Shop Detail Drawing Presentation Guidelines

AASHTO/NSBA Steel Bridge Collaboration
Preface

This document is a standard developed by the AASHTO/NSBA Steel Bridge Collaboration. The primary goal of the Collaboration is to achieve steel bridge design and construction of the highest quality and value through standardization of the design, fabrication, and erection processes. Each standard represents the consensus of a diverse group of professionals.

It is intended that Owners adopt and implement Collaboration standards in their entirety to facilitate the achievement of standardization. It is understood, however, that local statutes or preferences may prevent full adoption of the document. In such cases Owners should adopt these documents with the exceptions they feel are necessary.

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Introduction

The presentations shown in these Guidelines are based on a general consensus and are not intended to be binding on any Fabricator. Since fabrication drawings have information on them based on each Fabricator's equipment and fabrication processes, they may vary from the drawings shown.

At this time, for the purpose of presentation, metric dimensions have been used on all of the shop detail drawings. English dimensions shall be used if specified in the contract documents. Regardless of the system used, the presentation shown would apply to either metric or English units.
## Standard Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRG</td>
<td>Bearing</td>
</tr>
<tr>
<td>BTS</td>
<td>Bolt To Ship</td>
</tr>
<tr>
<td>CL</td>
<td>Centerline</td>
</tr>
<tr>
<td>CVN</td>
<td>Charpy V-Notch Testing</td>
</tr>
<tr>
<td>DA</td>
<td>Drill Assembled</td>
</tr>
<tr>
<td>DEV</td>
<td>Developed</td>
</tr>
<tr>
<td>DT</td>
<td>Drilling Template</td>
</tr>
<tr>
<td>DOR</td>
<td>Direction Of Rolling</td>
</tr>
<tr>
<td>DWG</td>
<td>Drawing</td>
</tr>
<tr>
<td>FCM</td>
<td>Fracture Critical Member Or Fracture Critical Material</td>
</tr>
<tr>
<td>FCW</td>
<td>Fracture Critical Weld</td>
</tr>
<tr>
<td>FLG</td>
<td>Flange</td>
</tr>
<tr>
<td>FS</td>
<td>Far Side Or Field Splice</td>
</tr>
<tr>
<td>FWS</td>
<td>Field Weld Shrinkage</td>
</tr>
<tr>
<td>HCL</td>
<td>Horizontal Control Line</td>
</tr>
<tr>
<td>MK</td>
<td>Mark</td>
</tr>
<tr>
<td>MATL</td>
<td>Material</td>
</tr>
<tr>
<td>MT</td>
<td>Magnetic Particle Ndt</td>
</tr>
<tr>
<td>NC</td>
<td>Numerical Control</td>
</tr>
<tr>
<td>NDT</td>
<td>Nondestructive Testing</td>
</tr>
<tr>
<td>NS</td>
<td>Near Side</td>
</tr>
<tr>
<td>N.T.S.</td>
<td>Not To Scale</td>
</tr>
<tr>
<td>OBG</td>
<td>Orthotropic Box Girder</td>
</tr>
<tr>
<td>OPP.</td>
<td>Opposite</td>
</tr>
<tr>
<td>PC</td>
<td>Point Of Curvature</td>
</tr>
<tr>
<td>PCC</td>
<td>Point Of Compound Curve</td>
</tr>
<tr>
<td>PT</td>
<td>Point Of Tangency</td>
</tr>
<tr>
<td>R</td>
<td>Radius</td>
</tr>
<tr>
<td>RA</td>
<td>Ream Assembled</td>
</tr>
<tr>
<td>RT</td>
<td>Radiographic Ndt</td>
</tr>
<tr>
<td>SECT.</td>
<td>Section</td>
</tr>
<tr>
<td>STIFF.</td>
<td>Stiffener</td>
</tr>
<tr>
<td>U.N.</td>
<td>Unless Noted</td>
</tr>
<tr>
<td>UT</td>
<td>Ultrasonic Ndt</td>
</tr>
<tr>
<td>WP</td>
<td>Work Point</td>
</tr>
<tr>
<td>WS</td>
<td>Weld Shrinkage</td>
</tr>
<tr>
<td>WT</td>
<td>Wrench Tight Bolts (Snug Tight)</td>
</tr>
</tbody>
</table>
Shop Detail Drawing Presentation Guidelines

Section 1
Preferred Uniform Procedures

1.1 Shop Drawing Format
1.1.1 Sheet Size and Layout
- The sheet size should be 610 mm x 915 mm (24” x 36”) with a 38 to 50 mm (1 1/2” to 2”) border on left edge and a 12 mm (1/2”) border on the other 3 sides.
- Title block to be as required by Fabricator, contain all the required information as specified by the Owner and located in the lower right of drawing.
- Allow ample open space near the title block for approval review stamps. Normal size should be 50 mm x 25 mm (2” x 1”) for full size sheets and an appropriate size for reduced size sets.

