Chapter 03 - Superstructure

SECTION 05

STRUCTURAL STEEL (SUP-SS)

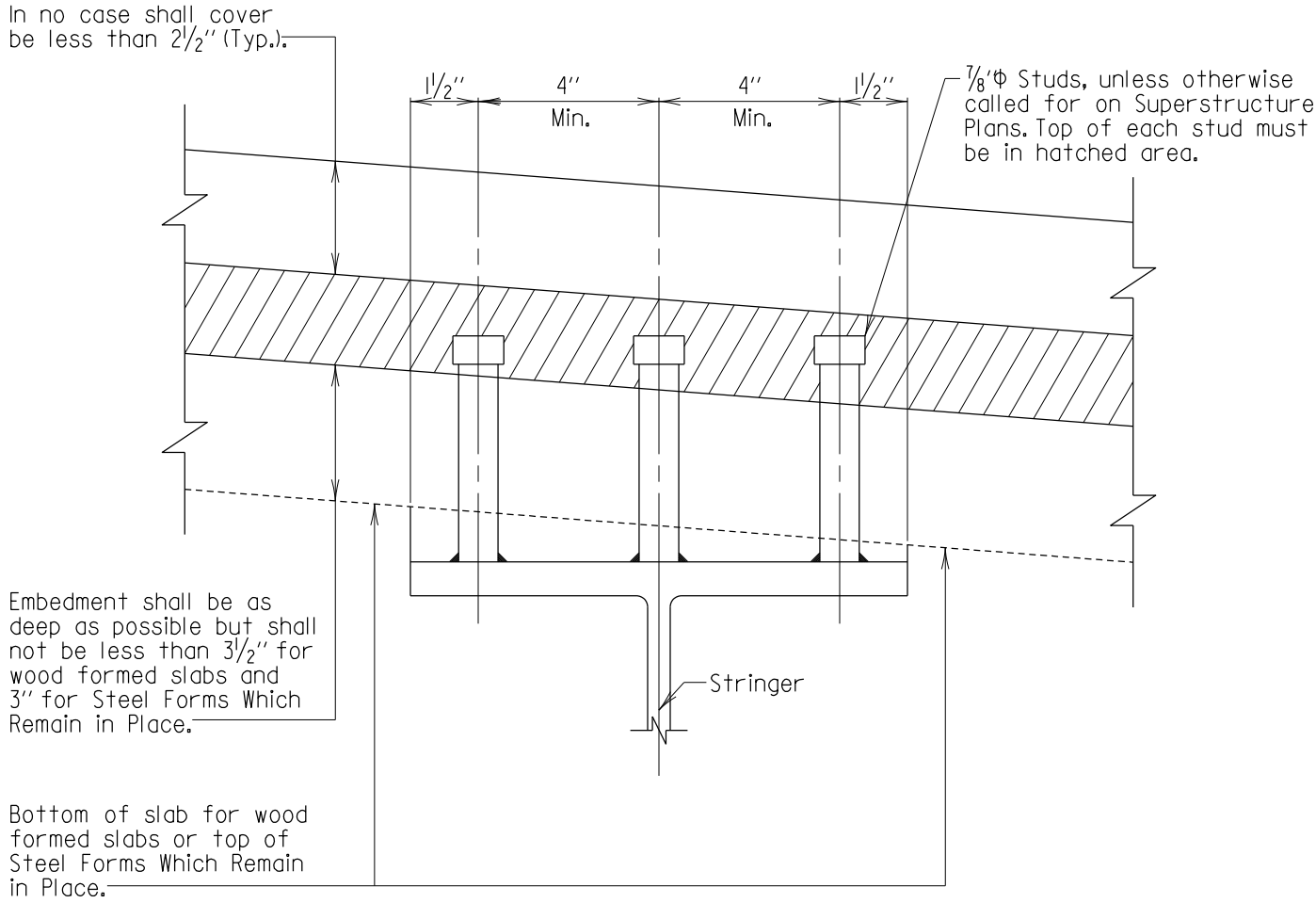
Chapter 03 - Superstructure

Section 05 – Structural Steel

SUB-SECTION **01**

GENERAL

(SUP-SS(GEN))



ELEVATION

Scale: None

Notes:

1. For number of studs per row, and longitudinal spacing of rows see pertinent Superstructure sheets.
2. For flange widths less than 11", only two rows of studs are to be used.
3. Steel Forms Which Remain in Place not shown.

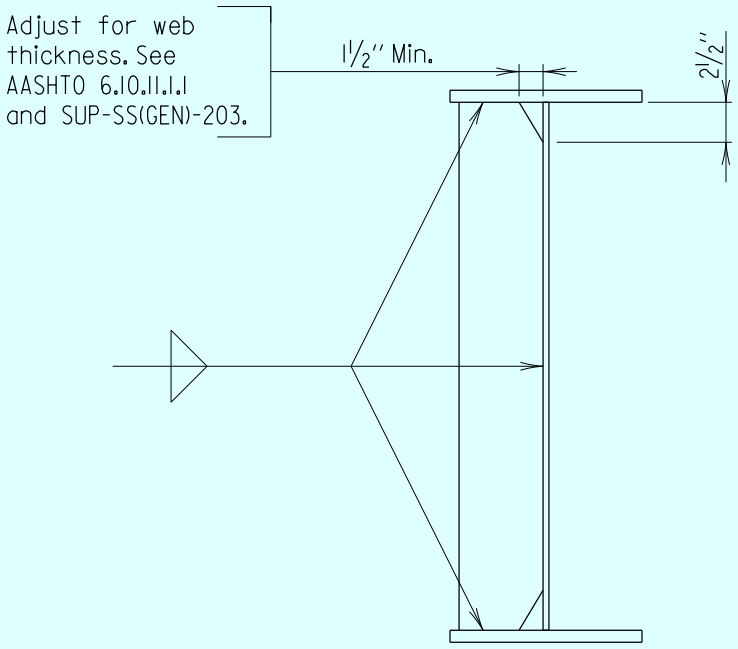
APPROVAL
E.S. Freedman DIRECTOR OFFICE OF STRUCTURES
DATE: 09/08/1976
VERSION
1.0

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES

STEEL STUD SHEAR DEVELOPER EMBEDMENT DETAIL

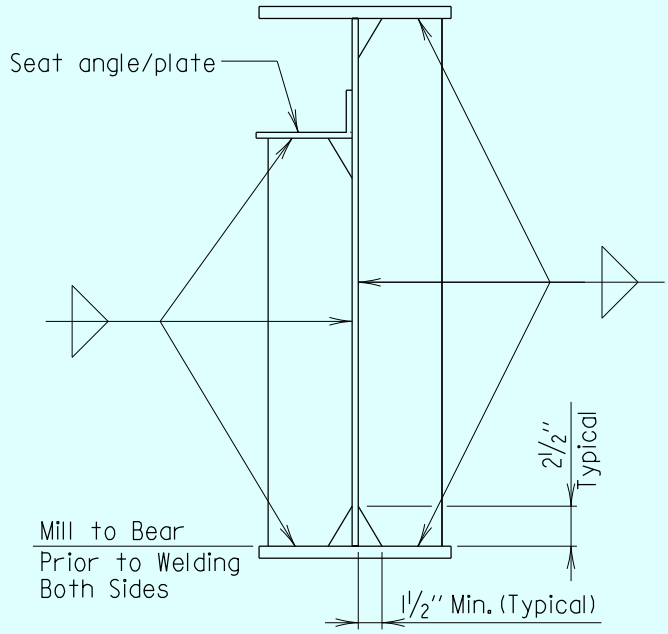
DETAIL NO. SUP-SS(GEN)-101 SHEET 1 OF 1

SUPERSTRUCTURE STEEL

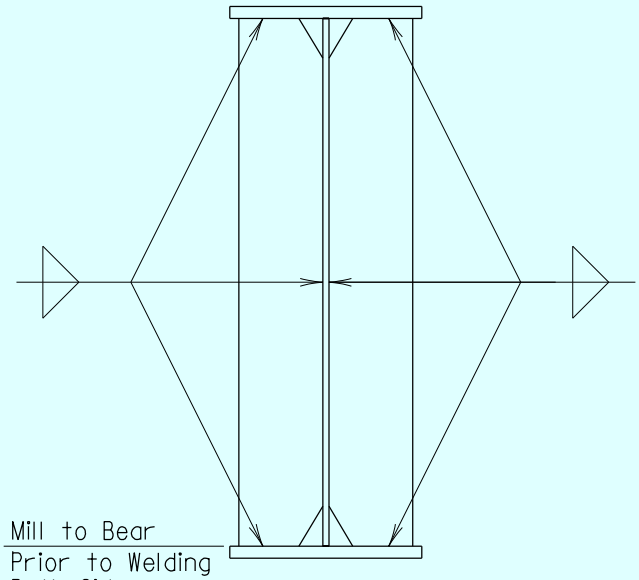


INTERMEDIATE STIFFENERS - ANGLE CLIPS

Scale: 1" = 1'-0"



END BEARING



INTERIOR BEARING CONTINUOUS GIRDER

BEARING STIFFENERS - ANGLE CLIPS

Scale: 1" = 1'-0"

Notes:
1. Minimum stiffener thickness ½".
2. On exterior girders place all intermediate stiffeners on inside of girder.
3. When longitudinal stiffeners are required, place all longitudinal stiffeners on one side of web, place transverse stiffeners on opposite side.
4. Minimum fillet weld is 5/16".

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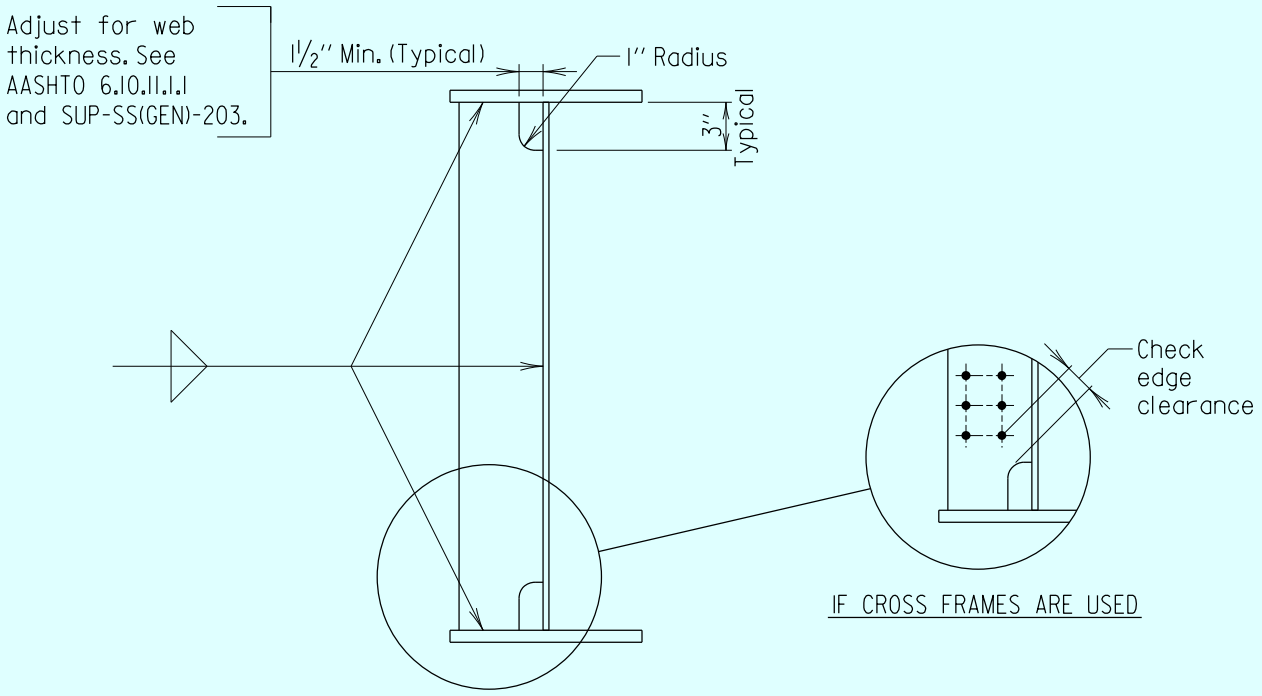
APPROVAL
E.S. Freedman DIRECTOR OFFICE OF STRUCTURES
DATE: 10/09/2007
VERSION
1.0

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES

STIFFENER ATTACHMENT DETAILS FOR STEEL GIRDERS ANGLE CLIP

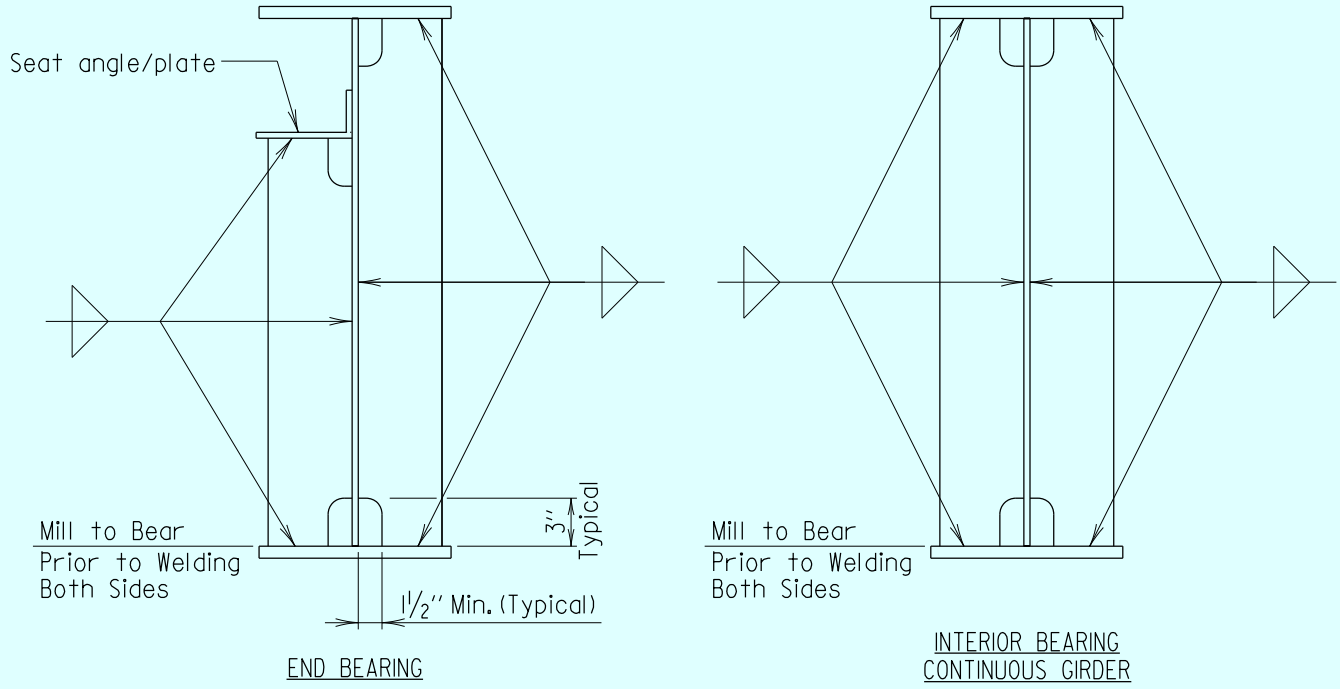
DETAIL NO. SUP-SS(GEN)-201 SHEET 1 OF 2

SUPER-STRUCT. STEEL



INTERMEDIATE STIFFENERS - RADIUS CLIPS

Scale: 1" = 1'-0"



BEARING STIFFENERS - RADIUS CLIPS

Scale: 1" = 1'-0"

Notes:
1. Minimum stiffener thickness ½".
2. On exterior girders place all intermediate stiffeners on inside of girder.
3. When longitudinal stiffeners are required, place all longitudinal stiffeners on one side of web, place transverse stiffeners on opposite side.
4. Minimum fillet weld is 5/16".

