



Presented by

Derek Manz

Stupp Bridge Company

1992 graduate of Purdue University - BSCE with Structural Engineering (Major)
Transportation Engineering (Minor)

10 Years field experience as Project Engineer with INDOT Construction

20+ Years experience in manufacturing, project management, business, and sales engineering

ABCD Luncheon
Columbus, Ohio

December 5, 2023



Let's Talk the ABCs and "D"s of Structural Steel ... Don'ts and Dos for a Better Steel Bridge Design!

We will discuss ...

Recent Steel Bridge projects

Steel Industry news, current market trends, & updates

Potential Pitfalls in your steel design detailing that could lead to added fabrication costs, project delays, avoidable RFIs, or constructability concerns.

Useful NSBA design documents including Lean on Bracing, Uncoated Weathering Steel, and Single Coat IOZ to help you deliver a better steel bridge design to our customer,

the DOT owner!



STUPP BRIDGE ... WHO WE ARE AND WHAT WE DO

Family owned & Operated since 1856

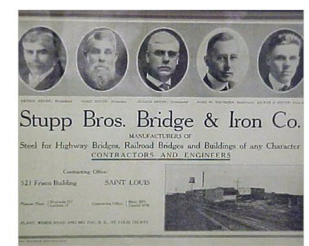
Founded in St. Louis, Missouri

Plate Girder Bridge Focus

Fabricating Structural Steel in
Bowling Green, Kentucky since 1999

COMPANY HISTORY

In 1856, John Stupp established the South St. Louis Iron Works to market the skills he learned as an apprentice in Europe. He founded the company on the basic principles of CRAFTSMANSHIP, QUALITY, SERVICE, and INTEGRITY- principles that still hold true today. With the rapid growth and the addition of John's sons, the company was incorporated under the name of Stupp Bros. Bridge & Iron Company. If it was made from iron or steel, Stupp Bros. made it- boilers, ornamental iron, lathes, and during times of war, numerous items to assist our country to victory. The Stupp name can be seen on buildings, factories, and bridges all across the country.



STUPP BRIDGE COMPANY WORK AREA & LOCATIONS

- Production Plant in Bowling Green, Kentucky
- **Visitors welcome anytime!**
- Multiple States - Regional Sales Offices
 - St. Louis, MO
 - Nashville, TN
 - Louisville, KY



ADAM P. DEMARGEL

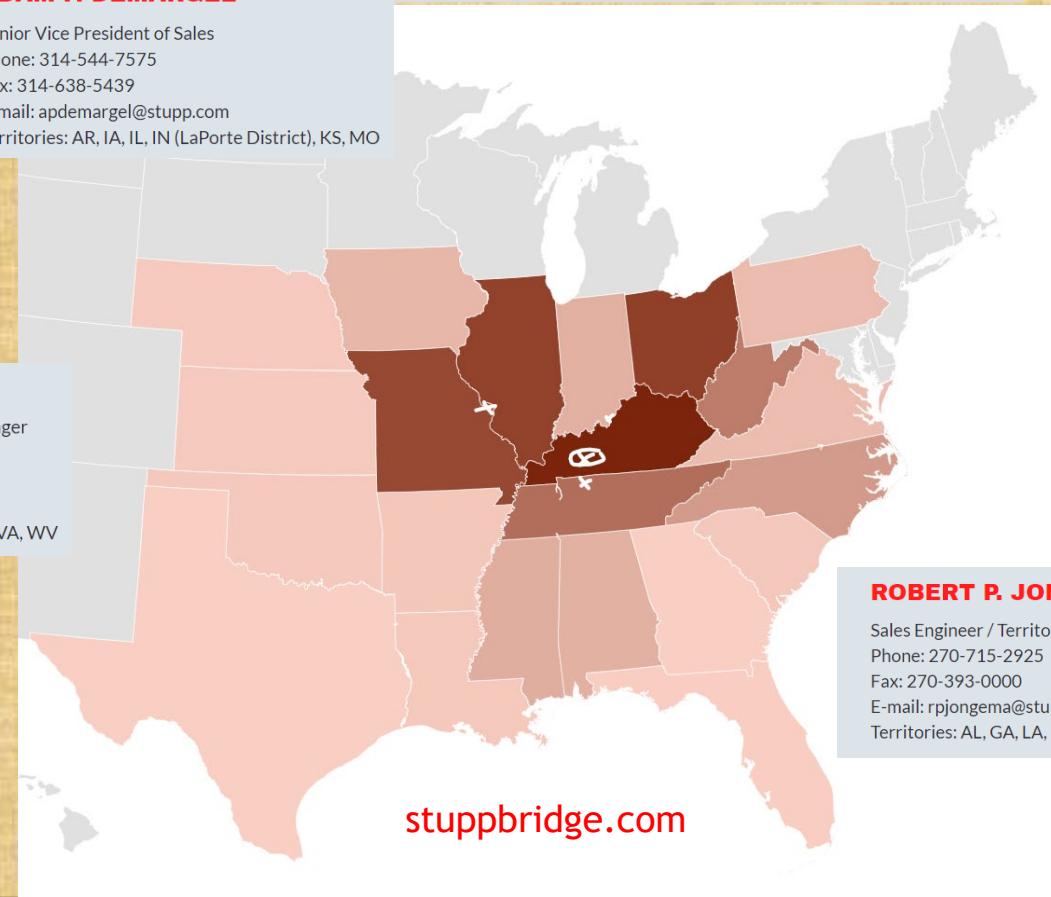
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QUALIFICATIONS & CAPABILITIES

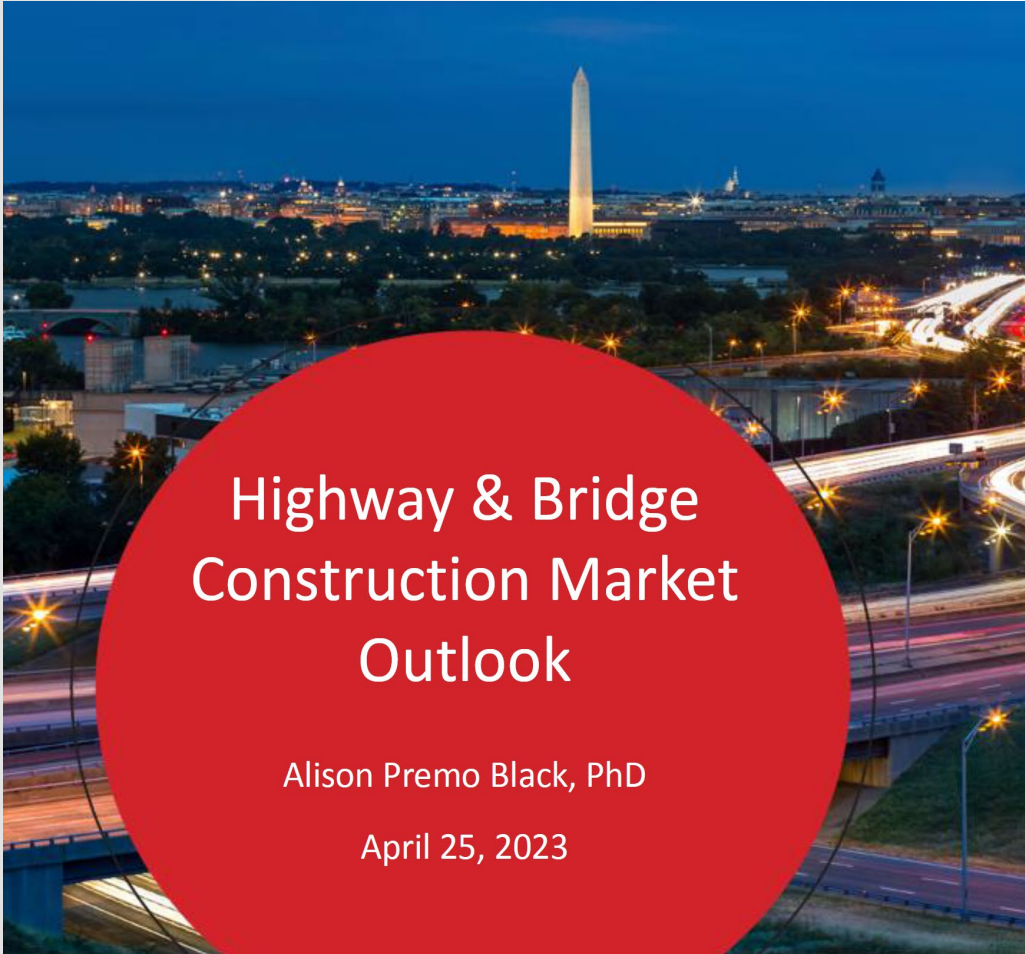
- AISC Certified for Bridge - Advanced
- (Level 4,5,6 Steel for ODOT - Plate Girders)
- AISC Complex Coating Endorsement
- AISC Fracture Critical Endorsement
- AWS Certified Welders to D1.5
- NACE Level 1 & 2 Inspectors
- Curved or Straight Girders
- Parallel Flange or Variable Depth Girders
- Continuous Girder or Simple Span Bridges
- Plate Girders up to 174" (14.5 feet) Tall
- Highway or Railroad Bridges

