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Revised 03-11: Added Standard 1021W to List. Added a Hyphen to the 1036 BT Beam Standard Numbers.
Issued 02-10.
Beams.dgn - 100-B - This Sheet Re-Issued 04-2024, Sheet Format Update.

Index of Beam Standards

FILE NO.	ENGLISH	DESIGN TEAM	Index Of Beam Standards	Standard Sheet 100-B	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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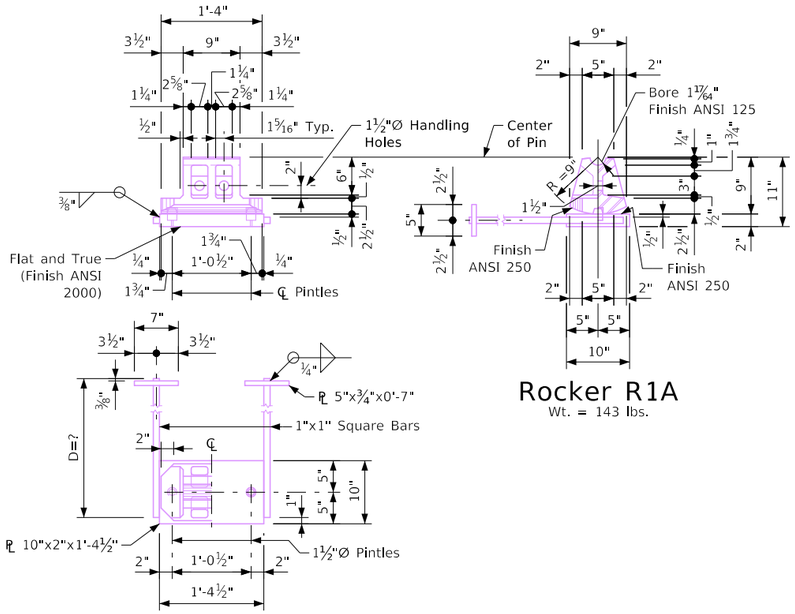
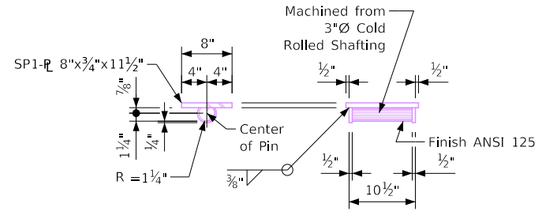


Rocker R1A

Wt. = 143 lbs.

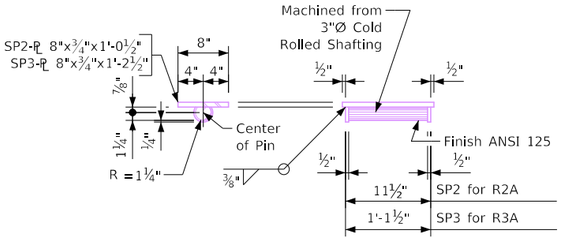
Abutment Masonry Plate MP1A

Wt. = 110 lbs. (Does Not Include 1"x1" Square Bars)
Wt. = ? lbs. for 1"x1" Square Bars



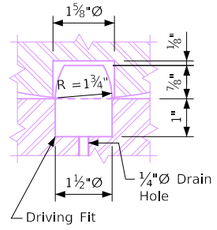
Sole Plate SP1 for R1A

Wt. = SP1 = 34 lbs.



Sole Plate SP2 & SP3

Wt. — SP2 = 37 lbs.
SP3 = 43 lbs.



Typical Pintle Detail

Bearing Notes:

The casting of R1A, R2A, & R3A shall be in accordance with Article 4153.04, of the Standard Specifications. Castings may be gray iron or nodular iron.

The pins shall be in accordance with Article 4153.02, of the Standard Specifications, and with the requirements of ASTM A108 steel.

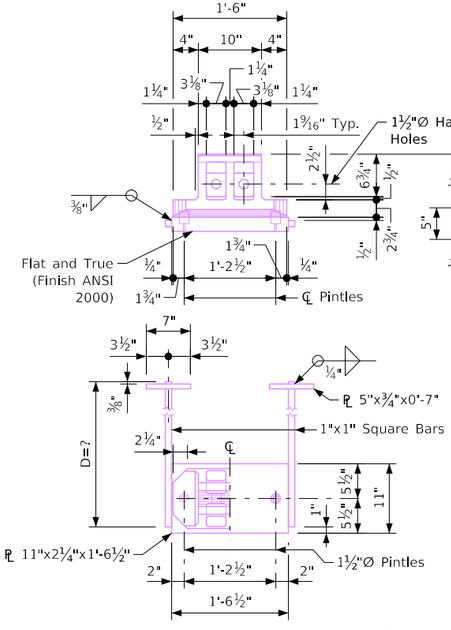
Preparation of bearing area shall be in accordance with Article 2408.03, M, of the Standard Specifications. The bedding shall be a single layer of ⅛ inch neoprene sheet.

The ⅛ inch neoprene sheets are to be 50, 60, or 70 durometer hardness and shall be 1 inch greater in length and width than the bottom surface of the masonry plates or steel bearings.

