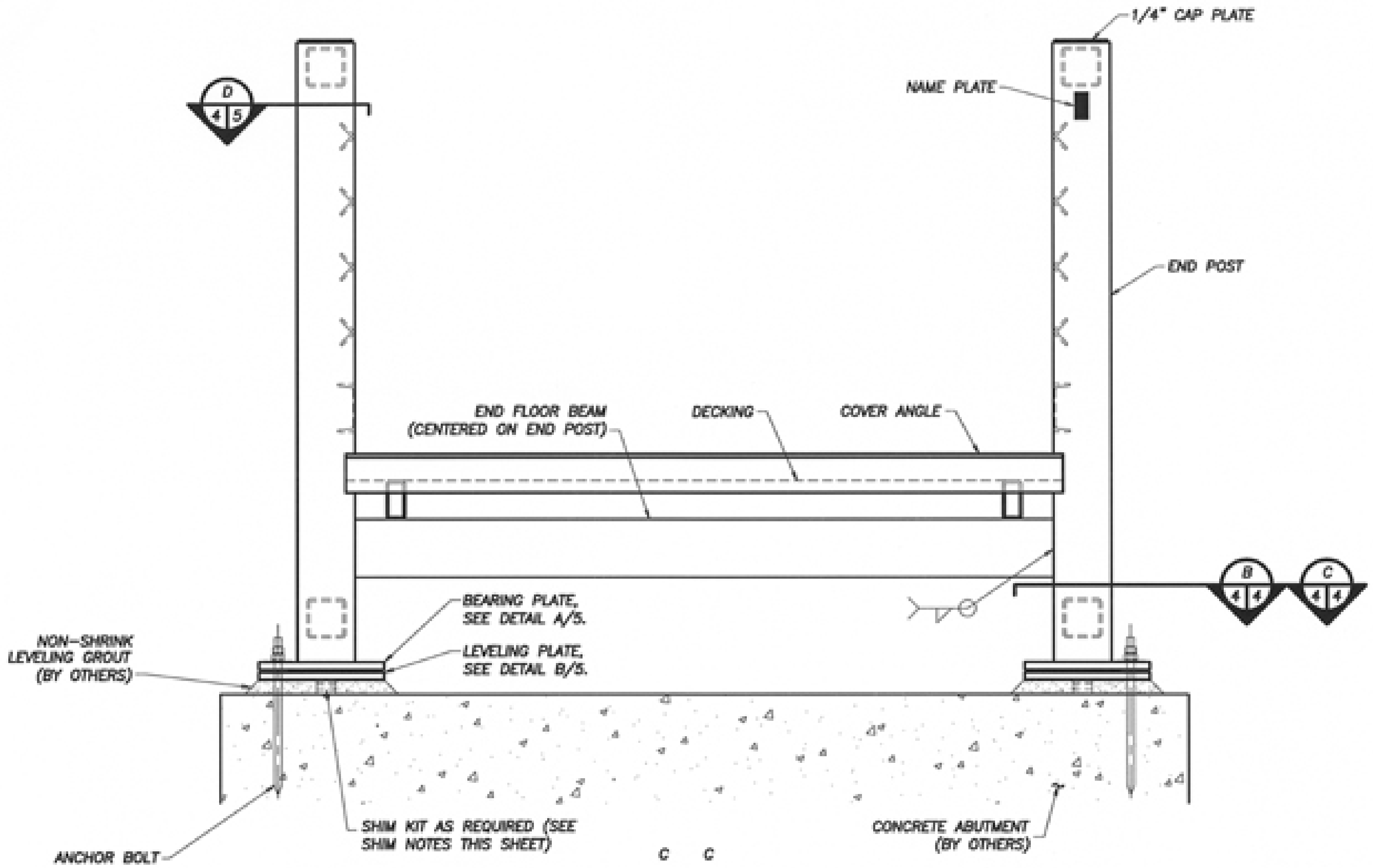


B 3 3 MEMBER ATTACH TO CHORDS DETAIL

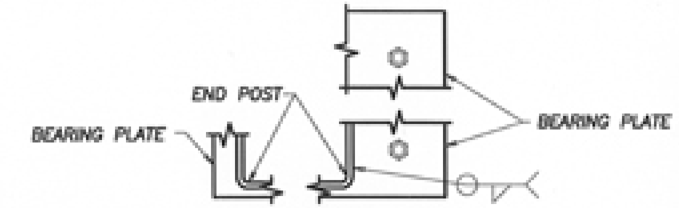
KEY NOTES:

① SAFETY RAIL TO CONTAIN A 4" SPHERE FROM PASSING THROUGH.

