AASHTO/NSBA Steel Bridge Collaboration

G 1.4 - 2006

Guidelines for Design Details

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.

Disclaimer

The information presented in this publication has been prepared in accordance with recognized engineering principles and is for general information only. While it is believed to be accurate, this information should not be used or relied upon for any specific application without competent professional examination and verification of its accuracy, suitability, and applicability by a licensed professional engineer, designer, or architect.

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U.S. COAST GUARD, Nick E. Mpras, Jacob Patnaik
U.S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE, Rosana Barkawi

INDEX OF SHEETS

NOTES:

NUMBER AND DIAMETER OF BOLTS, WELD SIZES AND TYPES , LINES ,ROWS, COLUMNS OF HOLES,
AND MATERIAL DIMENSIONS SHOWN ON ALL THESE SHEETS ARE FOR PRESENTATION PURPOSES ONLY.
IT IS THE RESPONSIBILITY OF THE DESIGNER TO DETERMINE THE NUMBER AND DIAMETER OF BOLTS,
WELD SIZES AND TYPES , AS WELL AS THE SIZES OF MEMBERS AND CONNECTION PLATE SIZES.

STRUCTURAL STEEL INDEX OF SHEETS

AASHTO/NSBA STEEL BRIDGE COLLABORATION

TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS

MATERIAL : (UNLESS NOTED OTHERWISE)

ALL STRUCTURAL STEEL, FOR PAINTED PROJECTS, SHALL BE ASTM A709, GRADE 50. EXCEPT THAT STIFFENERS, INTERMEDIATE AND END CROSSFRAMES AND LATERAL BRACING MAY BE GRADE 36.
USE ASTM A709-50W FOR ALL MATERIAL ON UNPAINTED JOBS.
ALL BOLTS FOR PAINTED STEEL SHALL BE A325-TYPE 1 (MECH GALV) ROTATIONAL CAPACITY TESTED (RCT)
ALL BOLTS FOR UN-PAINTED STEEL SHALL BE A325-TYPE 3 ROTATIONAL CAPACITY TESTED (RCT)
ALL STRUCTURAL STEEL SHALL BE OF PRODUCED DOMESTICALLY ON FEDERAL AID PROJECTS.

FRACTURE CRITICAL MEMBERS:

DESIGN PLANS SHALL DESIGNATE EACH MEMBER OR COMPONENT THAT MUST MEET THE AASHTO REQUIREMENTS FOR FRACTURE CRITICAL MEMBERS. THE SPECIAL PROVISIONS FOR "FRACTURE CRITICAL" SHALL CONFORM TO THE PROVISIONS OF THE CURRENT AASHTO FRACTURE CONTROL PLAN. THE FABRICATOR MUST HAVE THE AISC FRACTURE CRITICAL ENDORSEMENT.

CHARPY V-NOTCH:

DESIGN DRAWINGS SHALL IDENTIFY ALL MAIN LOAD CARRYING MEMBERS.
ALL STRUCTURAL STEEL AS DESIGNATED ON THE PLANS SHALL RECEIVE CHARPY V-NOTCH TESTING IN ACCORDANCE WITH ASTM A709 AND SUPPLEMENTAL REQUIREMENT S83 OR S84 AS NOTED BELOW.

1. TENSION COMPONENTS OF REDUNDANT MEMBERS, DESIGNATED "T" ON THE PLANS, SHALL BE TESTED IN ACCORDANCE WITH TABLE S1.2 OF ASTM A709 (S83)

2. TENSION COMPONENTS OF FRACTURE CRITICAL MEMBERS, DESIGNATED "F" ON THE PLANS, SHALL BE TESTED IN ACCORDANCE WITH TABLE S1.3 OF ASTM A709 (S84)

STEEL FABRICATION:

FABRICATION SHALL BE PERFORMED IN ACCORDANCE WITH THE NSBA/AASHTO COLLABORATION DOC S2.1-2002 "STEEL BRIDGE FABRICATION GUIDE SPEC."
FABRICATORS OF STRUCTURAL STEEL SHALL HAVE THE APPROPRIATE AISC QUALITY CERTIFICATION.

WELDING:

1. WELDING DETAILS AND THE WELDING OPERATIONS SHALL BE IN ACCORDANCE WITH THE CURRENT EDITION OF THE AASHTO/AWS D1.5 BRIDGE WELDING CODE. WELDING PROCEDURES SHALL BE SUBMITTED AND APPROVED PRIOR TO WELDING ON PROJECT. NON-DESTRUCTIVE TESTING SHALL BE PERFORMED AS REQUIRED BY THE CURRENT EDITION OF THE ANSI/AASHTO/AWS D1.5 BRIDGE WELDING CODE.

2. THE FOLLOWING MEMBERS ARE CLASSIFIED AS ANCILLARY MEMBERS IN ACCORDANCE WITH THE CURRENT EDITION OF THE ANSI/AWS D1.5 BRIDGE WELDING CODE:

   A. EXPANSION JOINT

   B. DRAINAGE SYSTEM

   C. OTHER MISCELLANEOUS MATERIAL

FIELD CONNECTIONS:

ALL BOLTED CONNECTIONS SHALL USE 7/8 " DIAMETER ASTM A325 BOLTS UNLESS OTHERWISE NOTED, INSTALLED PER THE RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS (RCSC). BOLTS FOR SLIP CRITICAL CONNECTIONS (SPLICES, CURVED BEAM/GIRDER BRACING) SHALL HAVE ROTATIONAL CAPACITY TESTING (RCT).

PAINTING IF REQUIRED:

STRUCTURAL STEEL SHALL BE PAINTED WITH A COATING SYSTEM IN ACCORDANCE WITH THE APPROPIATE SECTION OF THE OWNERS SPECIFICATIONS, AND THE AASHTO/NSBA DOCUMENT ON PAINTING (TG8). S8.1-2002,"GUIDE SPECIFICATIONS FOR INORGANIC ZINC-RICH PRIMER BASED COATING SYSTEMS" AND S2.1-2002,"STEEL BRIDGE FABRICATION GUIDE SPEC."

DRAWING PRESENTATION AND APPROVAL GUIDELINES:

DESIGN DRAWINGS SHOULD BE PREPARED IN ACCORDANCE WITH THE AASHTO/NSBA "DESIGN PLAN PRESENTATION GUIDELINES" G1.2
DETAIL DRAWINGS SHOULD BE PREPARED IN ACCORDANCE WITH THE AASHTO/NSBA "SHOP DETAIL DRAWINGS PRESENTATION GUIDELINES" G1.3
SHOP DETAIL DRAWINGS SHOULD BE REVIEWED IN ACCORDANCE WITH THE AASHTO/NSBA "SHOP DETAIL DRAWING REVIEW/APPROVAL GUIDELINES" G1.1

NOTES TO DESIGNERS:

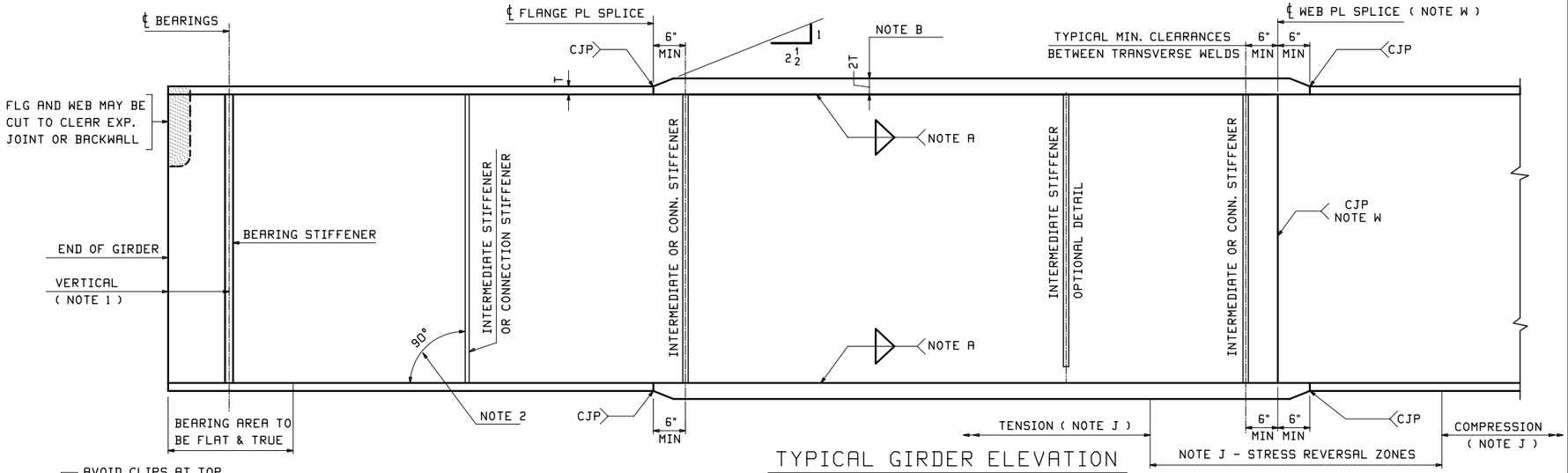
A... 1" DIAMETER HSB CAN BE USED TO REDUCE THE NUMBER OF BOLTS REQUIRED IN LARGE SPLICES OR CONNECTIONS BASED ON A RE-DESIGN BY A LICENSED ENGINEER AT THE CONTRACTOR'S EXPENSE.

DISCLAIMER NOTE
INFORMATION SHOWN IS FOR CONCEPT ONLY. APPLICATION TO SPECIFIC STRUCTURES IS THE DESIGNER'S RESPONSIBILITY.

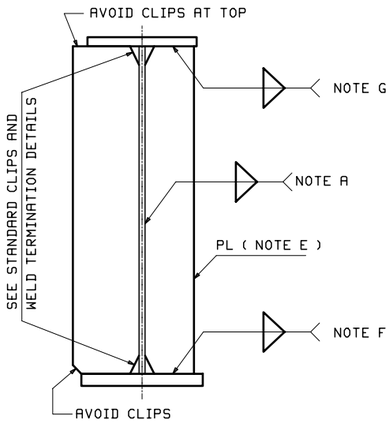
GENERAL NOTES STRUCTURAL STEEL

AASHTO/NSBA STEEL BRIDGE COLLABORATION

TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS

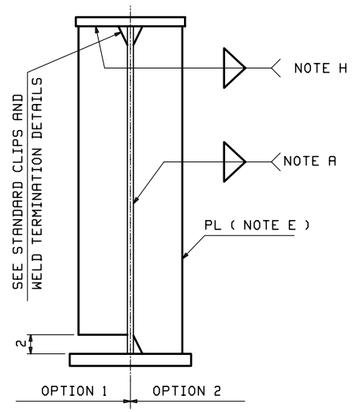


TYPICAL GIRDER ELEVATION



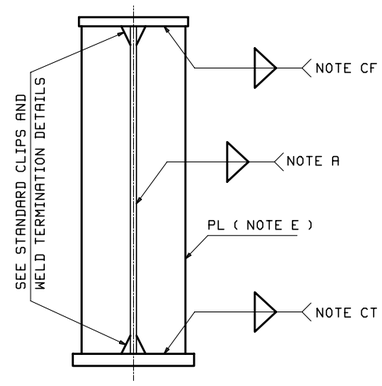
BEARING STIFFENER

BEARING STIFFENER TO FLANGE WELDING IS REQUIRED IF A DIAPHRAGM OR CROSSFRAME IS ATTACHED TO THE STIFFENER.



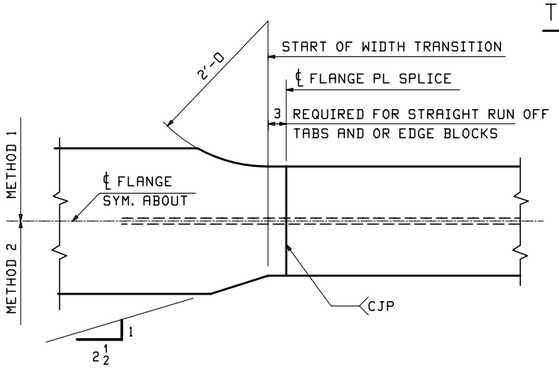
INTERMEDIATE STIFFENER

REQUIRED ON ONE SIDE AS A WEB STIFFENER ONLY (NOT A CONN PL.) EITHER WELD TO COMPRESION AND GAP AT TENSION FLANGE OR TIGHT FIT TO BOTH.



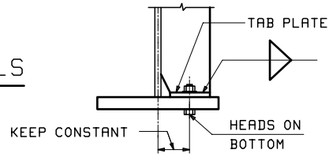
CONNECTION STIFFENER

TYPICAL STIFFENER DETAILS



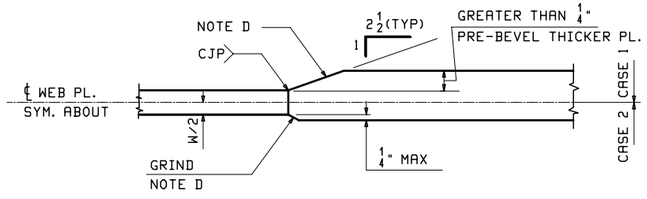
FLANGE PLATE WIDTH TRANSITION

AVOID FLANGE WIDTH TRANSITIONS (NOTE C)

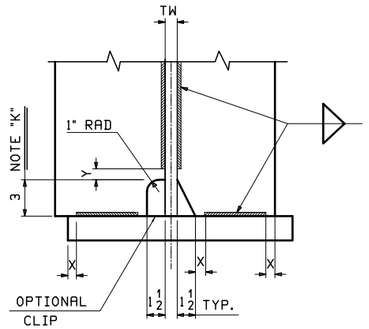


TAB PLATE DETAIL

NOTE CT AND J



WEB PLATE THICKNESS TRANSITION



STANDARD CLIP & WELD TERMINATION DETAIL

X=	1/4" +/- 1/8"
Y=	1/2" +/- 1/4"

DISCLAIMER NOTE

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NOTES FOR DESIGN DRAWINGS:

1 ... ENGINEER SHOULD SPECIFY THAT UNDER FULL DEAD LOAD, GIRDER ENDS AND ALL BEARING STIFFENERS, INCLUDING BEARING STIFFENERS AT PIERS, ARE VERTICAL OR NORMAL TO GRADE LONGITUDINALLY.

2 ... INTERMEDIATE STIFFENERS AND CONNECTION STIFFENERS SHOULD BE NORMAL TO THE FLANGE UNLESS OTHERWISE REQUIRED BY DESIGNER OR REQUESTED BY THE FABRICATOR, SUCH AS A CONNECTION STIFFENER IN AN AREA OF COMPLEX FRAMING. PLACE INTERMEDIATE STIFFENERS ON THE INTERIOR SIDE OF FASCIA GIRDERS.

NOTES TO DESIGNERS:

A ... FILLET WELD SIZES SHALL BE SHOWN ON THE DESIGN DRAWINGS OR A NOTE STATING THAT MINIMUM AASHTO/AWS WELDS SHALL BE USED. WHERE EVER POSSIBLE AVOID FILLET WELDS OVER 5/16. AVOID CJP WELDS, FOR OTHER THAN WEB AND FLANGE SPLICES.

B ... THICKER PLATE PREFERABLY SHOULD NOT BE MORE THAN 2X THE THICKNESS OF THINNER PLATE AT CJP WELDS.

C ... AVOID SHOP SPLICE FLANGE WIDTH TRANSITIONS WITHIN A GIRDER SHIPPING UNIT, CHANGES IN THE THICKNESS OF FLANGE PLATES ARE PREFERRED.

D ... WHERE DIFFERENCES IN WEB PLATE THICKNESS ARE LESS THAN 1/4" TRANSITIONS MAYBE ACCOMPLISHED BY GRINDING AFTER WELDING.

E ... DESCRIBE STIFFENER PLATE SIZES HERE OR ON GIRDER ELEVATIONS. USE 7 1/2" MINIMUM WIDTH FOR CONNECTION STIFFENERS WITH 2 VERTICAL ROWS OF BOLTS. USE 5" MINIMUM WIDTH CONNECTION PL'S FOR ONE ROW OF BOLTS.

F ... FINISH TO BEAR (TYP) AND FILLET WELD IF A DIAPHRAGM OR CROSSFRAME ATTACHES TO STIFFENER. INSURE CLEARANCE TO BRG. ATTACHMENT BOLTS. INVESTIGATE LOAD FOR REQUIREMENT OF CJP WELDS.

G ... USE FILLET WELD IN LIEU OF TIGHT FIT WHEN A DIAPHRAGM OR CROSSFRAME ATTACHES TO STIFFENER. TIGHT FIT ONLY WITHOUT A DIAPHRAGM OR CROSSFRAME ATTACHED.

H ... USE FILLET WELD TO COMPRESSION FLANGE AND GAP AT TENSION FLANGE OR TIGHT FIT TO BOTH FLANGES.

J ... SHOW LIMITS WITH DIMENSIONS OF TENSION ZONES AND STRESS REVERSAL ZONES. THESE ARE NEEDED FOR WELD TESTING AND FIT OF STIFFENERS.

K ... KEEP THE SIZE OF CLIPS THE SAME FOR ANY ONE PROJECT. 3" SHOULD WORK FOR ALMOST ALL STRUCTURES.

W ... DO NOT SHOW A CJP DETAIL FOR A WEB SPLICE UNLESS THE THICKNESS CHANGES. SPECIFY WHERE GRINDING IS REQUIRED.

X ... THESE DETAILS & MATERIAL SIZES ARE SUGGESTED AND ARE FOR A GUIDE ONLY. ENGINEER SHOULD CHECK WITH OWNER FOR POSSIBLE PREFERRED STANDARDS.

CF .. FILLET WELD TO COMPRESSION FLANGE.

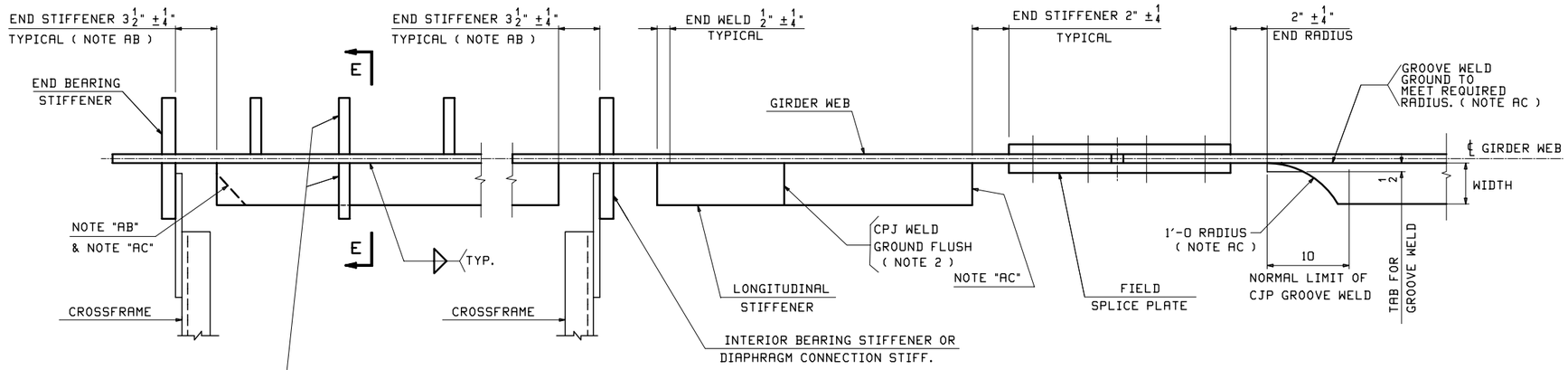
CT .. FILLET WELDING TO TENSION FLANGE IS PREFERRED. DESIGNER MUST CHECK STRESS RANGE FOR CATEGORY C . INVESTIGATE THICKENING FLANGE PLATE IN LIEU OF USING A BOLTED TAB PLATE. THEN USE TAB PLATES ONLY AT LOCATIONS WHERE REQUIRED. TAB PLATES COST ABOUT 150 DOLLARS EACH BASED ON 2003 COSTS.