As soon as the surfacing process is done, the surfaces finished with an ANSI 125 finish shall be shop coated with an application of waterproof National Lubricating Grease Institute (NLGI) No. 3 multipurpose grease. Just before the erection of the structural steel in the field, the shop coated surfaces are to be wiped clean and a field coat of NLGI No. 3 grease is to be applied.

Masonry Plates MP1A, MP2A and MP3A shall be galvanized after the 1"x1" square bars have been welded to the masonry plate and the pintles have been installed.

All masonry plate assemblies shall be galvanized. Galvanizing shall be in accordance with Article 4100.07, of the Standard Specifications.

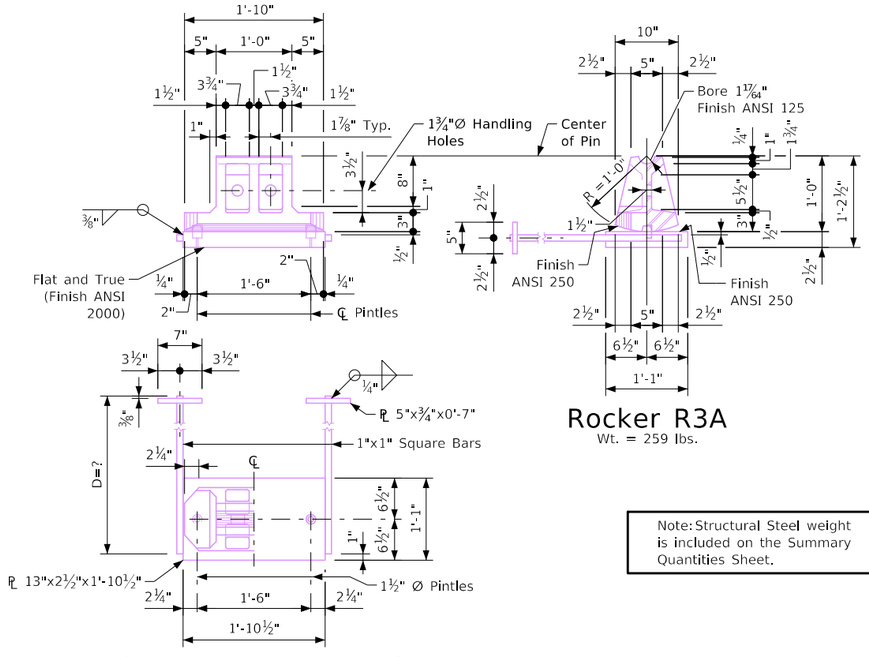


Rocker R2A

Wt. = 178 lbs.

Abutment Masonry Plate MP2A

Wt. = 146 lbs. (Does Not Include 1"x1" Square Bars)
Wt. = ? lbs. for 1"x1" Square Bars



Rocker R3A

Wt. = 259 lbs.

Abutment Masonry Plate MP3A

Wt. = 224 lbs. (Does Not Include 1"x1" Square Bars)
Wt. = ? lbs. for 1"x1" Square Bars

Distance From Top of Sole Plate to Bridge Seat

Rockers	D*
R1A	1'-0¾"
R2A	1'-2"
R3A	1'-4¼"

* Including ¾" Neoprene Sheet.

Maximum Reaction

(In KIPS)

R1A	R2A	R3A
132	171	263

Note: Structural Steel weight is included on the Summary Quantities Sheet.

Abutment Bearing

Correction 04-14 - Added Reference to Summary Quantities Sheet for Bearing Weights.
Issued 05-10.
Beams.dgn - 1008a - This Sheet Re-issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Abutment Bearing Standards	Standard Sheet 1008a	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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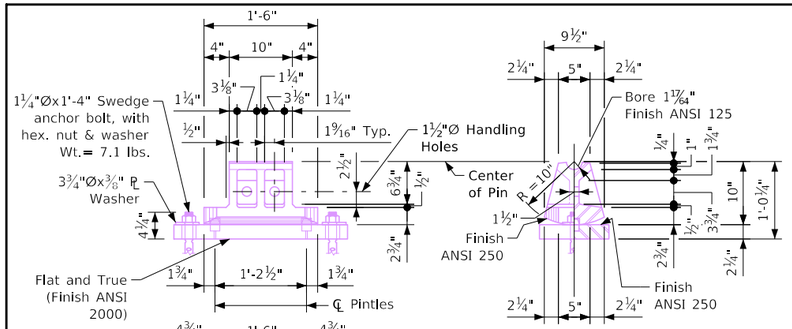
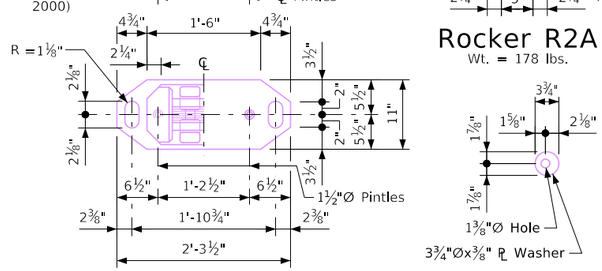


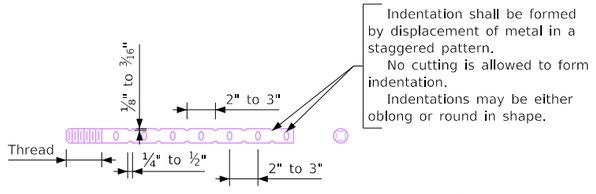
Rocker R2A

Wt. = 178 lbs.