167 years experience working with the industry leaders!

Guidelines to Design for Constructability and Fabrication G12.1-2020

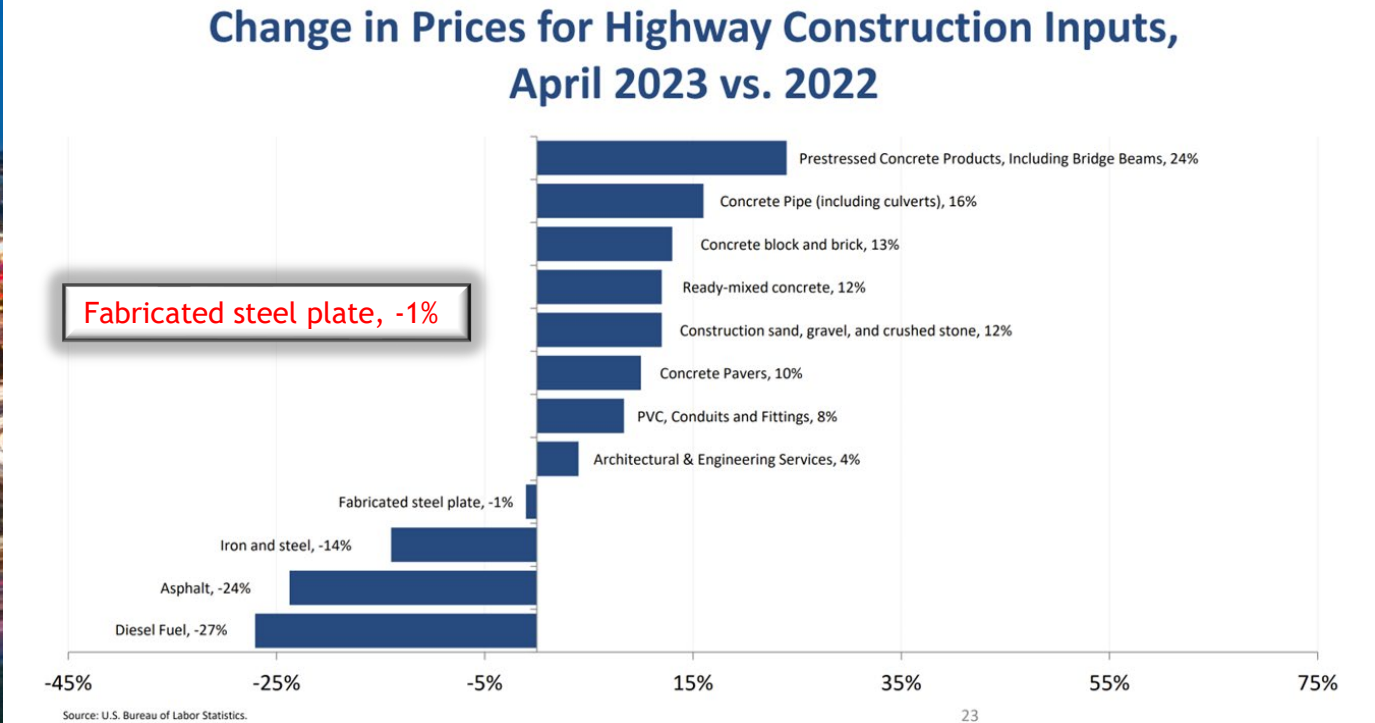


STEEL PRICES REMAIN STABLE IN 2023!



**Highway & Bridge
Construction Market
Outlook**

Alison Premo Black, PhD
April 25, 2023



**STEEL
AVAILABILITY
REMAINS
STRONG!**

\$1.7 billion Nucor steel plate mill in Brandenburg has grand opening

Project has created jobs for several hundred Kentuckians

🕒 October 6, 2023 👁 997 Views



BRANDENBURG, Ky. – Nucor Corp. leadership and local and state officials including Gov. Andy Beshear today held a grand opening of the company's \$1.7 billion steel plate manufacturing mill in Meade County, a project that has created several hundred new high-quality manufacturing jobs.

"Nucor and Kentucky have a longstanding partnership, and I'm excited that we continue to build on that by opening **Nucor Steel Brandenburg**," Gov. Beshear said. "This steel plate manufacturing mill provides opportunities for Kentucky workers, their families and the community in Meade County. I want to thank Nucor's leadership for their continued commitment to the commonwealth."

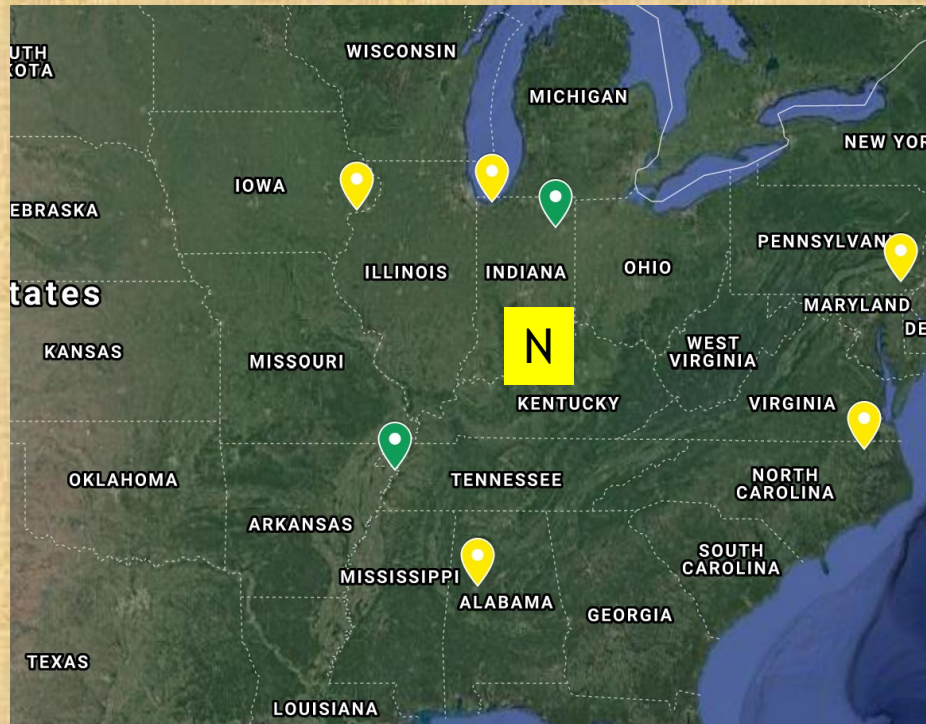
**Nucor Steel mill
now producing
raw plate
material in
Brandenburg,
Kentucky
about 100 miles
from our
fabrication plant**

