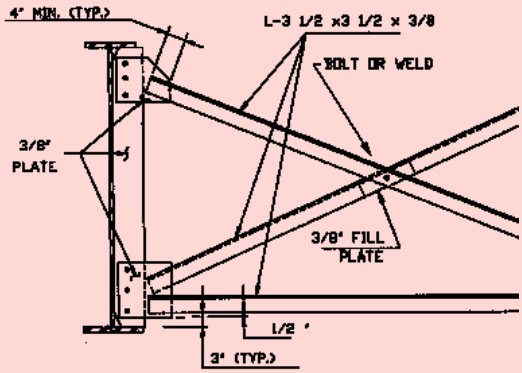

BRIDGE CROSSINGS

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Practical Information For The Bridge Industry

IMPROVING SHOP DETAILS

By Walter J. Gatti

Approval of Shop Details

One of the main problems for the fabrication and construction industry is obtaining approval of shop detail drawings. Today, it takes approximately five to six weeks to turn around a set of drawings. And for states that require a drawing to be free of comments before they will approve it—not to mention other requirements such as that all drawings that were submitted on a transmittal letter must all be approved before any one drawing can be approved—the turn around time can stretch to two or three months.

In order to expedite the approval process and reduce costs to everyone, the following checklist was prepared by a committee of engineers and fabricators (the checklist is in the process of being adopted by the Texas Department of Transportation):

Checklist for the Review of Steel Shop Detail Drawings

It should be clearly stated that the approval engineer will be responsible to review the shop detail drawings for conformation with the design plans and the job specifications only, and that the responsibility for all dimensions that effect the fit of the structure will be that of the contractor and the fabricator.

The approval engineer should check enough basic geometry dimensions in order to satisfy themselves that the shop details have conformed to the geometric intent of the design. Shop assembly diagrams for girder laydowns should be selectively checked to insure the profile of the girders are consistent with the vertical shape of the bridge.

In addition, the engineer should check the following:

✔ Check all web plates for:
- Thickness including shop splice locations
- Depths including tapers and end haunches
- Specification of material and testing requirements (such as A709-Gr. 50 CVN testing zone 2) for material in tension zones.

✔ Check flange plates for:
- Thickness including shop splice locations
- Width of flange plates
- Conformance to minimum length requirements
- Specification of material and testing requirement (such as A709-Gr. 50 CVN testing zone 2) for material in tension zones.

✔ Check size of all stiffeners and connection plates for:
- Width and thickness
- Welding (to web and flanges)
- Approximate spacing of intermediate stiffeners if any are required
- Interferences with shop weld and flange splice locations

✔ Check all bolted field splices for:
- Size of splice material
- Numbers and size of bolts in bolt material

✔ Check all cross frame connections for:
- Number of bolts in connection plates if bolted
- Length and size of welding for shop welds
- Size and type of members
- Spot check camber mid-ordinate for girder sections

✔ Check center of span, field splice and interior pier ordinates on shop assembly diagrams

✔ Check fillet weld sizes for all welded connections for the following:
- Web to flange
- Stiffeners to web and flange
- Built-up members

✔ Check number and size of bolts in floor beam, diaphragm and cross girder connections
- Verify that all painted and non-painted surfaces are in conformance with design and specifications
- Non-destructive testing of all welds is in conformance with design and specifications
- Verify that all material and material testing is in conformance with design and specifications
- Confirm that details follow the latest revision to contract plan
- Answer any questions noted on drawings as “engineer verify” or similar

Basic Framing Plan Information

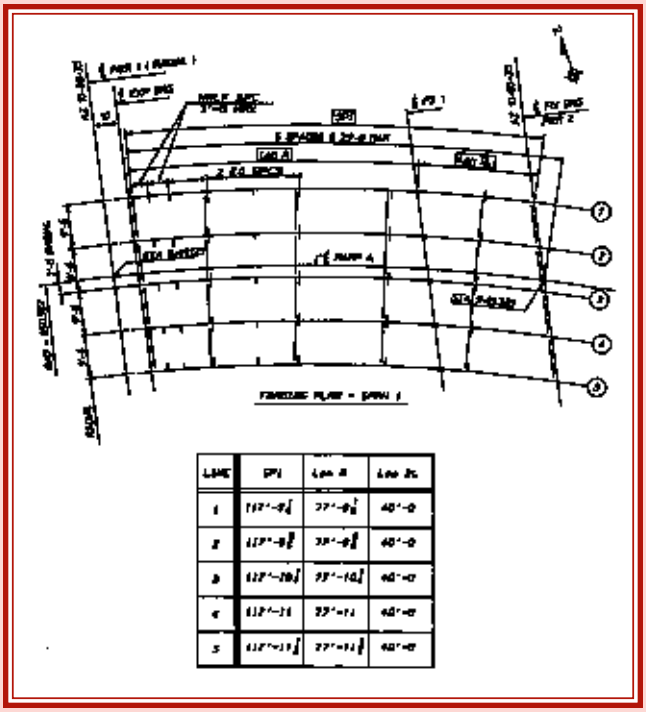
The more complete a shop drawing, the easier and less expensive the detailing and fabrication. Basic framing plans should include:

- Show the centerline or geometric control line relative to the girder line spacing. If the bridge is curved, this should be a radial dimension.