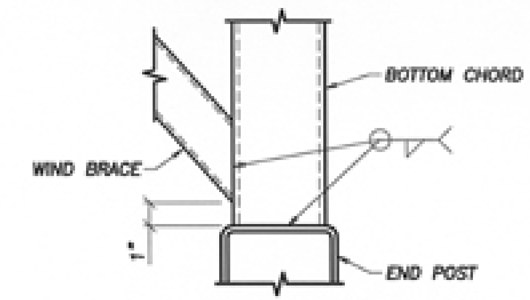
SHEET TITLE: SECTION DETAILS		
SAMPLE		
Wheeler Lumber, LLC 9330 JAMES AVE. S. BLOOMINGTON, MN 55431		
DATE:	TRACKING NO.	SHEET NO. 3 OF 5
CHK: DWN:	ORDER NO.	



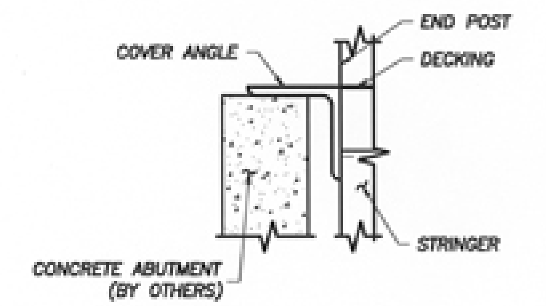
A 2 4 **END VIEW SECTION**



B 4 4 **BEARING PLAN**



C 4 4 **END POST TO BOTTOM CHORD WELD DETAIL**



ABUTMENT GAP DETAIL

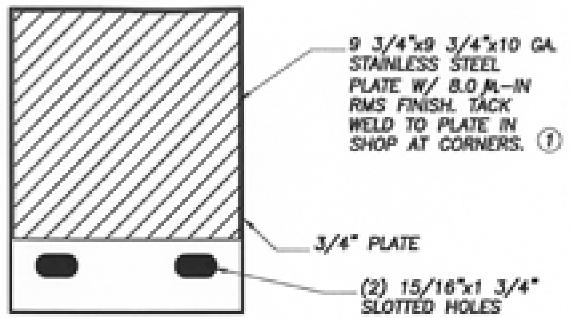
ANCHOR BOLT NOTES:
ANCHOR BOLTS SHALL HAVE AN EMBEDMENT DEPTH OF 10 INCHES. THE CHEMICAL ADHESIVE SHALL BE LIQUID ROC 300 OR EQUAL AS APPROVED BY THE SEALING ENGINEER. INSTALLATION SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

ABUTMENT REINFORCEMENT SHALL BE CAREFULLY PLACED TO AVOID ANCHOR RODS, 2" CLEARANCE REQUIRED. ANCHORS SHALL BE SURROUNDED BY AT LEAST ONE BAR ON ALL SIDES.

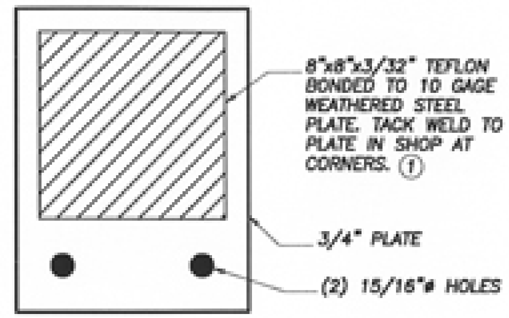
SHIM KIT NOTES:
FINAL ELEVATION ADJUSTMENT OF THE BRIDGE WILL BE MADE WITH TWO INCH BY TWO INCH SQUARE SHIMS (PROVIDED). SHIM PLATES SHALL BE CENTERED ON THE END POST. ALLOW COVER ANGLES TO JUST TOUCH THE TOP OF THE ABUTMENT BACKWALL, DO NOT ALLOW ANY BRIDGE WEIGHT TO REST ON COVER ANGLES.