October 2023

STEEL IS WIDELY AVAILABLE

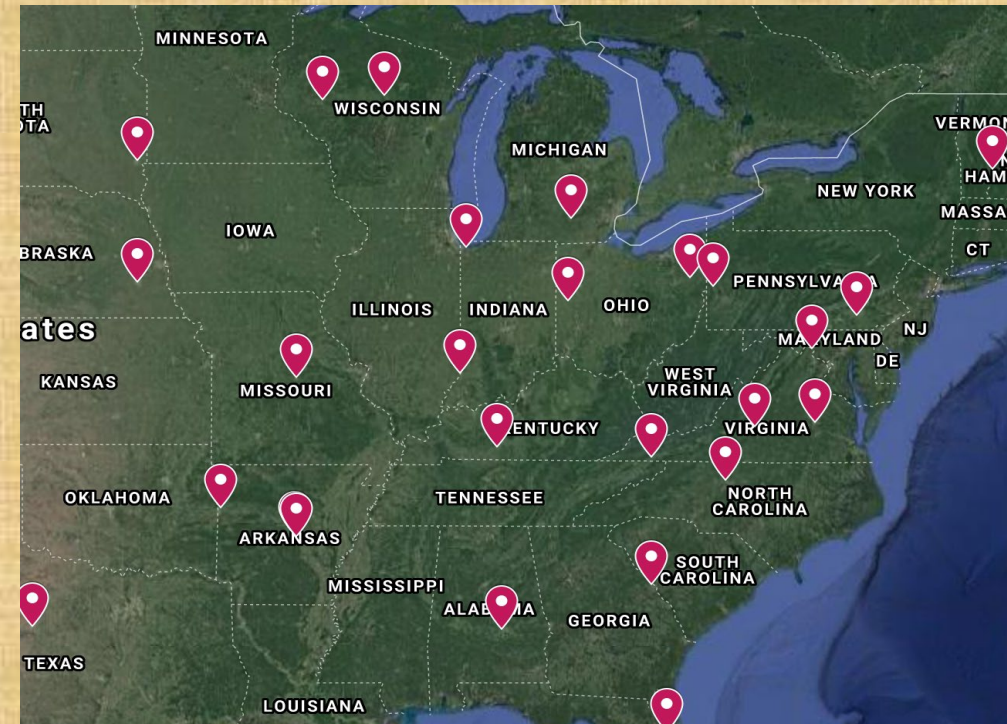
STEEL PRODUCERS MAP

(PLATE MILLS IN YELLOW & SHAPE MILLS IN GREEN)



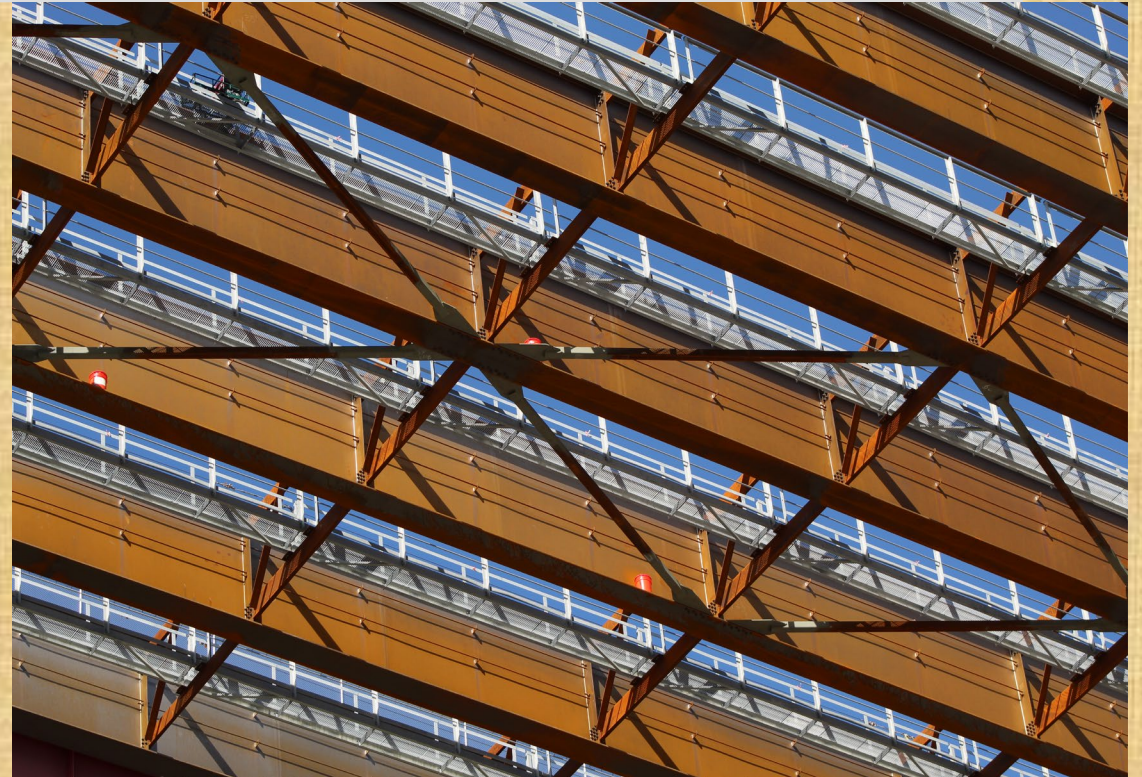
STEEL BRIDGE

FABRICATORS MAP



WHY CHOOSE STEEL?

- Widely Available
- Easily Inspectable - Visible or Simple Tools
- Fast Assembly & Erection
- Strong & Light - High Strength to Weight Ratio
- Resilient & Durable - Field Repairable
- Environmental Benefits - 100% Recyclable
- **Low Cost - Call us for Budget Pricing!**



I-480 Valley View Bridge - Cleveland, Ohio

WHEN IS STEEL PLATE GIRDER THE BEST OPTION?