TYPICAL GIRDER DETAILS - I

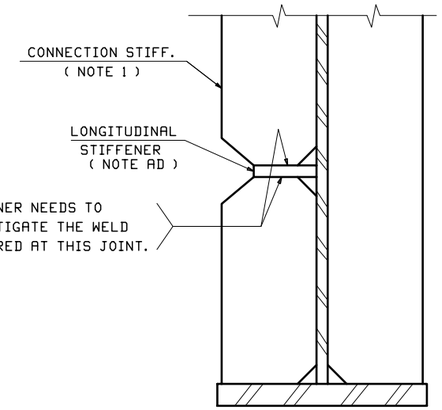
AASHTO/NSBA STEEL BRIDGE COLLABORATION

TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS

PAGE NO. 103

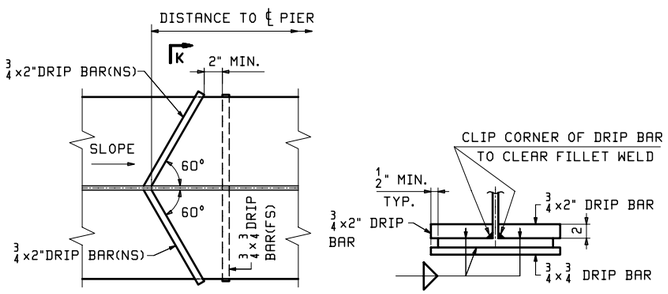


LONGITUDINAL - TRANSVERSE STIFFENER INTERSECTION DETAIL



SECTION E-E

(IN TENSION OR REVERSAL ZONE ONLY)
(AT INT. STIFF. OR CONN. PL.)

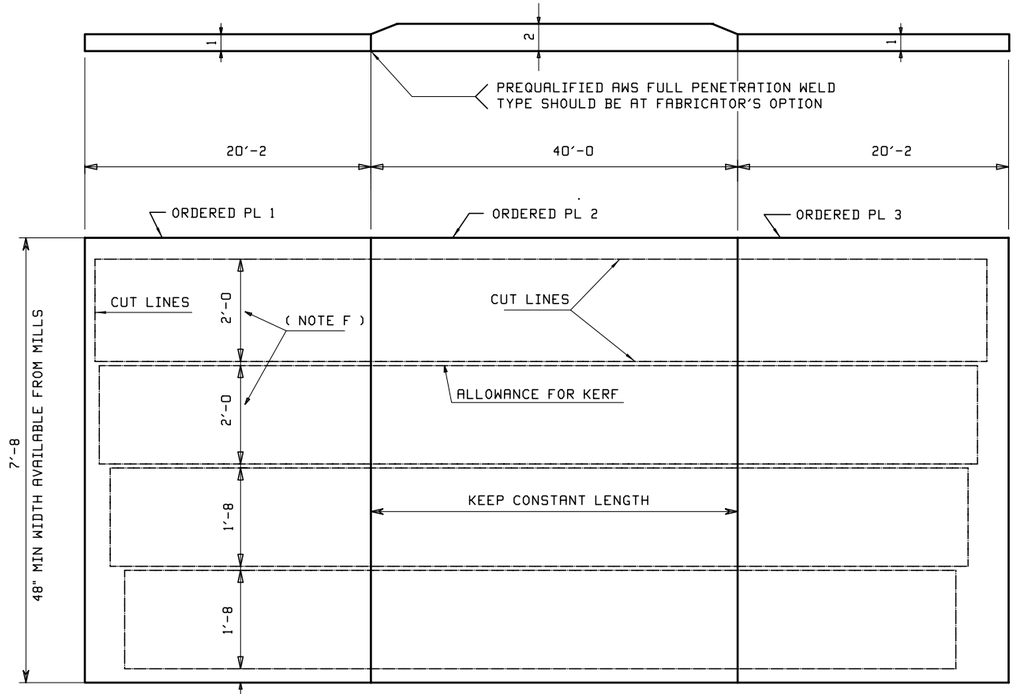


DRIP BAR DETAIL

SECTION K

NOTE:
DRIP BAR ON TOP OF BOTTOM FLANGE SHALL BE CAULKED AGAINST FLANGE, WEB & FILLET WELD SUBJECT TO APPROVAL OF THE ENGINEER.

FOR INFORMATION ONLY - NOT PART OF DESIGN PLANS



SLABBING AND STRIPPING

LONGITUDINAL & TRANSVERSE STIFFENER

NOTES FOR DESIGN DRAWINGS:

1...LOCATE ALL INTERMEDIATE STIFFENERS ON OPPOSITE SIDE OF WEB FROM LONGITUDINAL STIFFENERS WHEN POSSIBLE. LOCATE LONGITUDINAL STIFFENER ON EXTERIOR FACE OF FASCIA GIRDERS.

2...PERFORM NON-DESTRUCTIVE TESTING ON LONGITUDINAL STIFFENER BUTT WELDS PRIOR TO ATTACHMENT TO GIRDER WEB. WELD NOT DETAILED ON DESIGN PLANS.

3...SEE SECTION E-E FOR STRESS REVERSAL ZONE AT STIFFENERS.

NOTES TO DESIGNERS:

AA...AVOID THE USE OF LONGITUDINAL STIFFENERS WHEREVER THICKENING THE WEB PLATE MIGHT BE MORE ECONOMICAL.

AB...CROSSFRAME MAY INTERFERE WITH LONGITUDINAL STIFFENER DURING ERECTION, IF SO CLIP STIFFENER AS REQUIRED.

AC...USE GROOVE WELD TERMINATION AND RADIUS CUT ONLY WHEN REQUIRED BY DESIGN.

AD...AVOID INTERSECTING TRANSVERSE AND LONGITUDINAL STIFFENERS BY LIMITING LENGTH OF THE LONGITUDINAL STIFFENER OR THICKENING THE WEB PLATE..

DISCLAIMER NOTE

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SLABBING & STRIPPING DETAIL

NOTES TO DESIGNERS

A...STEEL MILLS NO LONGER ROLL PLATES IN WIDTHS LESS THAN 48 INCHES. THE FABRICATOR'S ARE REQUIRED TO COMBINE PLATES AND NEST THEM IN ORDER TO ECONOMIZE AND REDUCE SCRAP.

B...THE ENDS OF ORDERED PLATES ARE PREPARED AND THEN WELDED TOGETHER AS SHOWN. THE INDIVIDUAL FLANGE PLATE ASSEMBLIES ARE THEN FLAME CUT TO THEIR FINISHED WIDTHS BY MULTIPLE TORCHES. NON-DESTRUCTIVE TESTING MAYBE PERFORMED PRIOR TO OR AFTER STRIPPING BUT BEFORE WELDING THE FLANGE PLATE ASSEMBLIES TO THE WEB PLATES.

C...THE COST OF SPLICING THE SLAB WHICH INCLUDES HANDLING, BEVELING, GRINDING AND TESTING, WOULD BE SUBSTANTIALLY LESS THAN FABRICATING EACH FLANGE PLATE ASSEMBLY INDIVIDUALLY.

D...AVOID TRANSITIONS IN FLANGE WIDTH IN ANY ONE GIRDER SHIPPING LENGTH (VARY THICKNESS INSTEAD) THIS WILL ELIMINATE EXTENSION TABS AND RUN-OFF BARS.

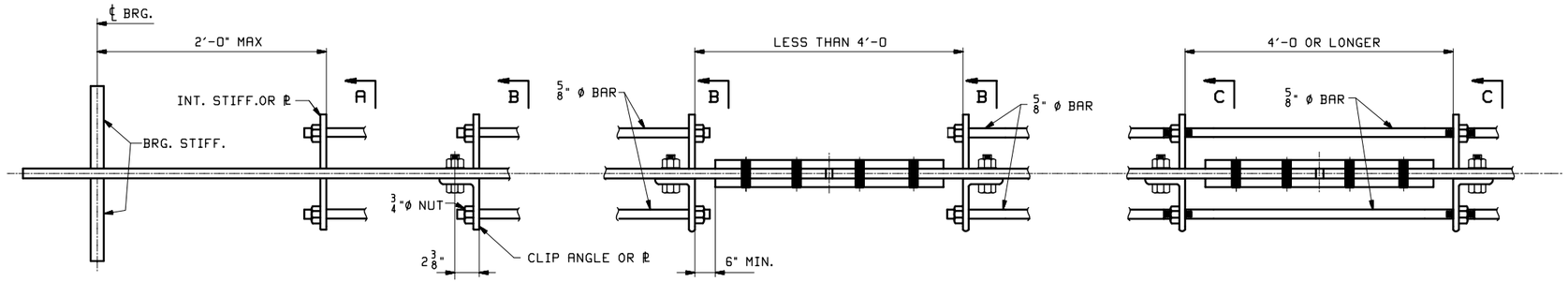
E...MINIMIZE CHANGES IN FLANGE PLATE THICKNESS. IT MAY BE MORE ECONOMICAL TO ELIMINATE A FLANGE SPLICE AND EXTEND THE THICKER FLANGE. THE COST OF A SPLICE MAY EXCEED THE MATERIAL COSTS.

F...IF DIFFERENT FLANGE AREAS ARE NEEDED FOR ADJACENT CURVED GIRDERS, VARY WIDTHS INSTEAD IF THICKNESS.

TYPICAL GIRDER DETAILS - II & FLANGE SLABBING AND STIPPING DETAILS

AASHTO/NSBA STEEL BRIDGE COLLABORATION

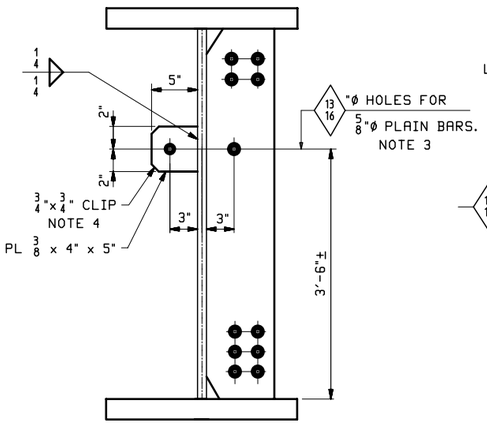
TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS



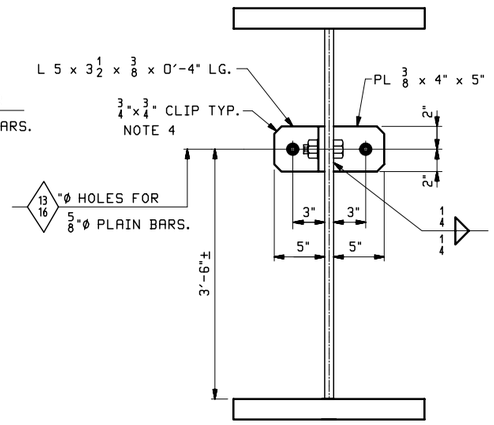
AT GIRDER END

AT GIRDER FIELD SPLICE

SAFETY HANDRAIL - END CONNECTIONS



SECTION-A



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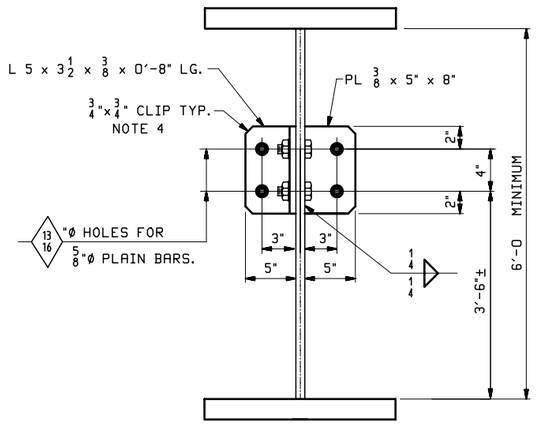

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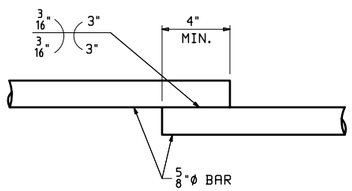
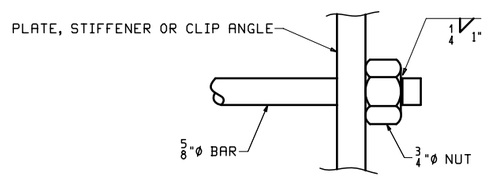


SHOP OR FIELD
WELDED SPLICE DETAIL
NOTE 1



END CONNECTION DETAIL

NOTES FOR DESIGN DRAWINGS:

1...BARS TO BE MADE CONTINUOUS THROUGH USE OF WELDED SPLICES.

2...DISTANCE BETWEEN HANDRAIL SUPPORTS NOT TO EXCEED 8'-6 MAXIMUM SPACING.

3...HOLE FOR HANDRAIL IN CONNECTION STIFFENERS MAY BE THE SIZE AS OTHER HOLES IN THE STIFFENER. (MIN. 13/16"Ø)

4...GRIND CORNERS AT CLIPS SMOOTH.

NOTES TO DESIGNERS

A...AVOID HANDRAILING FOR GIRDERS UNDER 6'-0 DEEP.

B...HANDRAILS ARE ONLY REQUIRED WHEN SPECIFIED BY THE OWNER.

C...CONNECTION PLATES ARE PREFERRED IN LIEU OF CLIP ANGLES. ANGLES REQUIRE LAYOUT AND DRILLING OF THE WEB PLATE AND CONTACT SURFACE PAINTING.

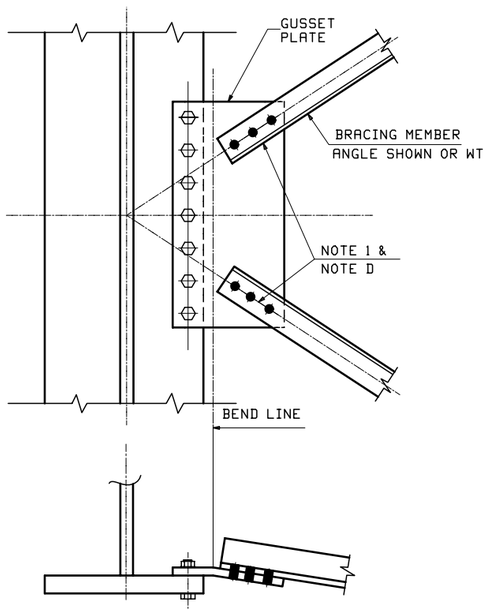
D...THESE DETAILS & MATERIAL SIZES ARE SUGGESTED AND ARE FOR A GUIDE ONLY. ENGINEER SHOULD CHECK WITH OWNER FOR POSSIBLE PREFERRED STANDARDS.

DISCLAIMER NOTE
INFORMATION SHOWN IS FOR CONCEPT ONLY. APPLICATION TO SPECIFIC STRUCTURES IS THE DESIGNERS RESPONSIBILITY.

TYPICAL GIRDER DETAILS - III

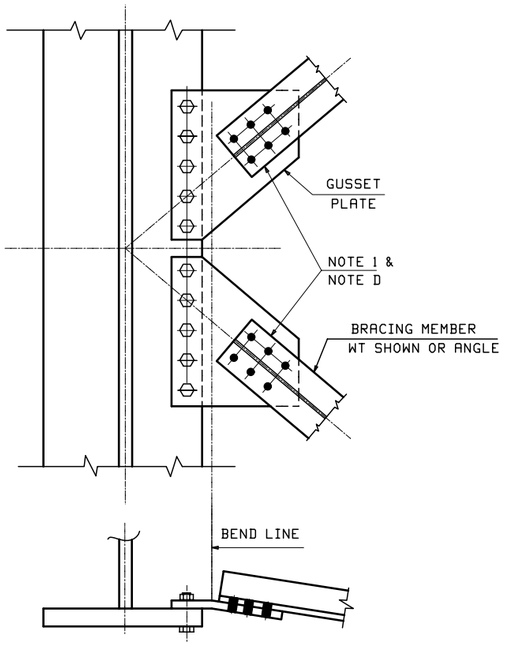
AASHTO/NSBA STEEL BRIDGE COLLABORATION

TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS



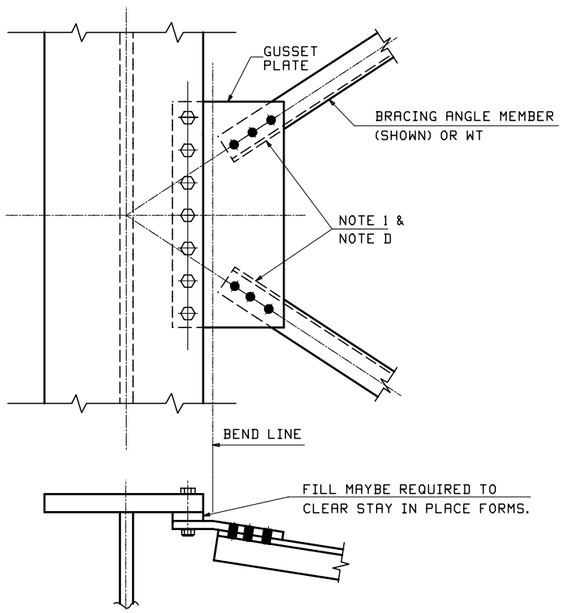
LATERAL BRACING CONN.

(AT BOTTOM FLANGE)



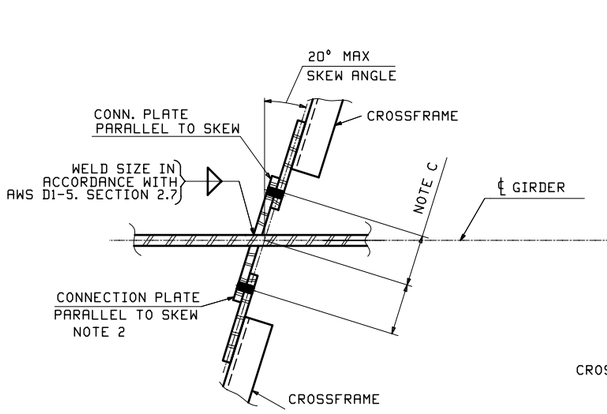
LATERAL BRACING CONN.