WHEN THE DEAD LOAD REACTION EXCEEDS 20,000 LBS, THE SHIM KIT SHALL BE PLACED ON A 4"x4"x1/2" PL. (PROVIDED). FOR BRIDGES WITH CONCRETE DECK, THE BEARINGS SHALL NOT BE GROUTED UNTIL AFTER DECK PLACEMENT. IN ALL CASES THE CONTRACTOR SHALL ENSURE STABILITY PRIOR TO GROUTING.

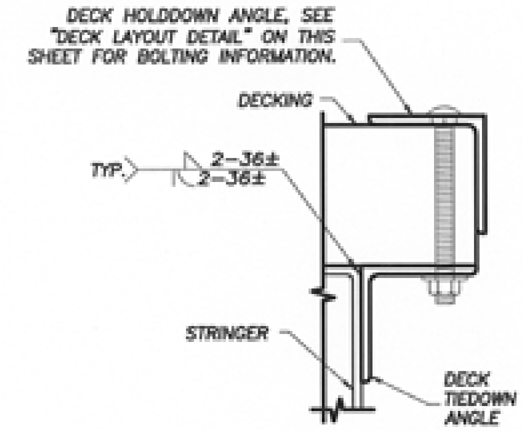
SHEET TITLE:		
END SECTION DETAILS		
SAMPLE		
Wheeler Lumber, LLC 9330 JAMES AVE. S. BLOOMINGTON, MN 55431		
DATE:	TRACKING NO.	SHEET NO.
CHK: DWN:	ORDER NO.	4 OF 5



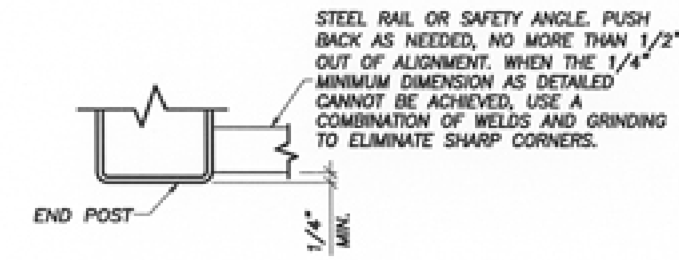
A 4|5 **BEARING PLATE**
4 THUS



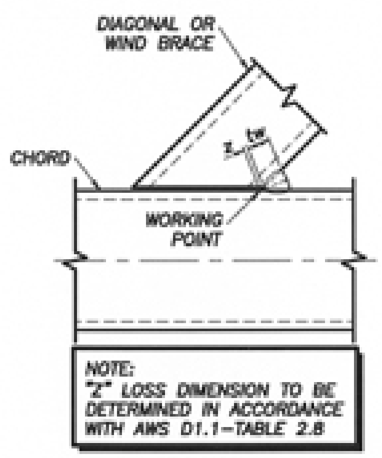
B 4|5 **LEVELING PLATE**
4 THUS



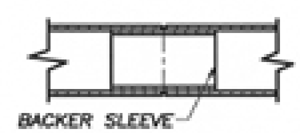
C 3|5 **SECTION AT EDGE DECK ATTACHMENT**



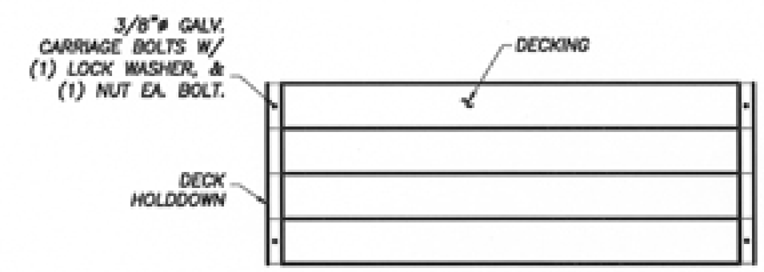
D 4|5 **STEEL RAIL TO END POST ATTACHMENT DETAIL**



TYPICAL SKEWED MEMBER STANDARD WELD DETAIL



TYPICAL SHOP SPLICE
WITH BACKER SLEEVE



DECK LAYOUT DETAIL

KEY NOTES:

(1) TEFLON AND STAINLESS TO BE COVERED UP DURING SHIPMENT AND LIFTING TO AVOID ANY DAMAGE TO EITHER PRIOR TO BRIDGE PLACEMENT.