1.1.2 Line Weights and Text
- Object lines to be shown with approximately 0.70 mm width lines and dimensional lines shown with approximately 0.30 mm width lines.
- Text to be a minimum of 2.8 mm in height and be in block form with a line weight of 0.35 mm. Text must be legible when reduced to half size prints. (Detailing reference information may be shown smaller.)
- Upper case is generally used for all text except shop assembly piece marks, which are usually shown in lower case.

1.1.3 Drawing Medium
- Electronic files for approval and final distribution to be in either TIFF or PDF format based on prior agreement with Reviewer and Owner.
- Hard copy approval to be half size paper prints. Full size if required by specification. (half size preferred)
- Final hard copy distribution to be per specification: paper, vellum, film or microfilm. Electronic files on a CD is preferred and may be utilized upon mutual agreement.

1.2 Shop Drawing Numbering System

For Type of Drawing

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Contents Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS</td>
<td>Worksheets (calculation and layouts used to prepare shop drawings; not to be reviewed as shop fabrication drawings)</td>
</tr>
<tr>
<td>TD</td>
<td>Typical details and layouts (details and layouts to prepare shop drawings; not to be reviewed as shop fabrication drawings)</td>
</tr>
<tr>
<td>GN</td>
<td>General shop notes and typical details (lists appropriate notes for welding, paint, etc.)</td>
</tr>
<tr>
<td>BG</td>
<td>Basic girder diagrams (web and flange cutting diagrams)</td>
</tr>
<tr>
<td>WC</td>
<td>Web camber details (camber cutting and splicing of webs)</td>
</tr>
<tr>
<td>FS</td>
<td>Flange splicing details (assembly and splicing of flanges). Web to flange welds may be shown here, on WC drawing, or on girder detail drawing</td>
</tr>
<tr>
<td>FW</td>
<td>Field work sheets (used to obtain field dimensions and/or show required fieldwork, including field reaming and drilling)</td>
</tr>
<tr>
<td>HC</td>
<td>Horizontal curve diagrams (final line curve diagrams per piece with horizontal ordinates shown)</td>
</tr>
</tbody>
</table>
## Shop Detail Drawing Presentation Guidelines

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Contents Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Girder job standards (parts details for I girders, box girders and tub girders)</td>
</tr>
<tr>
<td>Z</td>
<td>Stringer job standards</td>
</tr>
<tr>
<td>M</td>
<td>Miscellaneous job standards (parts details, rolled beams, cross frames, diaphragms, etc.)</td>
</tr>
<tr>
<td>SB or SD</td>
<td>Sub-assemblies (parts, shop or field assembled, as units prior to incorporating into a shipping piece or the structure)</td>
</tr>
<tr>
<td>E</td>
<td>Anchor bolt plans, field bolt and erection framing plans (location of shipping piece marks). Note: these are not erection procedure plans.</td>
</tr>
<tr>
<td>SA</td>
<td>Shop assembly diagrams (line assembly reaming, unit assembly, etc.)</td>
</tr>
<tr>
<td>1 thru...</td>
<td>Details of girders, cross frames, stringers, diaphragms, etc.</td>
</tr>
<tr>
<td>SP</td>
<td>Shipping procedures (detailed procedure to ship unique pieces)</td>
</tr>
<tr>
<td>WP</td>
<td>Welding procedures (used to show required welding procedures; to be submitted and approved separately from shop detail drawings)</td>
</tr>
</tbody>
</table>

Note: Prefix typically followed by numerical identification 1,2,3, etc.

### 1.3 Shop Detail Drawing Numbering Sequence

There should be a logical sequence in shop detail drawings that will aid the reviewer and shop personnel. The approval review process will be expedited if all structure drawings are organized in a common sequence. The prefixed drawings should be located within sets in the order shown in Section 1.2.

Numbered drawings should be sequenced similarly to the following example:

<table>
<thead>
<tr>
<th>Description</th>
<th>Drawing No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing Details</td>
<td>1</td>
</tr>
<tr>
<td>Girders 2G1A</td>
<td>2AC, 2BC, 2C*</td>
</tr>
<tr>
<td>3G2A</td>
<td>3</td>
</tr>
<tr>
<td>4G3A</td>
<td>4</td>
</tr>
<tr>
<td>5G4A</td>
<td>5</td>
</tr>
<tr>
<td>6G1B</td>
<td>6</td>
</tr>
<tr>
<td>7G2B</td>
<td>7</td>
</tr>
<tr>
<td>8G3B</td>
<td>8</td>
</tr>
<tr>
<td>9G4B</td>
<td>9</td>
</tr>
<tr>
<td>Cross Frames, Diaphragms &amp; other Misc.</td>
<td>10</td>
</tr>
</tbody>
</table>

*Use letters as suffix when details require more than one drawing.