- Bridges Spans from 100 to 500+ feet in length
- We are currently fabricating a plate girder bridge with 625-foot main span!
- Bridges with Horizontally Curved Members, especially with Radius less than 1200 feet
- Bridges that have challenging vertical clearance or the need to eliminate piers
- Bridges over congested or challenging jobsites
- **When aesthetics and long service life matter**



Louisville, Kentucky - The Parklands of Floyds Fork

LONG OR SHORT SPANS

490' SPAN TAPERED WEB FOR MULTI-UNIT STRUCTURE

HYBRID MATERIAL CONFIGURATION GRADE 50W WEBS WITH

HPS70W TENSION FLANGES AND HPS70W COMPRESSION FLANGES IN THE NEGATIVE MOMENT REGIONS



I-70 near Rocheport, Missouri

91' SPANS AND SHALLOW CLEARANCE

GRADE 50W - PARTIAL PAINT OF **FASCIA GIRDERS ONLY**



Allisonville Road over I-465 (Indianapolis, IN)

CURVED OR SKEWED

CURVED TO A **190' RADIUS**



Cincinnati CVG Airport (Hebron, Ky)

STRAIGHT OR SKEWED



Jeffersonville, Indiana

CHALLENGING JOBSITES

Railroads require 150% crane-lifting capacity over their tracks

Contractors can size **smaller cranes** with steel versus concrete over same span!

Skyline Drive
over NSRR &
12th Street

Dubois Co., IN



**Steel is
lighter
than
concrete!**



REDUCE STEEL BRIDGE COSTS - **ELIMINATE THE RFI**

- Mill Grades & Availability
- Crossframes
- Girder Spacing
- Optimal Size Mill Plates
- Flange Sizing & Flange Splices
- Web Sizing
- Stiffeners
- Inspection Handrail
- Haunched, Tapered or Parallel Flange Girders
- Deep Girder Options (Long Spans)
- Curved versus Straight “Kinked” Girders
- Shop Assembly / Laydown
- High Strength Bolts
- Corrosion Protection
- Transportation Considerations

MATERIAL INFO & AVAILABILITY

- **Steel Plate (ODOT Level 4,5,6):**

- Grade 36, Grade 50, 50W and HPS70W are most common and best value
- Grade 36 and Grade 50 are NOT WEATHERING and require a coating
- Material rolls “first come first served”
- Plate lead times for 36, 50 or 50W material typically 10-12 weeks
- Plate lead times for HPS70W material typically 12-16 weeks

- **Structural Shapes (WF or Rolled Beams):**

- **ODOT Level 1,2,3** - Grade 50 or 50W are most common grades
- Material rolls on set schedule by shape/weight
- Light shapes roll every 4-6 weeks
- Heavy shapes roll every 8-12 weeks
- **At web depths of 40” and over, Plate Girder typically lower cost due to design optimization and competition**

Mill Creek Expressway (Cincinnati)

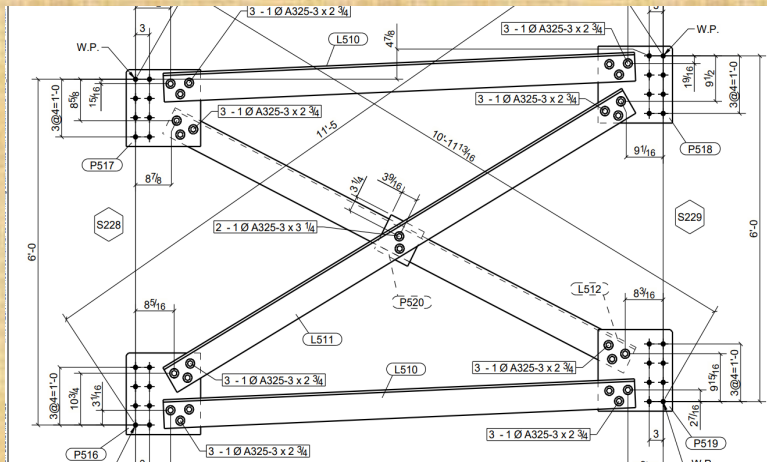


CROSSFRAMES

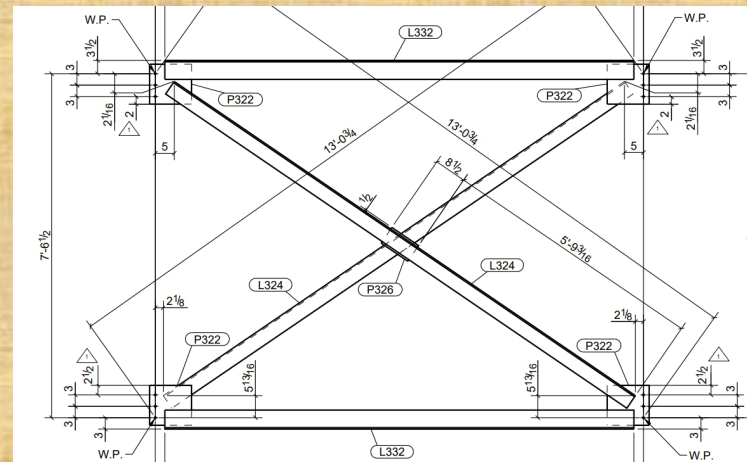
- **Keep Crossframe Types to a Minimum**



- Different Crossframe Types Require Different Setups which is costly
- **Weld instead of shop bolt whenever possible**
- For girders shallower than 48", use a channel or bent plate diaphragm



Don't



Do

Shop Bolted crossframes typically costs 2x to 3x welded crossframes!

Due to added labor, added hardware, assembly time, bolt testing (welds are a visual inspection only).

WELDED CROSSFRAMES

- Example of a low cost, repeatable **Welded Crossframe** with light angles welded to the gussets, and bolted to stiffeners in the field

In the Jig



Welded



Finished



CROSSFRAMES

- Use Same Size/Type Materials
 - **Light Angles (6x6x1/2")** are best (single-angle), followed by Heavier Angles, Channels, Misc. Channels and lastly WT's.
 - **WT's are most expensive due to labor required to make them**



- WT's require Multiple Fabrication Steps
 - Not Rolled to WT shape at the Mill

Buy a WF Beam. Torch Cut to Split. Straighten.
Grind all Cut edges. EXPENSIVE!



Don't

Substitute Lean on Bracing for Intermediate Crossframes
on straight or skewed bridges

Use NSBA's new Lean on Bracing Reference Guide

CROSSFRAMES

Don't



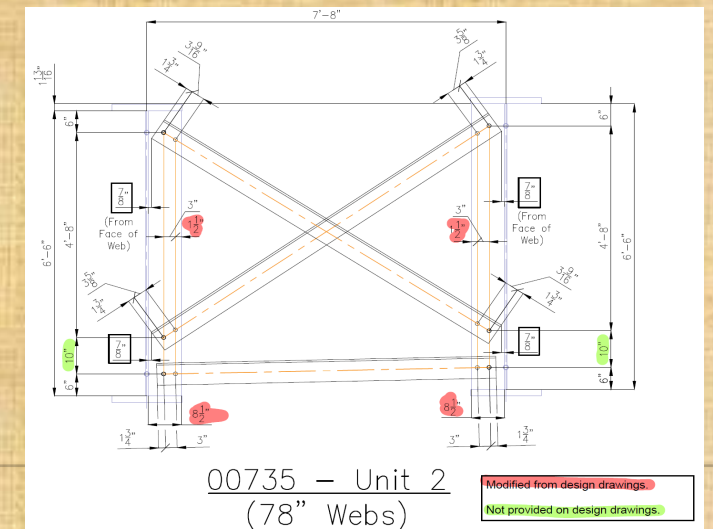
EXAMPLE OF BOLTED "K" CROSSFRAMES WHICH REQUIRE SIGNIFICANTLY MORE LABOR THAN WELDED

Avoid shop bolted connections!