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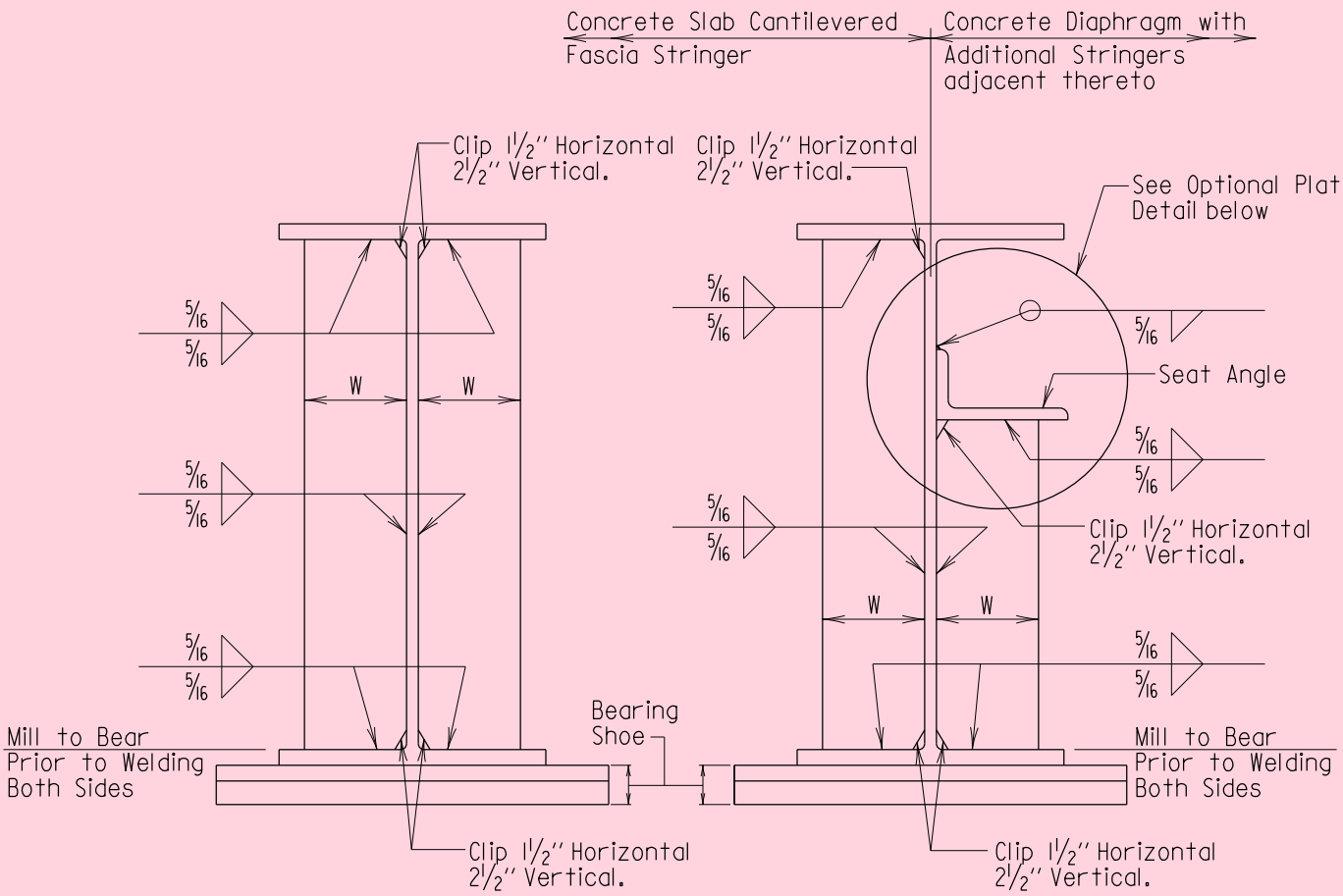
E.S. Freedman DIRECTOR OFFICE OF STRUCTURES
DATE: 10/09/2007
VERSION
1.0

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES

STIFFENER ATTACHMENT DETAILS WITH OPTIONAL RADIUS CLIPS FOR STEEL GIRDERS

DETAIL NO. SUP-SS(GEN)-201 SHEET 2 OF 2

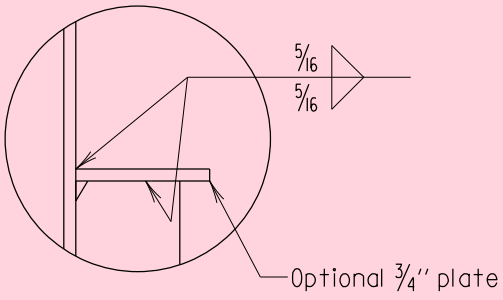
SUPERSTRUCTURE STEEL



AT PIERS
(WHERE STRINGER IS
CONTINUOUS OVER SUPPORT)
Scale: ½" = 1'-0"

AT PIERS
(WHERE STRINGER IS NOT
CONTINUOUS OVER SUPPORT) AND
AT ABUTMENTS
Scale: ½" = 1'-0"

Location	W= Stiffener Width	Stiffener Thickness
Abutment		
Pier		
Pier		
Pier		
Abutment		



OPTIONAL SEAT PLATE DETAIL

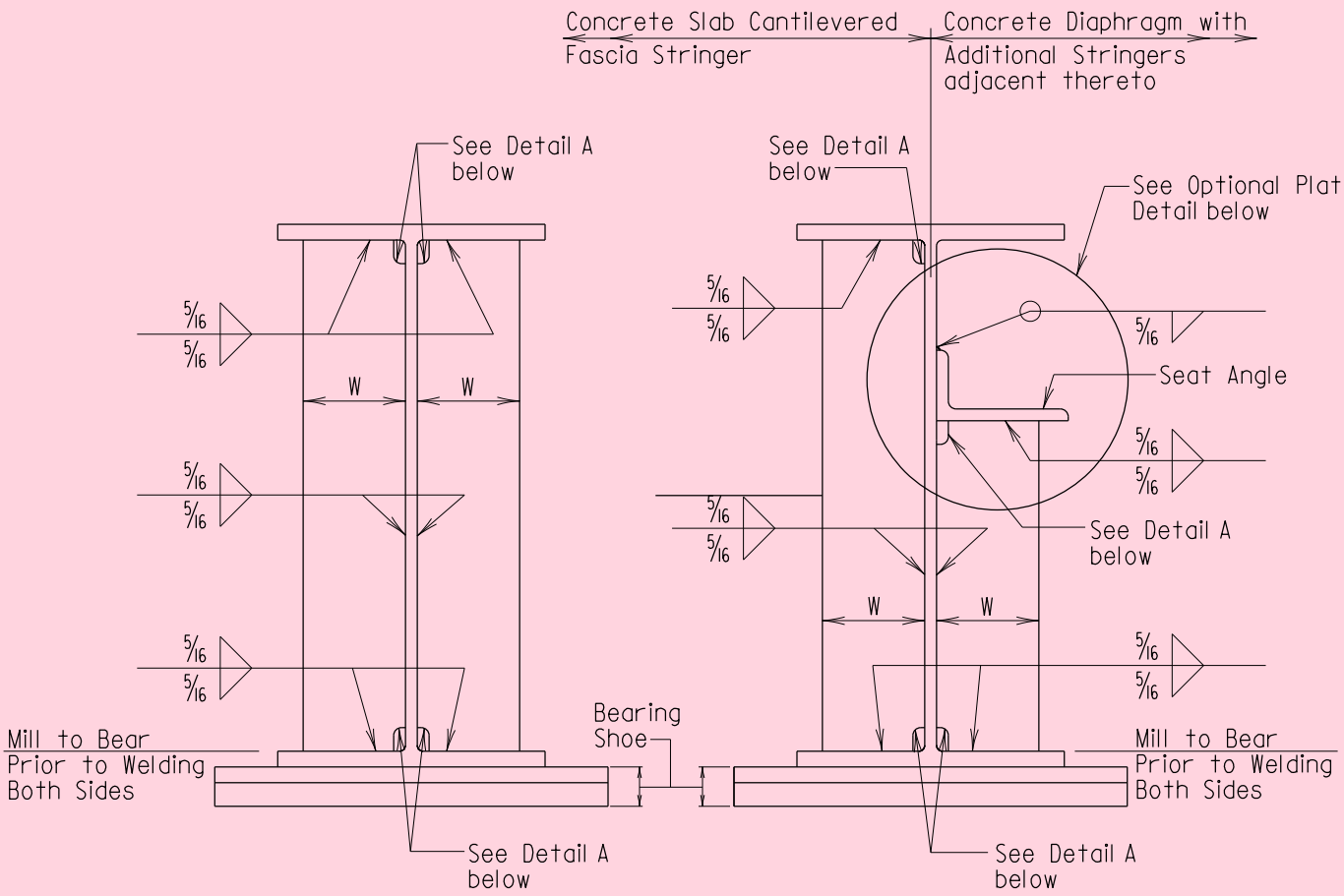
APPROVAL
Glenn C. Crampton DIRECTOR OFFICE OF STRUCTURES
DATE: 04/03/2018
VERSION
1.01

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES

BEARING STIFFENERS FOR ROLLED STEEL BEAMS ANGLE CLIP

DETAIL NO. SUP-SS(GEN)-202 SHEET 1 OF 2

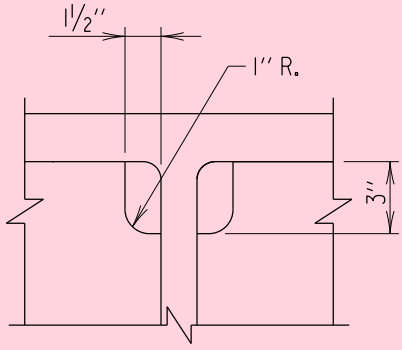
SUPERSTRUCTURE STEEL



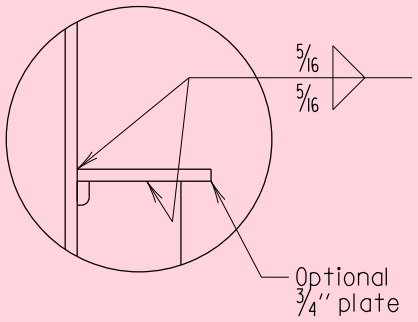
AT PIERS
(WHERE STRINGER IS
CONTINUOUS OVER SUPPORT)
Scale: 1/2" = 1'-0"

AT PIERS
(WHERE STRINGER IS NOT
CONTINUOUS OVER SUPPORT) AND
AT ABUTMENTS
Scale: 1/2" = 1'-0"

Location	W= Stiffener Width	Stiffener Thickness
Abutment		
Pier		
Pier		
Pier		
Abutment		



DETAIL A
Scale: 1 1/2" = 1'-0"



OPTIONAL SEAT PLATE DETAIL

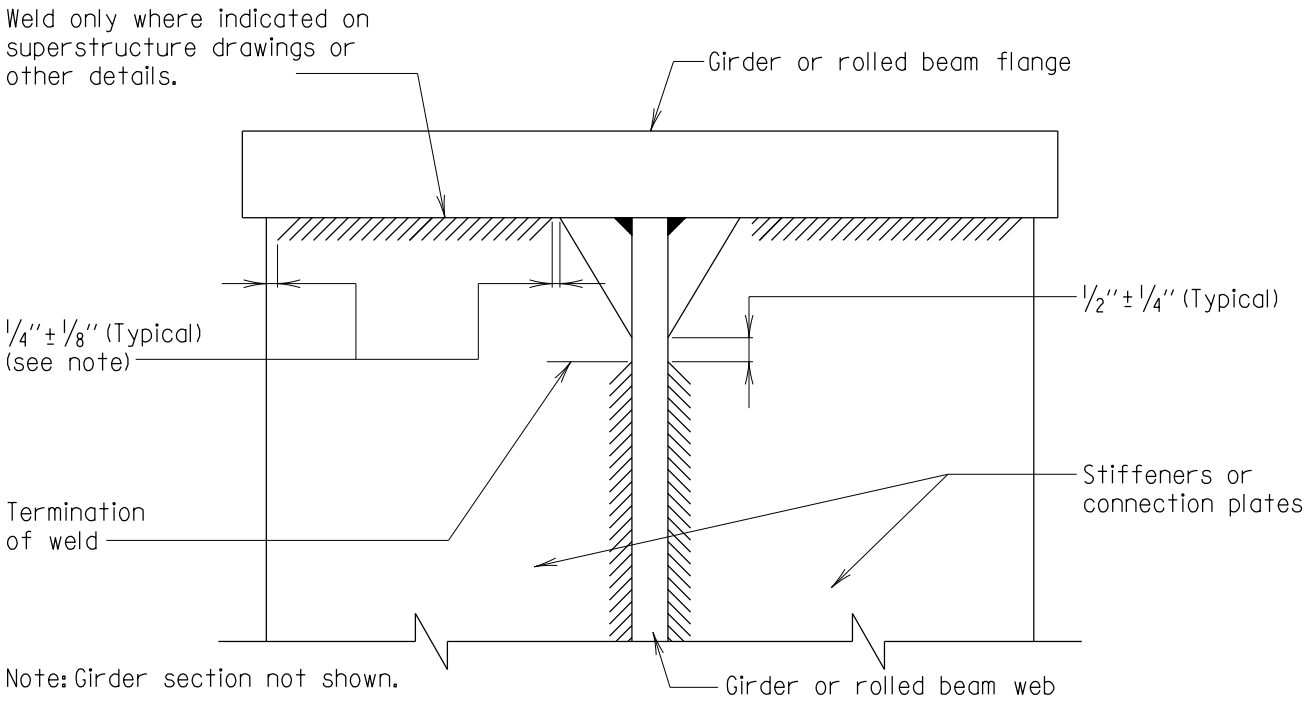
APPROVAL
Glenn C. Crawford DIRECTOR OFFICE OF STRUCTURES
DATE: 04/03/2018
VERSION
1.01

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES

BEARING STIFFENERS FOR ROLLED STEEL BEAMS OPTIONAL RADIUS CLIP

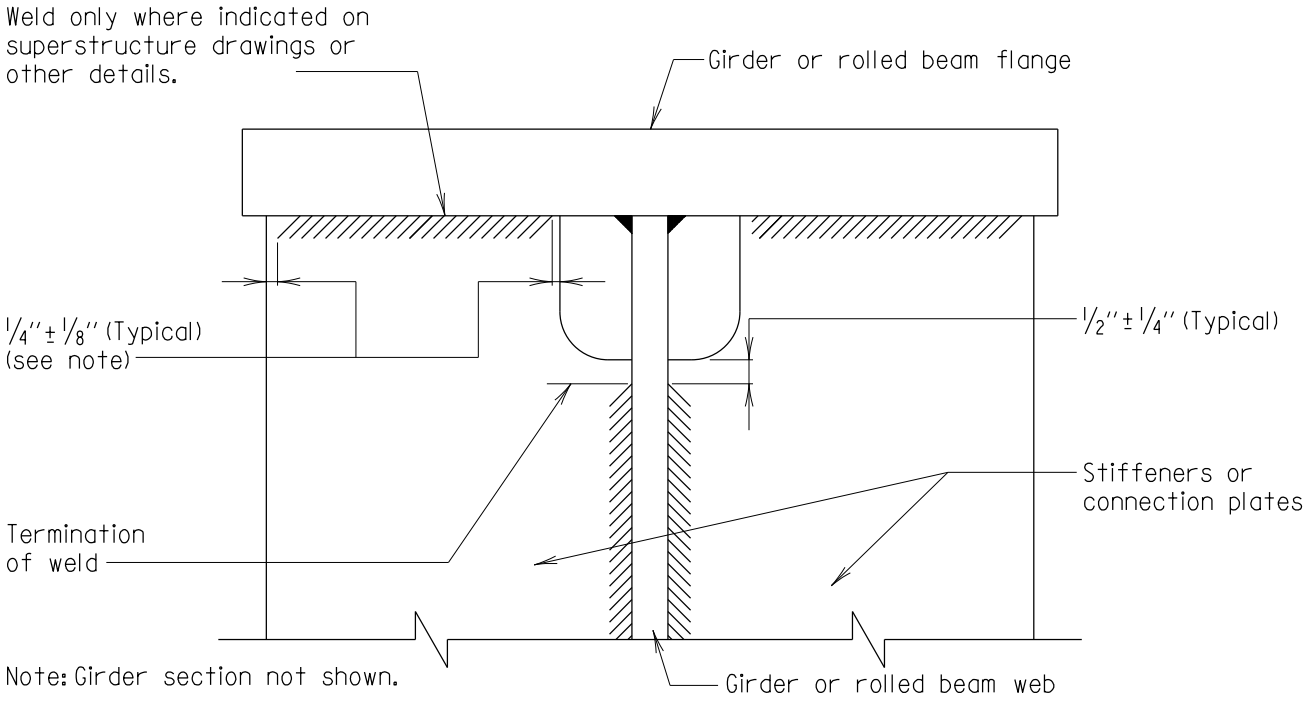
DETAIL NO. SUP-SS(GEN)-202 SHEET 2 OF 2

SUPERSTRUCTURE STEEL



SECTION - ANGLE CLIP

Scale: 3'' = 1'-0''



SECTION - OPTIONAL RADIUS CLIP

Scale: 3'' = 1'-0''

Notes:

1. For all stiffeners (intermediate or bearing) top and bottom, including connection plate for channel diaphragms for all girders and rolled beams.
2. Welding to flange as per this detail will only be required where plans or other detail sheets indicate stiffener is extended and welded to flange.