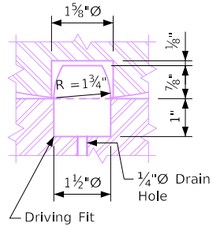


Pier Masonry Plate MP2P

Wt. = 160 lbs.



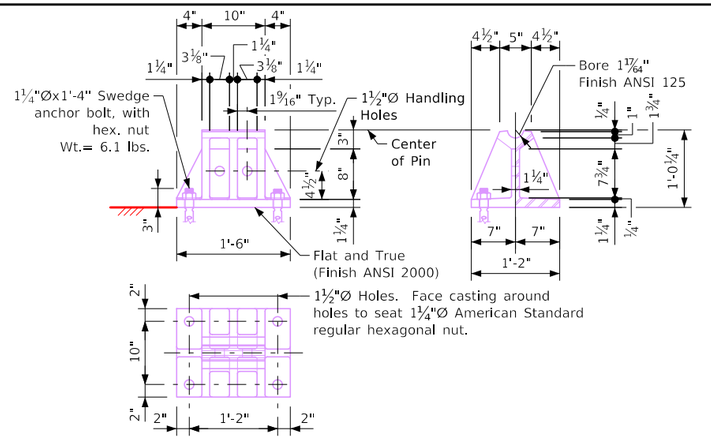
Anchor Bolt Swedge Detail



Typical Pintle Detail

Sole Plate SP2 & SP3

Wt. SP2 = 37 lbs.
SP3 = 43 lbs.



Fixed Shoe S2

Wt. = 222 lbs.

Bearing Notes:

The casting of R2A, S2, R3A and S3 shall be in accordance with Article 4153.04, of the Standard Specifications. Castings may be gray iron or nodular iron.

The pins shall be in accordance with Article 4153.02, of the Standard Specifications, and with the requirements of ASTM A108 steel.

Anchor bolts shall be set in accordance with Article 2405.03, H, of the Standard Specifications.

Preparation of bearing area shall be in accordance with Article 2408.03, M, of the Standard Specifications. The bedding shall be a single layer of ⅛ inch neoprene sheet.

The ⅛ inch neoprene sheets are to be 50, 60, or 70 durometer hardness and shall be 1 inch greater in length and width than the bottom surface of the masonry plates or steel bearings.

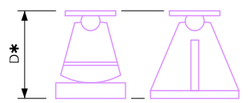
As soon as the surfacing process is done, the surfaces finished with an ANSI 125 finish shall be shop coated with an application of waterproof National Lubricating Grease Institute (NLGI) No. 3 multipurpose grease. Just before the erection of the structural steel in the field, the shop coated surfaces are to be wiped clean and a field coat of NLGI No. 3 grease is to be applied.

After masonry plates and rockers are in correct location, fill slotted holes around anchor bolts with a hydraulic cement or polymer grout in accordance with Article 2405.03, H, of the Standard Specifications.

All pintles, masonry plates, swedge anchor bolts, nuts and washers shall be galvanized. The pintles and masonry plates shall be assembled prior to galvanizing. Galvanizing shall be in accordance with Article 4100.07, of the Standard Specifications.

Plate washers shall be ASTM A709 Grade 36 (AASHTO M270 Grade) steel.

Distance from Top of Sole Plate to Bridge Seat

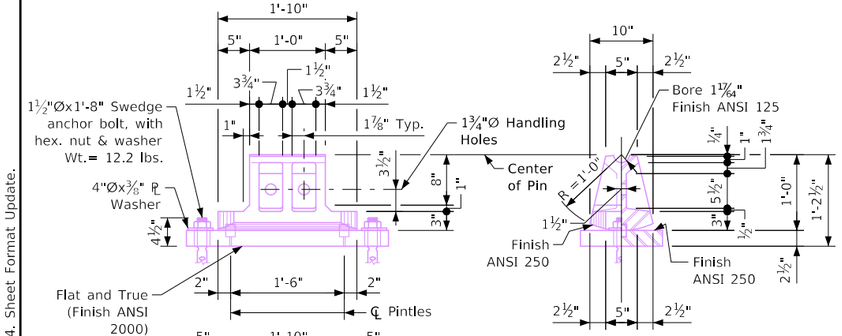
Rockers & Fixed Shoes	
R2A & S2	1'-2"
R3A & S3	1'-4¼"

* Including ¾" Neoprene Sheet.