- Show the azimuths of the piers or indicate that the piers are radial. An alternative would be showing the skew angle relative to a radial line.

- Indicate the stations of all pier centerlines at their intersection with the station line. In order to more accurately control the geometry, show stations to three decimal places rather than two (two decimal places would be to the nearest 1/8”).

- Locate the centerline of the bearings if it differs from



the centerline of the pier. Indicate if it is radial or parallel to the pier.

• Identify the type of bearings at each pier. On many design plans, this information is shown only on the general plan sheet.

• Identify the girder lines with either numbers or letters starting from the top of the plan. Show the information in a table in the same manner (numbers are preferable, but letters are acceptable).

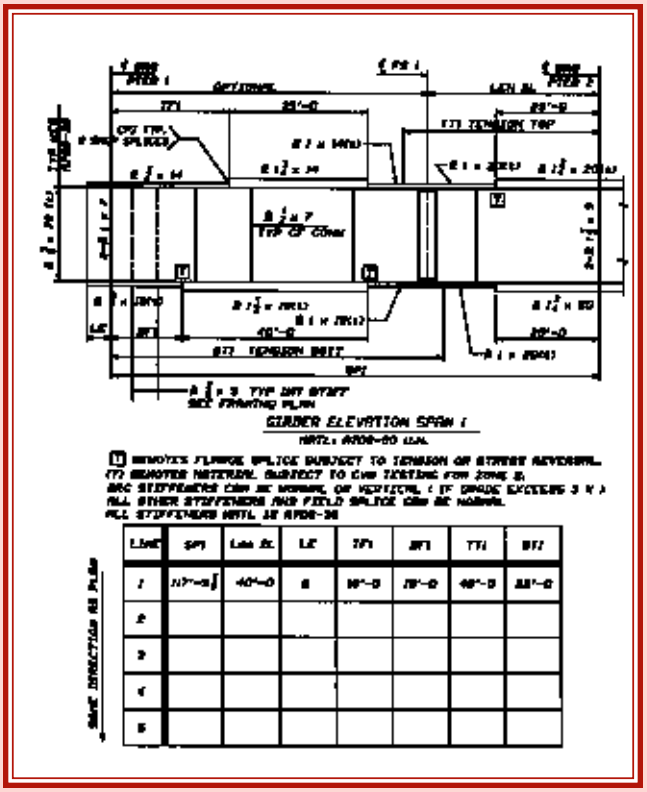
• Space the intermediate crossframes along an outside girder line or along the basic control line. In either case, only indicate the number of spaces and the maximum spacing permitted in accordance with your design criteria. Crossframe connection locations that interfere with field splice material are the cause of many of the problems with contract plans today.

• The framing plans are the best place to show intermediate stiffener locations and spacing. Indicate the number of equal spaces between the crossframe connections and, if required, the maximum spacing for the panel. Avoid showing stiffener spacing on the girder elevation sheets unless each girder has its own elevation.

Girder Elevation Information

• Since the end of girder overhang dimensions may be variable, show the length of flange plates from centerline of bearings (not from end of girder). Try to keep the width of the flange plates the same on each girder section. The top flange and bottom flange can be different widths. Vary the thickness as required by the design. Keep the same flange thickness for adjacent girders the same in order to provide the fabricator with an economical slab width for purchasing.

• Identify the tension areas and splices that are subject to tension. Note all flange plates that require CVN testing as well as the CVN zone.



• Give the minimum size of all stiffeners. Since the stiffeners have been shown on the framing plan, they need not be spaced on the elevation.

• Locate field splices from the piers. It is not necessary to locate field splices from each other, but this information can be helpful to the fabricator when he is estimating the project.

• It is not necessary to specify the type of shop welded splices required. Add a note that states: “All shop welded splices shall be prequalified AWS full penetration weld joints.” Since all fabricators must submit their welding procedures to the state's inspection agency, showing the weld preparation details on the design drawings and shop details is redundant.

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The mission of The National Steel Bridge Alliance (NSBA), which was formed in 1995, is to enhance the art and science of the design and construction of steel bridges. Its activities include organizing meetings, conferences and national symposia, conducting the Prize Bridge Awards competition, supporting research, developing design aids, and providing assistance to bridge owners and designers. The NSBA membership includes representatives from all aspects of the steel bridge industry.