Adjust bolt locations on stiffeners to keep crossframes square and uniform in size



Do



WIDE GIRDER SPACING



- Wider is more economical!
- **Spans Under 140' - Use 10' to 11' spacing**
- **Spans Over 140' - Use 11' to 14' spacing**
- Reduced number of girder lines and girders (fewer total linear feet) to be detailed, fabricated, coated, transported, erected, inspected and maintained
- Fewer diaphragms, X-frames and bearings

I-65 Approach to Abraham Lincoln Bridge (Indiana) - ORB Project = 15,000 Tons (Stupp)

PLATE MILL INFORMATION

Table 1
Plate Thickness Availability by Steel Grade (Inches)

Thickness	A709 Grade 50 & 50W	A709 Grade HPS 50W	A709 Grade HPS 70W	A709 Grade HPS 100W
3/16	●	●	○	○
1/4	●	●	○	○
5/16	●	●	○	○
3/8	●	●	○	○
7/16	●	●	○	○
1/2	●	●	○	○
9/16	●	●	○	○
5/8	●	●	○	○
11/16	●	●	○	○
3/4	●	●	○	○
13/16	●	●	○	○
7/8	●	●	○	○
1	●	●	○	○
1 1/8	●	●	○	○
1 1/4	●	●	○	○
1 3/8	●	●	○	○
1 1/2	●	●	○	○
1 3/4	●	●	○	○
2	●	●	○	○
2 1/4	●	●	○	○
2 1/2	●	●	○	○
2 3/4	●	●	○	○
3	●	●	○	○
3 1/4	○	○	○	○
3 1/2	○	○	○	○
3 3/4	○	○	○	○
4	○	○	○	○

Table 2
Plate Width Availability by Steel Grade (Inches)

Width	A709 Grade 50 & 50W	A709 Grade HPS 50W	A709 Grade HPS 70W	A709 Grade HPS 100W
48	●	●	○	○
54	●	●	○	○
60	●	●	○	○
66	●	●	○	○
72	●	●	○	○
75	●	●	○	○
78	●	●	○	○
81	●	●	○	○
84	●	●	○	○
87	●	●	○	○
90	●	●	○	○
93	●	●	○	○
96	●	●	○	○
99	●	●	○	○
102	●	●	○	○
105	●	●	○	○
108	●	●	○	○
111	●	●	○	○
114	●	●	○	○
117	●	●	○	○
120	●	●	○	○
123	○	○	○	○
126	○	○	○	○
129	○	○	○	○
132	○	○	○	○
135	○	○	○	○
138	○	○	○	○

●
Readily available from three domestic mills

●
Readily available from two domestic mills

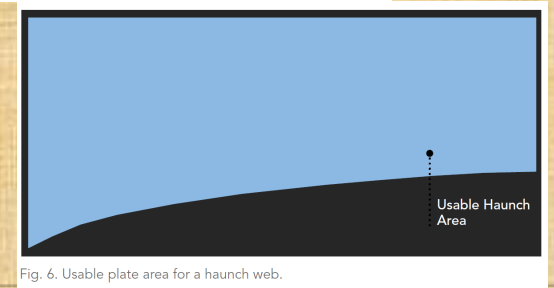
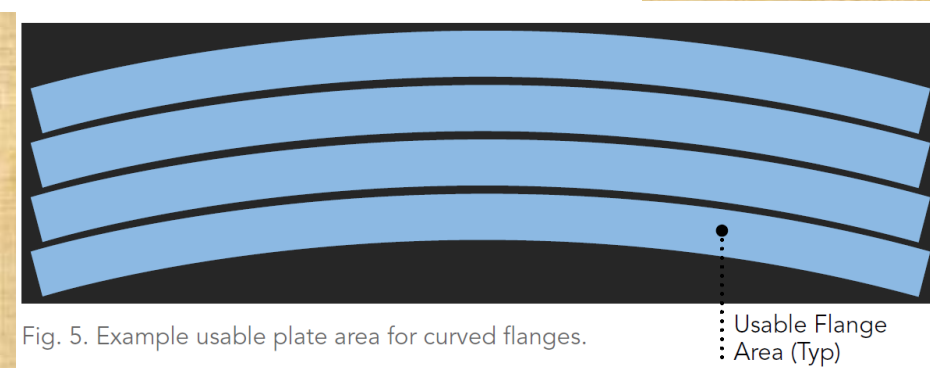
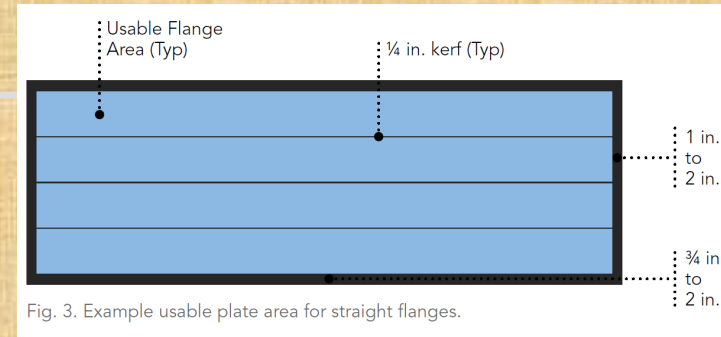
○
Readily available from one domestic mill

○
Not readily available

- Multiple Producers:
 - Plate Thickness maximum 4"
 - Plate Width up to 138"
- **Girder Web Depth current sweet spot 120"** and under but may soon change.
- **Plate length is based on weight**, which is currently maxed around **27,000 LBS**, but may soon change.
- Minimum Mill Order Size for a given thickness ranges from 3 tons to 40 tons based on differing mill so use same thicknesses for stiffeners, splice plates and connection plates to allow for material optimization.

PLATE INFORMATION

- **Most economical plate to buy from mill is between 72 and 120" wide.** Consider this when sizing flanges.
- Fabricators order plate with additional weight and length to account for cutting ($1/8$ " per cut between plates and along sides), plate sweep tolerance and waste (about $1/2$ " on each outside edge) (Fig. 3)
- **There will be more waste nesting flanges for horizontally cut-curved girder flanges** (Fig 5). For bridges with mild horizontal curve, **consider kinking** the bridge at field splices.
- **There will be more waste for haunched or tapered webs.** (Fig. 6)



FLANGE SIZING & SHOP-WELDED FLANGE SPLICES

- Change Thickness, **NOT WIDTH** at Designed Butt Splices.
 - Allows for opportunity to splice “mother plates”, then rip individual flanges from welded plates.



Consolidate increments and sizes when possible

Maximum change: thinner piece at least ½ of thicker

- As a rule of thumb, save at least 1000 LBS of material before introducing a designed welded butt-splice and design maximum 2 butt-splices per shipping piece



¾” Minimum thickness for flanges
1” preferred by Stupp (handling)

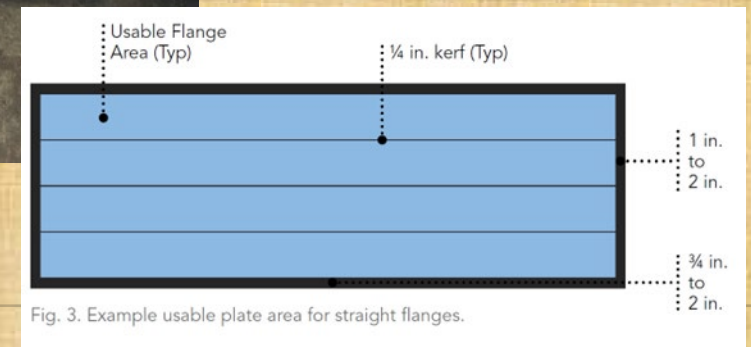


Fig. 3. Example usable plate area for straight flanges.