SHEET TITLE:

MISC. DETAILS

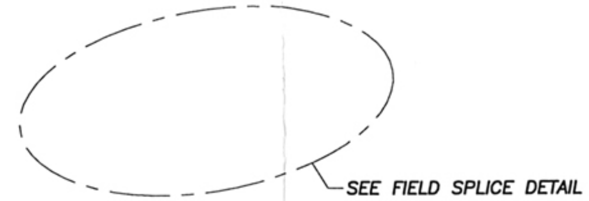
SAMPLE

Wheeler Lumber, LLC
9330 JAMES AVE. S.
BLOOMINGTON, MN 55431

DATE:		TRACKING NO.	SHEET NO.
CHK:	DWN:	ORDER NO.	5 OF 5

INSTALLATION INSTRUCTIONS

NUMBER OF SPANS, TRUSS STYLE, SAFETY RAILING, DECK TYPE, ETC. MAY VARY, SEE SEALED PLANS FOR ALL ACTUAL BRIDGE DETAILS.



NORTH SOUTH EAST WEST

SPAN/SECTION 1

START FIELD ASSEMBLY FROM THIS END, SEE Ⓐ

SPAN/SECTION 2

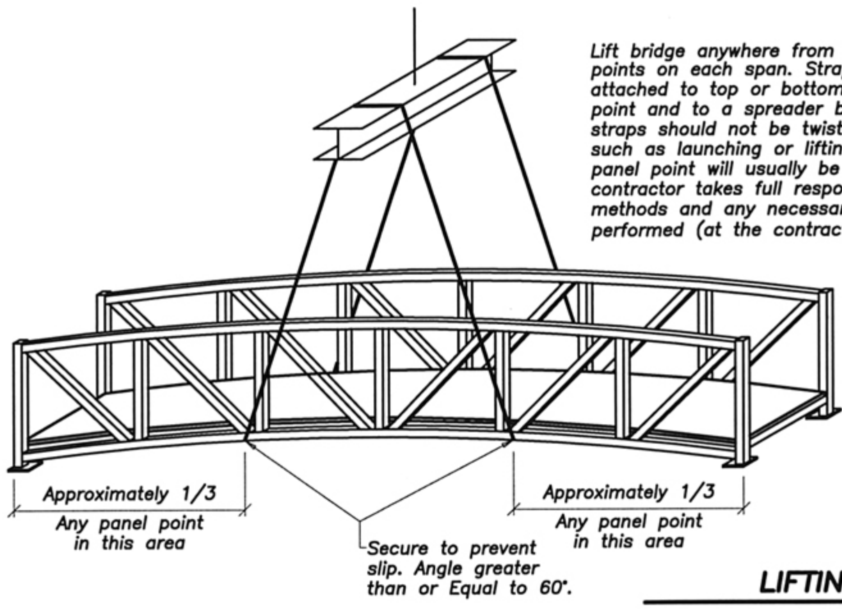
NORTH SOUTH EAST WEST

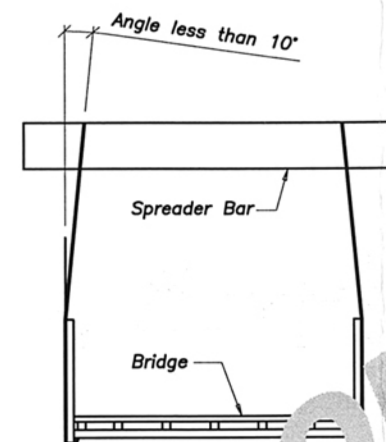
ABUTMENT OR PIER (TYP)

Ⓐ Preliminary Assumed Sequence:

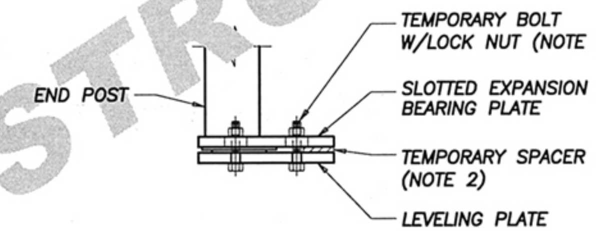
For spliced bridges, assembly of sections assumed to start from this end. Actual sequence may vary and is to be determined by the contractor. The contractor shall notify Wheeler Lumber, LLC, upon receipt of this plan, in writing, of their concurrence with, or changes to, the preliminary assumed assembly sequence and span erection sequence for multi-span bridges.