Maximum Reaction

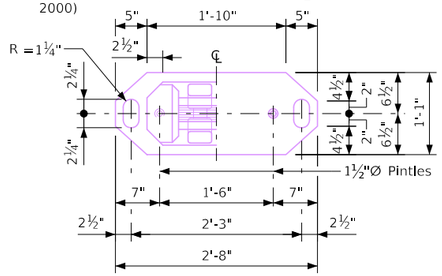
(In KIPS)

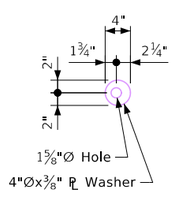
R2A S2	R3A S3
171	263



Rocker R3a

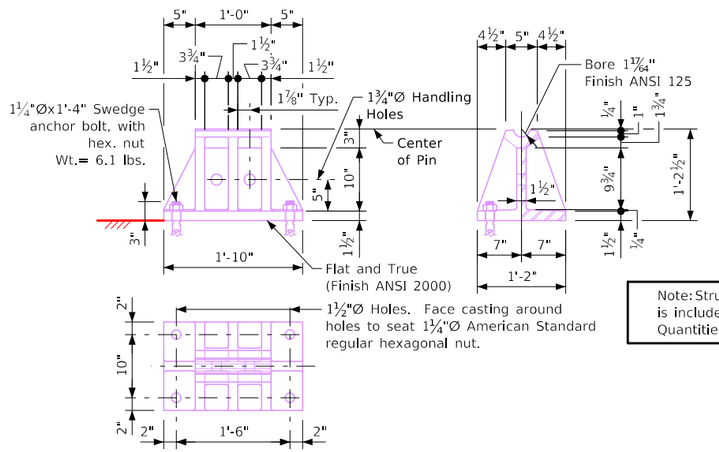
Wt. = 259 lbs.





Pier Masonry Plate MP3P

Wt. = 249 lbs.



Fixed Shoe S3

Wt. = 349 lbs.

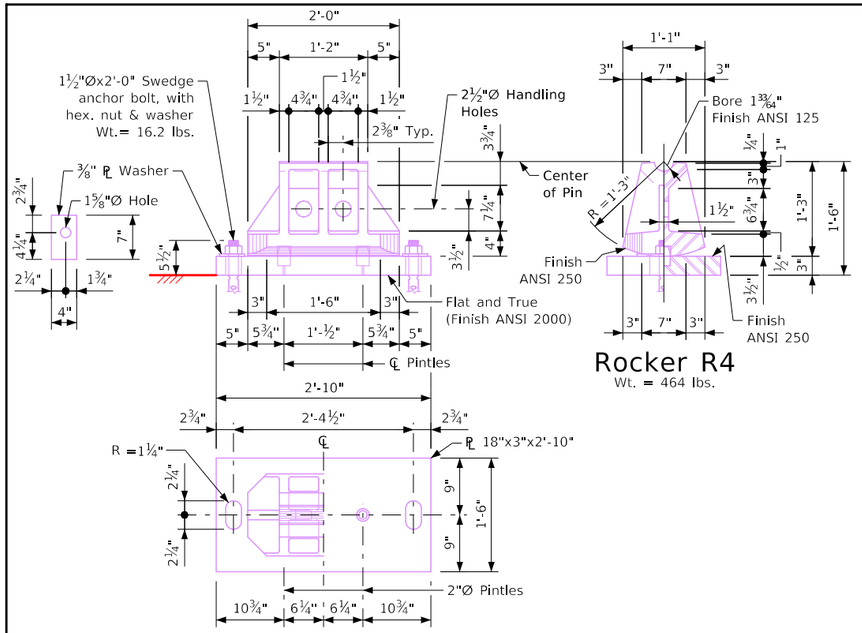
Note: Structural Steel weight is included on the Summary Quantities Sheet.

Pier Bearing

Correction 05-14: Added a Statement to Anchor Bolt Swedge Detail Stating that the Shape of the Indentations may be Oblong or Round in Shape.
Issued 05-10.
Beams.dgn - 1008b - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Pier Bearing Standards	Standard Sheet 1008b	COUNTY	PROJECT NUMBER	SHEET NUMBER

4:06:20 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

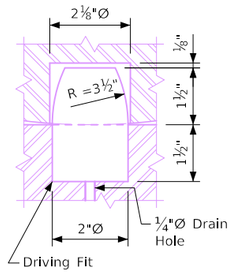


Pier Masonry Plate MP4P

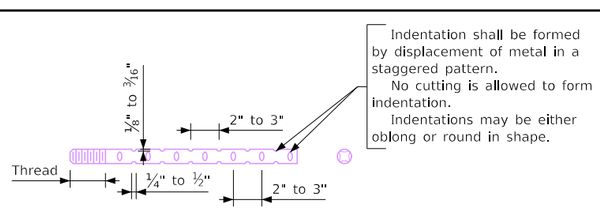
Wt. = 462 lbs.

Rocker R4

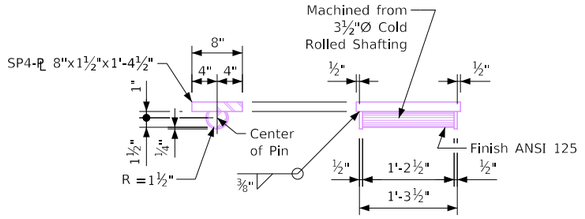
Wt. = 464 lbs.