NOTE: Certain projects may require deviation from the Shop Detail Drawing Numbering System Sequence, dependent upon the Fabricator's requirements. Also, WS, TD, GN, WC & FS drawings may be prepared and submitted [with other necessary sheets/information (E & WP)] prior to balance of detail drawings on large projects in order to begin with fabrication of these pieces. Partial submittals must be complete enough to allow checkers to adequately cross-reference information and avoid requiring later re-checking.
### 1.4 Marking System for Shipping Pieces

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>Girder (member built up of plates for flanges &amp; web)</td>
</tr>
<tr>
<td>BG</td>
<td>Box Girder (closed box member)</td>
</tr>
<tr>
<td>TG</td>
<td>Tub Girder (open box member)</td>
</tr>
<tr>
<td>S</td>
<td>Stringer (rolled beam member)</td>
</tr>
<tr>
<td>D</td>
<td>Diaphragm (single rolled shape between main members or built up plate type)</td>
</tr>
<tr>
<td>CF, K, X</td>
<td>Cross Frame (built-up member between main members made up of rolled shapes such as wide flange sections, channels or angles)</td>
</tr>
<tr>
<td>L or LB</td>
<td>Lateral Bracing (all horizontal plane, diagonal bracing)</td>
</tr>
<tr>
<td>MS</td>
<td>Miscellaneous (shipping pieces not in any other group)</td>
</tr>
<tr>
<td>DU</td>
<td>Deck Units (usually railroad bridge floor beams with plates attached)</td>
</tr>
<tr>
<td>AB</td>
<td>Anchor Bolts</td>
</tr>
<tr>
<td>BP</td>
<td>Bronze Plate</td>
</tr>
<tr>
<td>BR</td>
<td>Brackets (cantilever type)</td>
</tr>
<tr>
<td>EB</td>
<td>Elastomeric Bearing</td>
</tr>
<tr>
<td>FB or B</td>
<td>Floorbeams (rolled beam or built-up I-girder)</td>
</tr>
<tr>
<td>PP</td>
<td>Preformed Pad</td>
</tr>
<tr>
<td>LP</td>
<td>Leveling Plate</td>
</tr>
<tr>
<td>MP</td>
<td>Masonry Plate</td>
</tr>
<tr>
<td>P</td>
<td>Pin</td>
</tr>
<tr>
<td>RP</td>
<td>Rocker Plate</td>
</tr>
<tr>
<td>SP</td>
<td>Sole Plate</td>
</tr>
<tr>
<td>W</td>
<td>Washer</td>
</tr>
<tr>
<td>WD</td>
<td>Weld Detail Drawing (for use on complex structures with many weld details)</td>
</tr>
</tbody>
</table>

Fracture critical pieces may be prefixed ‘F’, such as FG, FBG, FTG, etc. This is optional and may be used by a Fabricator to differentiate this material. The above letters may be prefixed with the sheet number on which the piece is detailed, serving as a self-indexing system, and suffixed with a numerical identification. Longitudinal main members shall be suffixed A, B, C, etc. in addition to their numerical suffix. See sheets WS1 and E1 for reference.
Show the horizontal/geometric control line (HCL) with all defining points (e.g., PT, PC, PCC), azimuths and radii as applicable along with skew angle to bearing line.

Indicate the stations for the intersections of the centerlines of bearings and the HCL.

Show dimensions for center to center of bearing along the HCL in a horizontal plane.

Dimension the sloping length (along centerline of member) from field splice to field splice and crossframe to crossframe with corrections made for geometric camber. Note if correction for dead load camber has been made to the dimensions.

Show transverse dimensions for center to center of girders in a horizontal plane.

Indicate the direction of NORTH relative to the structure.

Show value and direction of crossframe drops with arrow pointing towards low end of member. Label designation of crossframe as per contract drawings.

Indicate the type of bearing at each support (i.e., fixed, expansion).

Label field splices (e.g., FS1, FS2), piers, abutments and span numbers.

Show grade of member at bearings and direction of grade (positive numbers for uphill grades left to right and negative numbers for downhill grades).

Show elevation view of girders when required to fully define dimensions.

Crossframe drops (difference in elevations) can be either given in their final (fully deflected) position or in a cambered (or erected) position. The camber position could be with all of the camber included or partial dead load camber after steel deadload deflection occurs. The Engineer should specify this value. This is extremely important on skewed or curved bridges where a different camber and deadload deflections exists between adjacent girders.
Section 3
Typical Layouts
(SHT No. TD1, page 9)

- Typical layouts are used to coordinate the geometry of connections that appear throughout the structure. Field splices are not generally shown on these sheets.
- Illustrate crossframes with the side that requires the most welding as the near side. Indicate whether this is up or down station or the direction looking (such as “Looking East”). Welds are not required to be shown here. (See crossframe details)
- Assign and label location of work points (WP) controlling the geometry of the crossframe. Crossframe WPs should be kept on the crossframe. Establish new fabrication WPs that are on the crossframe if the design drawings specifically indicate WPs not located on the crossframe.
- Dimension horizontal distance from center to center of girders.
- Show the horizontal distance from centerline of girder to the first vertical row of holes in the connection plate, and horizontal spacing of the rows of holes in the connection plate.
- Indicate depths of girder webs.
- Show the vertical dimensions along the centerline of girder web for crossframe: WP to WP and connection plate hole spacing.
- Indicate thickness and width of crossframe connection plates, gussets and fill plates, along with the size of all rolled shapes.
- Provide the AASHTO and/or ASTM specification for the material.
- Note bolt and hole diameters.
- Show edge distances on crossframe components.
Section 4
General Shop Notes
(SHT No. GN1, page 12)

A general note sheet must be made for all bridge contracts. It lists the specifications and requirements for fabrication, material, shop procedure, inspection, cleaning and painting, and shows standard details required for the particular structure. Notes are not intended to be all-inclusive, and compliance with relevant specifications remains a requirement.