APPROVAL
E.S. Freedman DIRECTOR OFFICE OF STRUCTURES
DATE: 10/01/2003
VERSION
1.0

STATE OF MARYLAND
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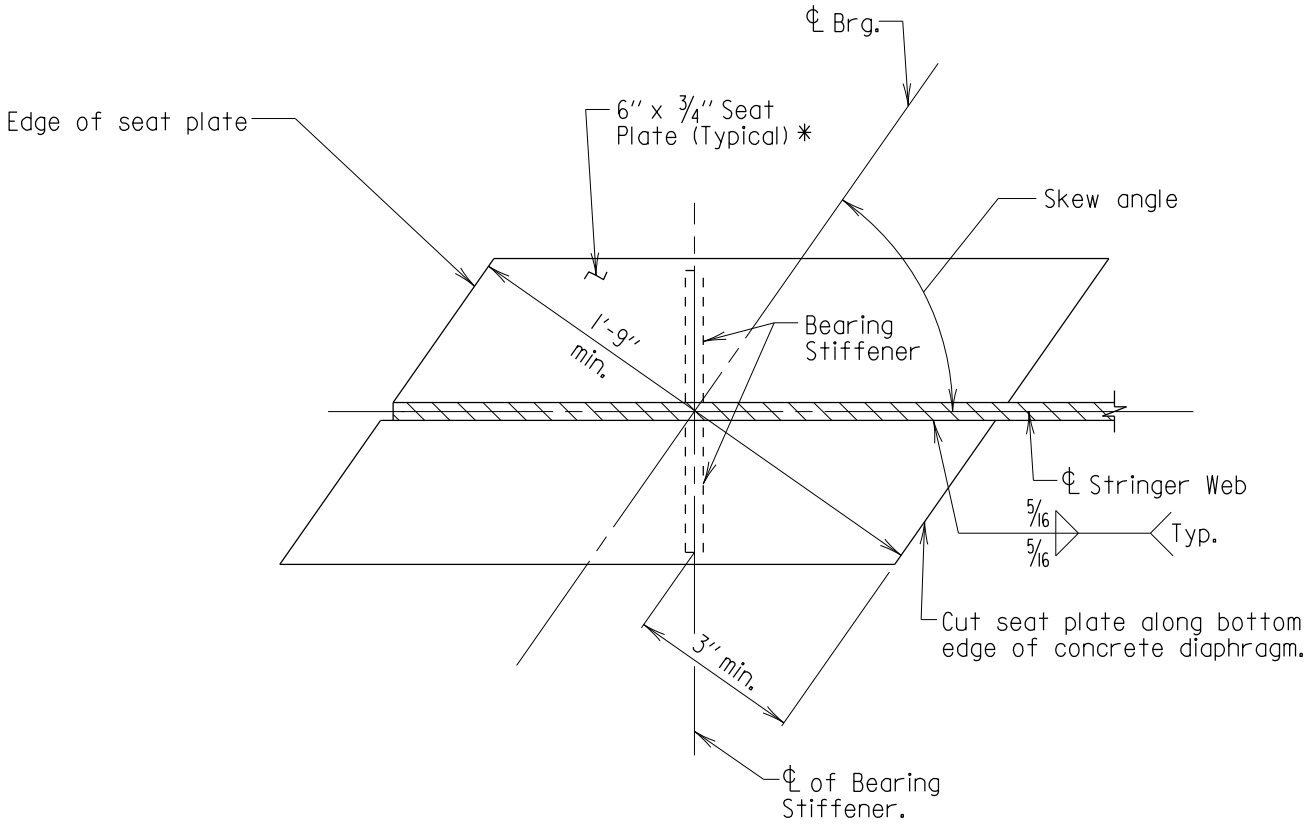
OFFICE OF STRUCTURES

STIFFENER AND STRINGER CONNECTION PLATE WELD TERMINATION DETAIL

DETAIL NO. SUP-SS(GEN)-203 SHEET 1 OF 1

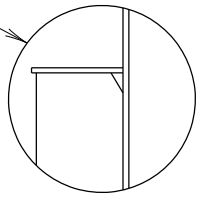
SUPERSTRUCTURE STEEL



PLAN VIEW OF STRINGER BELOW TOP FLANGE

Scale: 1½'' =1'-0''

* Seat plate width shall be increased as necessary so that plate exceeds stiffener width by at least ½''.



Notes:
1. Contractor has the option of using seat plates or seat angles, only one type shall be used per bridge.
2. Concrete diaphragm not shown.

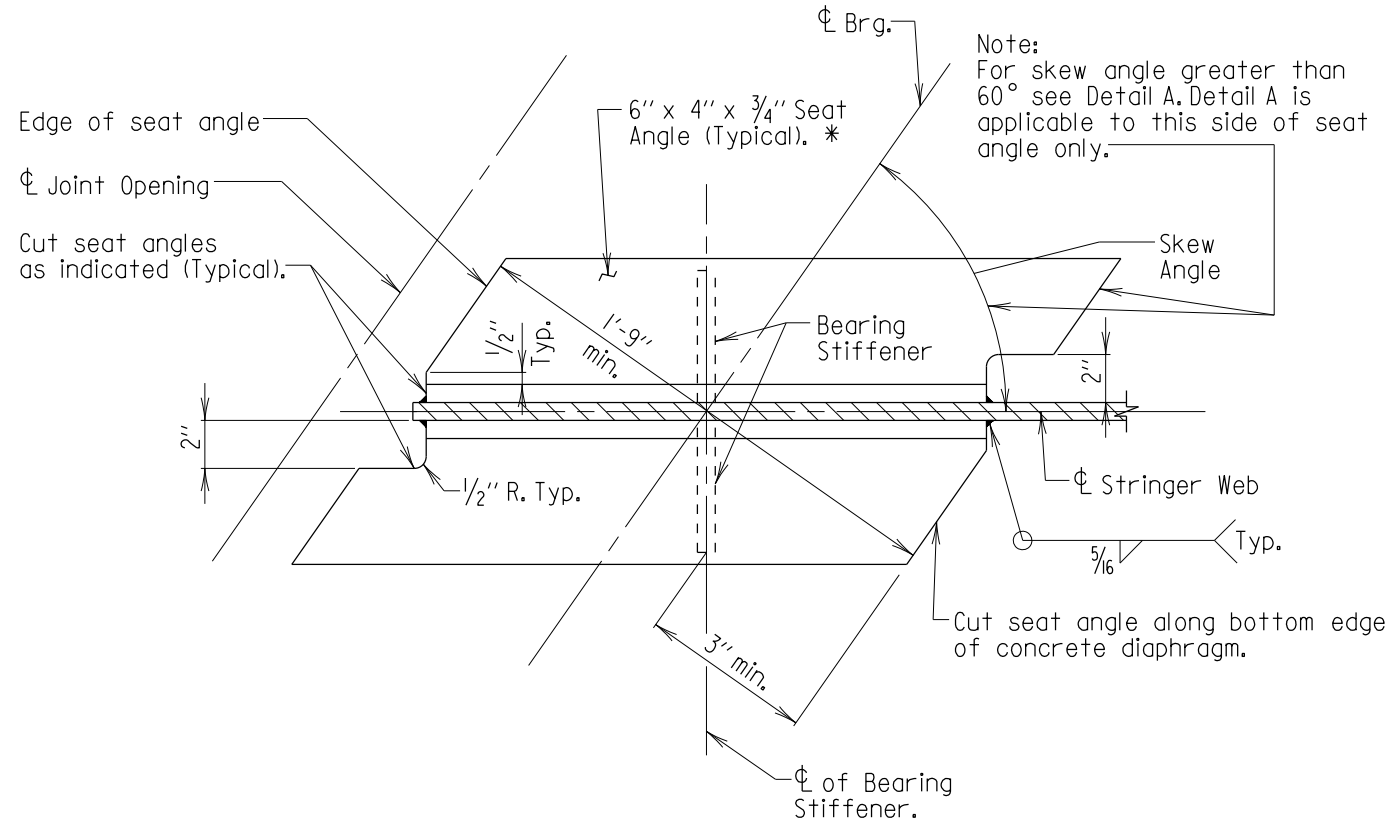
APPROVAL
E.S. Freedman DIRECTOR OFFICE OF STRUCTURES
DATE: 03/07/2013
VERSION
1.0

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES

STEEL SEAT PLATES FOR SKEWED CONCRETE DIAPHRAGMS

DETAIL NO. SUP-SS(GEN)-204 SHEET 1 OF 2

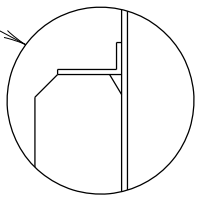
SUPERSTRUCTURE STEEL

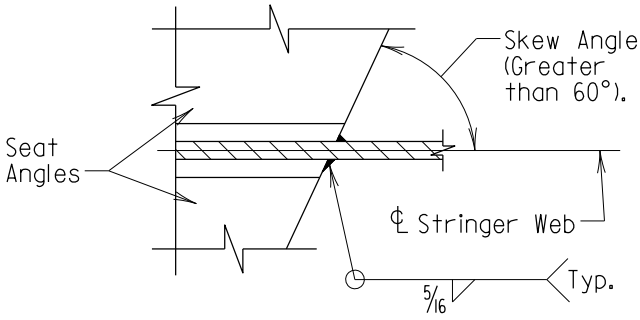


PLAN VIEW OF STRINGER BELOW TOP FLANGE

Scale: 1½" =1'-0"

* Longest leg of angle shall be increased as necessary so that angle exceeds stiffener width by at least ½". If angle size is not available to satisfy this requirement, stiffener shall be tapered at end to meet this requirement.





DETAIL A

Scale: 1½" =1'-0"

Note:
Concrete diaphragm not shown.

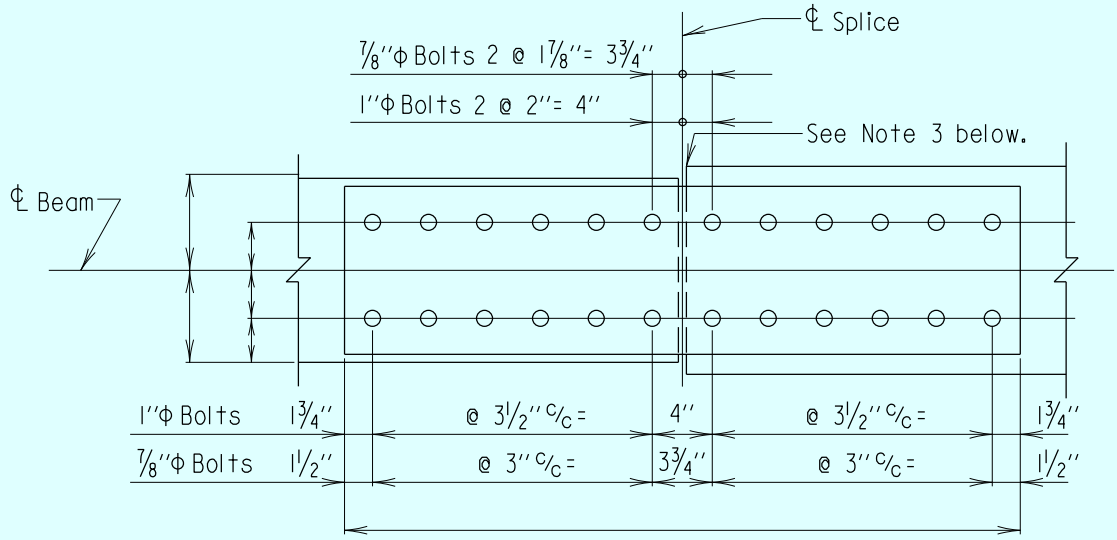
APPROVAL
E S Freedman DIRECTOR OFFICE OF STRUCTURES
DATE: 03/07/2013
VERSION
1.0

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES

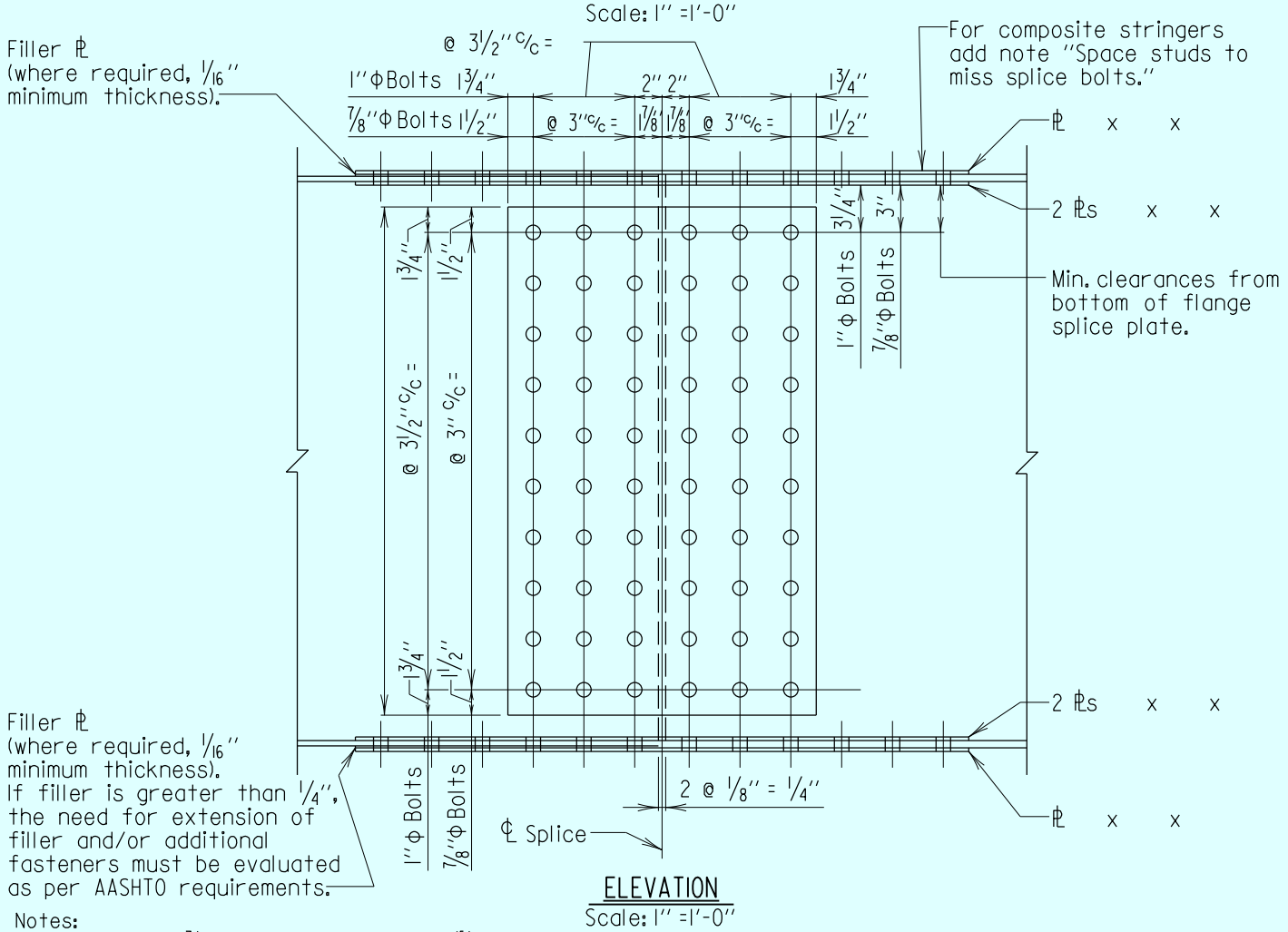
STEEL SEAT ANGLES FOR SKEWED CONCRETE DIAPHRAGMS

DETAIL NO. SUP-SS(GEN)-204 SHEET 2 OF 2

SUPERSTRUCTURE STEEL



PLAN
Scale: 1" = 1'-0"



ELEVATION
Scale: 1" = 1'-0"

Notes:
1. All bolts to be 7/8"ΦHigh Strength Bolts (15/16"Φopen holes), ASTM A 325 unless 1"Φ High Strength Bolts are required by design (1 1/16" open holes). Bolts to be used when weathering structural steel is called for shall be ASTM A 325, Type 3.
2. All splice plates to be a minimum 1/2" thick.
3. If flange widths of adjacent stringers vary more than 2", then larger flange shall be tapered to smaller flange width in a distance of 1/2 length of cover plate. This only applies to bottom flange.
4. Bolts not shown in splice.
5. Bolt heads shall be on the exterior face of the fascia stringer and the bottom of bottom flange.