Lift bridge anywhere from end post to 1/3 points on each span. Straps are to be attached to top or bottom chord at a panel point and to a spreader bar above. The straps should not be twisted. Other methods such as launching or lifting from middle panel point will usually be allowed when the contractor takes full responsibility for their methods and any necessary analysis is performed (at the contractor's expense).



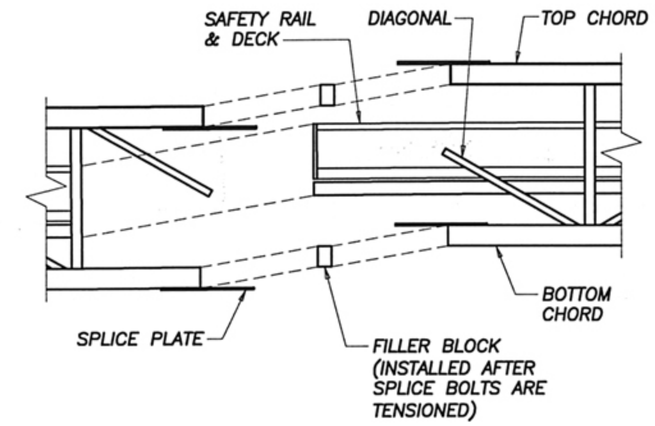


LIFTING DETAIL



BEARING DETAIL – ELEVATION

SUBSTRUCTURE NOT SHOWN FOR CLARITY



FEILD SPLICE DETAIL – ELEVATION

ALL PIECES ARE MATCH MARKED

BRIDGE INSTALLATION

1. Construct substructures with great care regarding squareness and distance between abutment backwalls and/or centerline of piers to precisely accommodate the bridge superstructure. MEASURE THESE DIMENSIONS IMMEDIATELY AFTER COMPLETION. If dimensions are incorrect, remove and replace or otherwise modify substructures as needed well before superstructure delivery to expedite installation. Also construct concrete substructures with great care regarding placement of rebars with respect to drilled anchor bolt locations, two inches clear from rebar to drilled anchor bolt is required and bars must surround anchor bolts on all sides. Re-measure rebar locations before placing concrete. For concrete or timber substructures, do not drill holes for anchor bolts until the bridge superstructure is sitting in the final position, unless indicated otherwise in the plans.

2. Upon delivery, remove temporary bolts and spacer from the sliding type bearings when applicable.

3. Install and fully tighten field splices when applicable. The contractor shall ensure that the bridge is safely supported and stabilized prior to anyone reaching inside the tube, where applicable. The bridge shall be blocked up to the correct profile before tensioning the bolts. All bolts, including filler block, shall be installed and fully tensioned while the bridge is safely supported and stabilized. Tension indicating washers (provided) will be placed in the exact locations as indicated in the plans. Bolts shall be tightened in accordance with washer manufacturer and AASHTO. A minimum one inch impact wrench operating at 150 psi is required.

4. Welding, drilling, cutting, grinding, and any other alterations performed without written permission may affect warranty coverage.

5. When substructures are not at equal elevations, make sure high and low ends are placed appropriately. When bridges have a combination of fixed and expansion bearings, be sure the expansion bearings (with slotted holes) are placed on the correct substructure, and also note that the specified joint opening is most critical at expansion substructures. When bridges have all expansion bearings, slight variations in joint openings will be equally distributed.

6. Final elevation adjustment of bridges with sliding type bearings on concrete substructures will be made with shims (provided, see plans). With elastomeric bearings or timber abutments, construct backwalls with extreme precision, or place backwall after placing the superstructure, or otherwise allow for adjustment in backwall height. In all cases, allow the cover plate or angle to just touch the top of the abutment backwall without carrying any bridge weight.