4.1 Specifications
List the appropriate documents that pertain to the structure and any provisions that may modify them. These typically include AASHTO, state and AWS specifications. If there are multiple edition dates for a particular specification or code stipulate the relevant version used in preparing shop drawings.

4.2 Material
- Identify the ASTM/AASHTO material specifications for the main and secondary members, bolts and shear studs. If thin fills are required and when A709M/M270 bridge steel is not available, alternate equivalent materials may need to be proposed for the Owners acceptance (e.g., ASTM A606).
- For CVN or FCM testing provide the zone, energy and frequency that corresponds to the grade and thickness of the material to be used.
- Specify whether the shear studs are to be shop or field applied.
- Note if the bolts are to be rotational capacity tested in shop, field and/or before delivery.

4.3 Fabrication and Workmanship
- Provide requirements for making re-entrant cuts.
- Indicate reaming or drilling procedures.
- Define Fabricator terms or identifiers (i.e., “DA”, “DT”, ”RA”, etc.).
- The remainder of this section is Fabricator/Owner dependant. Additional information shall be provided as necessary to eliminate repetitive notes or procedures on the actual detail drawings. In the example, the shop has provided a note prohibiting or taking exception to the use of the weights shown on the detail drawings for lifting or shipping purposes.
- A field splice plate match-marking scheme is necessary if the splice plates are reamed or drilled assembled. An additional match-marking scheme is shown on the shop assembly drawings addressing like-marking of plates when CNC drilled holes are used.

4.4 Shop Welding and Testing Notes
- Indicate the welding processes that may be utilized during fabrication of the structure.
- Define the specifications that control the welding procedures.
- Identify the type and extent of non-destructive testing and specifications required. Define the location and terms for each test (e.g., radiograph tension flange plate splices 100% and compression flange plate splices 25%)

4.5 Shop Cleaning and Painting Notes
- Identify the specifications for performing blast cleaning and any applicable profile requirements or time limits between blasting and priming.
Shop Detail Drawing Presentation Guidelines

- For structures that are to be completely or partially painted, the specifications should be given (e.g., State DOT supplemental provision 123). Indicate the type of paint, paint system, areas of no paint/mist coats and color for painted structures.
- For structures with complicated painting requirements, painting details and notes may be shown on a separate paint sheet (P1).

4.6 Optional Details Which May Appear on GN1

- For web or flange shop splices, the appropriate ANSI/AASHTO/AWS weld designation should be shown. When consumables must match weathering characteristics of unpainted steel, they shall be noted. Special weld details may be shown on this drawing on complex structures with special weld details. If there are many special details a 'WD' drawing may be provided.
- Weld termination details for stiffener/crossframe connection plates and other typical welds are to be given.
- Identify the spacing, size, method and testing required for shop installed shear studs.
EXAMPLE PRESENTATION ONLY

GENERAL SHOP NOTES

SHOP MOLDING AND TESTING NOTES:

1. WELDING SHALL BE IN ACCORDANCE WITH ANSI/AWWA/ASME BRIDGE MOLDING CODE, BO.5.3, EXCEPT AS MODIFIED BY THE CONTRACT DOCUMENTS & APPLIED SHOP MOLDING PROCEDURES (SEE DOCUMENTATION) FOR Shop.5.3.5.5.

2. NONDESTRUCTIVE TESTING SHALL BE IN ACCORDANCE WITH ANSI/AWWA/ASME BRIDGE MOLDING CODE, BO.5.3, AND SECTION 8.5.4.5 OF THE SHOP MOLDING SPECIFICATIONS, AS SHOWN ON THE DRAWING.

3. ALL WELDS SHALL BE VISUALLY INSPECTED. VISION INSPECTION SHALL BE PERFORMED BEFORE, DURING AND AFTER THE COMPLETION OF WELDING.

4. FLANGE SPLICES IN TENSION ARE NOTED “VT” ON THE AC & FS SHEETS.

5. FLANGE SPLICES IN COMPRESSION ARE NOTED “VP” ON THE AC & FS SHEETS.

SHOP CLERNING NOTES:

ALL MATERIAL TO BE BURNT CLEAN, FOR SPEC-ORG, EXCEPT POLING TO BE TREATED SHALL BE CLEANED FOR SPEC-ORG AND HAVE A SURFACE PROFILE OF 20 TO 30\unu.

SHOP PRINTING NOTES:

STEEL SHALL BE BURNT CLEAN, EXCEPT STEEL WITHIN 3 M 10 FEET OF AGGREGATE EXPANSION JOINTS, MAY BE BURNT CLEAN AND NOT BE POLISHED.