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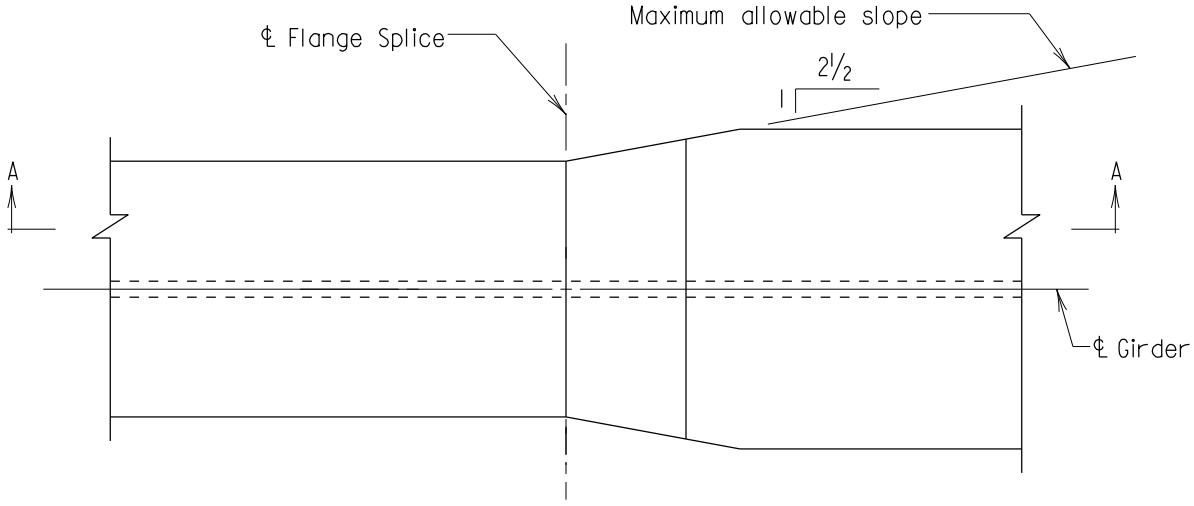
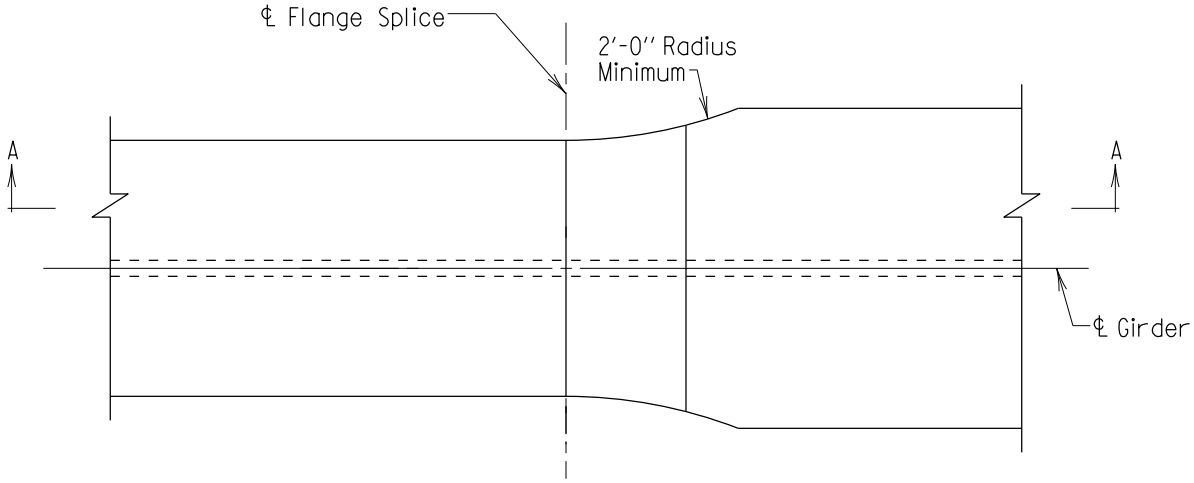
APPROVAL	STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES
E.S. Freedman DIRECTOR OFFICE OF STRUCTURES DATE: 10/09/2007	TYPICAL STEEL STRINGER SPLICE DETAIL
VERSION 1.0	DETAIL NO. SUP-SS(GEN)-301 SHEET X OF X

SUPERSTRUCTURE STEEL



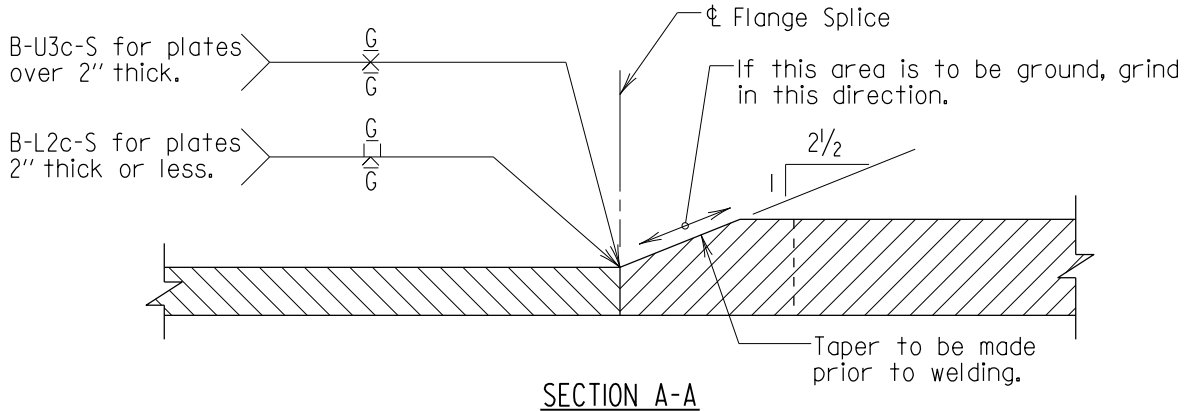
PLAN OF STRAIGHT TAPERED TRANSITION FLANGE SPLICE

Scale: None



PLAN OF RADIAL TRANSITION FLANGE SPLICE

Scale: None



SECTION A-A

Scale: None

Notes:

1. Butt welds of flange splice plates to be ground flush prior to attaching web plates.
2. Splice shown is for different width and different thickness flanges; if only one variation is present use pertinent portion of detail.
3. Fabricator may use either of the above transition details.

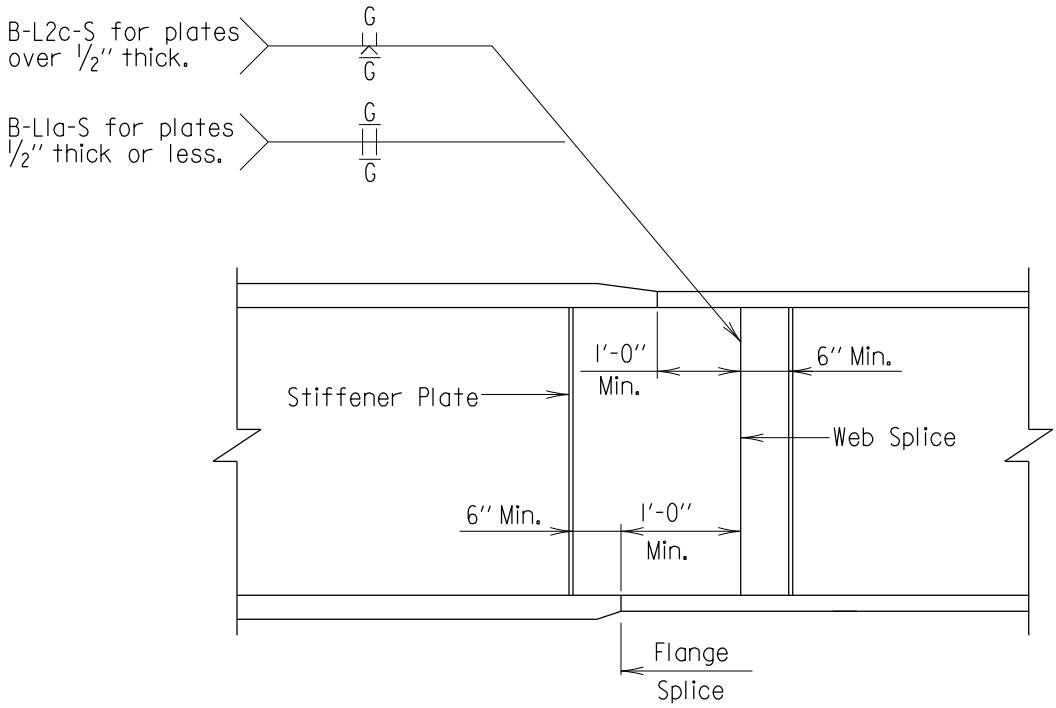
APPROVAL
R.S. Freedman DIRECTOR OFFICE OF STRUCTURES
DATE: 08/16/1992
VERSION
1.0

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES

SHOP SPLICE DETAILS FOR PLATE GIRDER STRINGERS

DETAIL NO. SUP-SS(GEN)-401 SHEET 1 OF 2

SUPERSTRUCTURE STEEL



ELEVATION OF GIRDER

Scale: None

APPROVAL	STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES
E.S. Freedman DIRECTOR OFFICE OF STRUCTURES DATE: 08/16/1992	SHOP SPLICE DETAILS FOR PLATE GIRDER STRINGERS
VERSION 1.0	DETAIL NO. SUP-SS(GEN)-401 SHEET 2 OF 2

SUPERSTRUCTURE STEEL

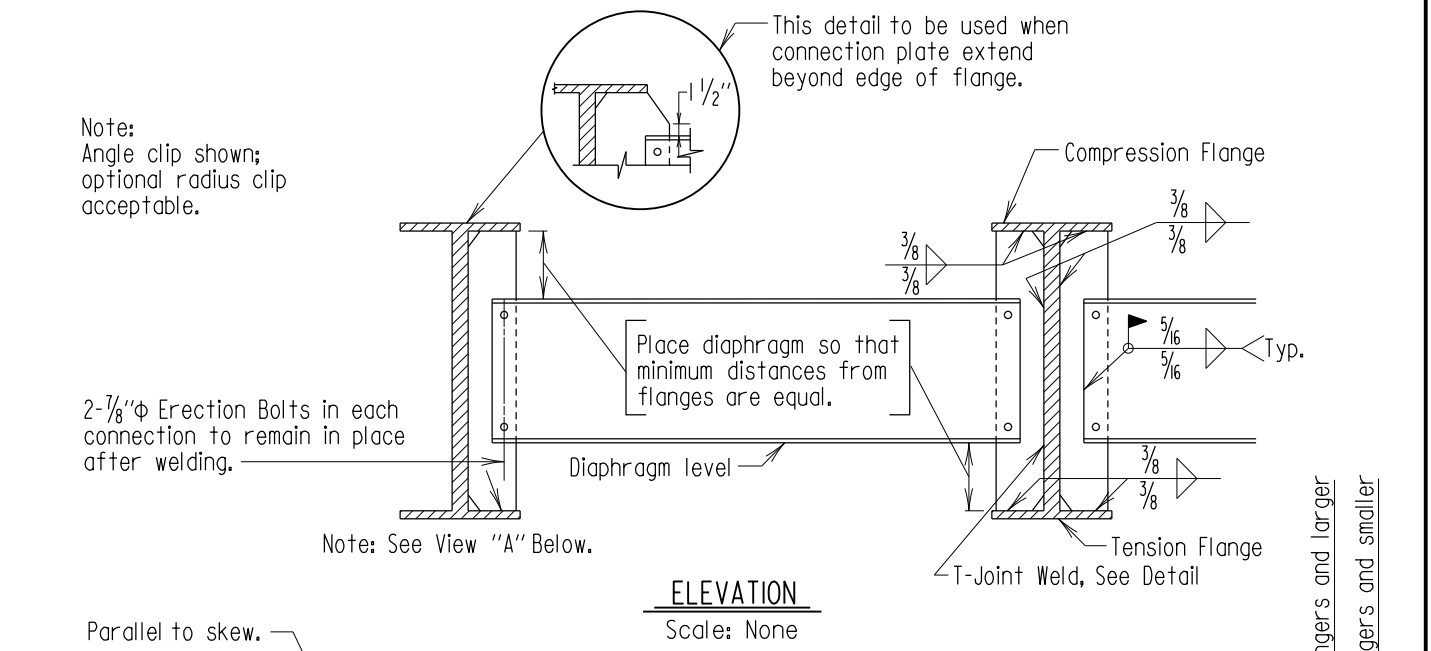
Chapter 03 - Superstructure

Section 05 – Structural Steel

SUB-SECTION **02**

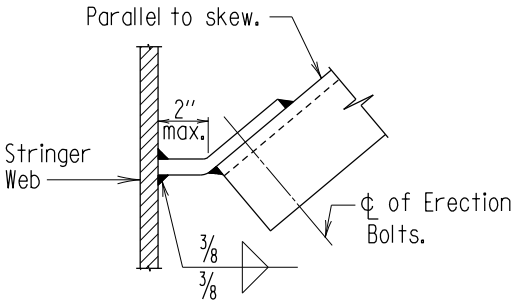
CROSS FRAMES

(SUP-SS(CF))



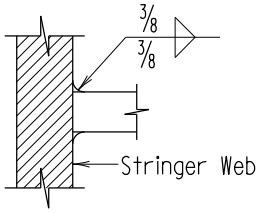
ELEVATION

Scale: None



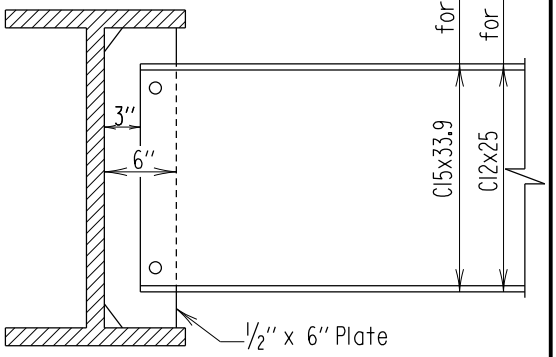
T-JOINT WELD DETAIL FOR SKEW ANGLE OVER 70° TO 90°

Scale: None



T-JOINT WELD DETAIL FOR SKEW ANGLE 70° OR LESS

Scale: None

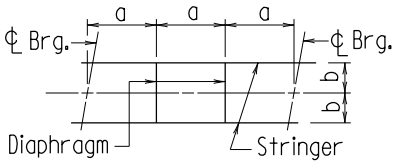


VIEW A

Scale: None

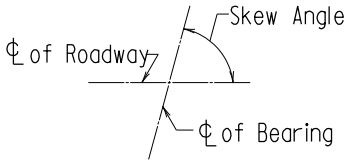
Notes:

1. *Slant lettering indicates note "For Office Use Only"*
2. Where the angle between the center line of roadway and the center line of bearing is 70° or less place diaphragms at 90 to the stringers. diaphragms shall be spaced as shown in detail this sheet and as noted below.
3. Where aforementioned angle is greater than 70, the diaphragms shall be parallel to the center line of bearing of the stringers.
4. Space intermediate diaphragms at 20'± to 25'± ℄/℄ ; i.e. for spans. (Non-curved bridges only).
   Up to 25' ℄/℄ bearings-no intermediate Diaphragm.
   From 25' to 50' ℄/℄ bearings-One Intermediate Diaphragm.
   From 50' to 75' ℄/℄ bearings-Two Intermediate Diaphragms, etc.
   (See Framing Plan).
5. All diaphragms are to be completely connected to stringers before deck slab is poured.



DIAPHRAGM SPACING 70° OR LESS SKEW

Scale: None



SKEW ANGLE

Scale: None

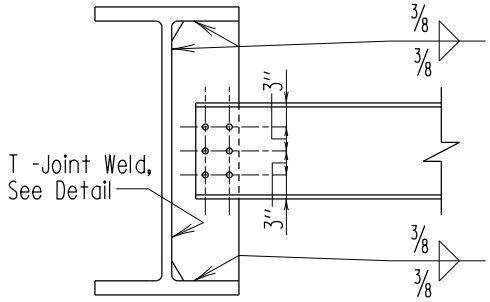
APPROVAL
C.S. Freedman DIRECTOR OFFICE OF STRUCTURES
DATE: 01/22/2003
VERSION
1.0

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES

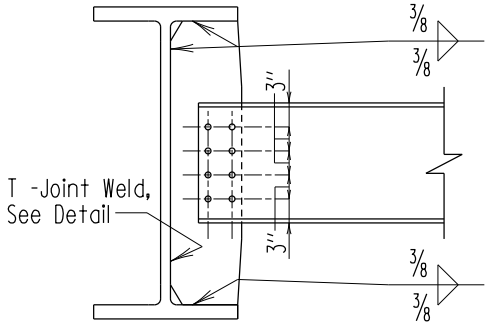
ROLLED STEEL BEAMS INTERMEDIATE DIAPHRAGM DETAILS WELDED CONNECTIONS

DETAIL NO. SUP-SS(CF)-101 SHEET 1 OF 2

SUPERSTRUCTURE - STEEL



24" & SMALLER
STRINGERS

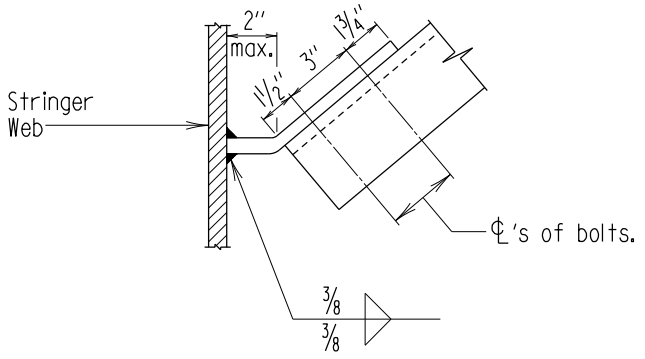


27" & LARGER
STRINGERS

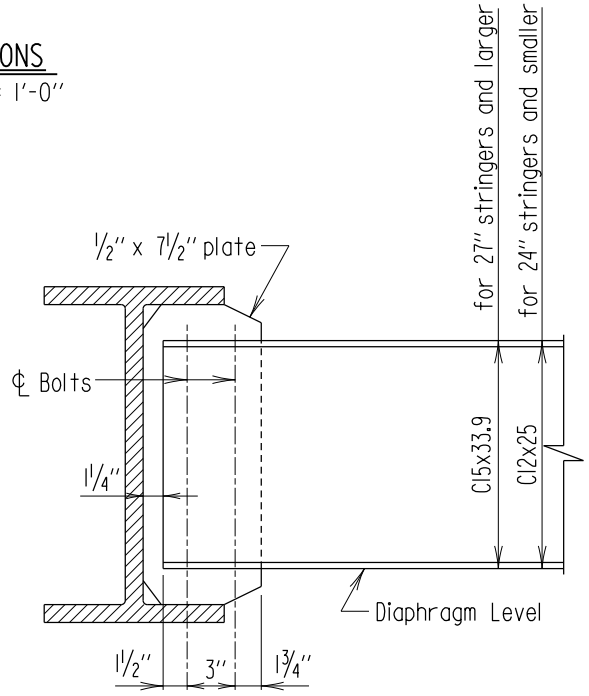
See View "A" Below.