FLANGE SIZING & SHOP-WELDED FLANGE SPLICES



- Shop welded butt splice operations include making and welding **run-off tabs** to the spliced members., **Beveling** the edges pieces, **Multiple weld passes**, **NDT** (possible rework) and finally **grinding!**
- **Allow fabricator to eliminate shop splices within a shipping piece by carrying thicker material through to next designed field splice location**
- Width transitions increase labor for flange assemblies by up to 50%
 - If you must change flange width, do so at bolted field splice (Do Not clip the corners of top flanges)



Welded shop splices are labor-intensive. Time is money!

WEB SIZING / STIFFENERS



Laying out and fitting stiffeners is a very manual and labor-intensive process.

**Consider thicker webs
Fewer stiffeners = lower cost!**

**½" Minimum thickness
for girder webs,
stiffeners &
connection plates**

BEARING STIFFENERS

- Bearing Stiffeners
 - Place normal to flanges
 - Minimum spacing between Stiffeners
 - 8" or 1.5x stiffener plate width
 - Bearing Stiffener Connection to Flanges
 - Finish-to-bear plus fillet weld to bottom flange if transversely loaded
 - Finish to bear if there is no crossframe.
 - For connecting to the top flange, finish-to-bear is unnecessary, and welding the stiffener to top flange only necessary if transversely loaded



**Avoid Full Penetration Welds or
Tight Fit tolerance less than 1/16"**



LA 23 over Intercoastal Waterway (Belle Chasse, LA)

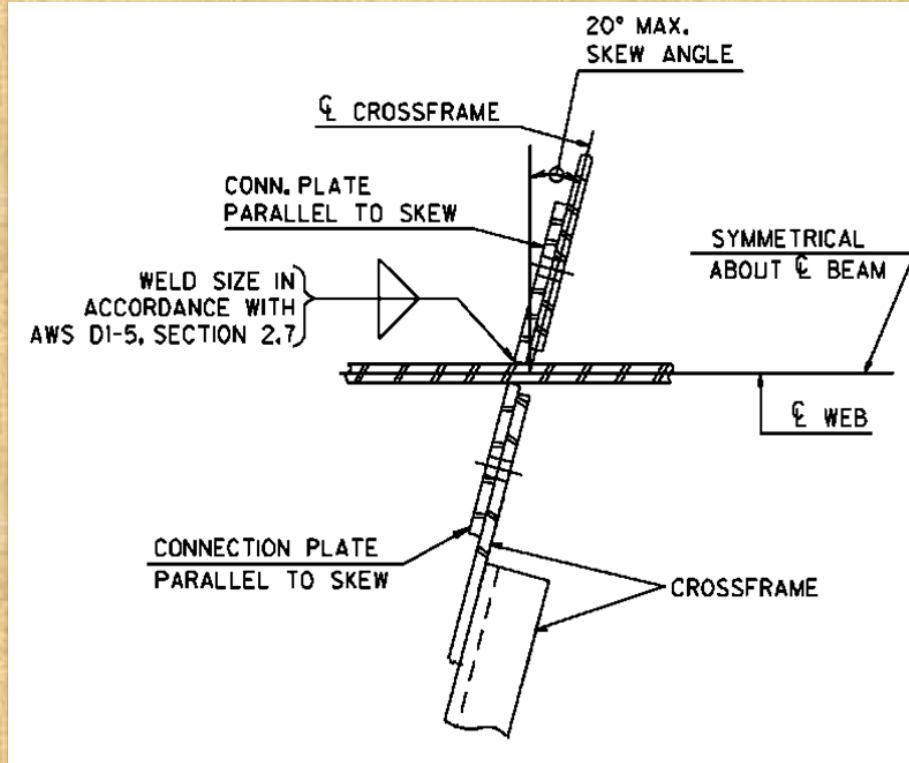
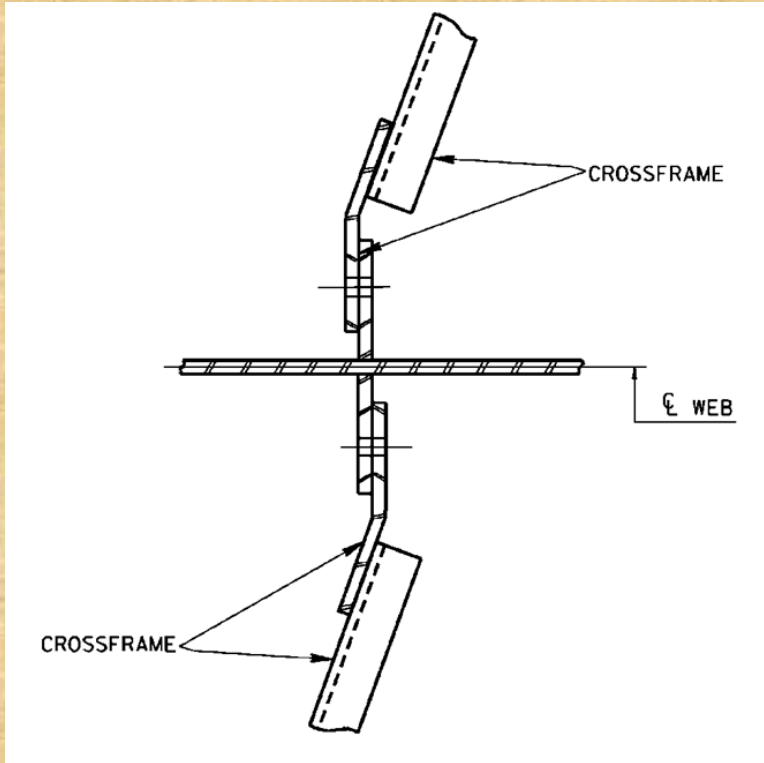
SKEWED BRIDGE STIFFENERS

- Weld stiffeners perpendicular to the web or at **mild skew (20-degree max)**
- Avoid skewed stiffeners greater than 20 degrees
- **Use bent plate gusset plates for CF's in lieu of using skewed stiffeners**
- When using the 8" or 1.5x the stiffener plate width for spacing rule, measure spacing from closest edge of the plate (not intersection of stiffener and web)



EXAMPLE OF SKEWED CF CONNECTION

Preferred Option



BENT GUSSET PLATES

Good Example & Use of Bent Gusset Plates



Use bent plate
gusset plates on
the crossframes
to keep
stiffeners
perpendicular
to the web!

INSPECTION HANDRAIL



It's the little details that could make a big difference ...

Just ask us if uncertain!

- Welded Inspection Handrail Connection Tabs & Lap-Weld Handrail Splices are always preferred to Bolted Tabs and Threaded Rod with Couplers

PARALLEL FLANGE GIRDERS = LOWEST COST



- Parallel flange is most economical to fabricate (almost always)
- Easier to weld webs to flanges to make girders
 - Most efficient for ordering / nesting materials
 - Keeps differing CF types to a minimum

Top and Bottom Flanges welded to web simultaneously. Easier/faster/lower cost with parallel flange girder. **Overhead gantry welder with dual heads.**

GIRDERS: HAUNCHED, TAPERED OR PARALLEL FLANGE WEBS

- **Haunching** increases different CF types (more set-ups, more labor, less efficient) and also adds labor to make the flange splices / bends
- **Haunching** also increases plate material waste when cutting web from mother plate
- **Tapered Girders are good for bridges with multiple units of varying web depths.**
Maintaining taper to single shipping unit is key.