SHEET REFERENCE:

Facilities Plan PREPARED "W-13"
Front View PREPARED "AC-13"
Details, End Views PREPARED "AC-13"
Flange Sections PREPARED "AC-13"
X-RAY Sections PREPARED "AC-13"
Welding Details PREPARED "AC-13"

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Section 5
Web Camber

(SHT No. WC1 – WC4, pages 14 - 17)

Note: These drawings may illustrate webs and flanges, as shown, or just webs

- Show camber ordinates at equal spaces or spaces per Fabricator request relative to a baseline. The baseline should go through the end points of the web plate at the bottom, unless the web plate is haunched or tapered, then take the baseline through the top end points.
- On web camber diagrams with an end overhang or simple span web cambers, baseline should go through the centerline of bearing(s).
- Show end overhang and centerlines of bearing (if applicable).
- Show top and bottom dimensions and end cuts relative to the baseline.
- Show dimension from end of web plate to centerline of bearing along baseline at both top and bottom of the web plate for web plates that go over a pier bearing. Or, as an option, baseline could be shown from end to end of the girder.
- Show camber ordinates perpendicular to the baseline. If required for final dimensional accuracy, camber ordinates are to be adjusted for anticipated weld shrinkage.
- Give web plate thickness, width, length and mark. Width of web plate is usually billed as nominal width. A camber cutting allowance is to be added to the width when material is ordered. Some Fabricators might bill the ordered size in lieu of the nominal.
- Show location of shop web splices (if any).
- Note web plate material to be Charpy V-Notch tested.
- Give the corresponding girder mark for which the web plate is detailed in title for the web plate (optional as per Fabricator's standards).
- Note FMC and FCW for fracture critical material and associated welds when applicable.
- Give the page and line number of the advance bill of materials where the material is ordered.
- A correction for dead load deflection may be included to aid in setting bearing at time of erection.
Section 6
Flange Splicing Diagram
(SHT No. FS1, page 19)

Note: These drawings are included when flanges are not shown on WC drawings.

6.1 Straight Girders
Similar to flanges shown on WC1 - WC3, pages 14 - 16)

- Show elevation of web plate and flanges
- Identify and locate centerline of bearings.
- Locate shop splices.
- Show the overhang and end cut dimensions.
- Identify whether flange splices are in tension or compression.
- Give the thickness, width and length of each flange plate.
- Identify plate requirements (Charpy V-Notch testing).
- Give the size and location of fillet welds for flange to web connections.
- Note the procedure for making flange splice connections or reference the general note sheet if it is located there.
- Note the ASTM and/or AASHTO designation for the material.
- Show any bevels for flange width and/or thickness transitions.
- Note FCW for fracture critical welding if applicable.
- For curved girders see sections 6.2 and 7.
- Give the page and line number of the advance bill of materials where the material is ordered.

6.2 Curved Girders

- Define centerline of flange plate and a baseline through the end points.
- Show chord lines between ends of steel segments to center line of shop butt splices along centerline of flange plate. Space ordinates along each chord in accordance with Fabricator's standards.
- Identify centerline of field splices and the set-back dimension.
- Locate work points.
- Show offsets of shop splice relative to baseline chord to the centerline of flange plate.
- Along the baseline, show the overall length and lengths from ends to center of splice.
- Assign flange plate marks.
- Give overall arc length along centerline of spliced flange plate and arc length of individual flange plates.
- Show plate offset dimensions along and perpendicular to baseline and along and perpendicular to the plate chord lines.
- Provide flange plate thickness and width.
- Identify plates requiring Charpy V-Notch testing.
- Note the ASTM and/or AASHTO designation of the material.
- Show flange plate assembly diagram with flange to web welding, plate marks, and direction of ends (East, West). Identify and label centerline of bearing and reference camber diagram for web plate
- Give the page and line number of the advance bill of materials where the material is ordered.
Section 7
Horizontal Curve Diagram
(SHT No. HC1, page 21)

• Show curving with baseline through end points. On girders with end bearing overhangs, show the baseline through the bearing points, not to the end of girder.

• Identify and label centerline of bearings.

• Space curve ordinates at equal spaces relative to the baseline.

• Show dimensions for the radius, chord and arc length along the centerline of each girder.

• Show offsets and dimensions to baseline at centerline PC, PT, or PCC points.
8.1 Stiffeners and Connection Plates
(SHT No. X1, page 24)

- Show length, width and thickness for each stiffener.
- Dimension hole spacing from the top of the stiffener and from the edge that is to connect to the web. Do not dimension holes to the bottom of the stiffener or to the edge of the stiffener not in contact with the girder web.
- Show skewed and/or vertical bearing stiffeners to provide a "finish to bear" at bearing flange (usually bottom) and tight fit at other flange, unless contract drawings otherwise dictate.
- Check theoretical gap to web at corner of skewed stiffeners and connecting plates. If gap exceeds 2 mm (1/16"), bevel the edge of the stiffener to be in align with the girder web. Adjust fillet weld size when and as required by AWS D1.5.
- Dimension skewed connection plates and stiffeners to the web face; do not dimension to the centerline of web plate. Detail edges that must be beveled for proper fit to webs and flanges.
- Identify the type of stiffener (i.e., bearing, intermediate, etc).
- Indicate whether the ends of each stiffener are tight fit or finished to bear.
- Identify plates requiring Charpy V-Notch testing.
- Indicate the ASTM and/or AASHTO material designation.
- Fracture critical material must be identified as FCM.
- Note clip, snipe, and chip dimensions.
- Indicate hole and/or slot size(s).
- Note material that is to be plain.
- Give the page and line number of the advance bill of materials where the material is ordered.