Note:
Angle clip shown;
optional radius clip
acceptable.

ELEVATIONS
Scale: 1/2" = 1'-0"



T-JOINT WELD DETAIL FOR SKEW ANGLE OVER 70° TO 90°
Scale: None



Note: Dimensions shown are for 90° connections.

VIEW 'A'
Scale: None

Notes:
1. For notes and all details not shown see sheet 1 of 2.
2. Contractor has option to use either welded or bolted connection. However only one type of connection may be used per bridge.
3. All bolts to be 7/8" ASTM A325.
4. All bolts holes to be 15/16" .
5. Bolt spacing applies regardless of skew.

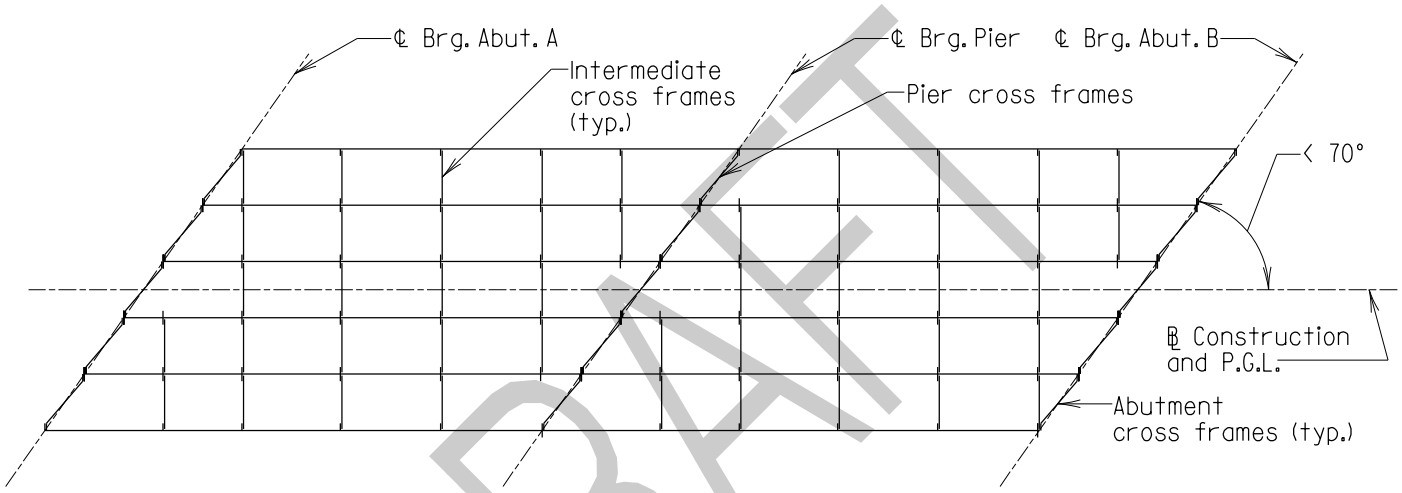
APPROVAL
E.S. Freedman DIRECTOR OFFICE OF STRUCTURES
DATE: 10/22/2003
VERSION
1.0

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES

ROLLED STEEL BEAMS INTERMEDIATE DIAPHRAGM DETAILS BOLTED CONNECTIONS

DETAIL NO. SUP-SS(CF)-101 SHEET 2 OF 2

SUPERSTRUCTURE - STEEL



FRAMING PLAN
Scale: None

Note:
All cross frames are to be placed normal to girders or to the girder tangent and shall be continuous lines.

Note to Designer:
The skew angle shown is the compliment of the skew angle as defined in AASHTO Section 6:7.4.

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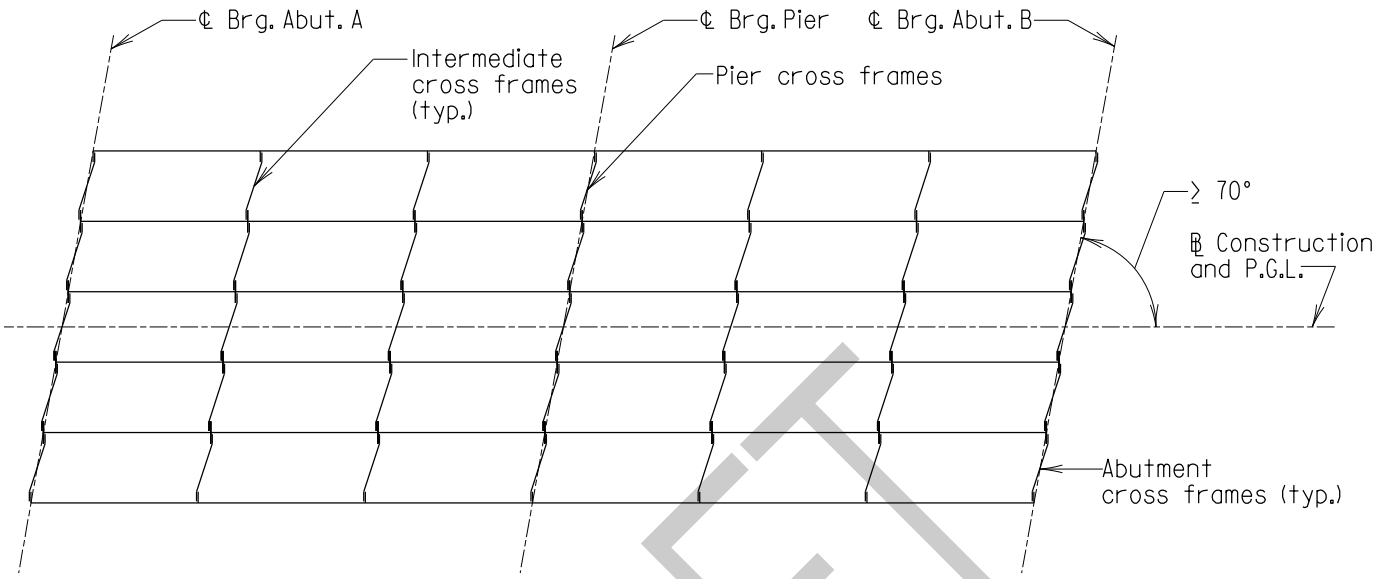
VERSION DRAFT	CROSS FRAM LAYOUT SKEW ANGLE IS LESS THAN 70°
	DETAIL NO. SUP-SS(CF)-201 SHEET 1 OF 1

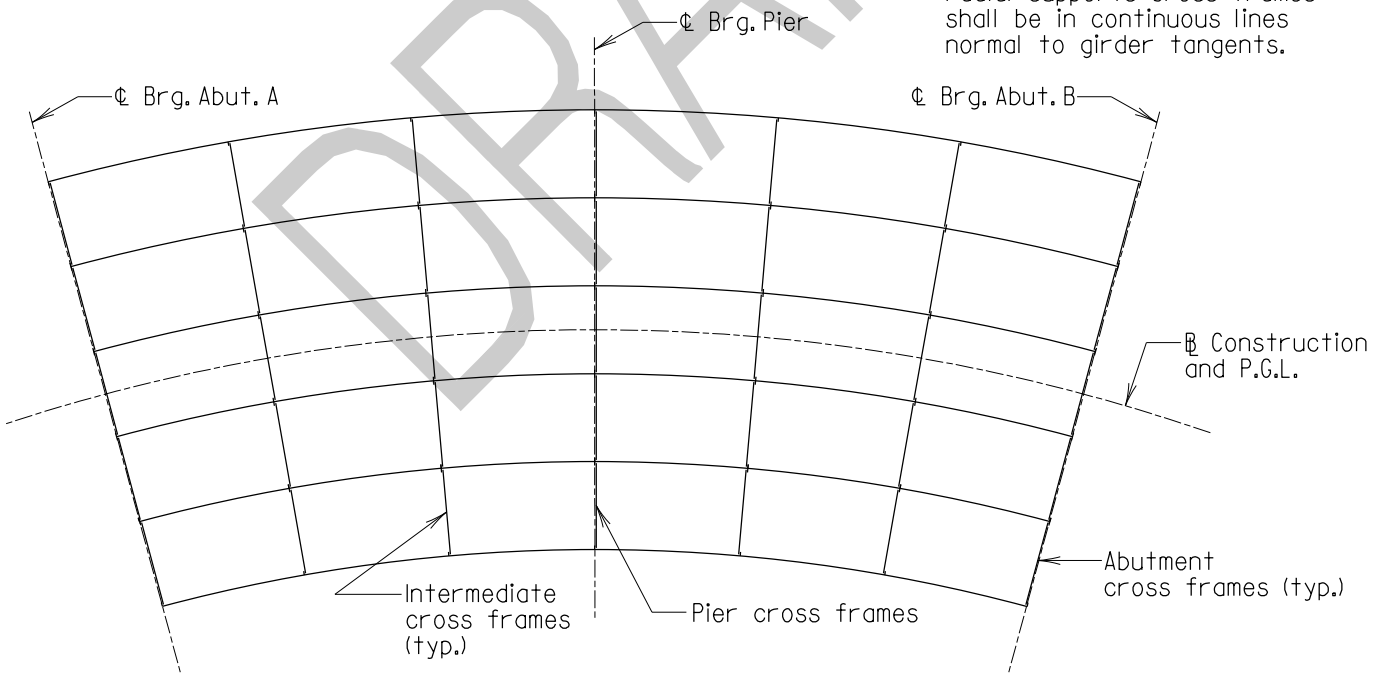
SUPERSTRUCTURE - STEEL



TANGENT FRAMING PLAN

Scale: None

Note:
All cross frames are to be placed parallel to abutments and pier in a continuous line.
For curved girders with radial supports cross frames shall be in continuous lines normal to girder tangents.



CURVED FRAMING PLAN

Scale: None

Note to Designer:
The skew angle shown is the compliment of the skew angle as defined in AASHTO Section 6:7.4.

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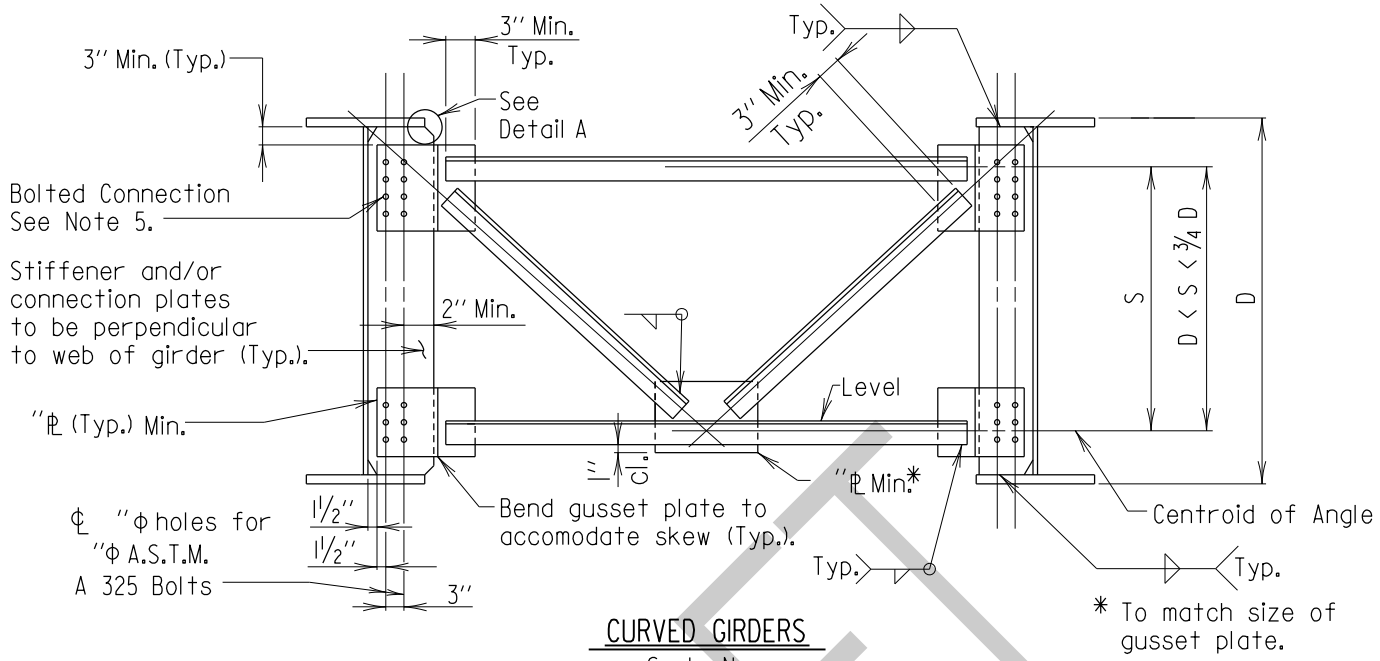
CROSS FRAM LAYOUT SKEW ANGLE IS GREATER THAN OR EQUAL TO 70° OR RADIAL SUPPORTS

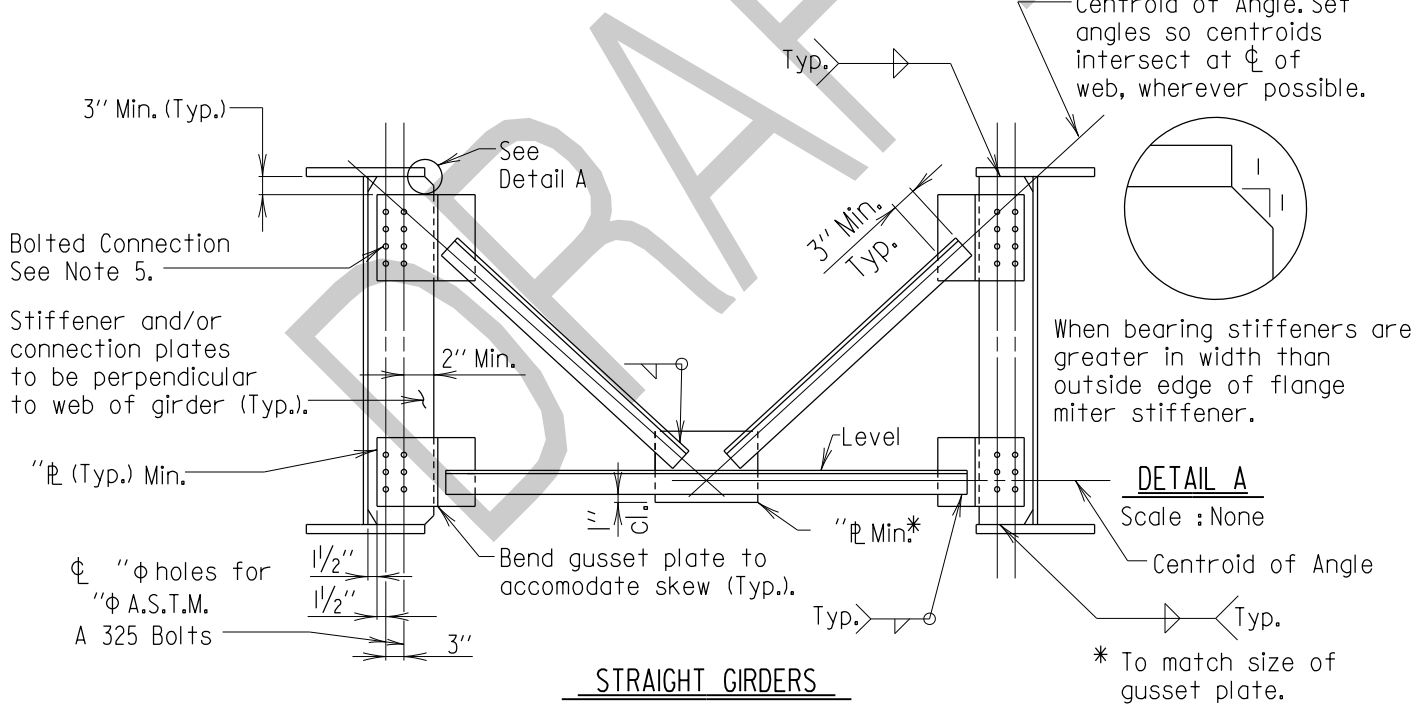
DETAIL NO. SUP-SS(CF)-202 SHEET 1 OF 1

SUPERSTRUCTURE - STEEL



CURVED GIRDERS

Scale: None



DETAIL A

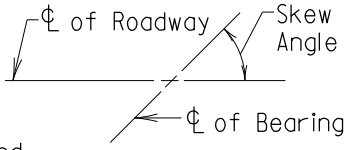
Scale : None

STRAIGHT GIRDERS

Scale: None

Notes:

1. Intermediate cross frames on curved girders shall be designed as main members.
2. Intermediate cross frames shall be placed as follows:
   - Curved Girders: Cross Frames shall be placed radially; and shall extend to intersection of ℄ bearing and ℄ girder at supports; wherever possible. Additional diaphragms shall be provided at all support areas.
   - Straight Girders: Where the skew angle between the center line of roadway and center line of bearing is 70° or less, place cross frames at 90° to the girders. Where aforementioned angle is greater than 70° , the cross frames shall be parallel to the center line of bearing of the girders.
3. Maximum interior cross frame spacing shall be 25 feet.
4. The smallest angle used for bracing shall be 3½ x 3½ x ⅜ inches.
5. Weld sizes and number of ⅞'' ASTM A 325 bolts shall be determined by the Designer. Minimum size weld is 5/16 in.
6. All cross frames are to be completely bolted and torqued before deck slab is poured.