7. For any type of drilled anchor, drill holes into the substructure (through bearing plates), centered on slotted holes when applicable, after the bridge is in the final position unless indicated otherwise in the plans. Be careful regarding the depth of holes into concrete when using pre-measured adhesive capsules. Carefully clean the hole, install the bolt and adhesive, using special cold weather methods when necessary, and allow to cure, all in conformance with adhesive manufacturer's recommendations. For timber substructures, be careful regarding the depth and size of pilot holes in relation to lag bolt requirements.

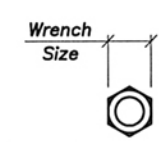
8. Inject an approved non-shrink grout between the leveling plate and concrete substructure when applicable.

9. Install nuts or lag bolts and washers as noted in plans. Upsetting of anchor bolt threads is also recommended. For timber structures, lag bolts shall be tightened to just eliminate any gap at washers and no further.

10. When applicable, touchup paint shall be field applied, after assembly, in regions of splices and in areas of damaged shop applied paint. Faying surfaces of splices shall not be painted unless indicated otherwise in the plans.

11. Some additional items may be shipped loose and require field installation, see plans.

PLEASE CALL JEFF BREZINKA AT 952-929-7854 ext.261 WITH ANY QUESTIONS FROM 7:30 AM TO 4:30 PM CST



Common Wrench Sizes:

Bolt Dia.	Bolt Head	Nut Size
3/4"	1-1/4"	1-1/4"
1"	1-5/8"	1-5/8"
1 1/4"	2"	2"

REV.	DESCRIPTION	DATE	INT.
1			
2			
3			
4			

SHEET TITLE: INSTALLATION INSTRUCTIONS

Wheeler Lumber, LLC
9330 JAMES AVE. S.
BLOOMINGTON, MN 55431

DATE: 2/18/04		TRACKING NO.	SHEET NO.
CHK:	DWN: JJB	ORDER NO.	E1 OF 1

INSPECTION AND MAINTENANCE GUIDELINES FOR SELF-WEATHERING STEEL RECREATION BRIDGES

Recreation bridges fabricated from self-weathering steel are relatively low maintenance, have enhanced atmospheric corrosion resistance, and are not usually susceptible to fatigue. Below are general guidelines for steel bridge inspection that may apply dependent on individual circumstances.

The bridge should be inspected by personnel qualified in bridge inspection at a frequency determined by the owner based on the location, environment and intended use of the bridge. Bridges under warranty shall be regularly inspected according to the National Bridge Inspection Standards for the warranty to remain in effect.

Physical Examination

All safety features including handrail, rubrail, safety rail, etc. shall be in place and functional.

If the bridge contains field bolted splice connections, all bolts shall be visually inspected for loosened or missing hardware.

De-icing salts and any other corrosive chemicals should not be applied to self-weathering steel bridges. Self-weathering steel exposed to corrosive chemicals should be properly cleaned or blasted.

The bridge shall be free of debris, soil deposits and overgrown vegetation, see section on Corrosion.

Foundations shall be reviewed for scour, settlement and general soundness. The bridge bearings shall be functional as shown in the design plans and with appropriate hardware in place.

It is important for analysis purposes that the members reported in the plans or inspection report correspond properly with the members actually used on the bridge. If incorrect member sizes are used, then any analysis of the safety of the bridge is worthless. Therefore, the inspector should measure the bridge members to verify that the sizes recorded in the plans or inspection report are accurate. For a new bridge, this function would be performed in the shop.

Corrosion

The most recognizable type of steel deterioration is corrosion, or rust. Corrosion results in the loss of member material. This partial loss of cross section due to corrosion is known as section loss. Bridge inspectors should be familiar with corrosion since section loss can lead to a substantial reduction in member capacity. Self-weathering steel is intended to rust and form a protective coating from the rust and is very durable under normal atmospheric conditions. However, rust can propagate adversely affecting self-weathering steel's performance under the following conditions:

- Environmental corrosion - primarily affects metal in contact with soil or water and is caused by formation of a corrosion cell due to deicing salt concentrations, moisture content, oxygen content, and accumulated foreign matter such as roadway debris and bird droppings.
- Stray current corrosion - caused by electric railways, railway signal systems, cathodic protection systems for pipelines or foundation pilings, DC industrial generators, DC welding equipment, central power stations, and large substations.
- Bacteriological corrosion - organisms found in swamps, bogs, heavy clay, stagnant waters, and contaminated waters can contribute to corrosion of metals.
- Stress corrosion - occurs when tensile forces expose an increased portion of the metal at the grain boundaries, leading to corrosion and ultimately cracking.
- Fretting corrosion - takes place on closely fitted parts which are under vibration, such as machinery and metal fittings, and can be identified by pitting and a red deposit at the interface.