Typical Pintle Detail

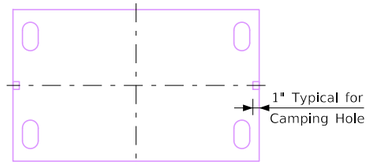


Anchor Bolt Swedge Detail



Sole Plate SP4 for S4

Wt. = SP4 = 85 lbs.



MP5Pa

MP5Pb & MP4P

Permissible cored hole (1¼"Øx1" deep) may be introduced to facilitate clamping to the milling table. The cored hole should be located at mid depth of plate.

Permissible Clamping Holes

Bearing Notes:

Castings R4 and R5 shall be nodular iron castings in accordance with Article 4153.04, of the Standard Specifications.

Masonry plates MP4P and MP5P shall be either nodular iron castings in accordance with Article 4153.04, of the Standard Specifications or structural steel complying with ASTM A572 grade 50. Pins shall be in accordance with Article 4153.02, of the Standard Specifications, and with ASTM A108.

Anchor bolts shall be set in accordance with Article 2405.03, H, of the Standard Specifications.

Preparation of bearing area shall be in accordance with Article 2408.03, M, of the Standard Specifications. The bedding shall be a single layer of ⅛ inch neoprene sheet.

The ⅛ inch neoprene sheets are to be 50, 60, or 70 durometer hardness and shall be 1 inch greater in length and width than the bottom surface of the masonry plates or steel bearings.

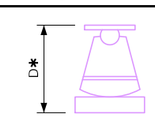
As soon as the surfacing process is done, the surfaces finished with an ANSI 125 finish shall be shop coated with an application of waterproof national lubricating grease institute No. 3 multipurpose grease. Just before the erection of the structural steel in the field, the shop coated surfaces are to be wiped clean and a field coat of NLGI No. 3 grease is to be applied.

After masonry plates and rockers are in correct location, fill slotted holes around anchor bolts with a hydraulic cement or polymer grout in accordance with Article 2405.03, H, of the Standard Specifications.

All pintles, masonry plates, swedge anchor bolts, nuts and washers shall be galvanized. The pintles and masonry plates shall be assembled prior to galvanizing. Galvanizing shall be in accordance with Article 4100.07, of the Standard Specifications.

Plate washers shall be ASTM A709 Grade 36 (AAHSTO M270 Grade) steel.

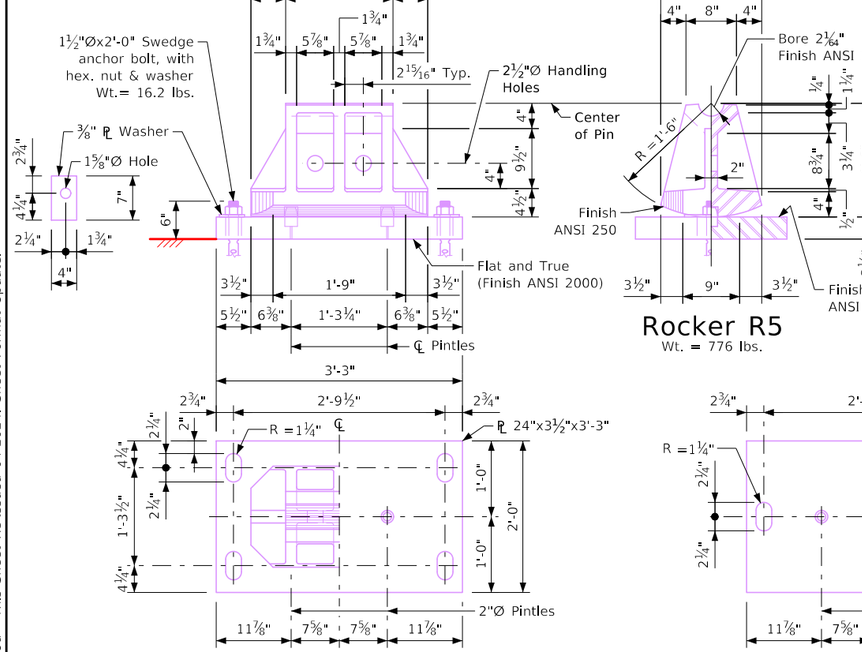
Distance from Top of Sole Plate to Bridge Seat

Rockers	
R4	1'-8⅝"
R5	2'-0⅞"

* Including ¾" Neoprene Sheet.

Maximum Reaction (In KIPS)	
R4	R5
475	650

Note: Structural Steel weight is included on the Summary Quantities Sheet.

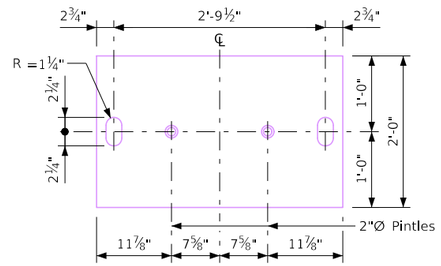


Pier Masonry Plate MP5Pa for Span Length Greater than 150'

Wt. = 808 lbs.