SKEW ANGLE

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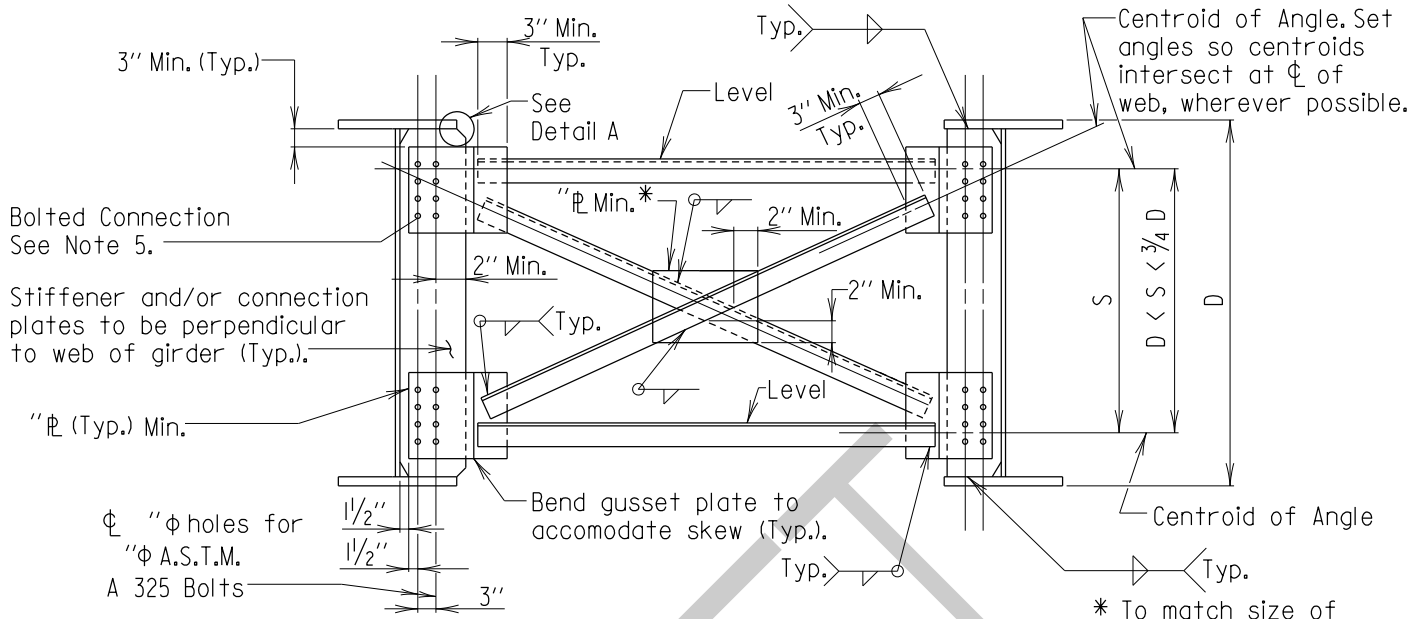
INTERMEDIATE CROSS FRAMS (K-FRAMES) FOR FABRICATED STEEL GIRDERS

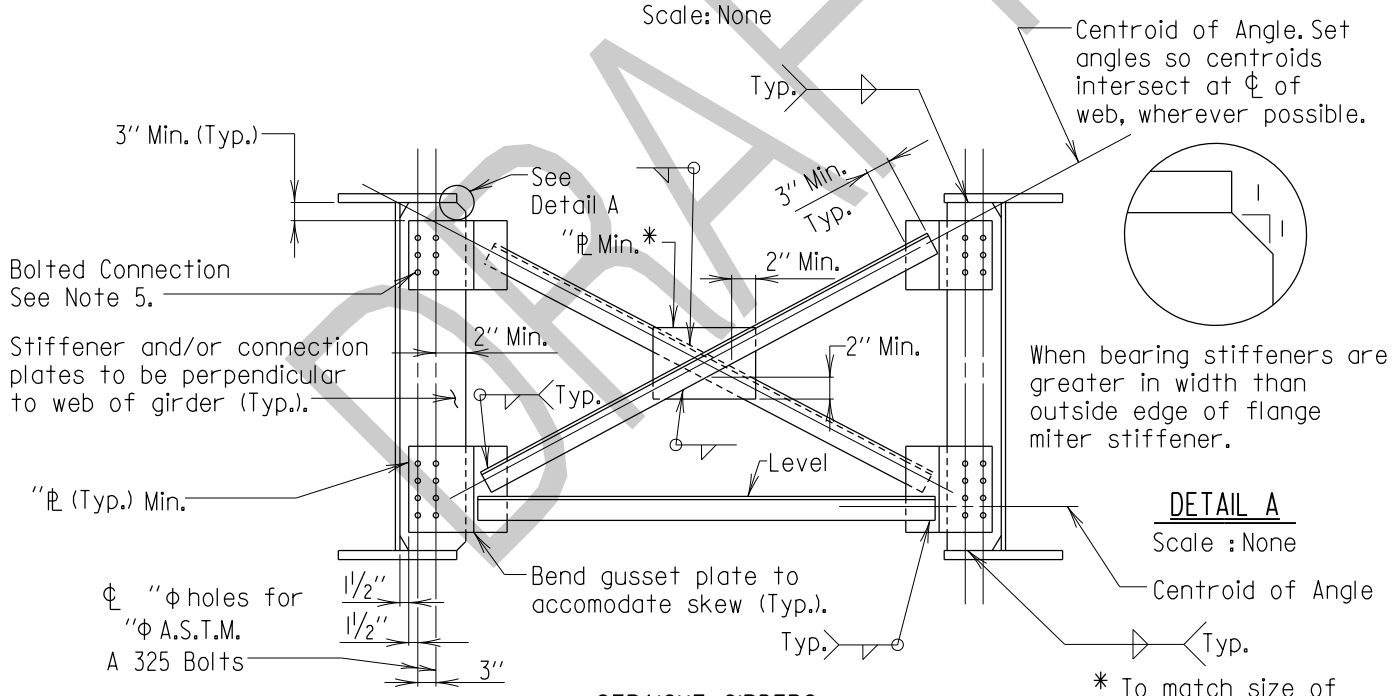
DETAIL NO. SUP-SS(CF)-301 SHEET 1 OF 1

SUPERSTRUCTURE - STEEL



CURVED GIRDERS

Scale: None



DETAIL A

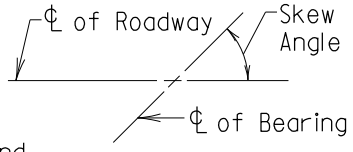
Scale : None

STRAIGHT GIRDERS

Scale: None

Notes:

1. Intermediate cross frames on curved girders shall be designed as main members.
2. Intermediate cross frames shall be placed as follows:
   - Curved Girders: Cross Frames shall be placed radially; and shall extend to intersection of ℄ bearing and ℄ girder at supports; wherever possible. Additional diaphragms shall be provided at all support areas.
   - Straight Girders: Where the skew angle between the center line of roadway and center line of bearing is 70° or less, place cross frames at 90° to the girders. Where aforementioned angle is greater than 70° , the cross frames shall be parallel to the center line of bearing of the girders.
3. Maximum interior cross frame spacing shall be 25 feet.
4. The smallest angle used for bracing shall be 3 1/2 x 3 1/2 x 3/8 inches.
5. Weld sizes and number of 7/8'' ASTM A 325 bolts shall be determined by the Designer. Minimum size weld is 5/16 in.
6. All cross frames are to be completely bolted and torqued before deck slab is poured.



SKEW ANGLE

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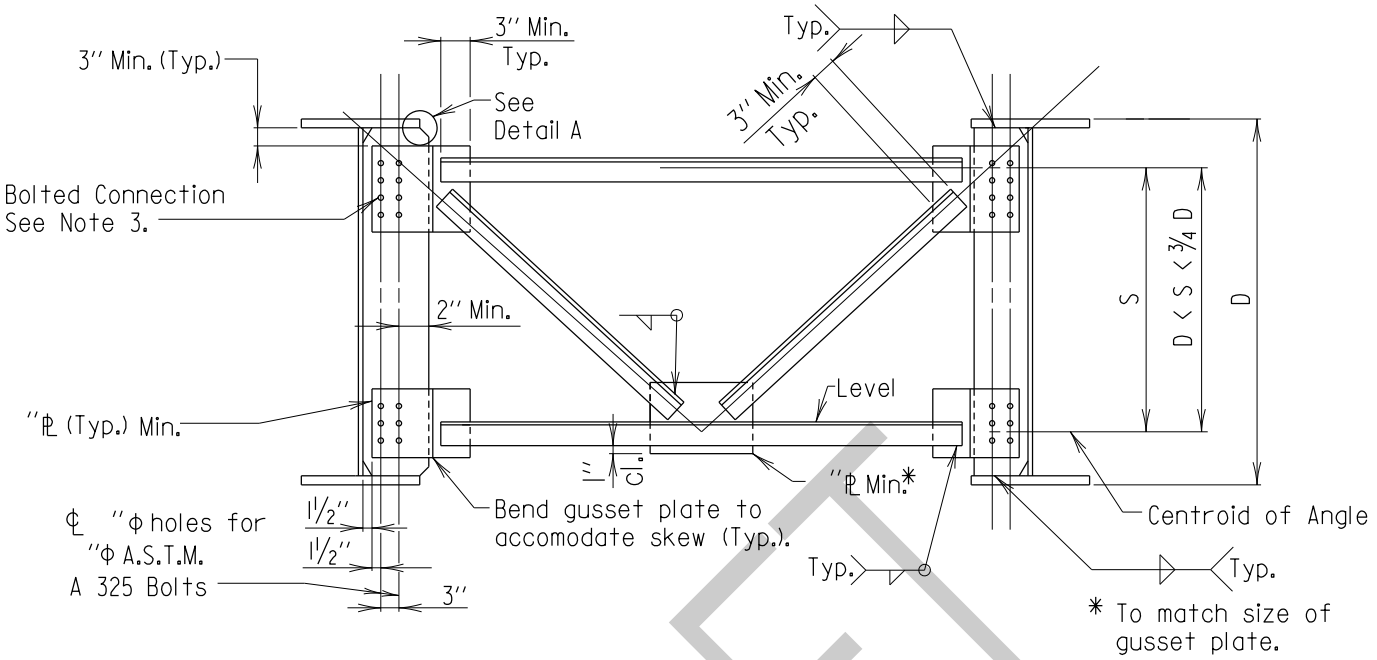
INTERMEDIATE CORSS FRAMES (X-FRAMES) FOR FABRICATED STEEL GIRDERS

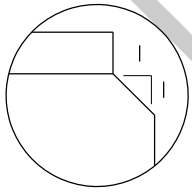
DETAIL NO. SUP-SS(CF)-302 SHEET 1 OF 1

SUPERSTRUCTURE - STEEL



CURVED AND STRAIGHT GIRDERS

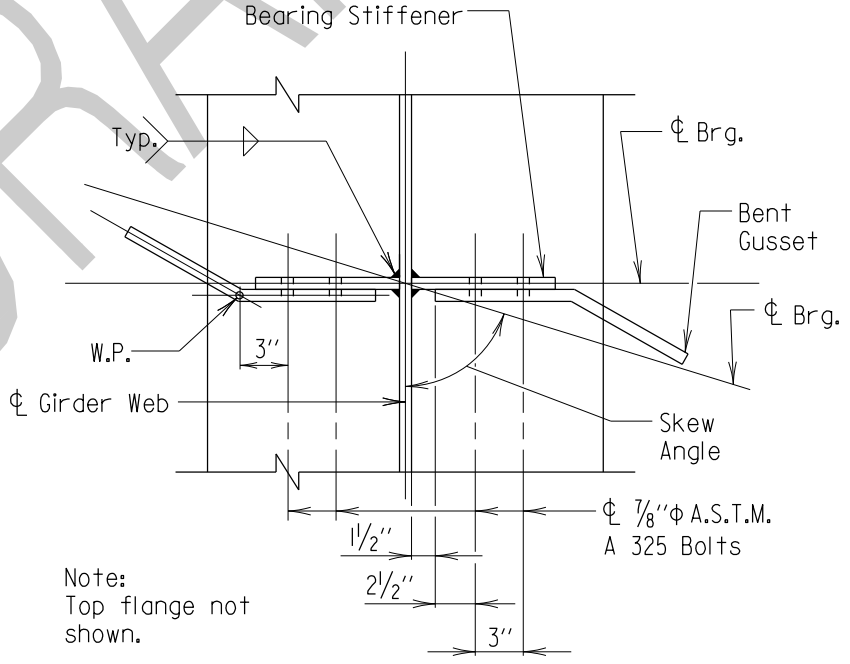
Scale: None



When bearing stiffeners are greater in width than outside edge of flange miter stiffener.

DETAIL A

Scale : None



Note: Top flange not shown.

CONNECTION DETAIL AT SKEWED PIER

Scale : None

Notes:

1. The smallest angle used for bracing shall be 3½ x 3½ x ⅜ inches.
2. Weld sizes and number of ASTM A 325 bolts shall be determined by the Designer. Minimum size weld is 5/16 in.
3. All cross frames shall be completely bolted and torqued before deck slab is poured.
4. For bearing stiffener attachment see SUP-SS(GEN)-201.

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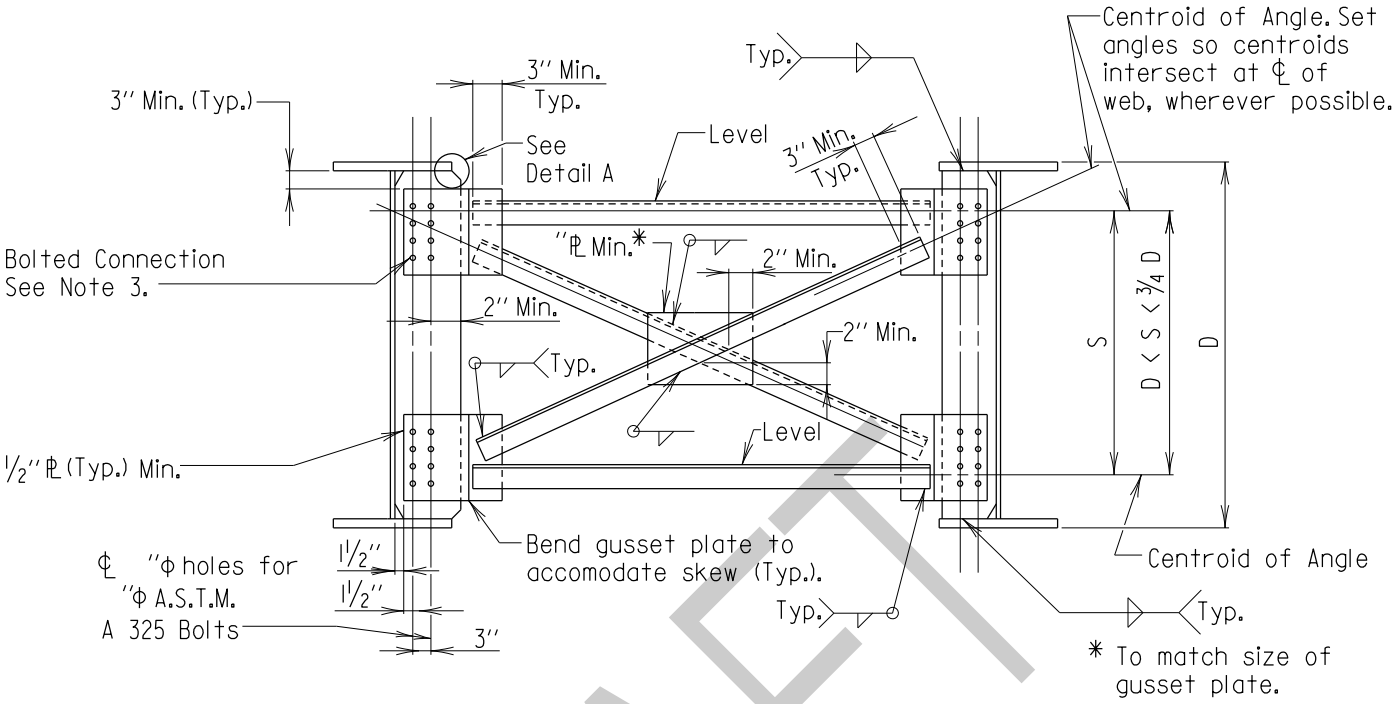
CROSS FRAMES (K-FRAMES) AT PIERS WHERE FABRICATED STEEL GIRDERS ARE CONTINUOUS