(AT BOTTOM FLANGE)
ALTERNATE DETAIL WHEN BRACING SLOPE CHANGES



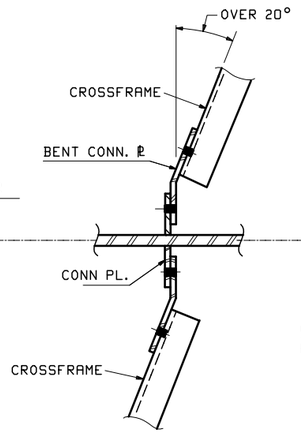
LATERAL BRACING CONN.

(AT TOP FLANGE)

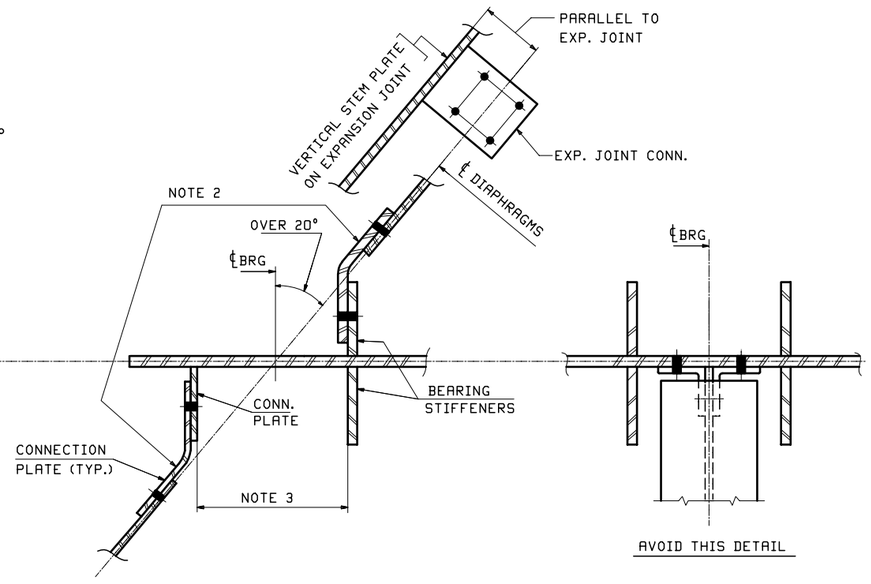


SKEWED CONN. PLATE

NOTE B



BENT GUSSET PLATE AT INTERMEDIATE CF



ALTERNATE BENT CONN. PLATE

CONSIDER THIS DETAIL IF DIAPHRAGM/CF MUST ALIGN TO SUPPORT EXPANSION JOINT SUPPORTS.

NOTES FOR DESIGN DRAWINGS:

1...USE OVERSIZED HOLES IN BRACING MEMBERS, AND STANDARD SIZE HOLES IN GUSSET PLATES.

2...ORIENT CONNECTION PLATES TO FACILITATE ERECTION AS REQUIRED AT ABUTMENTS.

3...CLEAR SPACING BETWEEN STIFFENERS SHALL NOT BE LESS THAN 8" FOR MANUAL AND SEMI-AUTOMATIC WELDS, AND CLEAR SPACING BETWEEN STIFFENERS SHALL NOT BE LESS THAN THE FOLLOWING FOR AUTOMATIC WELDS:
- 10" OR 1 1/2 TIMES THE MAXIMUM STIFFENER WIDTH, WHICHEVER IS LARGER.

NOTES TO DESIGNERS:

A...AVOID LATERAL BRACING EXCEPT WHERE ABSOLUTELY NECESSARY, THEN USE IN EXTERIOR BAYS. BRACING MAY NOT BE REQUIRED IN ALL BAYS.

B...ON SMALL SKEWS IT IS MORE ECONOMICAL TO USE A SKEWED CONNECTION PLATE THAN A SQUARE STIFFENER AND BENT CONNECTION PLATE. FOR SKEWS GREATER THAN 20° A BENT CONNECTION PLATE IS MORE EFFICIENT SINCE AUTOMATIC WELDING EQUIPMENT CANNOT BE USED TO WELD STIFFENER TO WEB.

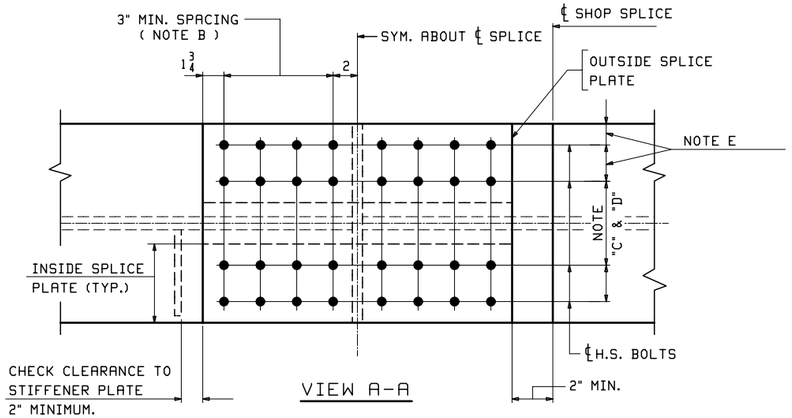
C...MAKE SURE GAGE IN CONNECTION PLATE IS LARGE ENOUGH TO INSTALL AND TORQUE BOLTS.

D...FIELD WELDED OPTIONS MAYBE PERMITTED IN LIEU OF BOLTING.

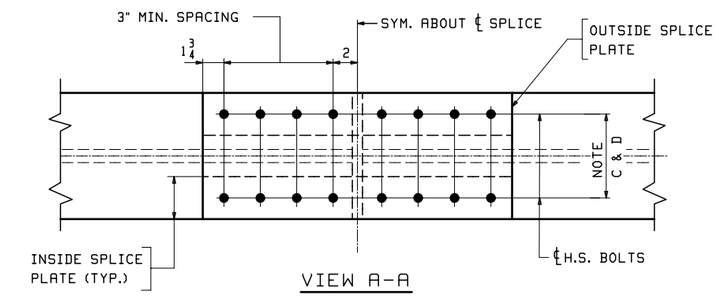
TYPICAL GIRDER DETAILS - IV

AASHTO/NSBA STEEL BRIDGE COLLABORATION

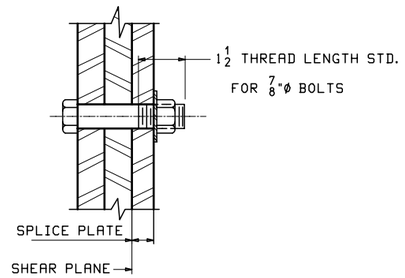
TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS



GIRDER FLANGE SPLICE DETAIL

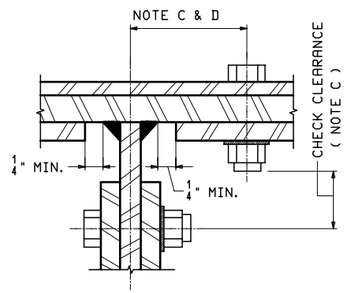


BEAM FLANGE SPLICE DETAIL



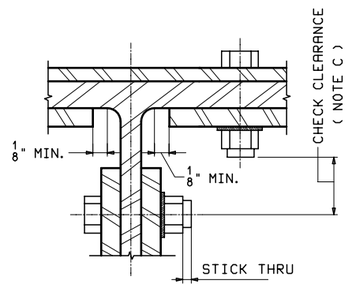
BOLT SHEAR PLANE

NOTE H



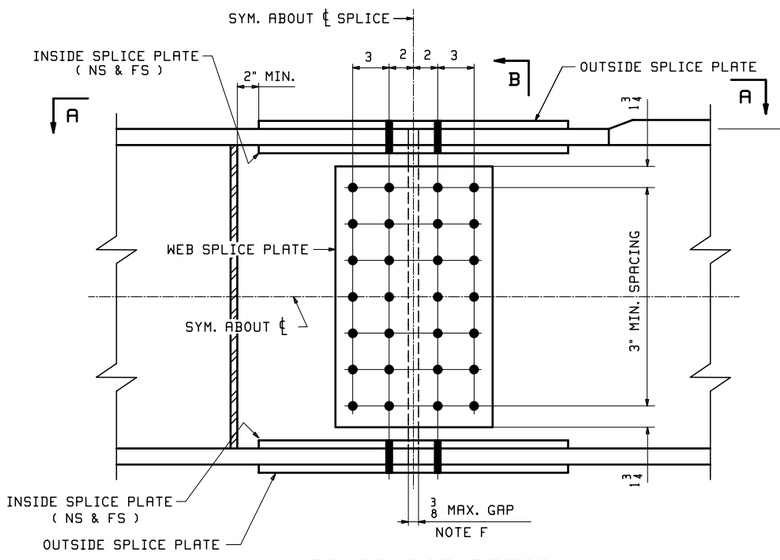
DETAIL A

FOR GIRDER

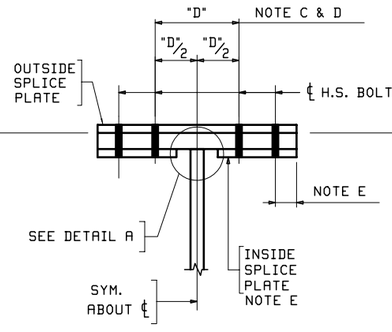


DETAIL A

FOR BEAM

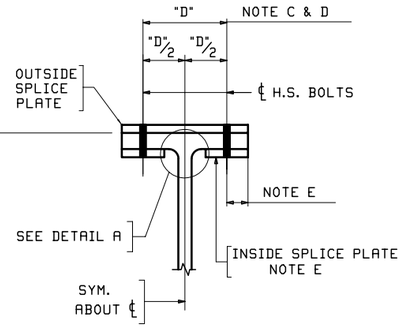


WEB SPLICE DETAIL



SECTION B-B

FOR GIRDER



SECTION B-B

FOR BEAM

NOTES FOR DESIGN DRAWINGS:

1...DETAILS SHOWN FOR $\frac{7}{8}$" DIAMETER HIGH STRENGTH BOLT. DIMENSIONS WILL VARY FOR OTHER BOLT DIAMETERS.

2...BOLT SPACING SHOWN ARE PREFERRED MINIMUMS.

3...EDGE DISTANCES SHOWN ARE MINIMUMS BASED ON SHEARED OR GAS CUT EDGES PLUS AN ADDITIONAL $\frac{1}{4}$" MATERIAL. THIS WILL PROVIDE A TOLERANCE FOR PUNCHING, DRILLING AND REAMING.

4...ALL SPLICE PLATES SHALL BE DETAILED WITH DIRECTION OF ROLLING PARALLEL TO STRESS DIRECTION.

5...ALL SPLICE PLATES ARE SUBJECT TO CHARPY V-NOTCH REQUIREMENTS.

NOTES TO DESIGNERS:

A...AVOID USING A490 BOLTS.

B...AVOID STAGGERED HOLE PATTERNS.

C...VERIFY INSTALLATION CLEARANCE. REFER TO THE AISC MANUAL OF STEEL CONSTRUCTION, "BOLT CLEARANCE TABLES"

D...VERIFY THAT BOLT SPACING FOR FLANGE SPLICES AND WEB SPLICES DO NOT EXCEED BOLT SEALING REQUIREMENTS.

E...MAKE INSIDE SPLICE PLATES SYMMETRICAL ($1\frac{3}{4}$" PREFERRED EDGE FOR $\frac{7}{8}$Ø BOLTS). DO NOT SPECIFY MINIMUM EDGE DISTANCES. REFER TO LRFD FOR MINIMUM EDGE DISTANCE CRITERIA.

F...NORMALLY MAXIMUM GAP BETWEEN END OF MEMBERS IS TO BE $\frac{3}{8}$". FOR DEEP GIRDERS AT THE FABRICATOR'S REQUEST, THE GAP MAY BE GREATER AS LONG AS MINIMUM EDGE DISTANCE IS MAINTAINED.

G...FILL MAY BE REQUIRED AT FLANGE AND WEB SPLICE. USE $\frac{1}{8}$" MINIMUM THICKNESS, CVN NOT REQUIRED FOR FILLS. FILLS CAN BE GR. 36

DISCLAIMER NOTE

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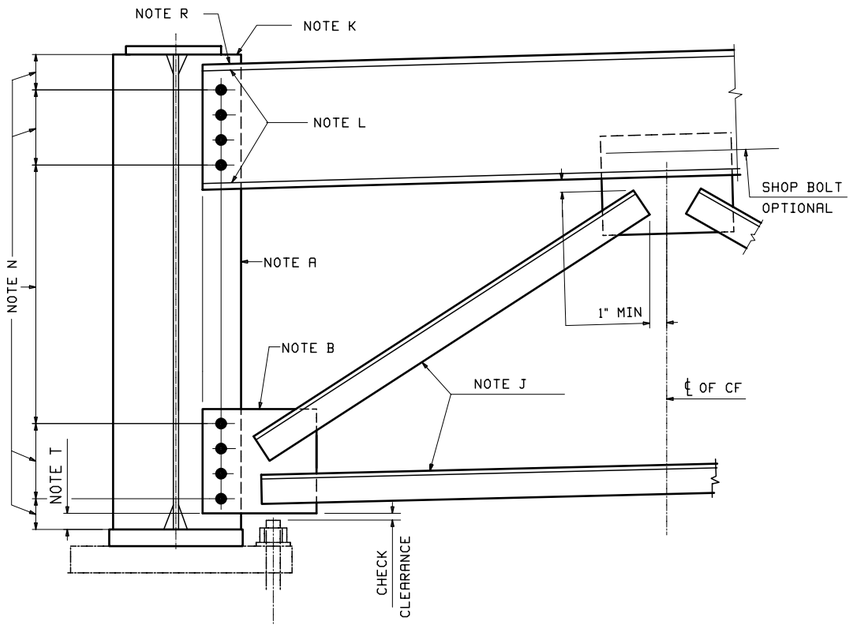
STANDARD BOLTED FIELD SPLICES

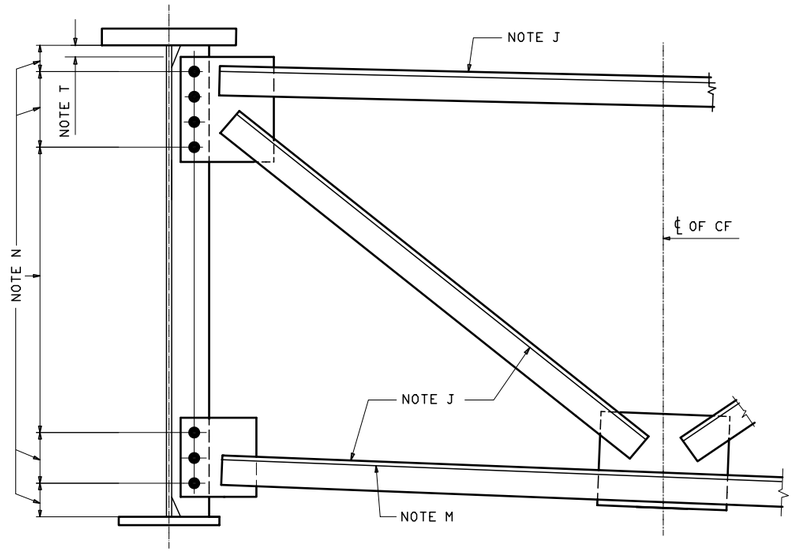
AASHTO/NSBA STEEL BRIDGE COLLABORATION

TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS



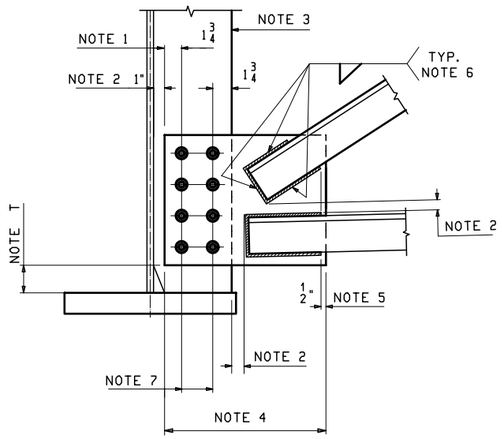
PREFERRED BEARING TYPE CROSSFRAME

FOR BEARING DIAPHRAGMS AT DECK JOINTS ONLY.
SEE NOTES A THRU T



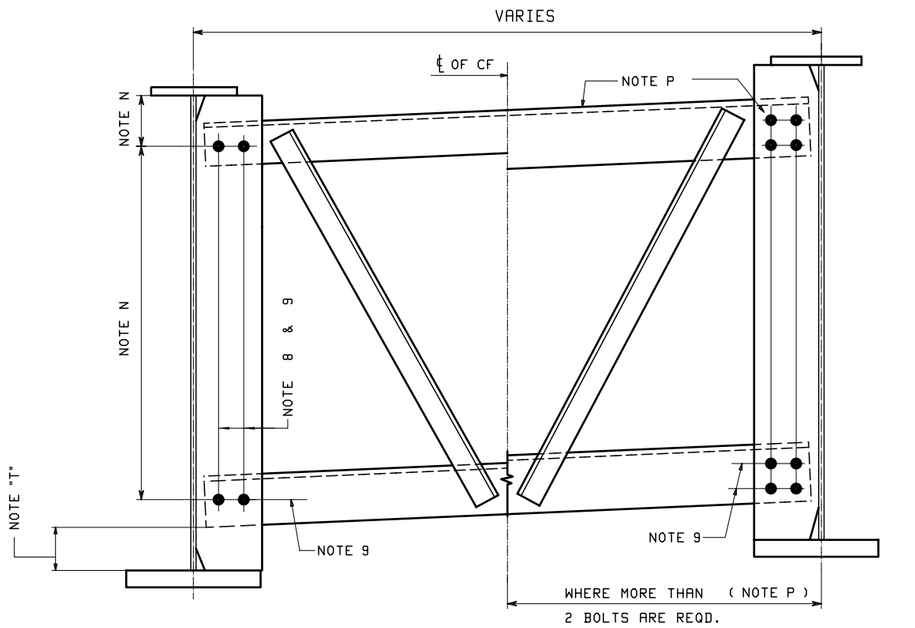
PREFERRED INTERMEDIATE "K" TYPE CROSSFRAME

SEE NOTES A THRU T



PREFERRED CONNECTION PLATE DETAILS

SEE NOTES 1 THRU 8



ALTERNATE INTERMEDIATE "K" TYPE CROSSFRAME - STRAIGHT BRIDGES

SEE NOTES A THRU T

ONE PIECE INTERMEDIATE CROSSFRAMES "K" TYPE

ADVANTAGES OVER KNOCKED DOWN FRAMES

(SEE PAGE NO. 109 FOR EXAMPLE OF KNOCKED DOWN FRAME)

A... ALL STIFFENERS WOULD HAVE THE SAME LAYOUT AND THE SAME PIECE MARK

B... NO LAYOUTS ARE REQUIRED SINCE CONNECTION PLATES ARE RECTANGULAR

C... DIAGONAL MEMBERS CAN CONNECT TO EITHER THE TOP STRUT FOR BEARING TYPE OR BOTTOM STRUT FOR INTERMEDIATE TYPE.