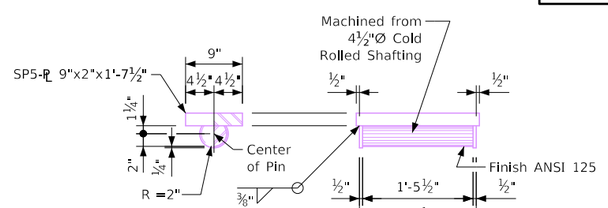
Rocker R5

Wt. = 776 lbs.



Pier Masonry Plate MP5Pb for Span Length 101' to 150'

Wt. = 825 lbs.



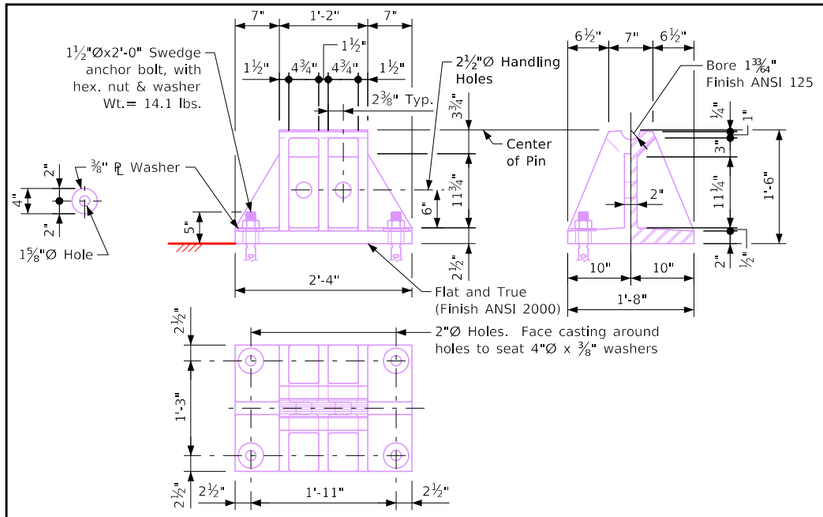
Sole Plate SP5 for S5

Wt. = SP5 = 159 lbs.

Pier Masonry Plate & Rocker Bearing

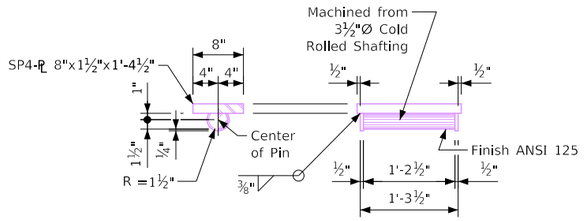
Correction 05-14: Added a statement to Anchor Bolt Swedge Detail Stating that the Shape of the Indentations May be Oblong or Round in Shape.
Issued 05-10.
Beams.dgn - 1009a - This Sheet Re-issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Pier Masonry Plate & Rocker Bearing Standards	Standard Sheet 1009a	COUNTY	PROJECT NUMBER	SHEET NUMBER
4:06:21 PM	4/9/2024	bkloss	pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



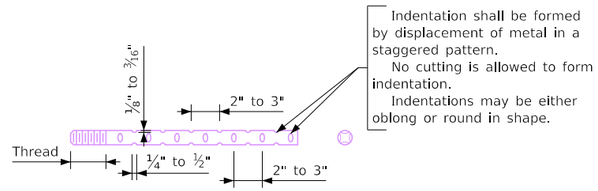
Fixed Shoe S4

Wt. = 735 lbs.

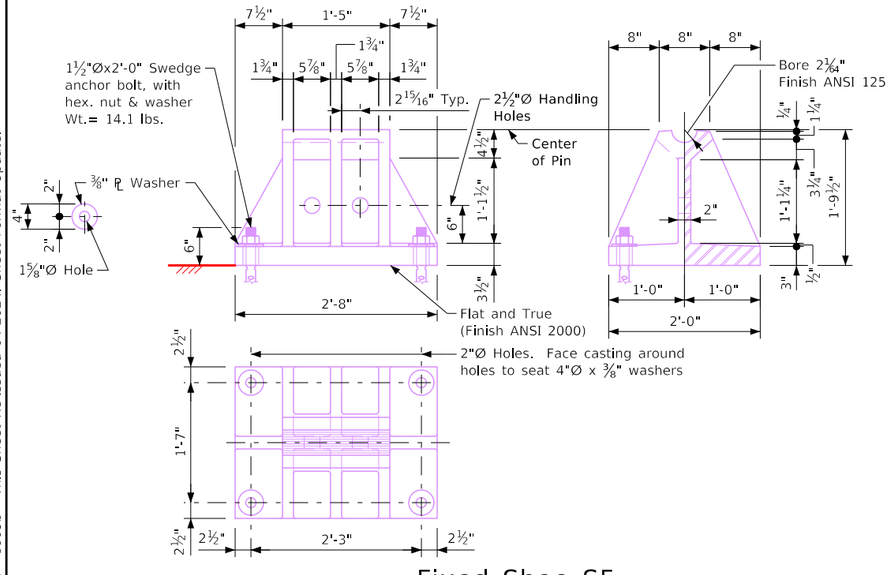


Sole Plate SP4 for S4

Wt. = SP4 = 85 lbs.