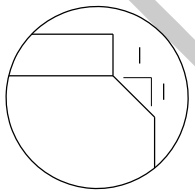
DETAIL NO. SUP-SS(CF)-401 SHEET 1 OF 1

SUPERSTRUCTURE - STEEL



CURVED AND STRAIGHT GIRDERS

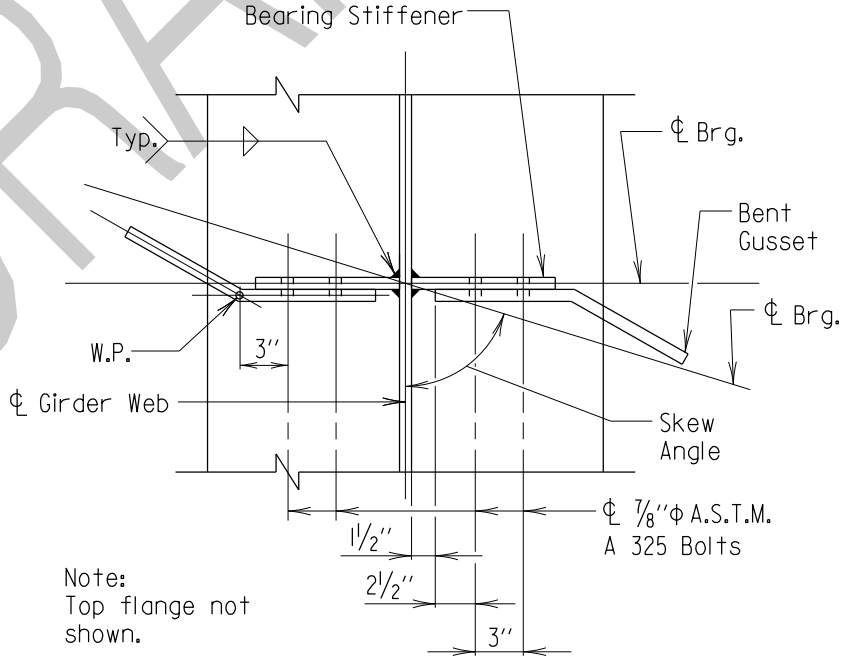
Scale: None



When bearing stiffeners are greater in width than outside edge of flange miter stiffener.

DETAIL A

Scale : None



Note: Top flange not shown.

CONNECTION DETAIL AT SKEWED PIER

Scale : None

Notes:

1. The smallest angle used for bracing shall be 3 1/2 x 3 1/2 x 3/8 inches.
2. Weld sizes and number of ASTM A 325 bolts shall be determined by the Designer. Minimum size weld is 5/16 in.
3. All cross frames shall be completely bolted and torqued before deck slab is poured.
4. For bearing stiffener attachment see SUP-SS(GEN)-201.

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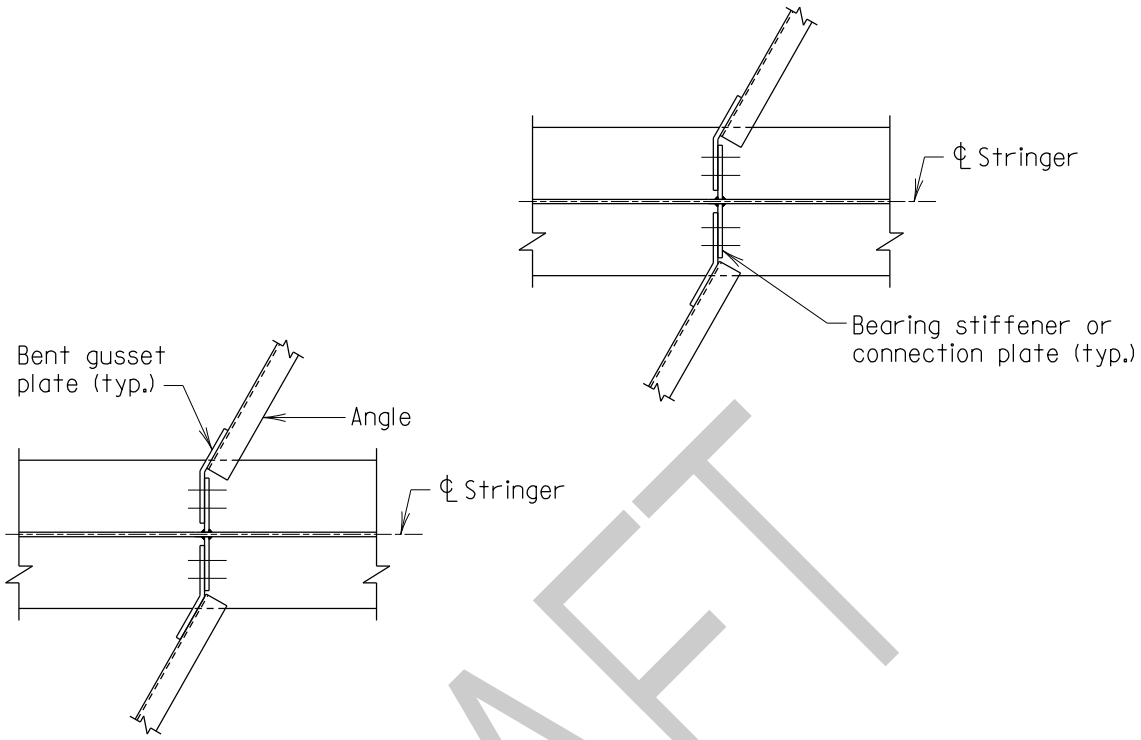
CROSS FRAMES (X-FRAMES) AT PIERS WHERE FABRICATED STEEL GIRDERS ARE CONTINUOUS

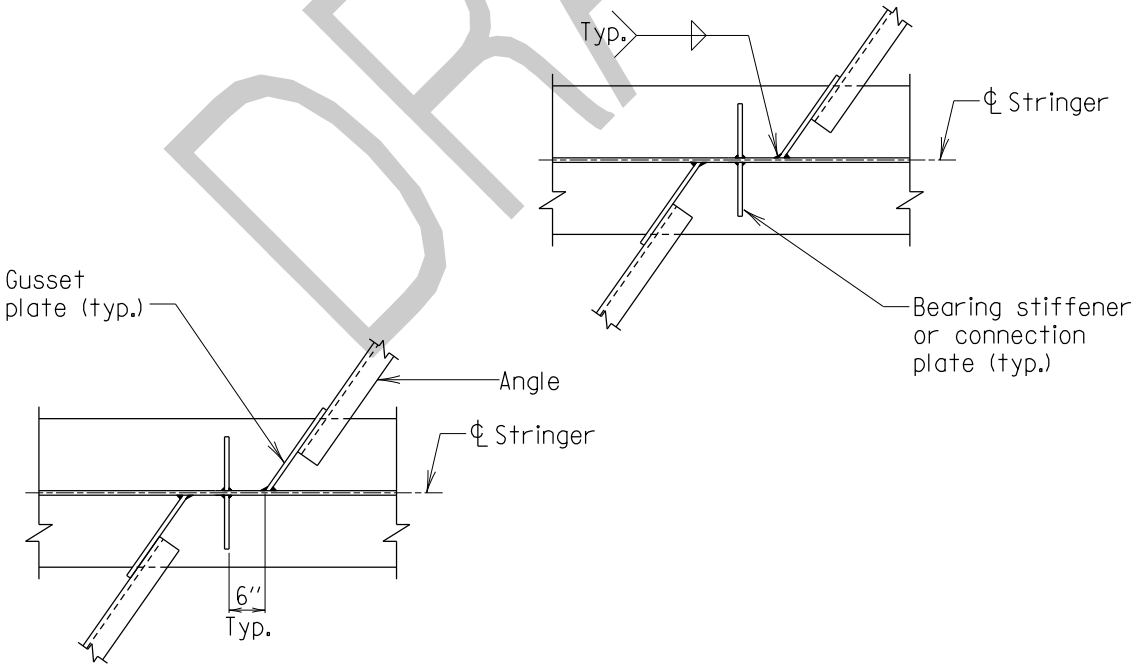
DETAIL NO. SUP-SS(CF)-402 SHEET 1 OF 1

SUPERSTRUCTURE - STEEL



PLAN - 60° TO 90° SKEW ANGLES

Scale : 3/8" = 1'-0"



PLAN - 60° OR LESS SKEW ANGLE

Scale : 3/8" = 1'-0"

Notes:

1. The smallest angle used for bracing shall be 3 1/2 x 3 1/2 x 3/8 inches.
2. Weld sizes and number of ASTM A 325 bolts shall be determined by the Designer. Minimum size weld is 5/16 in.
3. All cross frames shall be completely bolted and torqued before deck slab is poured.
4. For bearing stiffener attachment see SUP-SS(GEN)-201.

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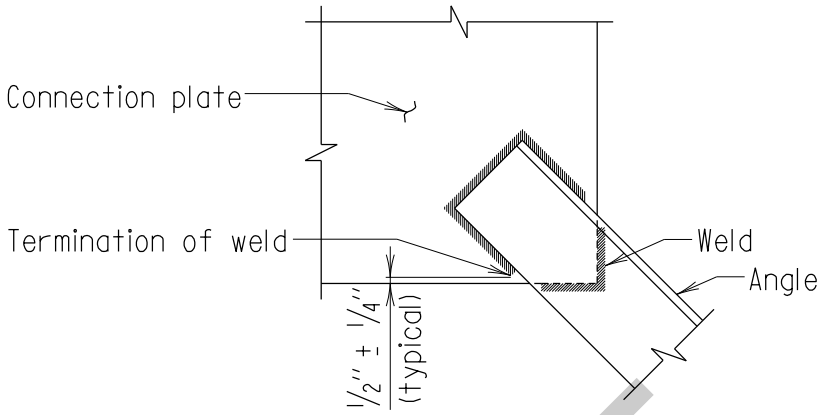
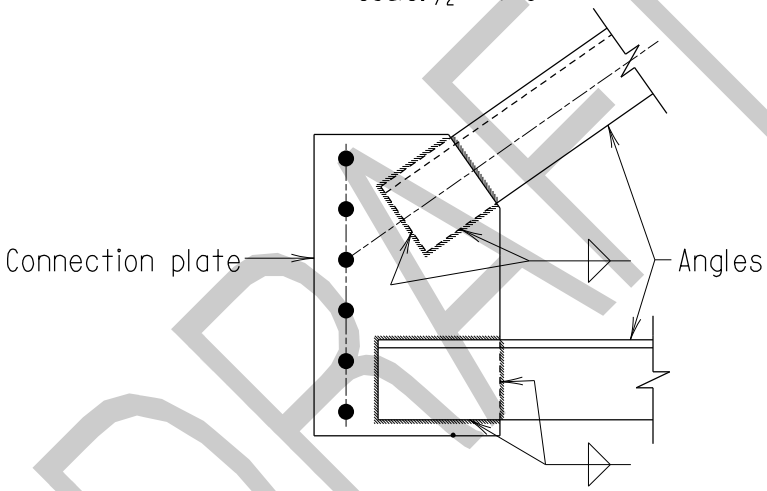
VERSION	
DRAFT	DETAIL NO. SUP-SS(CF)-501 SHEET 1 OF 1

SUPERSTRUCTURE - STEEL



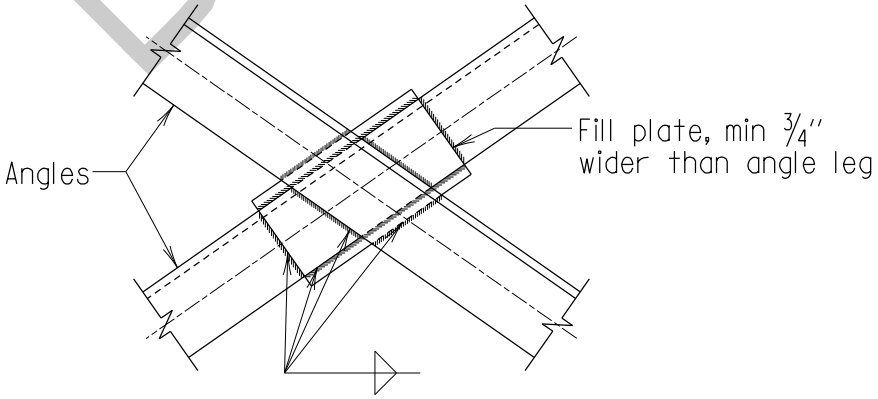
CROSS FRAME WELDING DETAIL

Scale: 1/2'' = 1'-0''



DETAIL A

Scale: 1/2'' = 1'-0''



DETAIL B

Scale: 1/2'' = 1'-0''

Note:
All cross frame welds to be terminated from edge of gusset plates, fill plates or angles as indicated.

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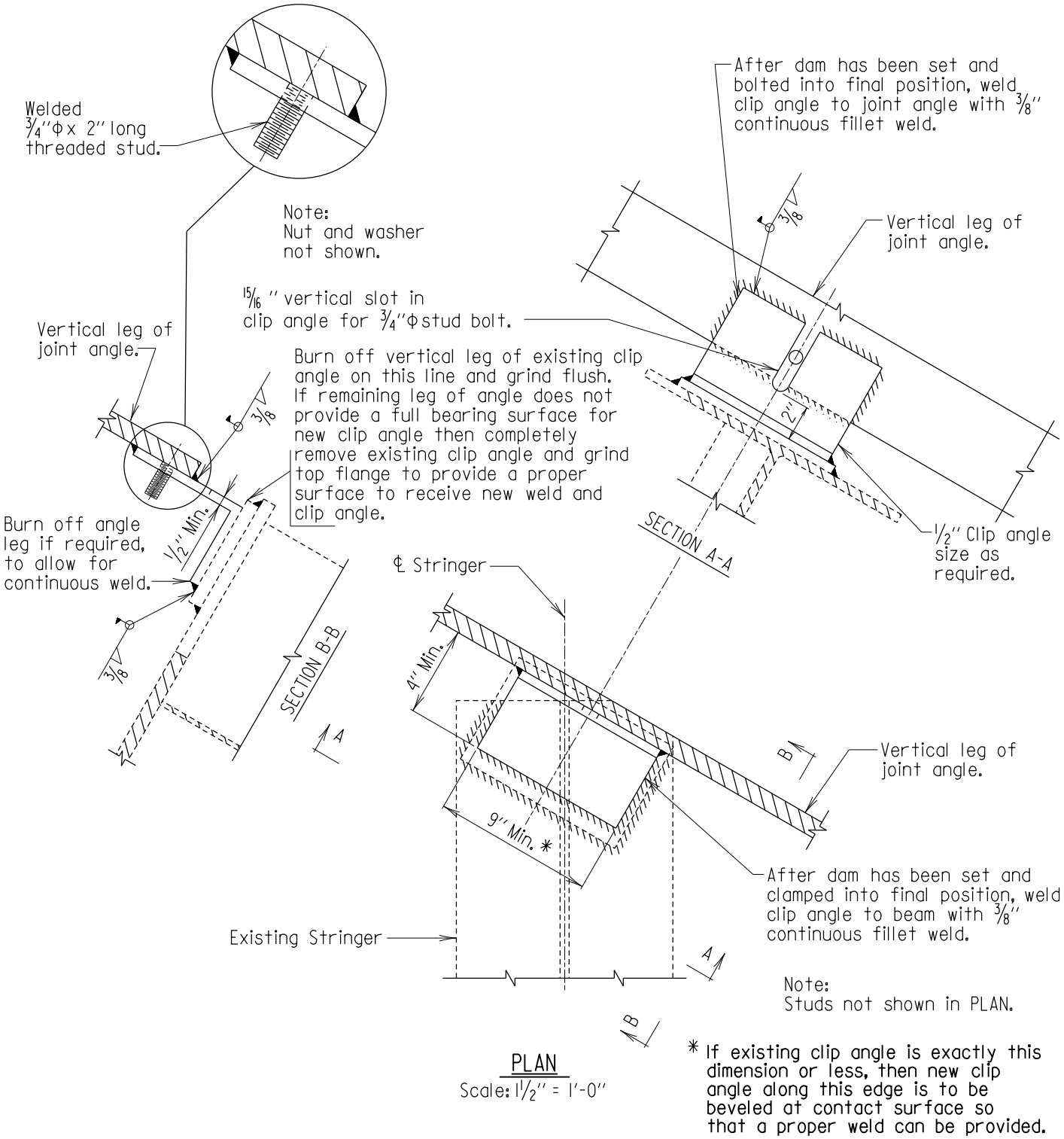
VERSION DRAFT	WELD TERMINATION DETAILS FOR CORSS FRAMES
	DETAIL NO. SUP-SS(CF)-502 SHEET 1 OF 1

Chapter 03 - Superstructure

Section 05 – Structural Steel

SUB-SECTION **03**

DECK REPLACEMENTS (SUP-SS(DR))



PLAN

Scale: 1 1/2" = 1'-0"

Note:
Existing members shown dashed.