D... ALL ANGLES CAN BE CUT WITHOUT ANY LAYOUTS

E... ERECTION IS QUICKER, DUE TO FEWER ERECTION PIECES

F... SINCE FRAMES ARE JIGGED, IN FABRICATION, CHANCE OF FIELD MISFITS ARE MINIMIZED

G... ALL PLATES CAN BE STACK DRILLED OR MULTIPLE PUNCHED , SINCE THE HOLE PATTERNS ARE IDENTICAL.

H... CHANGES IN THE GEOMETRY OF THE FRAME CAN EASILY BE ACCOMMODATED BY MOVING ONE SIDE OF THE JIG FOR DIFFERENCES IN ELEVATIONS.

I... ALL WELDING CAN BE DONE FROM THE NEAR SIDE, THEREFORE THE ASSEMBLY DOES NOT HAVE TO BE TURNED OVER.

J... USE SINGLE MEMBERS WHERE EVER POSSIBLE. TYPICAL ALL CROSSFRAMES. AVOID DOUBLE MEMBERS (ANGLES, CHANNELS, ETC.) DOUBLE MEMBERS CANNOT BE PAINTED PROPERLY.

K... SHOW CLIPPING OF STIFFENERS AS "OPTIONAL'.

L... CHANNELS ARE PREFERRED IN LIEU OF "WF" SHAPES SINCE BEAM FLANGES WOULD HAVE TO BE CUT AND GROUND FLUSH ON FAR SIDE, AND MAY COLLECT DEBRIS AT EXPANSION JOINTS.

M... ORIENT MEMBERS TO MINIMIZE COLLECTING DEBRIS AND MOISTURE.

N... KEEP THESE DIMENSIONS THE SAME AND SLOPE THE CROSSFRAME MEMBERS.

P... INCREASE SIZE OF MEMBERS AS REQUIRED TO ACCOMODATE DIFFERENT BOLT REQUIREMENTS.

R... LOWER CHANNEL TO AVOID COPING.

T... USE CONSTANT DIMENSION AT ALL GIRDERS, USUALLY APPROX. 2" TOP & BOTTOM

NOTES TO DESIGNERS:

1... PROVIDE FOR PREFERRED EDGE DISTANCES EG: 1 3/4 FOR 7/8 DIA BOLTS. AVOID LRFD MINIMUMS.

2... PROVIDE ABOUT 1" MINIMUM CLEARANCE FROM EDGE OF FILLET WELD

3... INCLUDE ALLOWANCES FOR NOTES 1 & 2 IN DETERMINING STIFFENER WIDTH. A 7 1/2" MINIMUM WIDTH STIFFENER IS REQ'D FOR THE CONNECTION SHOWN.

4... KEEP GUSSET PLATES RECTANGULAR

5... TERMINATE WELDS $\frac{1}{2}$" (+/- $\frac{1}{4}$") SHORT OF EDGE

6... AVOID ALL AROUND WELDS , OMIT WELD ON FAR SIDE. KEEP ALL WELDING ON ONE SIDE.

7... PERMIT THE USE OF OVERSIZED HOLES FOR CROSSFRAME CONNECTIONS THIS COULD BE AN OPTION IF REQUESTED BY CONTRACTOR OR FABRICATOR. OVERSIZED HOLES SHOULD NOT BE USED ON CURVED STRUCTURES.

8... SHOWN FOR TWO ROWS OF BOLTS, NOTES FOR ONE ROW ARE SIMILAR.

9... FOR 2 LINES OF BOLTS, HOLES ARE HORIZONTALLY ALIGNED ON CONNECTION PLATE, SO WILL BE SKEWED ON CROSSFRAME MEMBERS. INSURE ADEQUATE SPACE/EDGE DISTANCE IS PROVIDED.

DISCLAIMER NOTE
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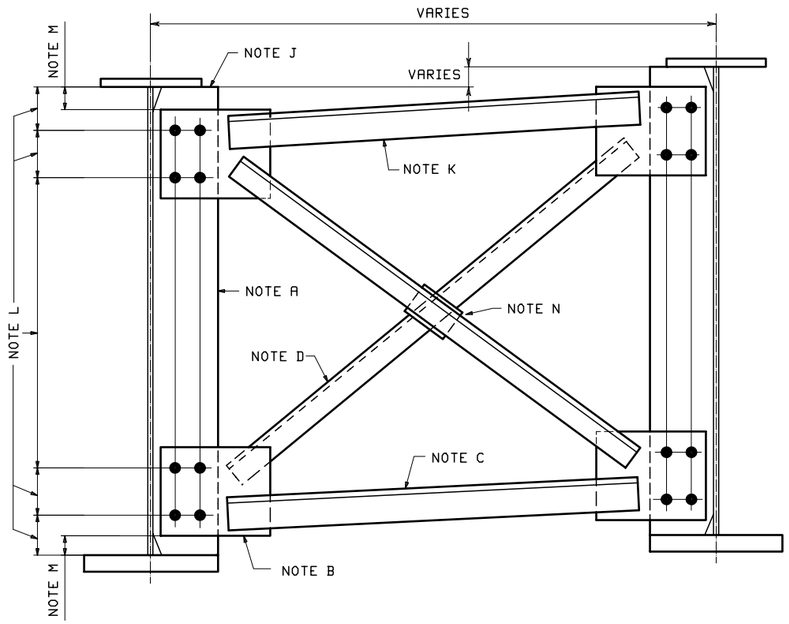
TYPICAL CROSSFRAME DETAILS "K" TYPE

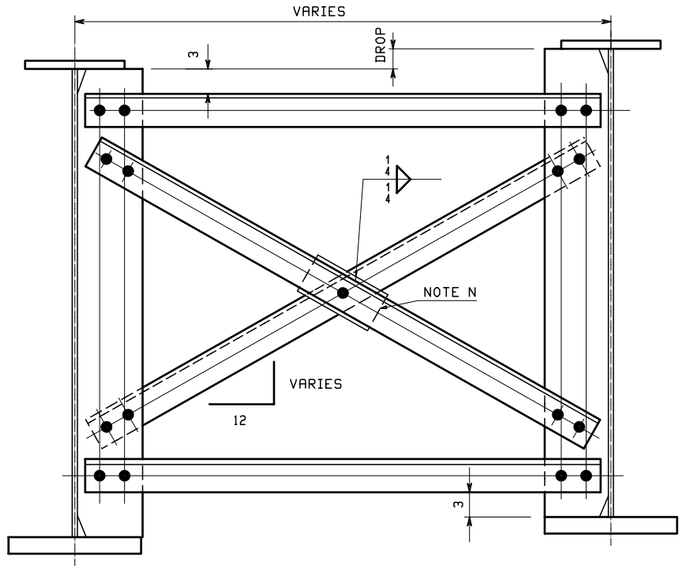
AASHTO/NSBA STEEL BRIDGE COLLABORATION

TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS



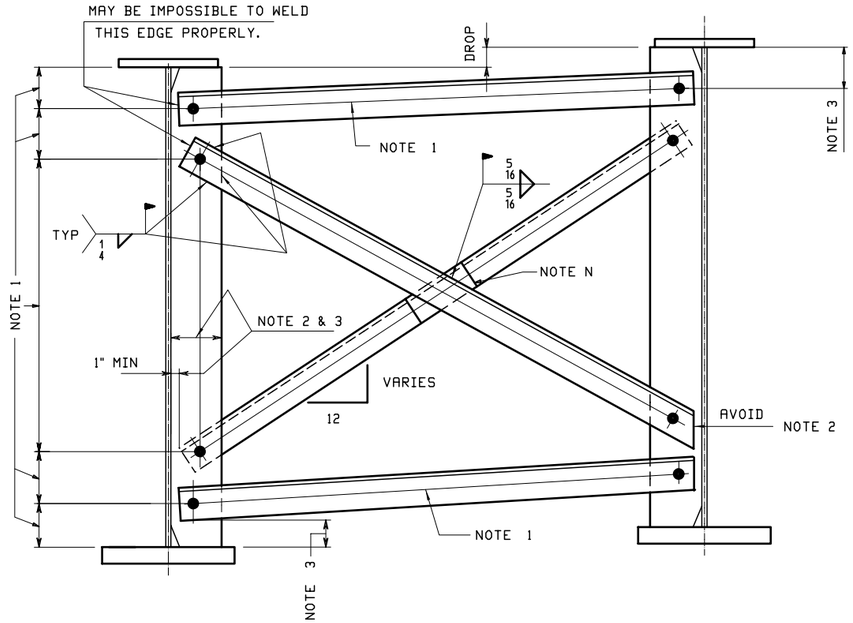
PREFERRED INTERMEDIATE "X" TYPE CROSSFRAME

SEE NOTES A THRU M



NON-PREFERRED "KNOCK-DOWN" TYPE CROSSFRAME

(4 SEPARATE SHIPPING PIECES)
USE THIS TYPE OF CROSSFRAME SPARINGLY.
AVOID THIS TYPE WHEN DROPS VARY.
SEE NOTES AA THRU AD



FIELD WELDED "KNOCK-DOWN" TYPE CROSSFRAME

IN STATES THAT PREFER FIELD WELDED CROSSFRAMES THIS METHOD
IS PREFERRED , PROVIDING NOTES 1 THRU 4 ARE INCORPORATED.

DISCLAIMER NOTE
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NOTES TO DESIGNERS:

PREFERRED INTERMEDIATE CROSSFRAMES "X" TYPE

ADVANTAGES OVER KNOCKED DOWN FRAMES

(SEE PAGE NO. 108 FOR PREFERRED CONNECTION PLATE DETAIL)

A... ALL STIFFENERS WOULD HAVE THE SAME LAYOUT AND THE SAME MARK

B... NO LAYOUTS ARE REQUIRED SINCE CONNECTION PLATES ARE RECTANGULAR

C... ORIENT MEMBERS TO MINIMIZE COLLECTING DEBRIS AND MOISTURE.

D... ALL ANGLES CAN BE CUT WITHOUT ANY LAYOUTS

E... ERECTION IS MUCH FASTER, DUE TO FEWER ERECTION PIECES

F... SINCE FRAMES ARE JIGGED , CHANCE OF FIELD MISFITS ARE MINIMIZED

G... ALL PLATES CAN BE STACK DRILLED OR MULTIPLE PUNCHED , SINCE THE HOLE PATTERNS ARE IDENTICAL.

H... CHANGES IN THE GEOMETRY OF THE FRAME CAN EASILY BE ACCOMMODATED BY MOVING ONE SIDE OF THE JIG FOR DIFFERENCES IN ELEVATIONS.

I... USE SINGLE MEMBERS WHERE EVER POSSIBLE. TYPICAL ALL CROSSFRAMES. AVOID DOUBLE MEMBERS (ANGLES, CHANNELS, ETC.) DOUBLE MEMBERS CANNOT BE PAINTED PROPERLY.

J... SHOW CLIPPING OF STIFFENERS AS "OPTIONAL".

K... ELIMINATE TOP STRUT ON STRAIGHT GIRDER BRIDGES IF POSSIBLE. DESIGNER MUST CHECK STABILITY DURING ERECTION

L... KEEP THESE DIMENSIONS THE SAME AND SLOPE CROSSFRAME MEMBERS

M... USE CONSTANT DIMENSIONS AT ALL GIRDERS, USUALLY 2" TOP & BOTTOM

N... FILL MAY BE OMITTED WHERE POSSIBLE.

NON-PREFERRED "KNOCK-DOWN" TYPE CROSSFRAMES

AA... MAY BE ECONOMICAL TO FABRICATE IF C/C GIRDERS AND DROPS ARE THE SAME BUT STILL DIFFICULT TO ERECT. AVOID THIS TYPE WHEN DROPS VARY.

AB... KNOCKED DOWN CROSSFRAMES REQUIRE MORE SHOP & FIELD HANDLING THEY ARE COSTLY TO ERECT DUE TO THE INCREASED NUMBER OF DIFFERENT PIECES TO TRACK , HANDLE AND HOIST .

AC... WITH VARYING DROPS AND VARYING DISTANCES BETWEEN GIRDERS THIS FRAME WOULD REQUIRE A DIFFERENT LAYOUT FOR EACH STIFFENER , EACH DIAGONAL , EACH STRUT AND EACH FILL PLATE . THE CHANCE OF AN ERROR ON THIS TYPE OF FRAME IS GREATER THAN A JIGGED CROSSFRAME AND WIDER CONNECTION PLATES ARE REQUIRED IF USING 3 BOLTS PER END ON DIAGONALS.

AD... USE SINGLE MEMBERS WHERE EVER POSSIBLE. TYPICAL ALL CROSSFRAMES. AVOID DOUBLE MEMBERS (ANGLES, CHANNELS, ETC.) DOUBLE MEMBERS CANNOT BE PAINTED PROPERLY.

FIELD WELDED TYPE CROSSFRAME

1... SLOPE THE TOP & BOTTOM STRUTS AND KEEP THESE DIMENSIONS THE SAME ON EACH GIRDER, MAKING THE STIFFENERS IDENTICAL.

2... DO NOT CUT MEMBERS ON THE SKEW. IT IS MORE ECONOMICAL TO MAKE THE STIFFENER WIDER SINCE MOST FABRICATORS USE AN ANGLEMATIC MACHINE WHICH PUNCHES AND CUTS THE ANGLE SQUARE AUTOMATICALLY. A BEVELED CUT REQUIRES A BURNING OR SAWING OPERATION AT EACH END.

3... MAKE THIS DIMENSION LARGE ENOUGH TO PROVIDE ROOM BETWEEN THE STRUT AND FLANGE OR WEB FOR FIELD WELDING.

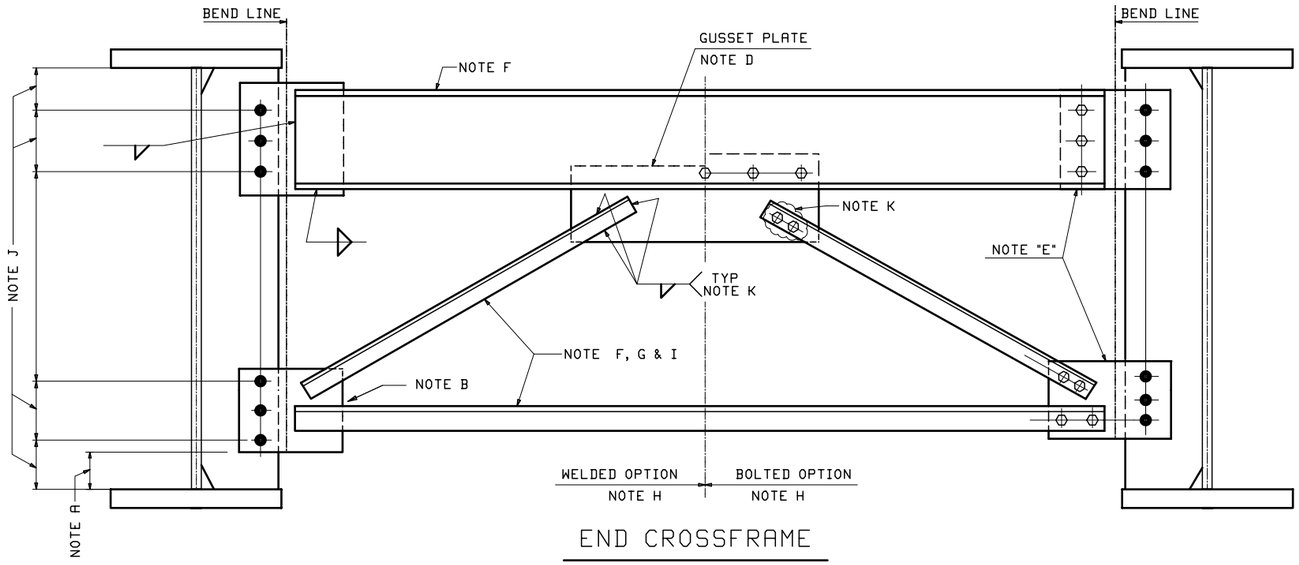
4... USE SINGLE MEMBERS WHERE EVER POSSIBLE. TYPICAL ALL CROSSFRAMES. AVOID DOUBLE MEMBERS (ANGLES, CHANNELS, ETC.) DOUBLE MEMBERS CANNOT BE PAINTED PROPERLY.

TYPICAL CROSSFRAME DETAILS "X" TYPE

AASHTO/NSBA STEEL BRIDGE COLLABORATION

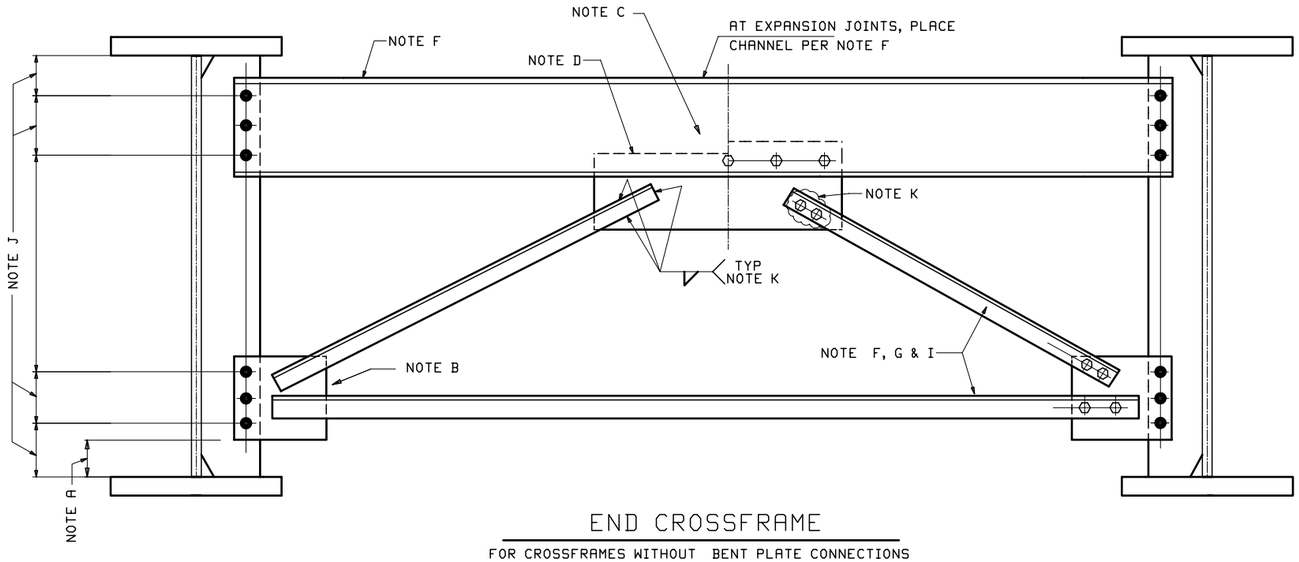
TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS

PAGE NO. 109



END CROSSFRAME

FOR SKEWED CROSSFRAMES WITH BENT PLATE CONNECTIONS



END CROSSFRAME

FOR CROSSFRAMES WITHOUT BENT PLATE CONNECTIONS CONNECT TOP MEMBER DIRECTLY TO CONNECTION PLATE. FOR ADDITIONAL DETAILS SEE "PREFERRED BEARING TYPE CROSSFRAME" ON SHEET 108.