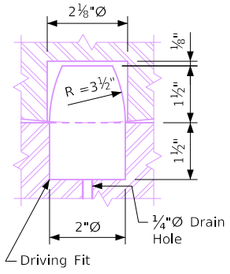


Anchor Bolt Swedge Detail

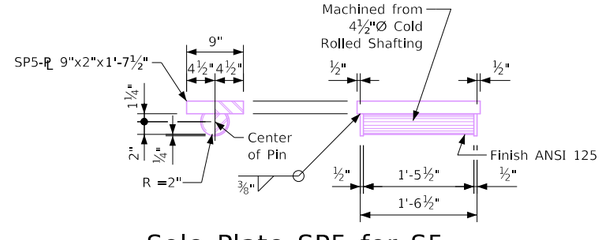


Fixed Shoe S5

Wt. = 1274 lbs.



Typical Pintle Detail



Sole Plate SP5 for S5

Wt. = SP5 = 159 lbs.

Bearing Notes:

Castings S4 and S5 shall be nodular iron castings in accordance with Article 4153.04, of the Standard Specifications.

Anchor bolts shall be set in accordance with Article 2405.03, H, of the Standard Specifications.

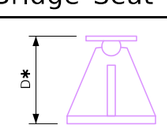
Preparation of bearing area shall be in accordance with Article 2408.03, M, of the Standard Specifications. The bedding shall be a single layer of ⅛ inch neoprene sheet.

The ⅛ inch neoprene sheets are to be 50, 60, or 70 durometer hardness and shall be 1 inch greater in length and width than the bottom surface of the masonry plates or steel bearings.

As soon as the surfacing process is done, the surfaces finished with an ANSI 125 finish shall be shop coated with an application of waterproof national lubricating grease institute No. 3 multipurpose grease. Just before the erection of the structural steel in the field, the shop coated surfaces are to be wiped clean and a field coat of NLGI No. 3 grease is to be applied.

All pintles, masonry plates, swedge anchor bolts, nuts and washers shall be galvanized. Galvanizing shall be in accordance with Article 4100.07, of the Standard Specifications.

Plate washers shall be ASTM A709 grade 36 (AAHSTO M270 grade) steel.

Distance from Top of Sole Plate to Bridge Seat	
Fixed Shoes	
S4	1'-8⅝"
S5	2'-0⅞"

✱ Including ¾" Neoprene Sheet.

Maximum Reaction (In KIPS)	
S4	S5
475	650

Note: Structural Steel weight is included on the Summary Quantities Sheet.

Pier Sole Plate & Fixed Shoe Bearing

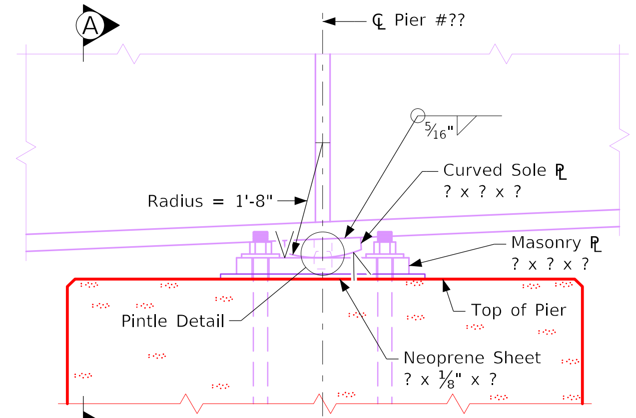
Correction 05-14: Added a Statement to Anchor Bolt Swedge Detail Stating that the Shape of the Indentations May be Oblong or Round in Shape.
Issued 05-10.
Beams.dgn - 1009b - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Pier Sole Plate & Fixed Shoe Bearing Standards	Standard Sheet 1009b	COUNTY	PROJECT NUMBER	SHEET NUMBER	

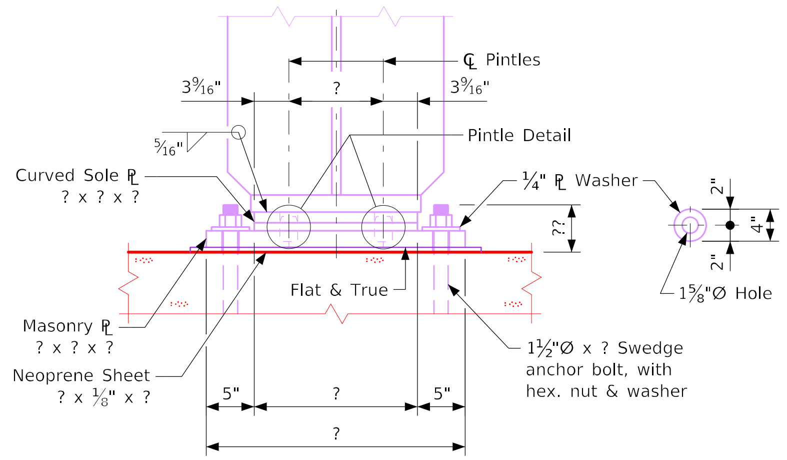
4:06:22 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Correction 05-14: Added a Statement to Anchor Bolt Swedge Detail Stating that the Shape of the Indentations may be Oblong or Round in Shape.
Issued 09-03.
Beams.dgn - 1010 - This Sheet Re-Issued 04-2024. Sheet Format Update.