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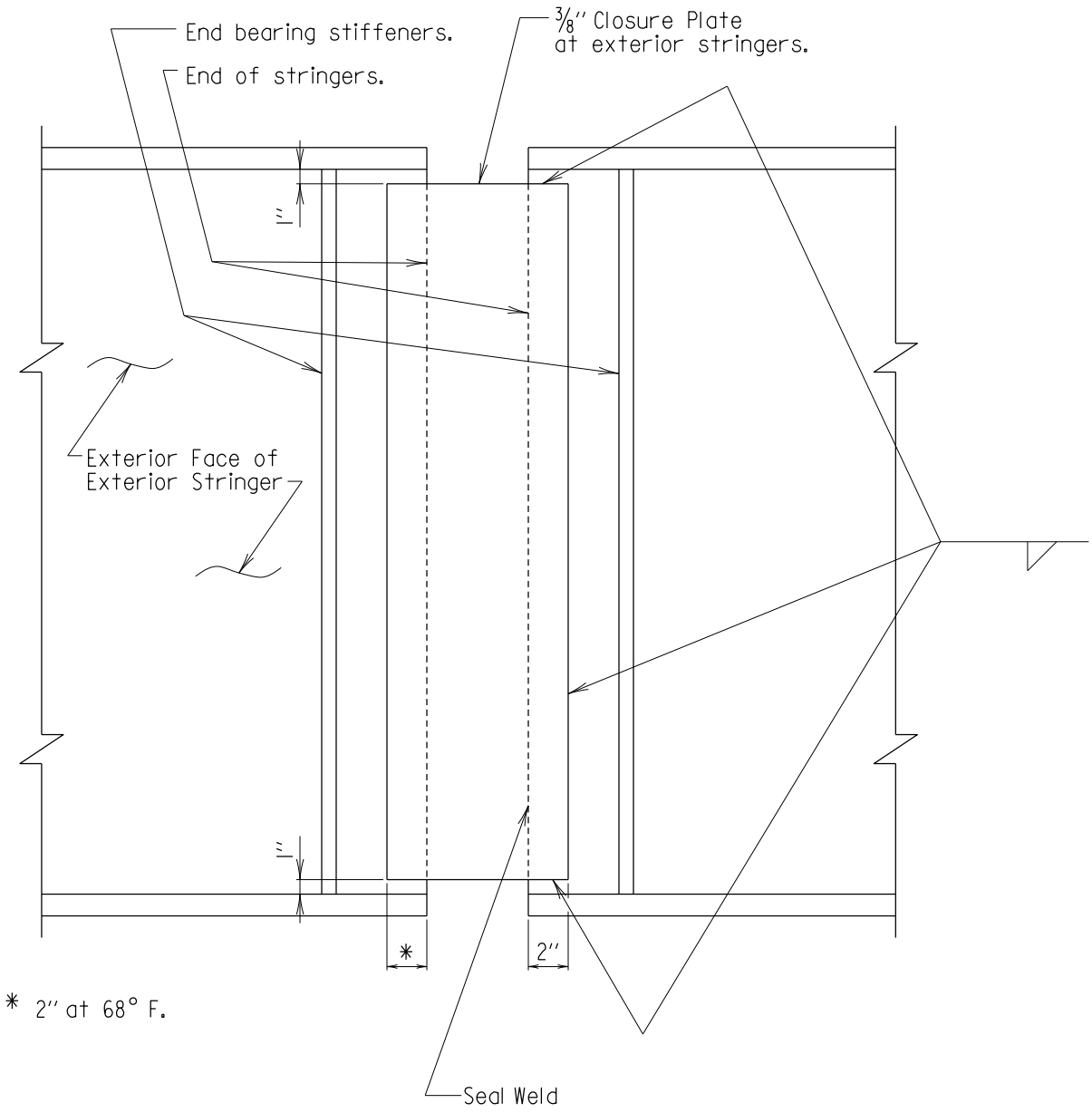
E.S. Freedman DIRECTOR OFFICE OF STRUCTURES DATE: 07/24/2001	ROADWAY JOINT - CLIP ANGLE DETAIL DECK REPLACEMENT - EXISTING STRINGER
VERSION 1.0	DETAIL NO. SUP-SS(DR)-101 SHEET 1 OF 1

SUPERSTRUCTURE-STEEL



ELEVATION

Scale: None

Notes:

1. Closure plates to be used on all exterior stringers at supports where stringers are not continuous.
2. If stringers are of different depths, at a support, control dimensions shall apply to shallower stringer.
3. Weld to stringer on fixed shoes, if possible, but only weld to one stringer.
4. Do not provide closure plates on the median side of dual bridges where facias are 50' or less apart.

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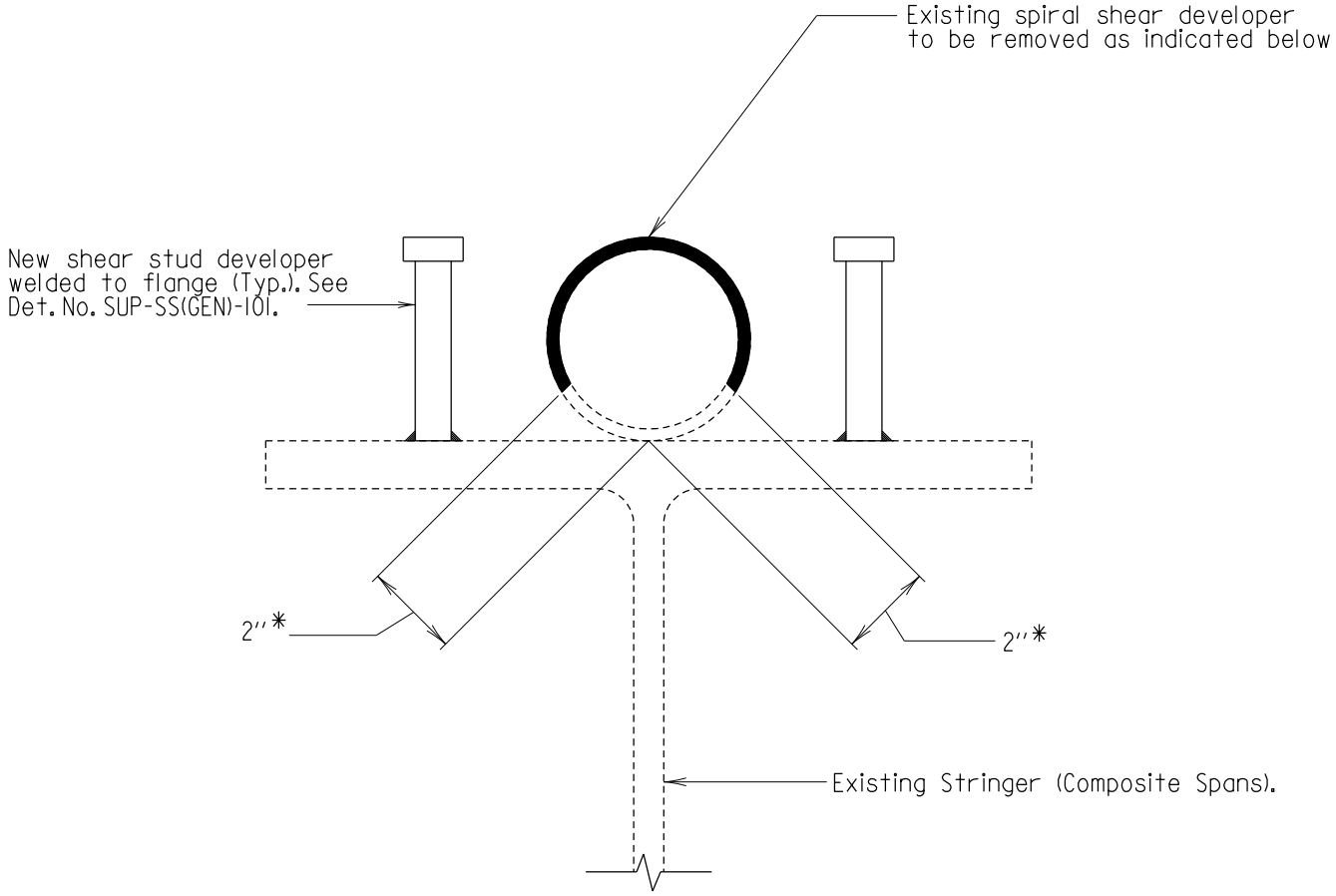
FASCIA STRINGER CLOSURE PLATE DETAIL

DETAIL NO. SUP-SS(DR)-201 SHEET 1 OF 1

SUPERSTRUCTURE STEEL



SPIRAL REMOVAL

Scale: 3'' = 1'-0''

* Maximum portion of existing spiral to remain.

Notes for Spiral Removal and New Shear Studs:

1. Contractor shall cut all spiral shear developers off as close to flange as possible. Burning off spirals from flange will not be allowed.
2. For size and number of new studs per row and for longitudinal spacing of rows, see pertinent superstructure sheet.

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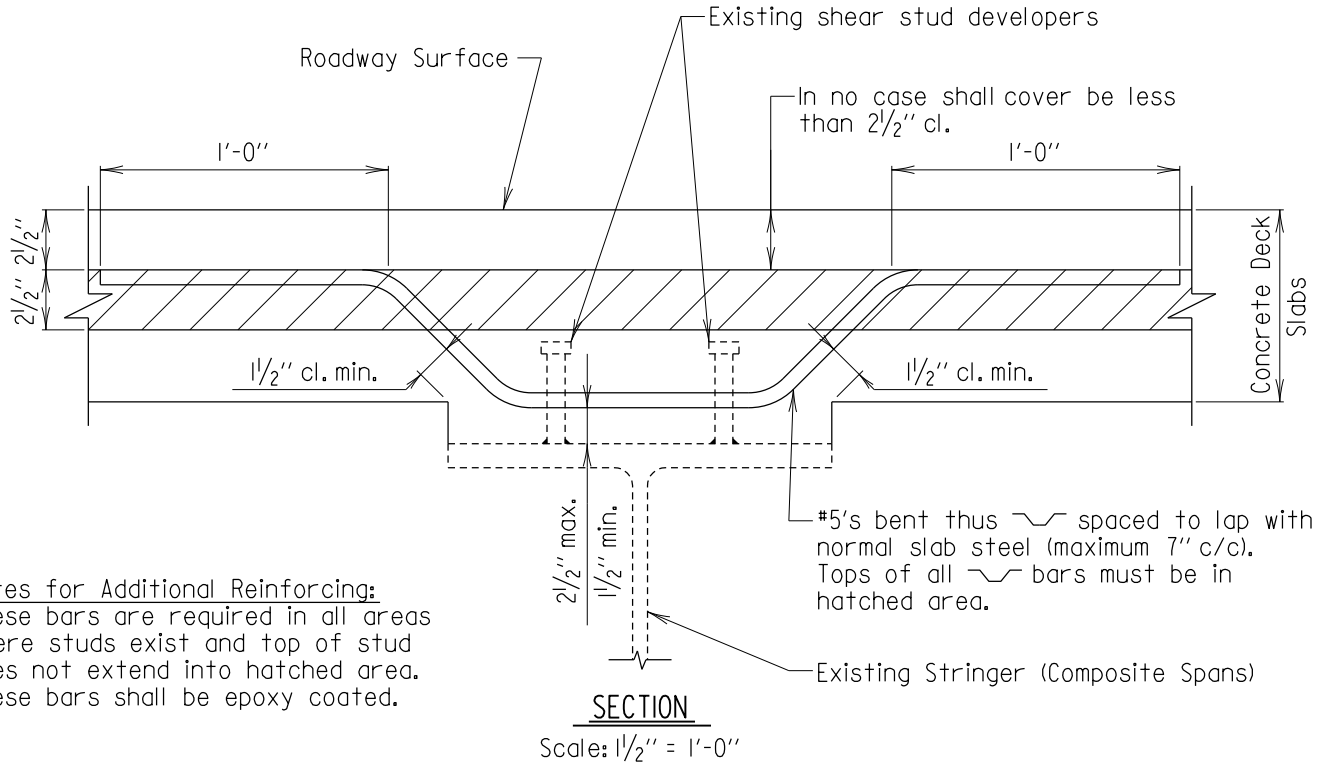
DETAIL OF EXISTING SPIRAL REMOVAL

DETAIL NO. SUP-SS(DR)-301 SHEET 1 OF 1

SUPERSTRUCTURE STEEL

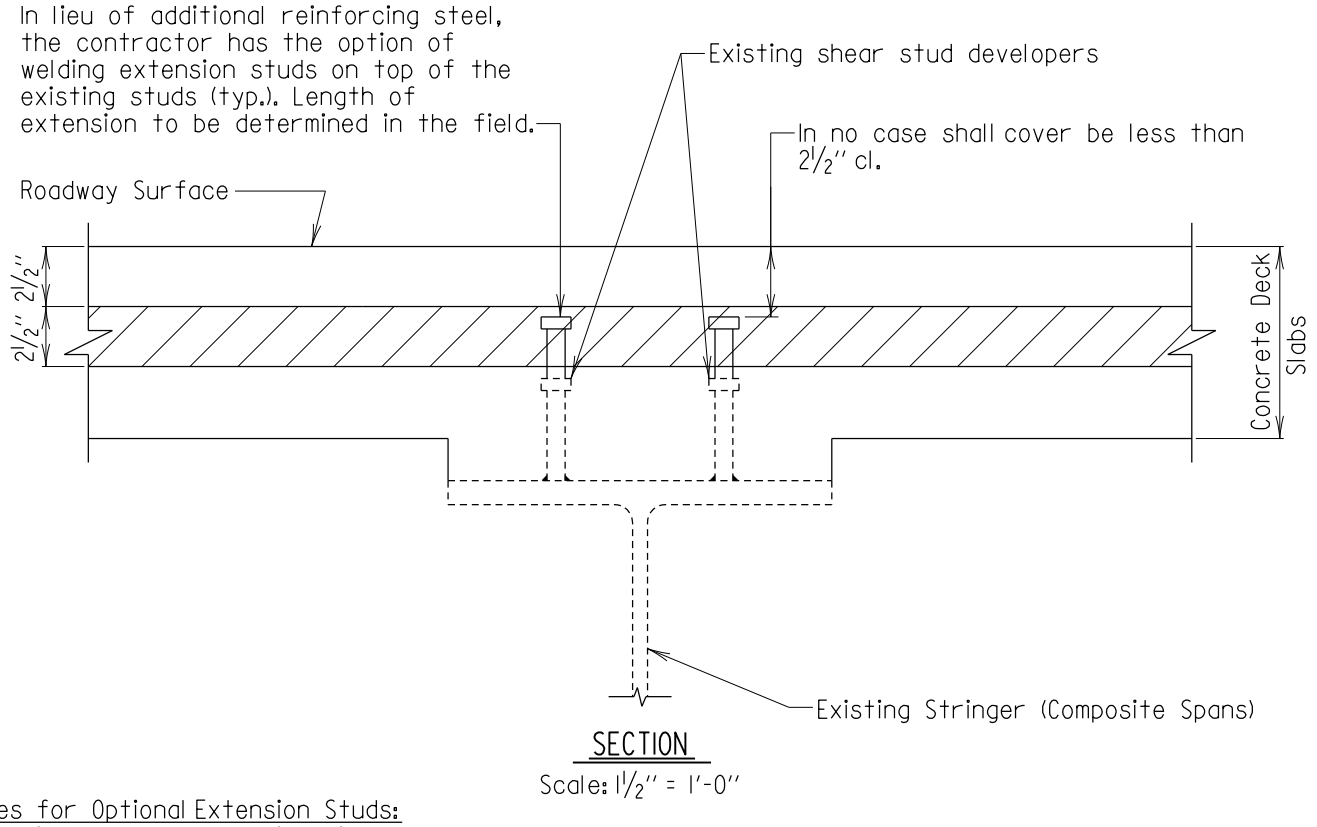


SECTION

Scale: 1½" = 1'-0"

Notes for Additional Reinforcing:

1. These bars are required in all areas where studs exist and top of stud does not extend into hatched area.
2. These bars shall be epoxy coated.



SECTION

Scale: 1½" = 1'-0"

Notes for Optional Extension Studs:

1. Extension studs are required in all areas where studs exist and top of stud does not extend into hatched area.
2. The diameter of the extension studs shall be the same as the existing studs.

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DETAIL OF ADDITIONAL REINFORCEMENT AT EXISTING SHEAR STUD DEVELOPERS OR ADDITION OF STUD EXTENSIONS

DETAIL NO. SUP-SS(DR)-302 SHEET 1 OF 1

SUPERSTRUCUTRE STEEL