8.2 Field Splices - Option 1
(SHT No. X2, option 1, page 25)

- Identify thickness, width and length of splice material.
- Show vertical and horizontal bolt spacing with edge distances.
- If the designs use minimum edge distances for the splice plates, request that the designer permit an increase in the edge distance according to shop preference.
- Indicate direction of mill rolling (DOR), typically longitudinal.
- Identify plates requiring Charpy V-Notch testing.
- Indicate the ASTM and/or AASHTO designation for field splice material.
- To simplify detailing show field splice plates stacked on top of one another. Show an elevation of how the plates are stacked.
- Give the advance bill order page and line number for all material.
- Note if the holes are to be drilled or reamed in assembly or by CNC.
- Determine if there is sufficient bolting clearances at field splice plates, and if spacing and clearances of splice holes meet minimum AASHTO requirements. If clearances are inadequate, contact the Engineer or designer and propose desired alterations.
8.3 Field Splices – Option 2  
(SHT No. X2, Option 2, page 26)

- Show the field splice as an assembly and assign a sub-assembly mark that correlates to the field splice number on the worksheet.
- Identify thickness, width and length of splice material.
- Show vertical and horizontal bolt spacing with edge distances.
- If the designs use minimum edge distances for the splice plates, request that the designer permit an increase in the edge distance according to shop preference.
- Determine if there is sufficient bolting clearances at field splice plates, and if spacing and clearances of splice holes meet minimum AASHTO requirements. If clearances are inadequate, contact the Engineer or designer and propose desired alterations.
- Indicate gap between girders at centerline of field splice.
- Indicate direction of mill rolling (DOR), typically longitudinal.
- Indicate the ASTM and/or AASHTO designation for the field splice material.
- Detail field splices showing top flange, web and bottom flange connections.
- Note if the holes are to be drilled or reamed in assembly.
- Show bevels or cuts for transitions in bottom flange width.
- Give the advanced bill order page and line number for all material.
EXAMPLE PRESENTATION ONLY

METRIC
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. ALL HEIGHTS ARE IN MILLIMETERS.

GIRDER STANDARDS

AASHTO/NSBA STEEL BRIDGE COLLABORATION
TENSEC GROUP OF COMPANIES LTD

SHOP NOTE
MATERIAL: [AASHTO/NSBA]
BRIDGE LOCATION:
MFG: [MFG NAME]

PRIORITY: [PRIORITY]
KIND: [KIND]
ADDITIONAL:

DATE: [DATE]
REV: [REV]


g"w"t"h"

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EXAMPLE PRESENTATION ONLY

FIELD SPlice DETAIL = X2M1
FIELD SPlice DETAIL = X2M2
FIELD SPlice DETAIL = X2M3

METRIC
1. ALL DIMENSIONS ARE IN MILLIMETERS UN.
2. ALL WEIGHTS ARE IN KILOGRAMS.

OPTIONAL BILL OF MATERIAL

GIRDER STANDARDS

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The crossframe standards sheet should be used for crossframe gusset plate material. Gussets and fill plates are typically repeated and may be shown on this sheet or detailed once on the crossframe detail sheet.

All pieces should be given a piece mark. Labeling varies by Fabricator, but most use a similar method to that shown for recurring material: the piece mark may be the drawing number followed by a letter.

Identify type of piece (i.e., gusset, fill, etc.).

Detail gusset plates approximately to scale with the following applicable information: length, width, and thickness, edge distances and hole to hole, dimension of clips, material specification, testing that is to be done to the material, quantity and piece mark.

Indicate hole and/or slot sizes.

Note material that is to be plain.

Consult the Fabricator for additional detailing information.

Give the page and line number of the advance bill of materials where the material is ordered.
Section 10
Erection Framing Plan

(SHT No. E1, page 31)

10.1 General

- The framing plan must clearly show the location of all the items provided by the Fabricator.
- Show horizontal span lengths and girder spacing along the bearings. Do not attempt to dimension the entire structure; general shape and size is the intent.
- Show stationing at supports shown on WS1.
- Label all supports, field splices and spans.
- Indicate the shipping mark in the same relative position as it will be when the steel is erected.
- Field welded items, if any, must be accurately located and weld symbols must be properly shown.
- Items related to the structural steel but provided by other sources should be identified by the use of phantom lines and notes.
- Show additional details as required to facilitate proper field placement of pieces.