PREFERRED BEARING TYPE CROSSFRAME

NOTES TO DESIGNERS:

END CROSSFRAME DETAIL

(SEE PAGE NO. 108 FOR ADDITIONAL NOTES AND PREFERRED CONNECTION PLATE DETAILS)

A... MODIFY THE DISTANCE BETWEEN THE BOTTOM GIRDER FLANGE AND THE LOWER DIAPHRAGM COMPONENT WHEN LOWER LATERAL BRACING IS USED. INDICATE MODIFICATIONS ON THE DESIGN DRAWINGS

B... SEE PREFERRED CONNECTION PLATE DETAIL ON PAGE NO. 108 FOR WELDING.

C... FILLS ARE NOT NECESSARY.

D... PLACE CHANNEL ON NEAR SIDE OF PLATES TO KEEP PLATES IN ONE PLANE FOR JIGGING. GUSSET PLATE MAY BE WELDED TO CHANNEL PRIOR TO ASSEMBLY IN JIG.

E... SHOW BOLTED OPTIONS FOR ALL BENT PLATES.

F... AT EXPANSION JOINTS, ORIENT CHANNEL FLANGES AND OUTSTANDING ANGLE LEGS AWAY FROM JOINT TO AVOID DEBRIS & CORROSION.

G... DESIGN DIAGONALS FOR WHEEL LOAD REACTIONS IF DECK HAUNCHES DOWN TO TOP STRUT.

H... DESIGN TO ALLOW FABRICATOR TO CHOOSE OPTION.

I... USE SINGLE MEMBERS WHERE POSSIBLE. AVOID DOUBLE MEMBERS (ANGLES, CHANNELS, ETC.) DOUBLE MEMBERS CANNOT BE PROPERLY PAINTED.

J... KEEP THESE DIMENSIONS THE SAME AND SLOPE THE CROSSFRAME MEMBERS.

K... ON SKEWED END CROSSFRAMES, THE GEOMETRY OF THE CROSSFRAME DIAGONALS VARY DUE TO THE END CONNECTION PLATE ROTATION CAUSED BY THE DEAD LOAD CAMBER. SLOTTED HOLES OR FIELD WELDING MAY BE REQUIRED.

DISCLAIMER NOTE
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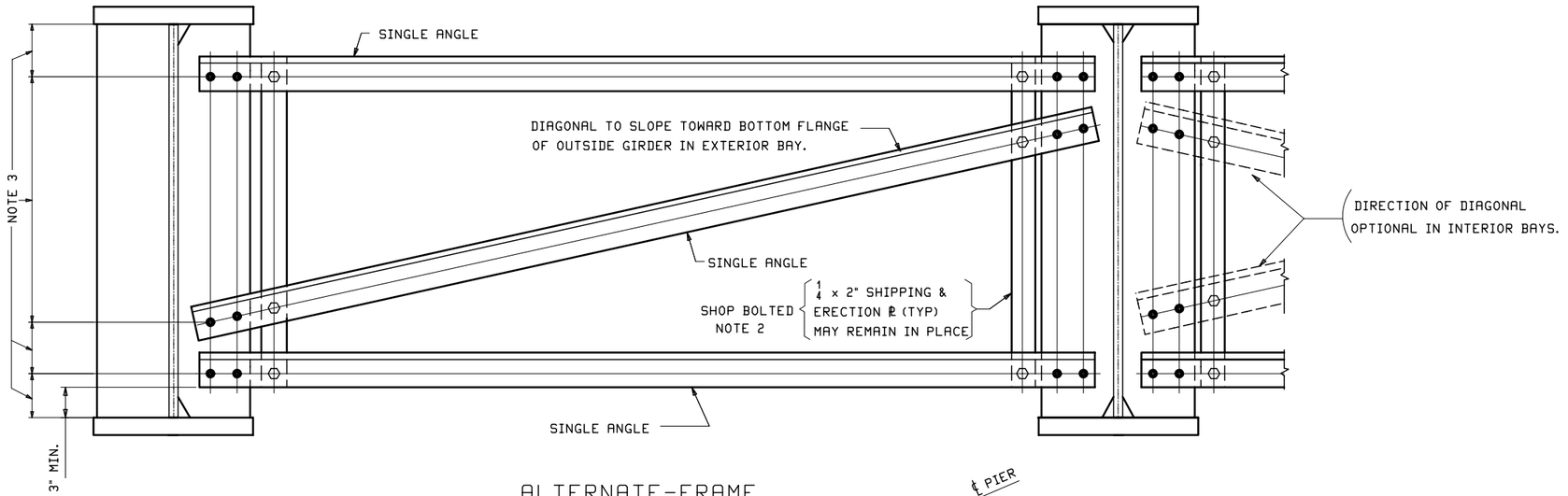
END CROSSFRAMES

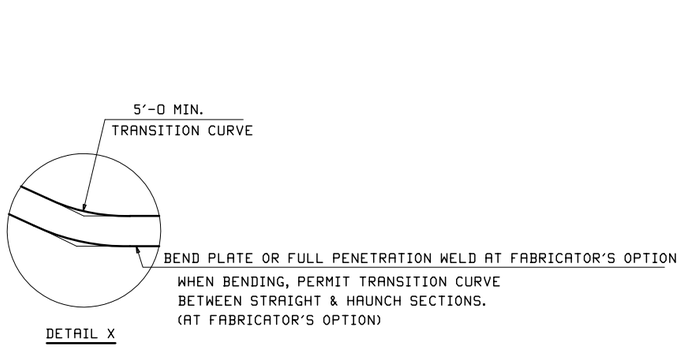
AASHTO/NSBA STEEL BRIDGE COLLABORATION

TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS

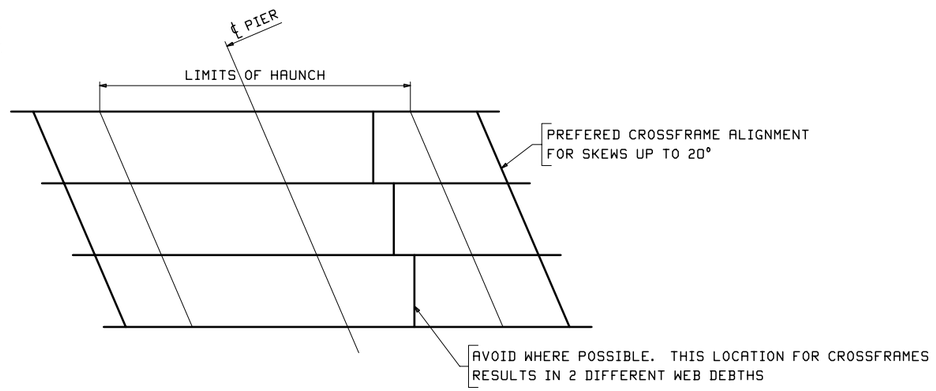
PAGE NO. 110



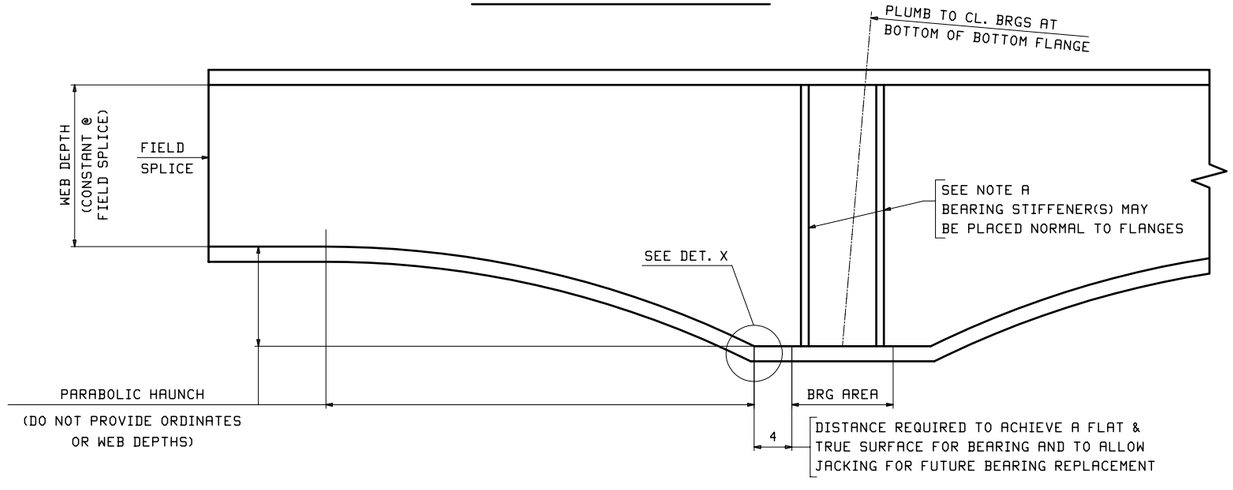
ALTERNATE-FRAME



DETAIL X



HAUNCH GIRDER PLAN



HAUNCH GIRDER ELEVATION

ALTERNATE-FRAME NOTES:

1...MODIFY THE DISTANCE BETWEEN THE BOTTOM GIRDER FLANGE AND THE LOWER DIAPHRAGM COMPONENT WHEN LOWER LATERAL BRACING IS USED.

2...NOT TO BE USED WITH ROLLED BEAMS OR PLATE GIRDERS < 42" DEEP. SIZE ANGLES FOR STRAIGHT GIRDER KL/r < 140 OR CURVED GIRDER KL/r < 120

3...KEEP THESE DIMENSIONS THE SAME AND KEEP THE CROSSFRAME LEVEL, MAKE LOW SIDE STIFFENER CONSTANT.

NOTES TO DESIGNERS:

A...PLACE BEARING STIFFENER NORMAL TO GRADE. NORMAL TO GRADE WILL BE MORE ECONOMICAL FOR FABRICATION. DESIGNER TO INVESTIGATE BEFORE PLACING STIFFENER VERTICAL.

DISCLAIMER NOTE
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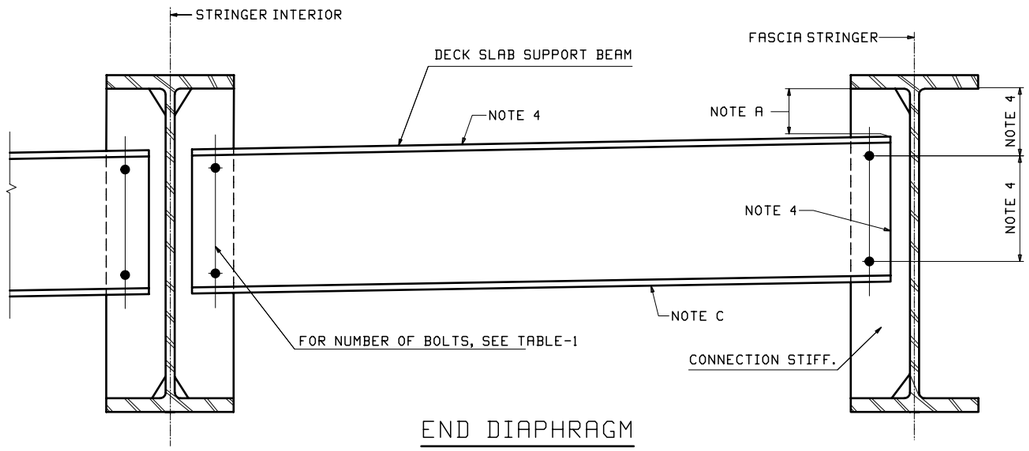
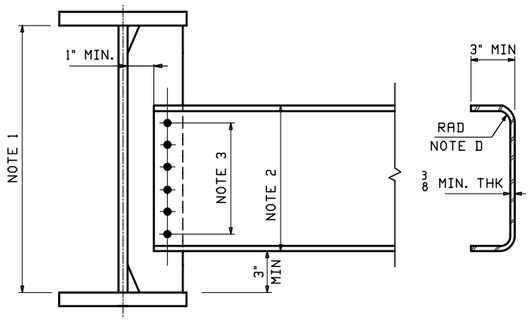
INTERMEDIATE CROSSFRAMES & HAUNCH GIRDERS

AASHTO/NSBA STEEL BRIDGE COLLABORATION

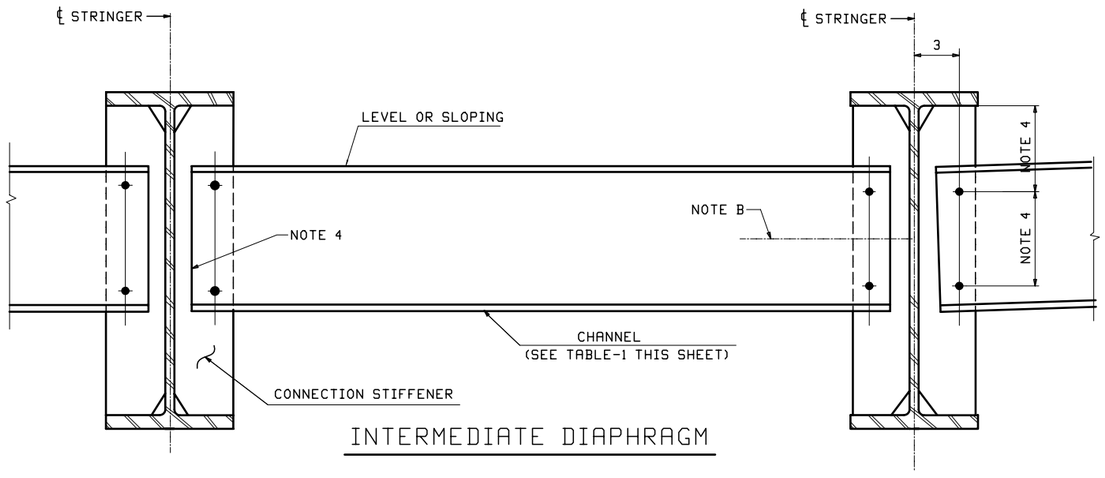
TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS



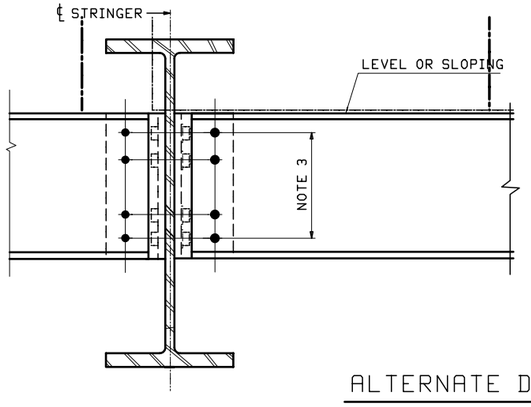
END DIAPHRAGM



BENT PLATE DIAPHRAGM



INTERMEDIATE DIAPHRAGM



ALTERNATE DETAIL

TABLE-1

STRINGER SIZE	DIAPHRAGM SIZE	NO. OF BOLTS
28 TO 36	C 18x42.7	5
25" TO 27"	C 15x33.9	4
UP TO 24" DEPTH	C 12x25	3

DISCLAIMER NOTE
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ROLLED SHAPE & BENT PLATE DIAPH. NOTES:

1...FOR WEB PLATE UP TO 48" DEEP.

2...DIAPHRAGM DEPTH - 0.4 TO 0.6 WEB DEPTH FOR ROLLED BEAMS AND 0.5 TO 0.75 WEB DEPTH FOR PLATE GIRDERS.

3...3" MIN and 7" MAX HOLE SPACING

4 ..SLOPE DIAPHRAGM AND KEEP HOLES VERTICAL IN STIFFENER AT CONSTANT DIMENSIONS (TO KEEP ALL STIFFENERS THE SAME) AND CUT ENDS OF DIAPHRAGM SQUARE.

NOTES TO DESIGNERS:

A... CONSTANT AT EACH STRINGER. DIMENSION BASED ON REQUIRED SLAB HAUNCH DEPTH.

B... MID DEPTH OF DIAPHRAGM AND STRINGER. TYPICAL AT EACH STRINGER FOR SLOPING DIAPH.

C... AT EXPANSION JOINT, ORIENT CHANNEL FLANGES AWAY FROM JOINT OPENING.