Haunched Plate Girder Bridge



Beautiful, but not efficient for small or short-span structures. Flanges are not parallel ... anywhere!

GIRDERS: HAUNCHED / TAPERED WEBS



Splicing a large bottom flange for a haunched girder. **Very time consuming and expensive!**

- Single Splices
- Time to build a jig to support the flange
- Time to weld the flange to the non-parallel web

HAUNCHED GIRDERS

- Where a Haunched / Tapered Girder works: 144” at Pier to 120” Mid Span - Good job by design engineer of maximizing most available web depth!



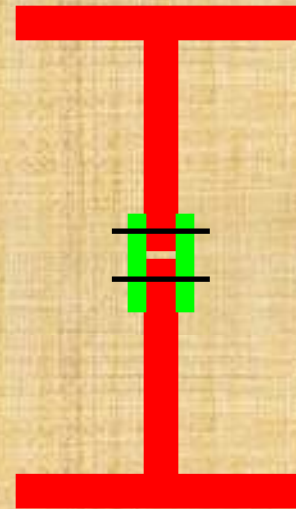
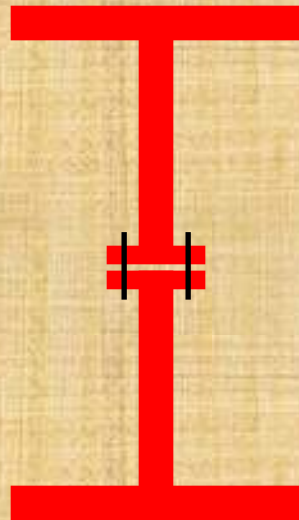
I-294 SB “Mile Long Bridge” in Chicago, IL

DEEP GIRDER “STACKING” OPTION

- **Longitudinal Web Field Splices** (deep girders built in two sections to accommodate shipping or fabricator constraints)

“Stacked” is
Preferred Option ----->

- Stability
- Stiffness
- Handling
- Installation



Must use Side Plates

DEEP GIRDER EXAMPLES



GIRDERS: STRAIGHT, CURVED OR KINKED?

- **Straight girders are lowest cost**
- Horizontally curved bridges can have girders that are either heat curved or cut curved, or possibly built with straight girders and kinked at the field splices
- **Heat curving adds cost to account for time** for labor to curve and handle/ship
- **Cut curving adds cost to account for wasted flange material**, plus additional time to fit the flange to web, handle and ship
 - **Cut Curve** typically used for girders with a tighter curve radius. Different fabricators have different preferences.
 - Heat curving girders with flanges that are very wide and thick is not recommended regardless of radius.



Curved Girder having flanges welded to webs. **Curved flanges slows the process**

GOOD USE OF STRAIGHT GIRDERS WITH **KINKED SPLICES**



“Buck O’Neil Bridge” over Missouri River (Kansas City)



KY 460 over Russell Fork River (Elkhorn City, KY)

FIELD CONNECTIONS / SHOP ASSEMBLY

- **Field Splices drilled from solid state**, or CNC / Template Drilling all acceptable, provided fabricator demonstrates accuracy of methods
- Connections for girders should be **drilled in horizontal** orientation or blocked vertically in no load condition
- Vertical Shop Assemblies should be reserved for exceptionally rigid bridges (bascules, thru girder bridges), or where girders terminate at load carrying diaphragms
- **Full span assembly is overkill and owner should leave the decision to assemble to fabricator / general contractor**
- Horizontally curved bridges should not be a reason alone to require a vertical assembly



SHOP LAYDOWN & ASSEMBLY



Curved girder splices drilled from solid in horizontal orientation. **No vertical assembly to crossframes required.**



Vertical Assembly Performed where stringer terminates at abutment crossframe

HIGH STRENGTH BOLTS

- A325 & A490 are most common
 - A325 - Type 1 Galvanized = best for painted areas.
 - A325 - Type 3 Weathering = best for weathering areas
 - A490 = Higher strength but can not be galvanized or retightened in the field.
 - Try not to mix A325 and A490 bolts in the same unit of a bridge to avoid confusion in the field.



For larger bridges, consider 1" bolts in lieu of 7/8" bolts to save fabrication time, reduce hardware costs & field labor



I-40/I-77 Interchange near Statesville, NC

GIRDER FIELD SECTIONS (TRUCK SHIPPING)

- **To have the most competition:**
 - Length < 120 feet (straight girders - shorter for horizontally curved girders)
 - Weight < 35 Tons
 - Height < 10 feet tall
- **To ship by road, max. fabricated segments:**
 - Length < 170-ish feet (straight girders)
 - Weight < 80 Tons (varies by state)
 - Height < 14.5 feet (on side) or 11 feet (upright)



KY-80 over Russell Fork, CSX RR & Roadway

TALL GIRDER SHIPPING

- Girders over 11' Tall should deliver in **horizontal orientation**
- Perfectly safe to transport and typically lower cost



LEAN-ON BRACING REFERENCE GUIDE

- Available at: www.aisc.org/nsba/design-resources/lean-on-bracing-reference-guide/



Lean-on Bracing
Reference
Guide



NEED
FOR
SPEED

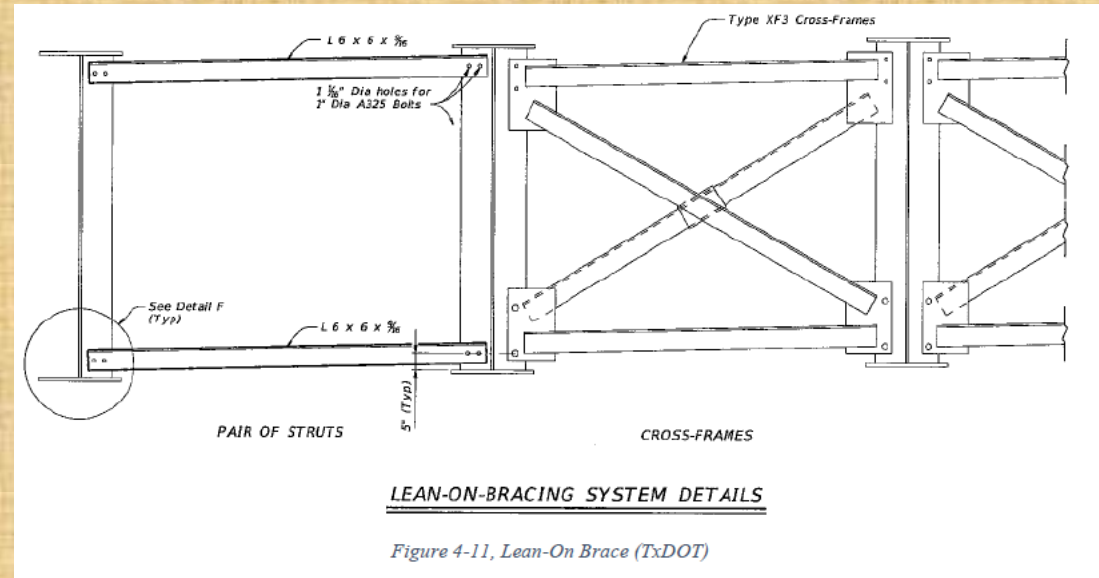


Smarter.
Stronger.
Steel.

LEAN-ON BRACING REFERENCE GUIDE

WHAT IS IT AND WHERE IS IT USED?