10.2 Field Bolt List

- Include all field bolted connections.
- Describe each field connection so the erector can correctly locate it. On complicated connections with multiple plies and pieces, special sketches may be required.
- List the thickness of each plate to be fastened, the total grip, the number of bolts required, the number of times the connection occurs, and the diameter and length of bolt for each connection.
- Indicate the type and quantity of washers per bolt for each connection.
- Use the AISC bolt length chart for determining the length of bolts. Bolts less than 5 inches are in ¼ inch increments; bolts that are to be over 5 inches may be in ¼ or ½ inch increments. Contact the Fabricator to verify preferences. (Domestically produced metric bolts are not currently available except by special order. For "metric" projects, contact Owner to verify how U.S. Customary dimensioned bolts and hole sizes are to be detailed. Bolt lists should show material actually furnished, not a "metric conversion" of inch-dimension bolts.)

10.3 Field Bolt Summary

- Provide the material specification for each fastener assembly (bolt, nut, washer, etc.).
- Show the actual count for each bolt length/diameter.
- Give the percentage of extra bolts to be added to the actual count and the number of bolts to be added for testing and possible field losses. The percentage and number for testing vary with quantity and contract requirements. Verify with Fabricator and Contractor, based on anticipated erection sequence and duration.
- Calculate the total count of each bolt length/diameter = Actual Count + % extra + Testing.
- Provide the total number of washers.
Shop Detail Drawing Presentation Guidelines

• Indicate if the bolts are to be rotational capacity tested by the manufacturing or Owner’s representative prior to delivery and if additional testing is required before shop and/or field installation.
Section 11
Shop Assembly Diagram

(SHT No. SA1, page 33)

11.1 Shop Assembly Diagram
[Dependent upon the shop fabrication process this diagram may be simplified if used only for a reaming diagram or check assembly diagram.]

11.2 Vertical Blocking Diagram
- Define baseline with equal offsets (305 mm shown in example; U.S. customary equivalent is 12 inches.) to the bottom of the web plate, from centerline of first bearing to centerline of last bearing for each line on the bridge. Offsets should be sufficient to keep all intermediate points above the baseline (positive).
- Show dimensions along and perpendicular to the baseline at all field splices, and bearing points unless otherwise required by the contract.
- Show all girder shipping marks.
- At each field splice, show the splice plates and their piece marks.
- For splice plates that are drilled or reamed in assembly (DA or RA) use the match-marking scheme shown on the example diagram or the one shown on the General Notes.

11.3 Plan View Blocking Diagram
- Define baseline from left end of steel or the left-most centerline of bearing to the right end of steel or the right centerline of bearing.
- Dimension all bearings and field splice points along and perpendicular to the baseline.
- Keep longitudinal presentation approximately to scale. Lateral offsets may be exaggerated for large radii or small-angle diverging flares.
Shop Detail Drawing Presentation Guidelines

Section 12
Girder Details

(SHT No. 1, 5, 9, 16, pages 36 - 39)

- Provide elevation of girder web and flanges. If flange or web is shop butt spliced, show location of splice(s).
- Show web to flange welding on both top and bottom flanges. (Optional if shown on camber and flange diagrams; see sections 5 & 6).
- Show web and flange plate marks.
- Show stiffener and crossframe connection plates on the elevation. Note plates as near side (NS) or far side (FS). When the same plate is on both side of the web, note thus: 2 – xlf. Do not use (BS) for both sides.
- Label elevation with the corresponding girder mark from the calculation plan.
- At the left end of the girder elevation, note the approximate compass direction the end is oriented (i.e., East, West, North or South).
- Label centerline of bearings.
- Label centerline of field splice showing the set-back distance from end of girder.
- Show bearing overhang on end girders.
- Develop all longitudinal dimensions with lengths in the cambered position. (This is usually along the chord line from end to end but may vary based on Fabricator's preferences.)
- Show full length of curved girders in a developed view.
- Show end cut dimensions and provide reference to the corresponding camber diagram sheet.
- Dimension from left end of girder to centerline of bearing and to the right end of steel for both top and bottom flanges, along baseline.
- Dimension top and bottom flange plate lengths from left end of steel or centerline of bearing to flange splice(s) and on to the right to end of steel or centerline of bearing along baseline.
- Show the center-to-center dimension of all connection plates and stiffeners.
- Give the dimension from each end of steel to the centerline of the nearest stiffener or connection plate along baseline. Locate intermediate web stiffeners as per designs and dimension accordingly.
- Start extension dimensions from the left end of steel, NOT centerline of bearing, to the left face or centerline of the first connection stiffener and to the same location on each of the remaining connection stiffeners. Some Fabricators may indicate intermediate plain stiffeners as a single line.
- Provide a section looking toward the left end of the girder at each type of connection plate or stiffener location.
Shop Detail Drawing Presentation Guidelines

- In each section, show the corresponding stiffener or connection plate with hole pattern, if applicable. Dimension laterally from the centerline of web and vertically from the top of the web to the first hole. Show whether fit-up of stiffener is tight fit or finished to bear, and show required welds to web and/or flange).

- Show a camber diagram with top and bottom flange lengths along baseline, depth, overhang and actual camber mid-ordinate dimensions before any dead load deflection occurs. Identify the centerline of bearing, where applicable, and when girder has an intermediate bearing, dimension from ends of bottom flange at field splices or end bearings to centerline of intermediate bearing. Show offset dimension from top of web to bottom of web relative to a chord taken through the top of the web plate between field splices or from field splice to end bearing.