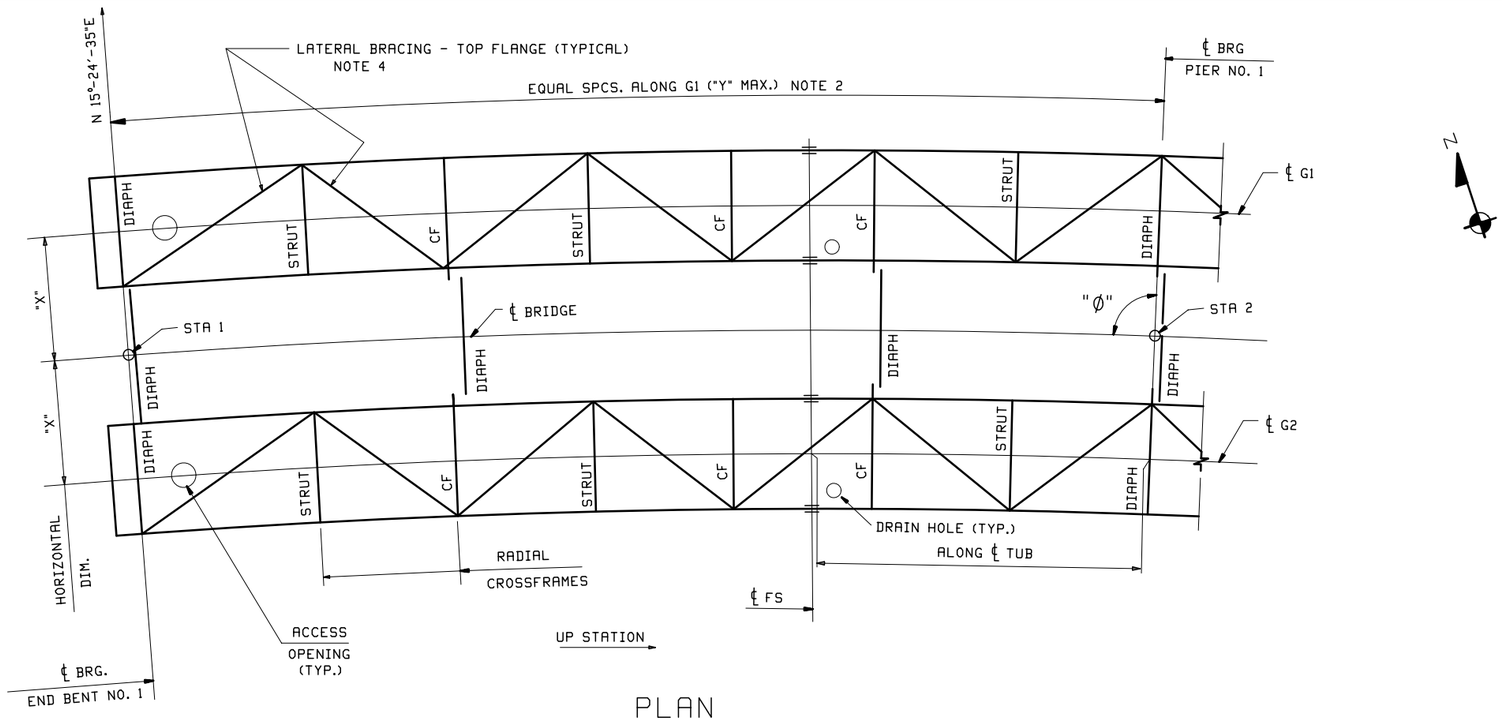
D... MINUMUM RADIUS AS PER AASHTO/NSBA FABRICATION S2.1

ROLLED SHAPE & BENT PLATE DIAPHRAGMS

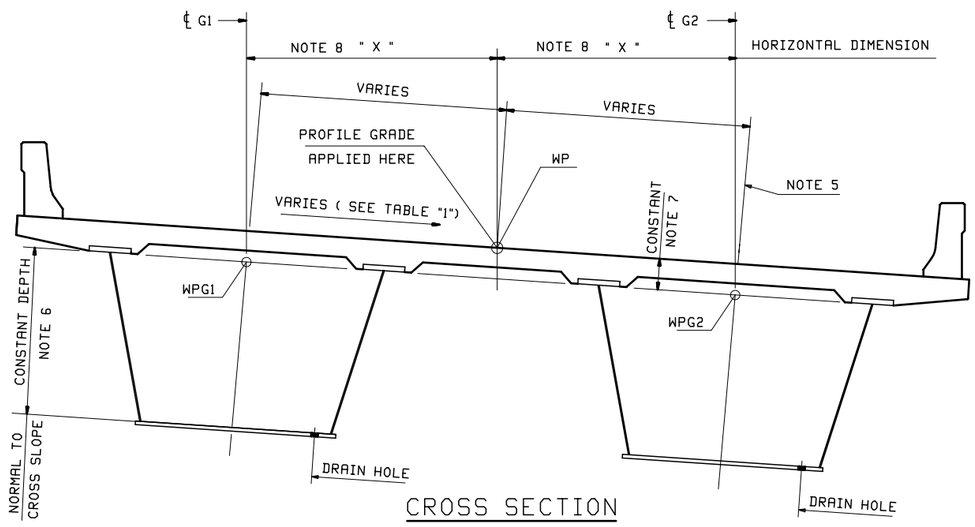
AASHTO/NSBA STEEL BRIDGE COLLABORATION

TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS

PAGE NO. 112



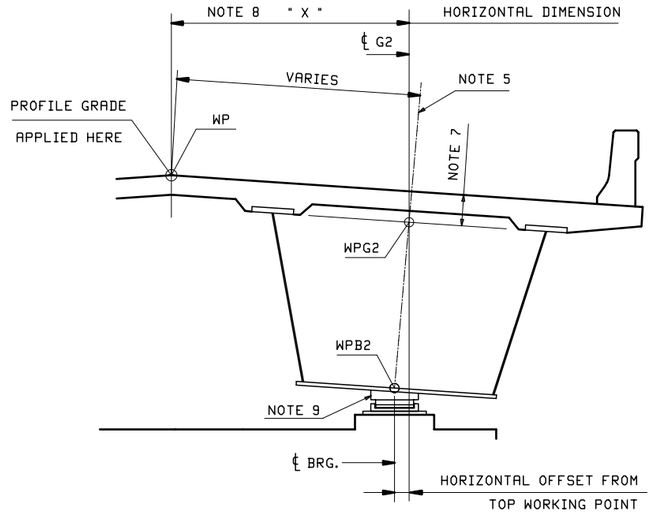
PLAN



CROSS SECTION

LOOKING UP STATION

TABLE "1"	
STATION	CROSS SLOPE OR SUPERELEVATION RATE



CROSS SECTION SHOWING

BEARING OFFSET

GENERAL GEOMETRY FOR STEEL TUB GIRDERS

KEEP THE HORIZONTAL DIMENSION BETWEEN TUB GIRDERS TOP WP'S CONSTANT AND ROTATE TUBS FOR THE REQUIRED BRIDGE CROSS SLOPE. ALSO SEE NOTE 6. THIS MAY RESULT IN THE THE LENGTH OF THE EXTERNAL DIAPHRAGMS BEING DIFFERENT DUE TO CHANGES IN THE SUPERELEVATION BUT WILL KEEP THE TUB GIRDER CENTERLINES RELATIVE TO THE HORIZONTAL CONTROL LINE.

FRAMING PLAN GEOMETRY

1... BASIC INFORMATION REQUIRED:
- STATIONS AT PC, SC, PT, ℄ BRG, ETC.
- AZIMUTHS , BEARINGS OR SKEW ANGLE OF ℄ PIER / ℄ BRG
- STATION AT CROSS SLOPE OR LANE WIDTH CHANGES.

2... SPACE CROSSFRAMES ALONG ℄ OF LONGEST GIRDER FOR MAX. SPACING.
3... LOCATE FIELD SPLICES (FS) RADIALLY TO EACH TUB. LOCATE ℄ FS FROM ℄ PIER.
4... CROSSFRAME LOCATION BASED ON DESIGN, TRY TO KEEP LATERAL BRACING AT AN ANGLE BETWEEN 30 DEGREES TO 45 DEGREES TO GIRDER WEB.

CROSS SECTION GEOMETRY

5... ROTATE TUB GIRDER WITH CROSS SLOPE.
6... MAINTAIN CONSTANT TRAPEZOIDAL SHAPE FOR ALL GIDERS ON A STRUCTURE. VARY DISTANCE BETWEEN TUBS IF DECK WIDTH FLARES.
7... MAINTAIN A CONSTANT DIMENSION FROM THE TOP OF DECK TO THE TOP OF THE WEB PLATE. SHOW THIS DIMENSION ON DESIGN DRAWINGS.
8... ALL TRANSVERSE GIRDER LOCATIONS SHALL BE LOCATED HORIZONTALLY. DO NOT CONTROL THE GIRDER LOCATIONS ALONG THE DECK.
9... USE A SINGLE BEARING ON CURVED AND/OR SKEWED STRUCTURES, TO ALLOW FOR TRANSVERSE ROTATION OF TUB. NOTE: BEARING DESIGN MUST ACCOMODATE THIS ROTATION.

DISCLAIMER NOTE
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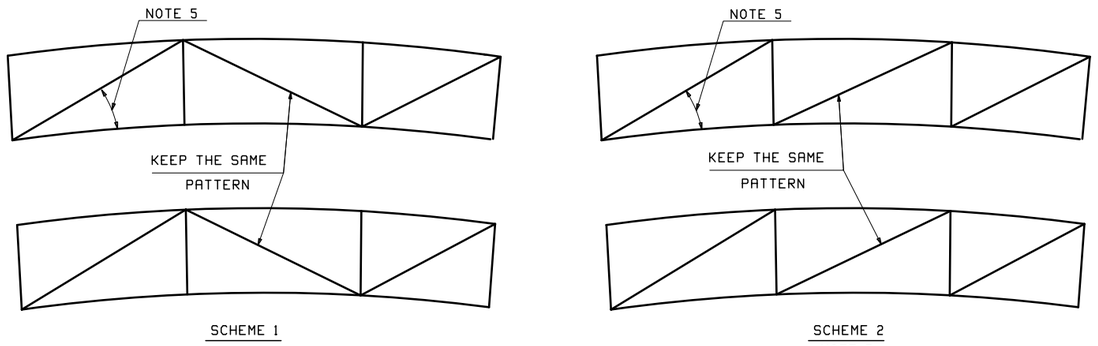
BASIC GEOMETRY - STEEL TUB GIRDERS

AASHTO/NSBA STEEL BRIDGE COLLABORATION

TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS

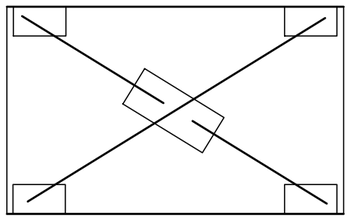
PAGE NO. 113



SCHEME 1

SCHEME 2
NOTE 7

TYPICAL BRACING SCHEMES



AVOID X BRACING

REQUIRES MORE PIECES, HOLES, BOLTS, AND UNNECESSSARILY STIFFENS GIRDER.

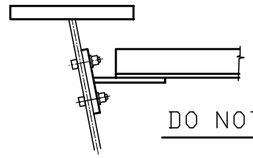
NOTES TO DESIGNER

1...WHEN POSSIBLE, BOLT LATERAL BRACING DIRECTLY TO FLANGES.

2...KEEP LATERAL GUSSET PLATES RECTANGULAR.

3...USE INDIVIDUAL GUSSET PLATES FOR EACH LATERAL BRACE WHERE POSSIBLE.

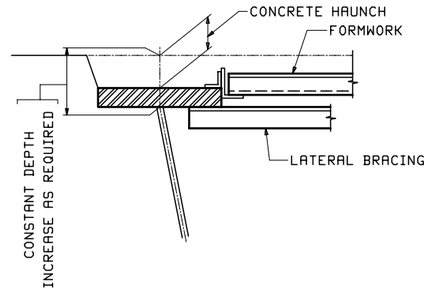
4...BRACING CONNECTIONS TO THE FLANGES ARE MORE ECONOMICAL, THAN CONNECTIONS TO THE WEBS, SINCE THEY INVOLVE FEWER COMPONENTS, AND BETTER FROM A DESIGN VIEWPOINT , SINCE IT PROVIDES A MORE DIRECT LOAD PATH.



DO NOT USE THIS DETAIL

5... ANGLE BETWEEN BRACING AND GIRDER SHOULD NOT BE LESS THAN 30° DEGREES, 45 DEGREES IS AN IDEAL ANGLE.

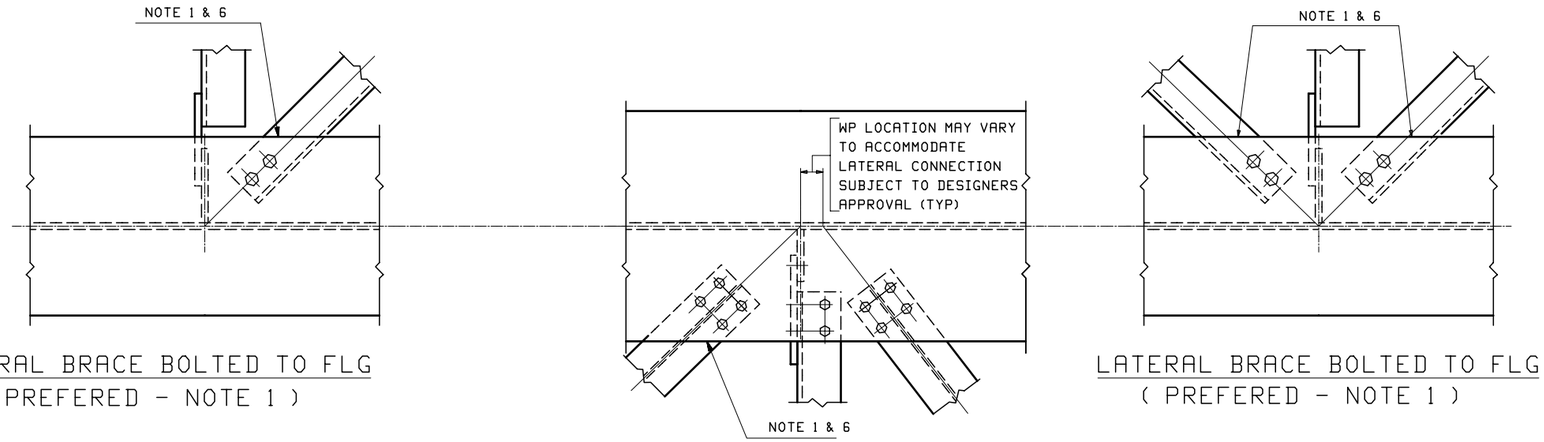
6... FILLS CAN BE USED TO DROP BRACING PLANE BELOW THE FORMWORK SUPPORTS. HOWEVER IT MAY BE MORE ECONOMICAL TO CUT FORMWORK AROUND THE BRACING MEMBERS. ANOTHER OPTION WOULD BE TO INCREASE THE HAUNCH DIMENSION AND RAISE THE FORMWORK SUPPORT ANGLES, SEE SKETCH:



OPTIONAL HAUNCH DETAIL

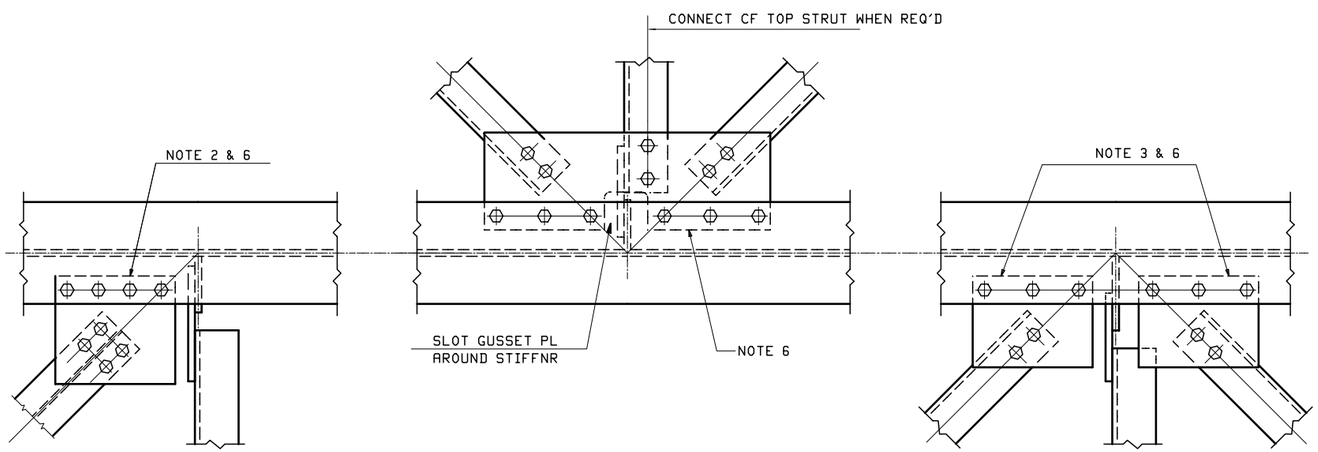
THIS DETAIL APPLIES TO STAY IN PLACE FORMS.
DESIGNER TO INVESTIGATE IF S.I.P FORMS CAN BE USED

7...FABRICATORS PREFER SCHEME 2 DUE TO MORE DUPLICATION OF DETAIL MATERIAL.



LATERAL BRACE BOLTED TO FLG
(PREFERED - NOTE 1)

LATERAL BRACE BOLTED TO FLG
(PREFERED - NOTE 1)



LATERAL BRACE @ NARROW FLG

LATERAL BRACE & CF @ NARROW FLG

DISCLAIMER NOTE
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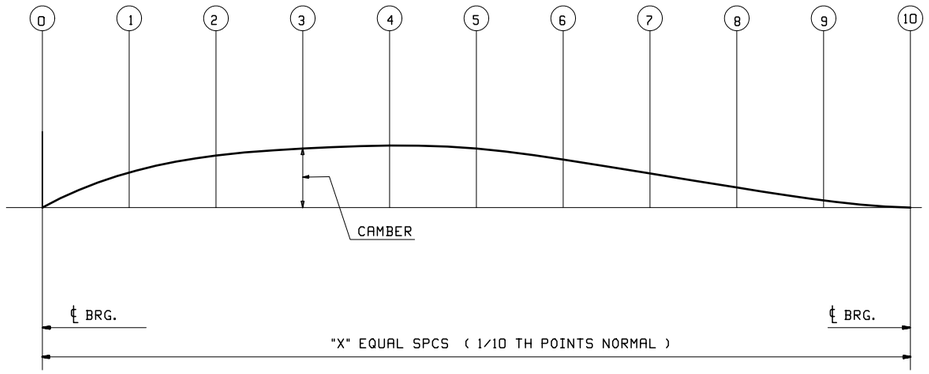
TUB GIRDER LATERAL BRACING

AASHTO/NSBA STEEL BRIDGE COLLABORATION

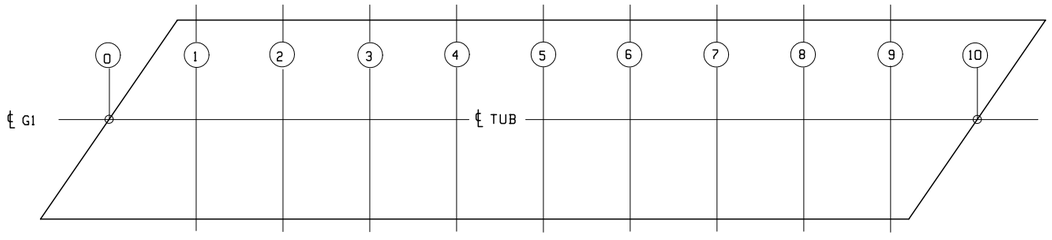
TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS

PAGE NO. 114



		VALUES SHOWN ARE IN INCHES (NOTE 1)										
LINE	CAMBER VALUES DUE TO DL	0	1	2	3	4	5	6	7	8	9	10
G1	STEEL DL	0										0
	DECK DL	0										0
	SUPERIMPOSED DL	0										0
	TOTAL DL	0										0

DO NOT PROVIDE GEOMETRIC CAMBER FOR TUB GIRDERS SINCE THIS INFORMATION IS NORMALLY GIVEN IN A VERTICAL PLANE AND A TUB IS NORMAL TO THE CROSS SLOPE. THE CAMBER DIAGRAM FOR EACH WEB IS BASED ON A MODIFIED CONICAL SHAPE IN THE PLANE OF THE WEB PLATE, WHICH IS NOT IN A VERTICAL PLANE.



TUB GIRDER CAMBER DIAGRAM

Show Camber Data Along ℄ Tub

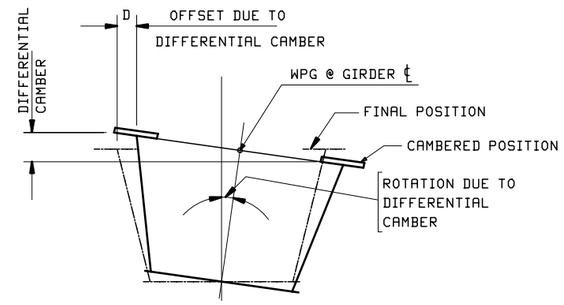
NOTES FOR DESIGN DRAWINGS:

1...CAMBERS CAN BE GIVEN IN FRACTIONS, DECIMAL OF A FOOT OR DECIMAL INCHES. STATE CLEARLY IF DIMENSIONS ARE IN FEET OR INCHES.

2...CAMBER INFORMATION IS SHOWN FOR A TUB GIRDER.

NOTES TO DESIGNER

1... AVOID HAVING DIFFERENT CAMBERS FOR EACH WEB BECAUSE OF PROBLEMS DUE TO DIFFERENTIAL CAMBERS.