Fatigue Cracking

Fatigue cracks develop in bridge structures due to repeated loadings. Since this type of cracking can lead to sudden and catastrophic failure, the bridge inspector should be able to identify fatigue cracks.

Some factors leading to the development of fatigue cracks are:

- Frequency of repeated loading
- Age or load history of the bridge
- Magnitude of stress range
- Type of detail
- Quality of the fabricated detail
- Material fracture toughness (base metal and weld metal)
- Quality of welds

There are two basic types of bending in bridge members: in-plane and out-of-plane. When in-plane bending occurs, the cross section of the member resists the load according to the design and undergoes nominal elastic deformation. Out-of-plane bending implies that the cross section of the member is loaded in a plane other than that for which it was designed and undergoes significant elastic deformation or distortion. More correctly, out-of-plane bending should be referred to as out-of-plane distortion. Out-of-plane distortion is common in beam webs where transverse members connect and can lead to fatigue cracking.

Overloads

Overloads are loads which exceed that for which the member or structure was designed.

Steel is elastic (i.e., it returns to its original shape when a load is removed) up to a certain point, known as the yield point. After this point is reached, steel will deform or elongate and remain in this condition even after the load has been removed. This type of deformation is called plastic deformation.

Plastic deformations due to overload conditions may be encountered in both tension and compression members. The symptoms in tension members are:

- Elongation
- Decrease in cross section, commonly called "necking down"

The symptoms in compression members are:

- Buckling in the form of a single bow
- Buckling in the form of a double bow or "S" type, usually occurring where the section under compression is pinned or braced at the center point.

An overload situation can lead not only to plastic deformation, but also to complete failure of the member. This occurs when a tension member breaks or when a compression member exhibits gross buckling distortion at the point of failure.

Vehicular Damage

Members of a bridge which are within reach of a moving vehicle are subject to damage by impact. Indications of vehicular damage include dislocated and distorted members.
Some common signs of distress include:

- Bent or damaged members - determine the type of damage (e.g., collision, overload, or fire), measure the variance from proper alignment, and check for cracks, tears, and gouges near the damaged location.
- Corrosion - since rust continually flakes off of a member, the severity of corrosion can not always be determined based simply on the amount of rust; therefore, corroded members must be examined by physical as well as visual means.
- Fatigue cracks - fatigue cracks are common at certain locations on a bridge, and certain inspection procedures should be followed when fatigue cracks are observed.
- Other stress-related cracks - determine the length, size, and location of the crack.

Timber Decking

The primary locations for timber deck inspection include:

- Areas exposed to traffic - examine for wear, weathering, and impact damage.
- Bearing and shear areas where the timber deck contacts the supporting floor system - inspect for crushing, decay, and fastener deficiencies.
- Tension areas between the support points - investigate for flexure damage, such as splitting, sagging, and cracks.
- Deck surface - check for decay, particularly in areas exposed to drainage.
- Outside edges of deck - inspect for decay.

The inspection of timber decks for deterioration and decay is primarily a visual activity. All surfaces of the deck planks should receive a close visual inspection.

However, physical examinations must also be used for suspect areas. The most common physical inspection techniques for timber include sounding and probing, drilling, core sampling, and electrical testing. An inspection hammer should be used initially to evaluate the subsurface condition of the planks and the tightness of the fasteners. In suspect areas, probing can be used to reveal decayed planks using a pick test or penetration test. If the deck planks are over 2 inches thick, suspect planks should be drilled to determine the extent of decay.

Concrete Decking

Reinforced concrete decks should be checked for excessive cracking, deterioration or wear. In the extreme case, the slab reinforcing may also be deteriorated.

Steel corrugated form decking is used to aid in the placement of the concrete. The steel forms should be inspected for excessive rust and/or damage. The steel forms are typically non-structural, but deterioration may be indication of, or the start of, related problems with the structure.

Excerpts obtained from FHWA Bridge Inspector's Training Manual, 1990