- Identify which cross-frame connection plates and/or stiffeners are perpendicular to the bottom flange and which are vertical (plumb) after erection.

- Studs may or may not be shop installed, based on contract requirements. If shop installed, show stud spacing and a section looking toward the left end of girder, and reference the typical section on the General Shop Notes sheet. Check clearance from edge of splice plates to studs. If shop installed studs fall on splice plates, request an increase in the number of studs adjacent to the splice. Omit shop primer in those areas when required.

- At field splices, refer to the splice detail sheet and the assembly piecemark for the field splice (8.2 Field Splices - Option 1 and sheet no. X2, option 1, page 25). Alternatively, show splice plates in position and piece marks along with flange transition when required (8.3 Field Splices – Option 2 and sheet no. X2, option 2 page 26).

- Bill all pieces for the girder assembly in the bill of materials starting with the assembly mark label, web and flange plates, splice plates, connection plates, stiffeners and shop installed studs.
EXAMPLE PRESENTATION ONLY

METRIC

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED.
2. ALL WEIGHS ARE IN KILOGRAMS.

ONE - GIRDER - SG2B
ONE - GIRDER - SG3B
ONE - GIRDER - SG4B

FOR GIRDER STANDARD DETAILS SEE SHEET E-1
FOR PLATE DETAILS SEE SHEET E-4
FOR ASSOCIATED PLATE details SEE SHEET E-10
FOR CONCRETE, DECK NOTES & TYPICAL DETAILS SEE SHEET E-10

SECTION - A
SECTION - B
SECTION - C

GERDER - SG2B, SG3B & SG4B

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Guidelines for Shop Detail Drawing Presentation

THANK YOU
Section 13
Crossframe Details

(SHT No. 20 - 22, pages 42 - 44)

- Detail crossframe with the side that requires the most welding on the near side.
- Charting or scheduling of crossframes is acceptable. However, keep the number of variables to a minimum and do not expand the numbers in the table to a point where the crossframe no longer resembles the picture.
- When charting or scheduling crossframes, sequence items according to depth first, length second, and drop third. (Optional)
- Consecutive shipping marks within the chart and drawings are preferred.
- Shipping marks are generally a combination of sheet number, shipping type designation (e.g., CF for crossframe or D for diaphragm), and a number. This varies with Fabricator. See 1.4 for the preferred marking system.
- Crossframe drops should be combined as stated on the calculation plan. Preferably show drops from top to top hole.
- Crossframe work points (WP) must be kept on the crossframe. If the design drawings specifically indicate WPs not located on the crossframe, then new fabrication WPs shall be established that are on the crossframe.
- Dimension crossframes from WP to WP horizontally, vertically and along slope.
- Dimension horizontal and vertical hole spacing.
- Locate crossframe members with set-back dimensions from only one end.
- All pieces should be rounded to a standard increment (e.g., 5mm, 10mm or 25mm; ¼”, ½” or 1”).
- Slopes shown are for reference. They are used to calculate angle to angle or hole to hole clearances, and lengths of welds.
- Show location and size of all welds. “TYPICAL” or "typ" may be used for common details.
- Provide all hole sizes.
- Indicate painting requirements when applicable. Do not detail crossframes as “Opposite Hand”; most Fabricators require a new picture. Check with Fabricator before using negative drops.
- If an identical assembly piecemark repeats on other sheets and is not on a standard sheet, use the same mark and bill the piece on each sheet.
- All gusset plates should be the same size and have the same hole spacing whenever possible. Contact the Fabricator if varying sizes are required by the contract so Fabricator may request appropriate changes.
- For K-type cross frames the check dimensions are for squaring up the crossframe jig and are optional.
Shop Detail Drawing Presentation Guidelines

- Showing the piece mark of the crossframe connection plate/bearing stiffener is a reference item for checking and is optional.

- Dimensions from centerline of girder or to top or bottom web are reference dimensions that can be found on the TD sheet and are not required by all shops.

- The shop bill should include the quantity, weight and mark for each assembly. Following each shipping mark, all pieces used to create the crossframe assembly should be listed.

- In the bill, provide the quantity, piece mark, shape, dimensions, page and line number and material specification for each piece detailed on the sheet. If all the material is of the same specification, provide one common note below the bill.

- Specify ASTM and/or AASHTO material type and any element requiring CVN testing. CVN testing may be required for bracing on curved or heavily skewed structures, cross-members supporting terminating main members, or elements subject to wind loads or traffic-induced vibration

- Some Fabricators may not require unique marks for crossframe component material such as angles, channels, etc.

- When applicable, clearly show and note "Painting" requirements on detail.
**Commentary**

**C4.6** Designate all fracture critical welds FC and governed by AWS bridge welding codes.

**C6.1 & 6.2** Show, when applicable, flange width transitions at shop welded splices (radius or straight temper) as preferred by Fabricator.

**C12** Locate skewed stiffeners to edge in contact with web and not to center line of stiffener. Show section for clarity.