DIFFERENTIAL CAMBER

PROBLEMS WHEN NEAR WEB AND FAR WEB HAVE DIFFERENT CAMBERS. THIS CAN BE AVOIDED IF THE TUB IS CAMBERED ALONG ITS ℄

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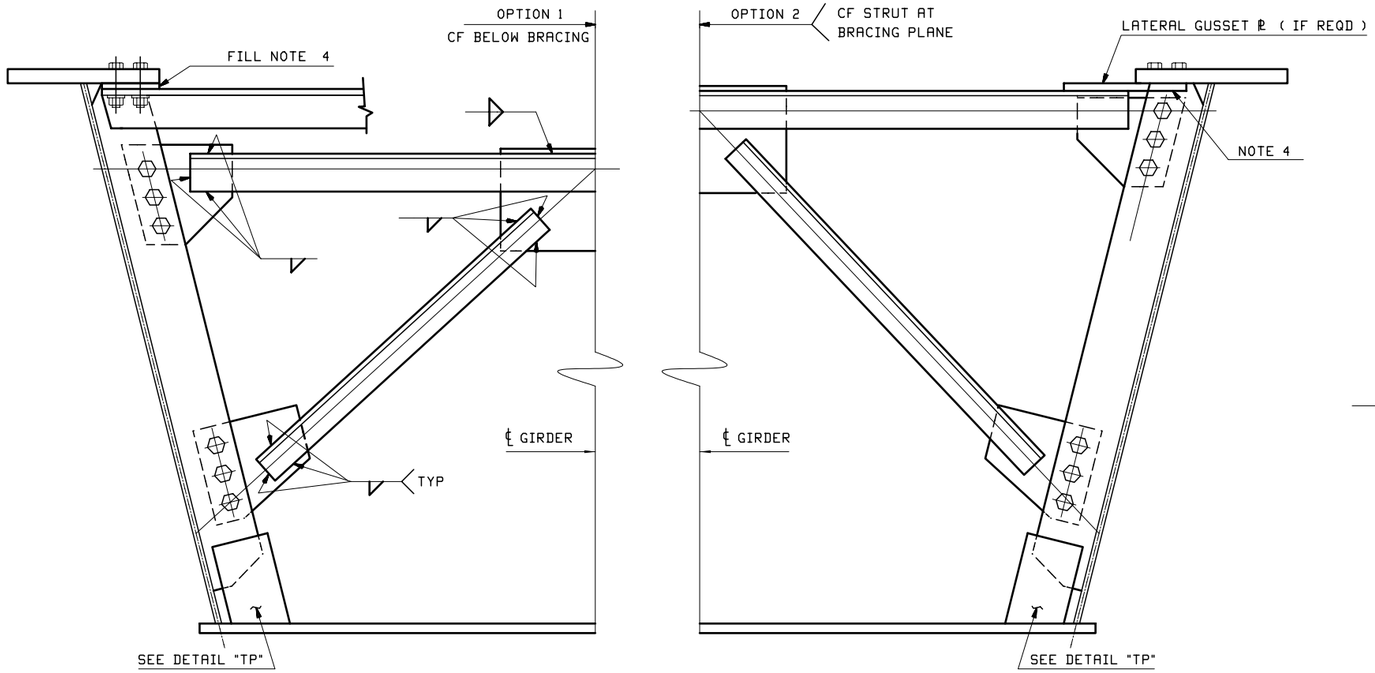
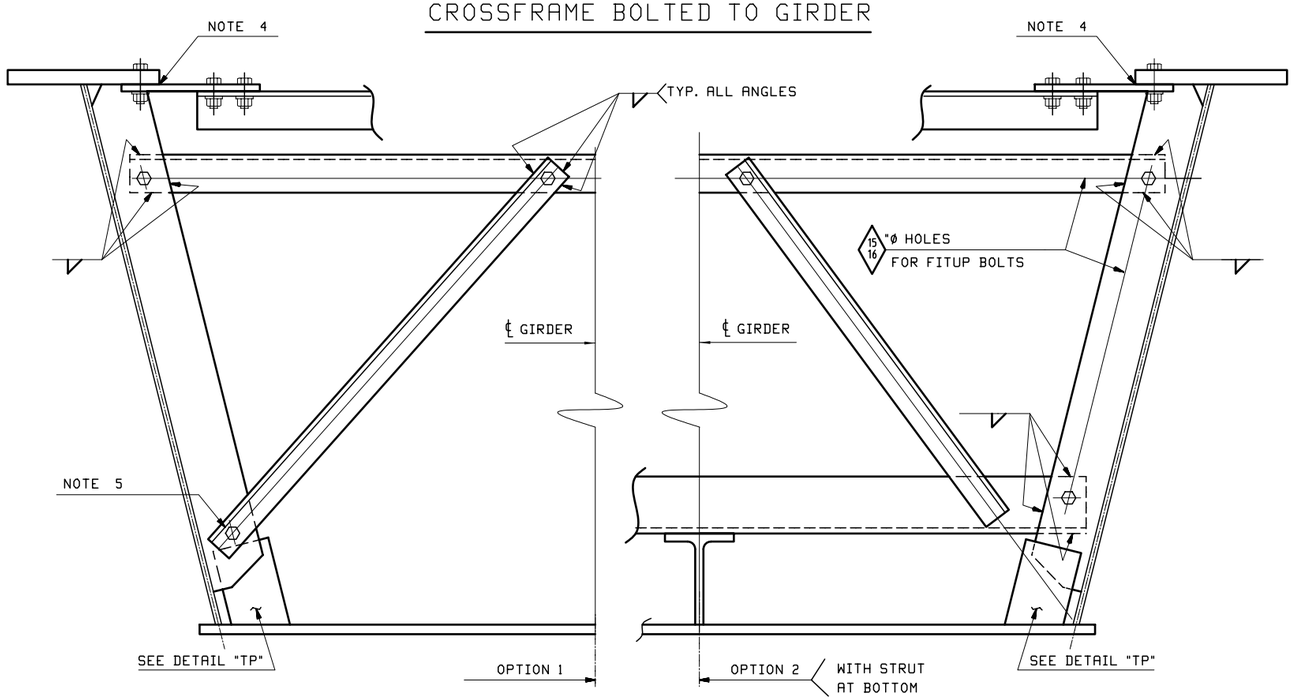
TUB GIRDER CAMBER DIAGRAM

AASHTO/NSBA STEEL BRIDGE COLLABORATION

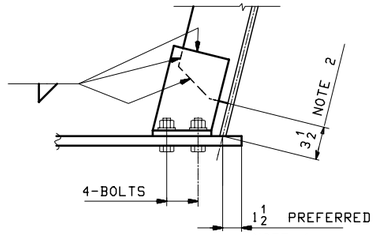
TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS



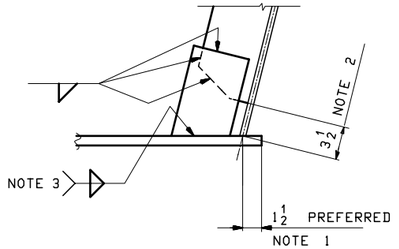
CROSSFRAME BOLTED TO GIRDER



CROSSFRAME WELDED TO GIRDER



DETAIL "TP"
BOLTED OPTION



DETAIL "TP"
WELDED OPTION

TYPICAL CROSSFRAME DETAILS FOR TUB GIRDER BRIDGES

DESIGNER MAY SHOW EITHER WELDED OR BOLTED CROSSFRAMES, BUT CONSIDER A FABRICATOR'S REQUEST FOR ALTERNATIVES.

1...THE BOTTOM FLANGE EXTENSION IS REQUIRED FOR FLUX SUPPORT AND THE WELDING MACHINE TRACKING. 1" MIN. MOST FABRICATOR'S PREFER $1\frac{1}{2}$"MIN.

2...A GAP OF $3\frac{1}{2}$" IS PREFERRED, DESIGNER TO CHECK 4 TO 6 t_w REQUIREMENT. THE GAP AT THE BOTTOM ALLOWS THE WEB TO FLANGE WELDING TO BE MADE WITHOUT INTERRUPTIONS. HOWEVER THIS DETAIL MAY VARY DEPENDING ON THE FABRICATOR'S EQUIPMENT AND PROCEDURES. EXTENDING THE STIFFENER TO THE FLANGE WITHOUT THE USE OF TAB PLATES IS ACCEPTABLE.

3...WELD TO FLANGE WHEREVER FATIGUE STRESS RANGE PERMITS. IF REQUIRED FOR FATIGUE , USE A BOLTED TAB PLATE. SEE DETAIL "TP"

4...FILLS CAN BE USED TO DROP BRACING PLANE BELOW THE FORMWORK SUPPORTS. HOWEVER IT MAY BE MORE ECONOMICAL TO MODIFY FORMWORK AROUND THE BRACING MEMBERS.

5...ASSEMBLY BOLTS MUST NOT INTERFERE WITH WELDING.

USUAL ASSEMBLY SEQUENCE

A...WEB, TOP FLANGE AND STIFFENERS ARE USUALLY FABRICATED AS A SUB-ASSEMBLY PRIOR TO FITTING TO THE BOTTOM FLANGE.

B...THE CROSSFRAME IS BUILT IN A JIG AS A SUB-ASSEMBLY, FIT-UP AND WELDED. NOTE THAT ALL WELDING IS MADE FROM NEAR SIDE. BOLTED CROSSFRAMES ARE PREFERRED BY MOST FABRICATORS WHICH MINIMIZES ROLLING TUBS TO GET PROPER POSITION FOR WELDING.

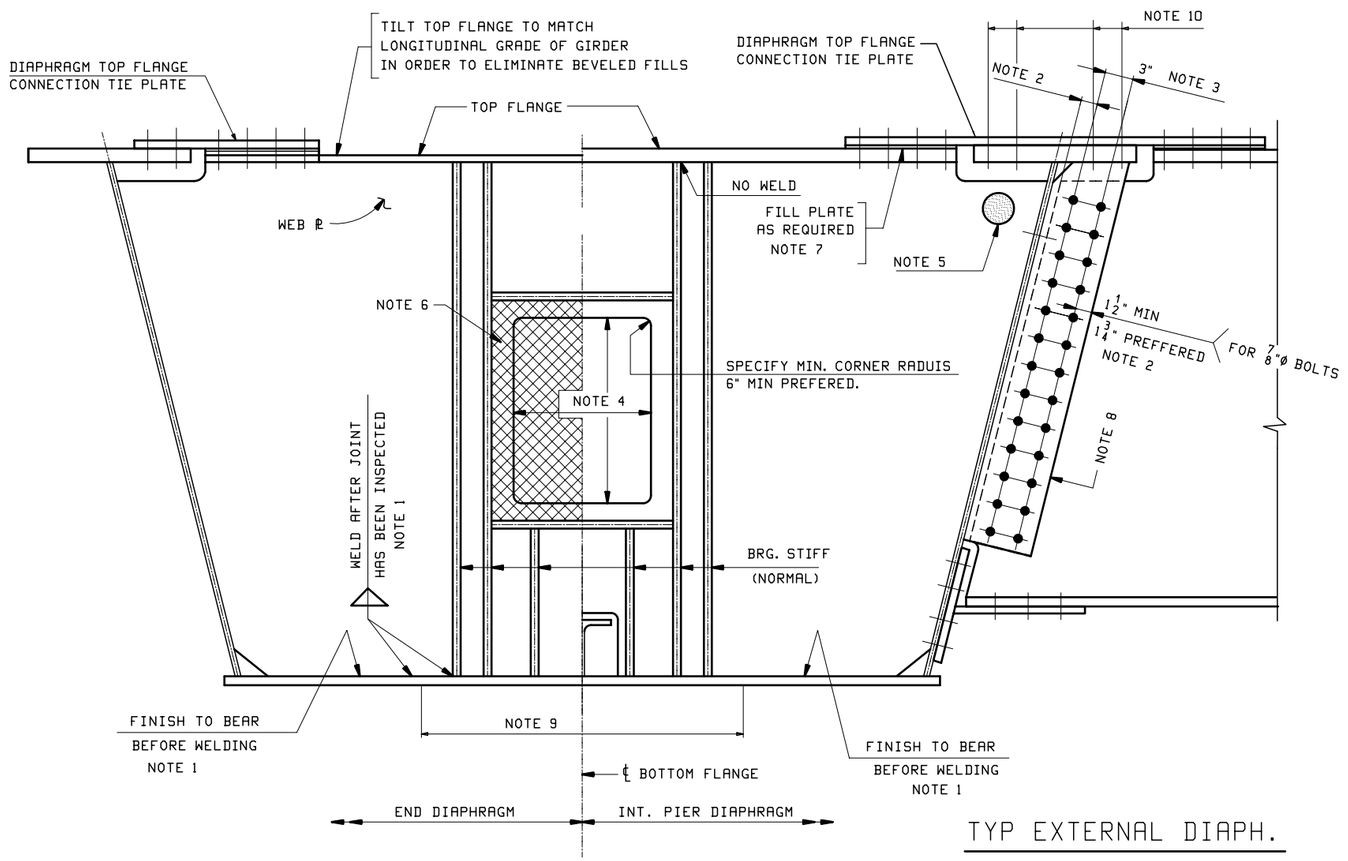
C...THE CROSSFRAME SUB-ASSEMBLY IS THEN BOLTED TO THE WEB/TOP FLANGE SUB-ASSEMBLY WHICH WILL CONTROL SHAPE FOR THE FINAL GIRDER ASSEMBLY.

D...THE WEB/TOP FLANGE SUB-ASSEMBLY WITH THE CROSSFRAMES BOLTED IN PLACE IS THEN FITTED TO THE BOTTOM FLANGE PLATE WHICH HAS BEEN BLOCKED TO ITS CAMBERED SHAPE. THE WEB TO BOTTOM FLANGE PLATE WELDS ARE THEN MADE.

TYPICAL CROSSFRAME DETAILS FOR TUB GIRDERS

AASHTO/NSBA STEEL BRIDGE COLLABORATION

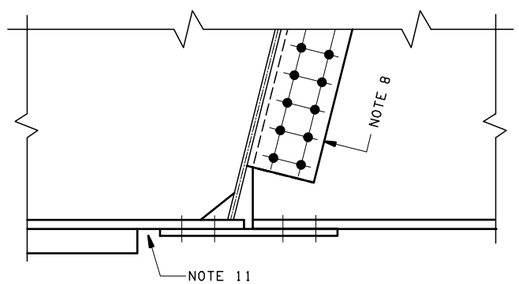
TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS



TYP EXTERNAL DIAPH.

(OPTION 1)

BEARING DIAPHRAGMS



TYP EXTERNAL DIAPH.

(OPTION 2)

DISCLAIMER NOTE
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NOTES TO DESIGNERS

1...DETAIL DIAPHRAGM ASSEMBLY/BOTTOM FLANGE CONNECTION WITH FILLET WELDS AND FINISH TO BEAR SURFACES. AVOID FULL PENETRATION WELDS.

2...SINCE MOST FABRICATOR'S PREFER MORE THAN MINIMUM EDGE TO ALLOW FOR FABRICATION AND DRILLING TOLERANCES, PROVIDE ANOTHER $\frac{1}{8}$" TO $\frac{1}{4}$" MORE MATERIAL THAN THE MINIMUM REQUIRED.

3...ALLOW SUFFICIENT DISTANCE BETWEEN END DIAPHRAGMS AND BACK WALLS TO FACILITATE FIELD BOLTING (PREFERRED) OR PROVIDE ACCESS HOLES.

4...SIZE DIAPHRAGM ACCESS OPENINGS IN ACCORDANCE WITH STATE DESIGN GUIDELINES. 18" × 36" PREFERRED MINIMUM.

5...PROVIDE OPENINGS IN DIAPHRAGM TO FACILITATE RACEWAYS FOR MAINTENANCE LIGHTING CONDUIT. USE EXISTING CLIPS AT WEB TO FLANGE WELD IF POSSIBLE.

6...DIAPHRAGM ACCESS OPENINGS AT END OF UNITS SHALL BE COVERED BY SCREENED DOOR TO ALLOW FOR VENTILATION AND INSPECTION ACCESS AT PIERS WHILE PROHIBITING ANIMAL ACCESS. AT END DIAPHRAGMS, ADJACENT TO ABUTMENTS, AN ACCESS HATCH IN THE BOTTOM FLANGE SHOULD BE PROVIDED. SEE PAGE MO. 118 FOR DETAILS.

7...FILLS MAY BE REQUIRED FOR FIT UP ($\frac{1}{8}$" MIN) THICKER FILLS MAY REQUIRE DEVELOPING THE FILL BY EXTENDING PAST THE END OF THE TOP FLANGE CONNECTION TIE PLATE, DESIGNER TO CHECK AASHTO REQUIREMENTS.

8...CONNECTION CAN BE MADE WITH EITHER A CONNECTION ℄ OR A ANGLE. AVOID USING END PLATES WELDED TO THE DIAPHRAGM WEB.

9...FINISH BEARING CONTACT AREA TO BEAR. (PER 3.5.1.9 OF D1.5 BRIDGE WELDING CODE)

10...WHEN POSSIBLE, DO NOT CONNECT TIRE PLATE TO TOP FLANGE. IF BOLTING TIE PLATE TO GIRDER IS REQUIRED, DESIGNER SHOULD INVESTIGATE NET SECTION OF TOP FLANGE DUE TO THIS HIGHLY STRESSED AREA.

11...DESIGNER TO CHECK CLEARANCE TO SOLE PLATE.

GENERAL DETAILING FABRICATION METHODS:

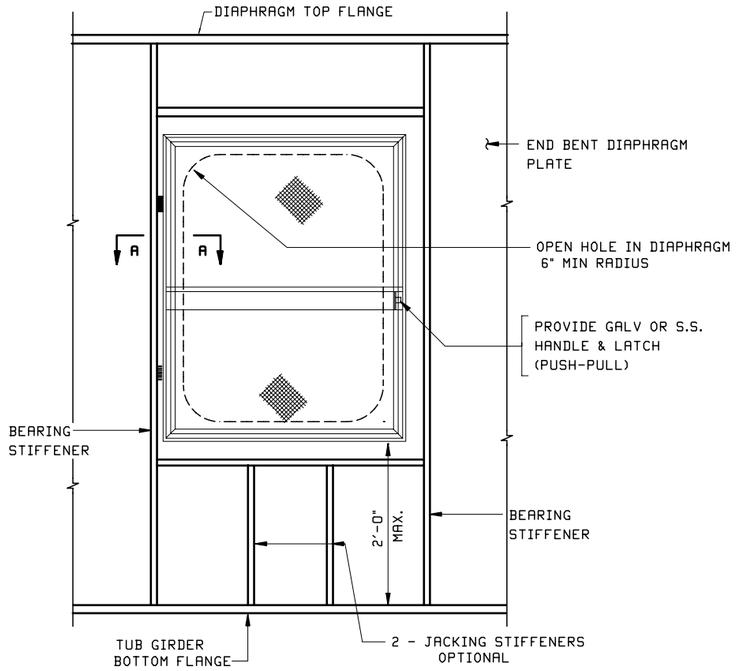
A...DETAIL DIAPHRAGM SO IT CAN BE SUB-ASSEMBLED, THEN FITTED TO BOTTOM FLANGE AND WEB ASSEMBLIES IN THE SHOP. KEEP STIFFENERS NORMAL TO BOTTOM OF FLANGE. IF BEARINGS ARE BOLTED TO FLANGE, THEN CHECK BOLT CLEARANCE TO STIFFENERS AND WELDS.