- Typically used on straight or skewed I-girder bridges
- Lean-on bracing is not a new concept. It has been used for years in commercial construction
- The concept is that one cross-frame braces multiple girders through top and bottom horizontal struts



LEAN-ON BRACING REFERENCE GUIDE

BENEFITS TO LEAN-ON BRACING

- **Improved structural performance** - Cross-frames can provide more than minimum brace strength and stiffness. Adding lean-on bracing reduces stiffness and improves overall structural performance
- **Improved long-term durability** - Struts are end bolted to connection plates on girders eliminating Category E details and improving fatigue life of bracing
- **Simplified inspections** - Struts have no welded details that can have potential fatigue cracking and less prone to corrosion

LEAN-ON BRACING REFERENCE GUIDE

BENEFITS TO LEAN-ON BRACING

- **Lower Cost** - Use of Lean-on bracing will **reduce material costs** as well as fabrication cost
- **Easier Fabrication** - **Removes welding and handling steps** of traditional cross-frames as well as jig set-up time
- **Easier Erection** - Not prone to fit up issues and has **2 bolts per connection** which saves time compared to traditional cross-frame fitting and bolting

UNCOATED WEATHERING STEEL REFERENCE GUIDE



- Available at: www.aisc.org/nsba/design-resources/uncoated-weathering-steel-reference-guide/

Uncoated
Weathering Steel
Reference
Guide



CORROSION PROTECTION

- **Weathering Steel is best for Corrosion Protection!**

- Completely unpainted if jointless (Simple Span).
- Partial Paint under joints



- **Do not apply full paint to Weathering Steel**
- Reference the Uncoated Weathering Steel Reference Guide from NSBA for thoughtful detailing suggestions and environmental considerations
- **Low Cost = only 3 to 4 cents per pound adder to upgrade from 50 to 50W**

UNCOATED WEATHERING STEEL REFERENCE GUIDE

BENEFITS OF UNCOATED WEATHERING STEEL (UWS)

- Due to the length of time UWS has been in service, the service life and performance is well established
- With regular inspection, the life of an UWS bridge can be more than 100 years (El Sarraf et al 2020)
- Compared to non-weathering steel the increase to use UWS is 2-6% but when considering costs for painting as well as long-term maintenance on painted steel, UWS is approximately 10% less
- Eliminating the need to re-paint decreases maintenance costs as well as preventing the release of VOCs into the atmosphere

WEATHERING STEEL

Bus. US 23 over Scott
Creek & Southern RR,
Dillsboro, NC



PAINT IS NEXT BEST OPTION

- Lowest Cost Painted Solution: **Single Coat IOZ (Inorganic Zinc)**
- Reference recent synthesis study from NSBA for more information
- If you want an aesthetic look, paint has you covered
- Best multi-coat solution: Apply Primer in Shop
- **Apply 2nd coat or 2nd/3rd Coats in Field to prevent touch-up and re-work costs!**
- For multi-coat shop systems, Organic Zinc Primer is as good as Inorganic Zinc Primer and requires less time to cure/topcoat - Lowest cost multi-coat shop option



SINGLE COAT IOZ PROTECTION FOR STEEL BRIDGES

- Available at: www.aisc.org/nsba/design-and-estimation-resources/corrosion-protection-and-durability-resources/single-coat-inorganic-zinc-protection-for-steel-bridges/



Single Coat
Inorganic Zinc
Protection for
Steel Bridges



NEED
FOR
SPEED

Smarter.
Stronger.
Steel.

SINGLE COAT IOZ PROTECTION FOR STEEL

WHAT IS IT AND WHERE IS IT USED?

- 1 coat of IOZ saves time and material costs versus a full paint system and studies showing longterm durability without a 2nd or 3rd coat of paint!
- Comes in two colors - Gray and Green, similar aesthetically to precast concrete
- Can add one acrylic topcoat of a specific color and still lower cost versus a 3-coat system



(a) over a creek



(b) over a river



(c) large vertical clearance over a roadway



(d) typical vertical clearance over a roadway and railroad

ALTERNATIVE COATINGS

- **Do not Galvanize Plate Girders** as they will warp due to cooling rates of differing material thicknesses. Galvanizing more stable for rolled beams.
- Galvanizer takes no responsibility for warpage. Leads to blame and likely re-work!
- **Metalize Plate Girders if weathering steel or painting is not an option**
- Metalizing is very expensive. 50%+ premium over other options
- Should only be used in areas where future painting can not be easily accomplished.





Cleveland, Ohio. 3rd Level of Interchange I-77 over I-490. Metalized to prevent future painting costs.

METALIZED GIRDER

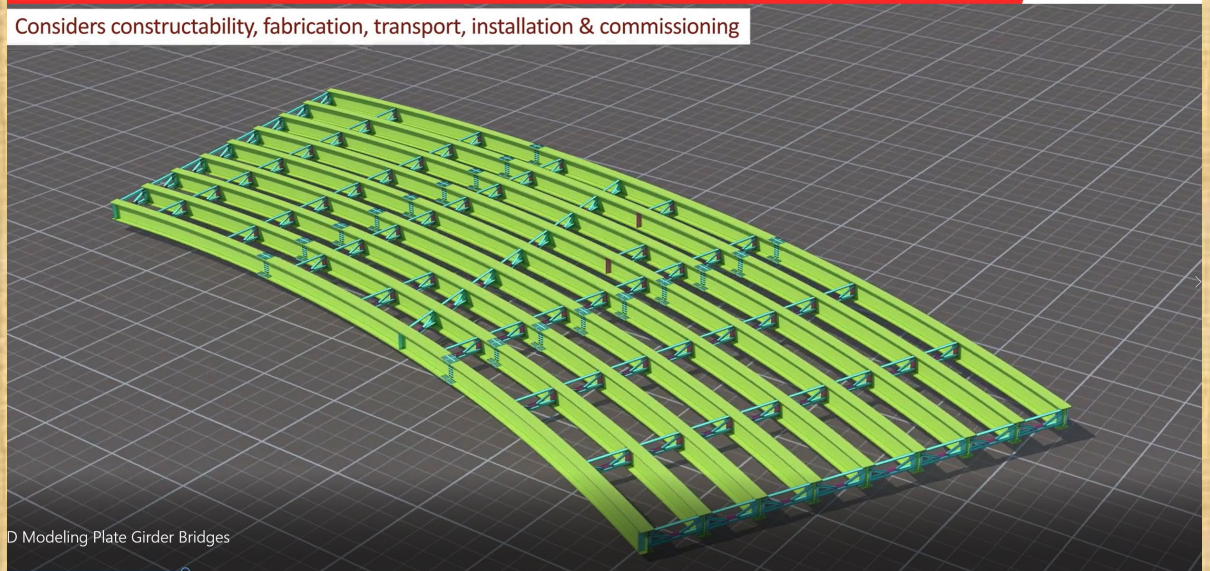


NOW MODELING EVERY BRIDGE IN 3D

- Tekla Estimating Project Management, Tekla Structures to make model, Trimble Connect to view
- RFI's, Shop Drawings and Key Reports generated from the model
- Stakeholders have access to view the model in Trimble Connect
- Faster Drawing Review Time
- Better Fabrication Accuracy
- Fewer Fabrication Errors
- Fewer Erection Conflicts
- Less Re-work
- Lower Cost
- Data from Model used to Power Equipment in Shop

As-built 3D Model

Considers constructability, fabrication, transport, installation & commissioning





CONTACT ME TO LEARN MORE

Thank You!

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