BEARING DIAPHRAGMS - TUB GIRDER BRIDGES

AASHTO/NSBA STEEL BRIDGE COLLABORATION

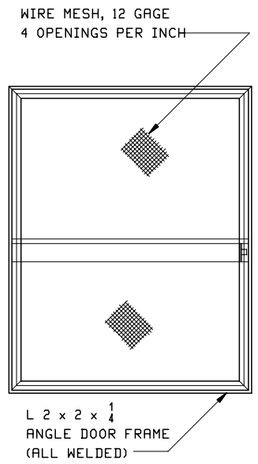
TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS

PAGE NO. 117

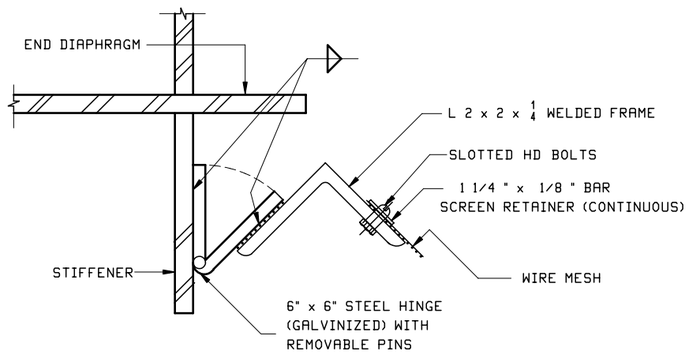


ELEVATION OF ACCESS DOOR

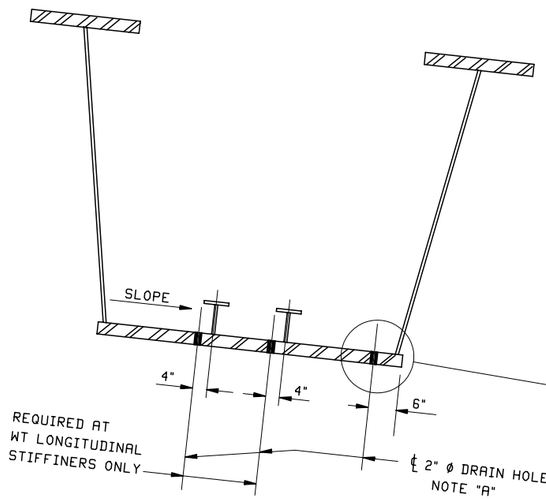
AT END BENT DIAPHRAGM OPENING



DOOR FRAME

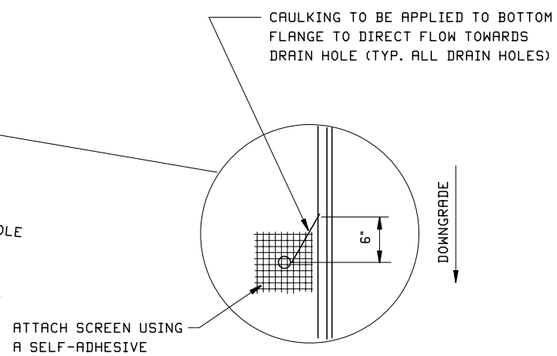


SECTION A-A



SECTION - GIRDER DRAIN HOLE DETAIL

PLACE DRAIN HOLES AT 50'-0" MAXIMUM SPACING, AND 5'-0 MIN. FROM ℄ PIER OR BACKWALL.



PLAN OF DRAIN HOLES

NOTES FOR DESIGN DRAWINGS:

1...DOOR MUST OPEN TOWARDS THE INSIDE OF THE STEEL TUB GIRDER.

2...COST OF SCREENED CLOSURE DOOR IS INCIDENTAL TO THE COST OF STRUCTURAL STEEL.

3...STRUCTURAL STEEL FABRICATOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL.

4...ALL WORK SHOWN ON THIS SHEET SHALL BE SHOP FABRICATED AND MOUNTED PRIOR TO SHIPPING TO THE JOB SITE.

5... THESE DETAILS & MATERIAL SIZES ARE SUGGESTED AND ARE FOR A GUIDE ONLY, ENGINEER SHOULD CHECK WITH OWNER FOR POSSIBLE PREFERRED STANDARDS.

NOTE "A":
COVER VENT HOLES AND DRAIN HOLES WITH 20 GAGE GALVANIZED WELDED METAL SCREENING (1/4 " OPENINGS). ATTACH TO GIRDER WEBS/FLANGES, WITH AN OWNER APPROVED METHOD.

DISCLAIMER NOTE

INFORMATION SHOWN IS FOR CONCEPT ONLY. APPLICATION TO SPECIFIC STRUCTURES IS THE DESIGNER'S RESPONSIBILITY.

STEEL TUB SCREENING DETAILS

AASHTO/NSBA STEEL BRIDGE COLLABORATION

TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS

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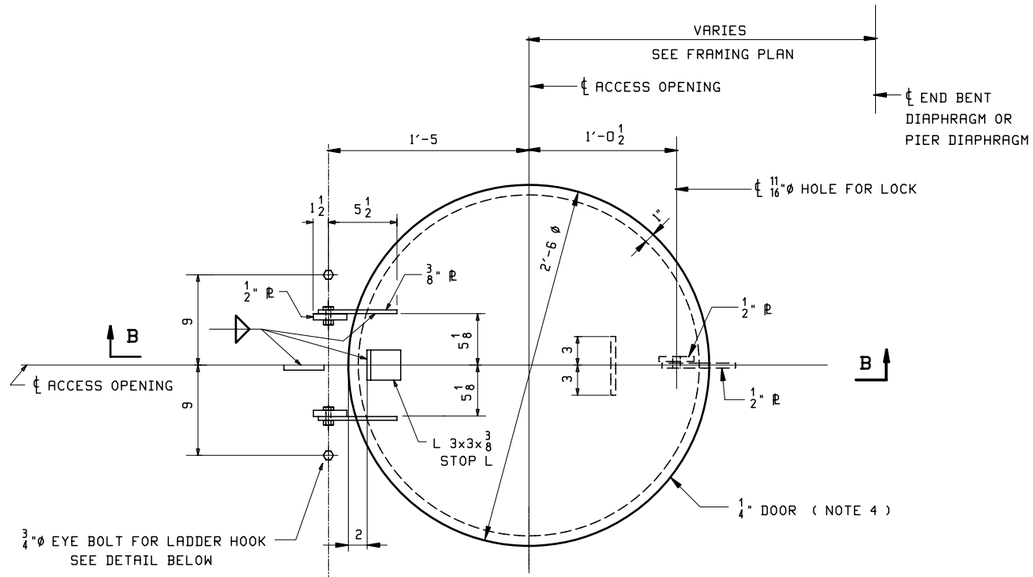
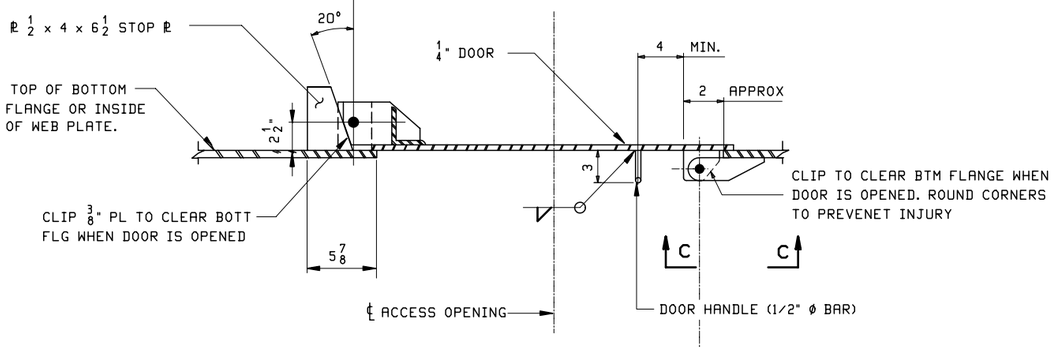
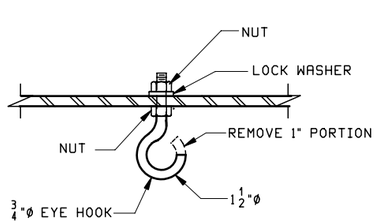


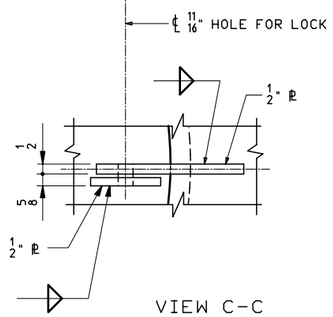
PLAN VIEW



SECTION B-B



EYE HOOK DETAIL



VIEW C-C

NOTE !!

THESE DETAILS & MATERIAL SIZES ARE SUGGESTED AND ARE FOR A GUIDE ONLY, ENGINEER SHOULD CHECK WITH OWNER FOR POSSIBLE PREFERRED STANDARDS.

THIS DETAIL COULD BE USED FOR A WEB OR FLANGE ACCESS DOOR.

NOTES FOR DESIGN DRAWINGS:

1...FOR ACCESS OPENING LOCATION SEE FRAMING PLAN.

2...ALL STRUCTURAL STEEL IN ACCESS HATCH SHALL BE ASTM A709 GRADE 36 AND SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A-123.

3...ALL EXPOSED EDGES OF PLATES AND OPENINGS SHALL BE GROUND SMOOTH.

NOTES FOR DESIGNERS

CHECK THE RESULTING CROSS-SECTION OF BOTTOM FLANGE TO DETERMINE IF A REINFORCING PLATE IS REQUIRED.

4...INVESTIGATE USE OF A PERFORATED PLATE, GRATING, OR OTHER OWNER PREFERRED MATERIAL.

5...DOOR MUST OPEN TOWARDS INSIDE OF THE STEEL TUB GIRDER.

DISCLAIMER NOTE
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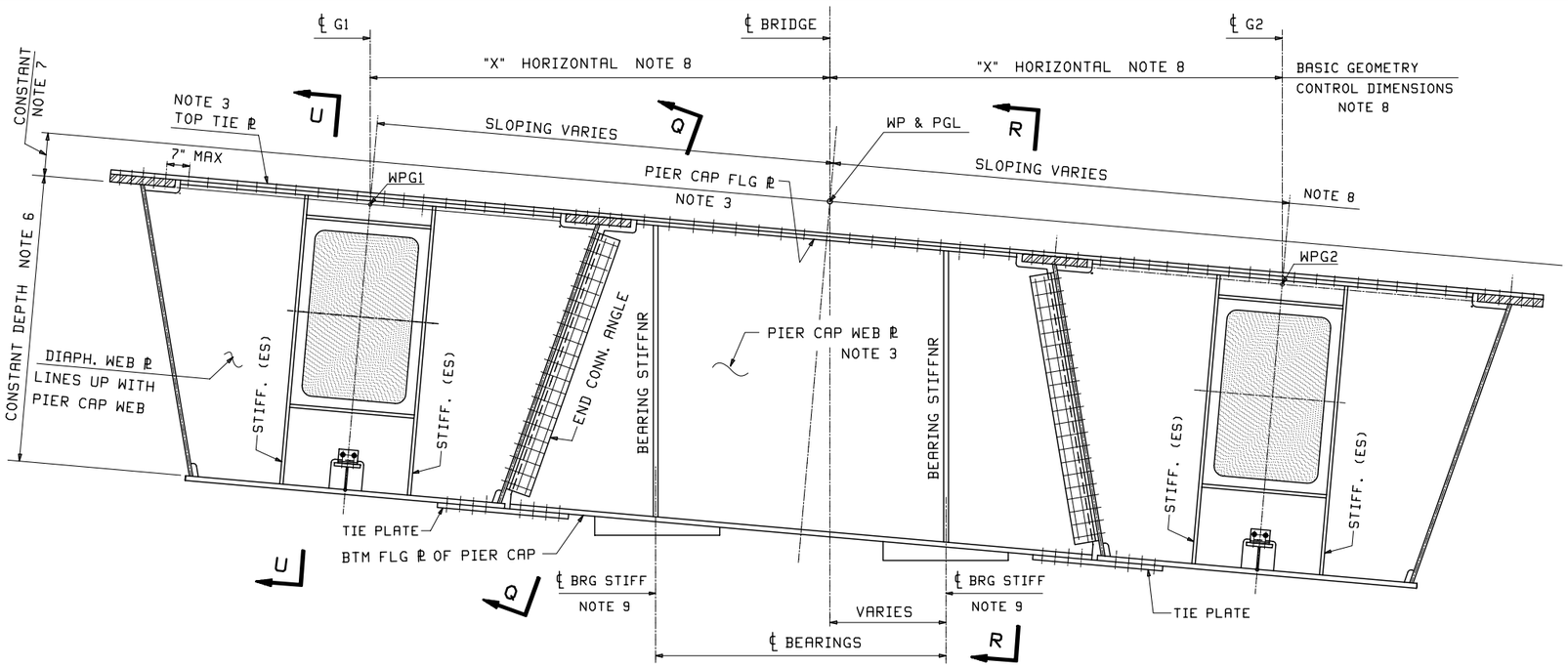
ACCESS OPENING DETAILS

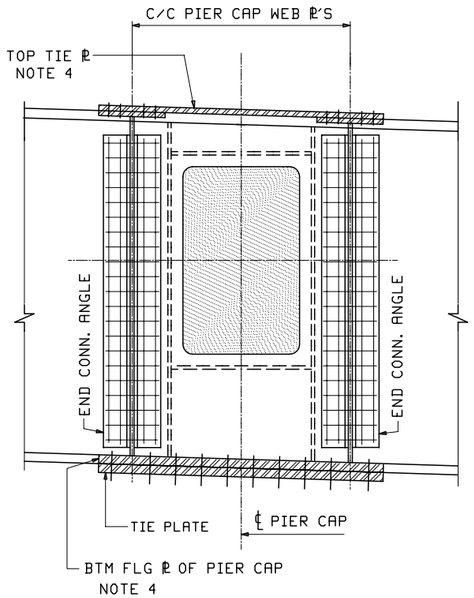
AASHTO/NSBA STEEL BRIDGE COLLABORATION

TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS

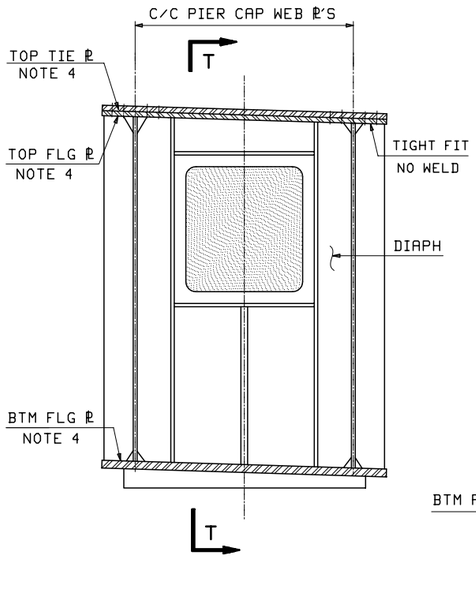
PAGE NO. 119



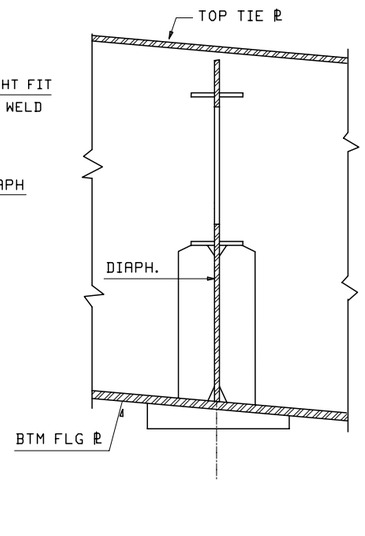
SECTION AT PIER CAP



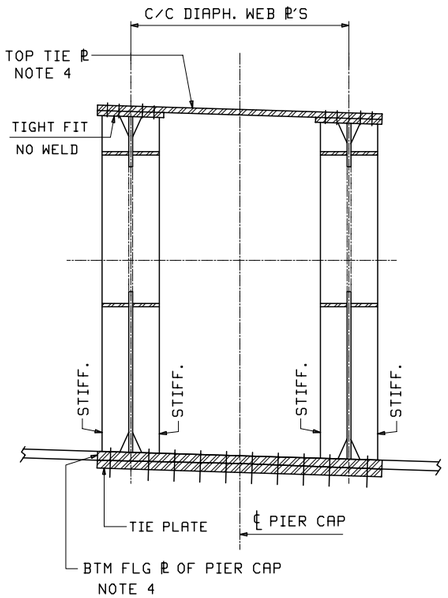
SECTION Q-Q



SECTION R-R



SECTION T-T



SECTION U-U

GENERAL NOTES

1...ALL STRUCTURAL STEEL SHALL BE ASTM A709 UNLESS OTHERWISE NOTED.

2...ALL BOLTED CONNECTIONS SHALL BE SLIP-CRITICAL.

3...TOP FLANGES AND WEBS OF PIER CAP AND DIAPHRAGM ARE FRACTURE CRITICAL AND SHALL MEET THE REQUIREMENTS OF CHAPTER 12 OF ANSI/AASHTO/AWS D1.5 BRIDGE WELDING CODE, FRACTURE CONTROL PLAN (FCP) FOR NONREDUNDANT MEMBERS.

4 ...SLOPE TOP AND BOTTOM FLANGES OF PIER CAP TO BE PARALLEL TO GRADE OF LONGITUDINAL GIRDER. THIS WILL ELIMINATE USING BEVELED FILL PLATES.

CROSS SECTION GEOMETRY

5... ROTATE TUB GIRDER WITH CROSS SLOPE.

6... MAINTAIN CONSTANT TRAPEZOIDAL SHAPE FOR ALL GIDERS ON A STRUCTURE. VARY DISTANCE BETWEEN TUBS IF DECK WIDTH FLARES.

7... MAINTAIN A CONSTANT DIMENSION FROM THE TOP OF DECK TO THE TOP OF THE WEB PLATE. SHOW THIS DIMENSION ON DESIGN DRAWINGS.

8... ALL TRANSVERSE GIRDER LOCATIONS SHALL BE LOCATED HORIZONTALLY. DO NOT CONTROL THE GIRDER LOCATIONS ALONG THE DECK.

9... BEARING STIFFERNERS MAY BE VERTICAL OR NORMAL TO FLANGES.

NOTES FO RDESIGNERS

A... AVOID FULL PENETRATION WELDS OF PLATES OR STIFFENERS TO FLANGES. USE FINISH TO BEAR WITH FILLET WELDS

B... SEE PAGE NO. 117 FOR ADDITIONAL APPLICABLE NOTES FOR ACCESS OPENINGS, BOLT SPACING, EDGE DISTANCES, WELDING , ETC.

C... SEE PAGE NO. 118 FOR DRAIN HOLES NOTES.

DISCLAIMER NOTE

INFORMATION SHOWN IS FOR CONCEPT ONLY. APPLICATION TO SPECIFIC STRUCTURES IS THE DESIGNER'S RESPONSIBILITY.

INTEGRAL PIER CAP STEEL BOX

AASHTO/NSBA STEEL BRIDGE COLLABORATION

TASK GROUP 1, SUBTASK - GROUP 1.4
GUIDELINES FOR DESIGN DETAILS

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