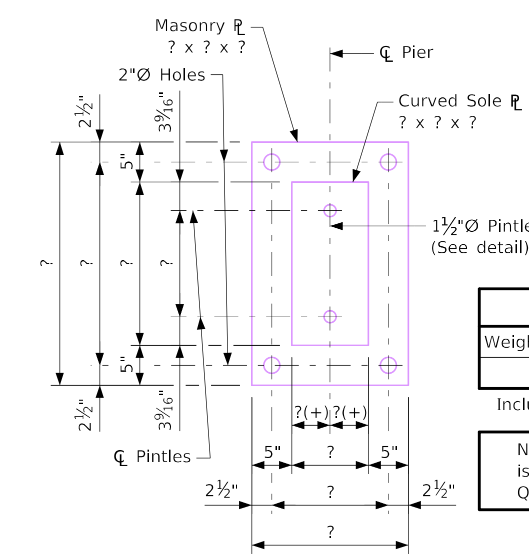
Masonry ℙ / Curved Sole ℙ Assembly



Part Elevation



Section A-A



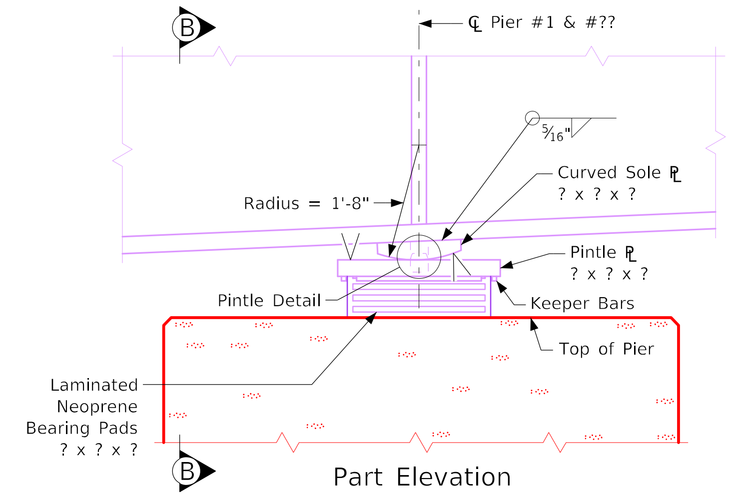
Plan View of Masonry and Sole Plates
Fixed Pier

Structural Steel	
Weight	? lbs.

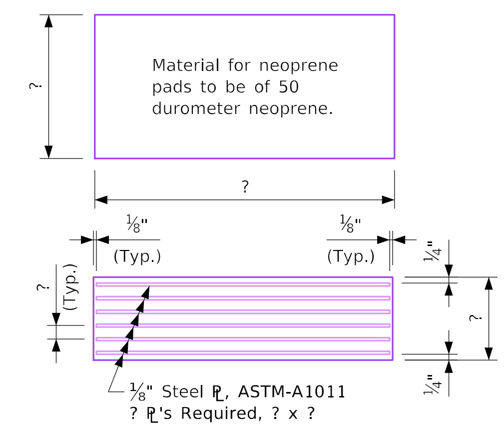
Includes Curved Sole ℙ

Note: Structural Steel weight is included on the Summary Quantities Sheet.

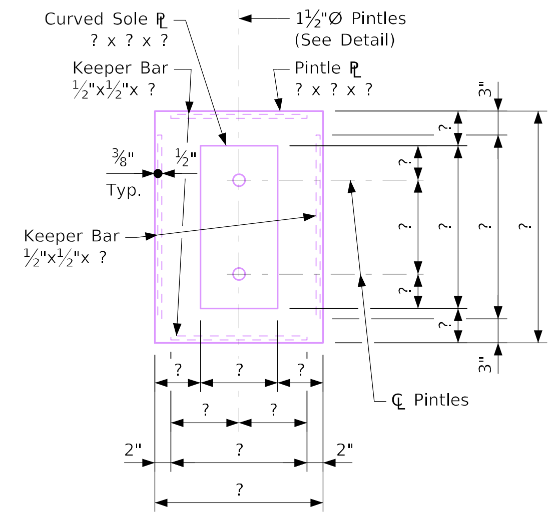
Laminated Neoprene Pad / Curved Sole ℙ Assembly



Part Elevation



Laminated Neoprene Pads

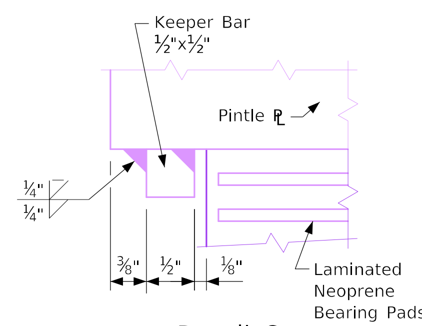


Plan of
Pintle Plate

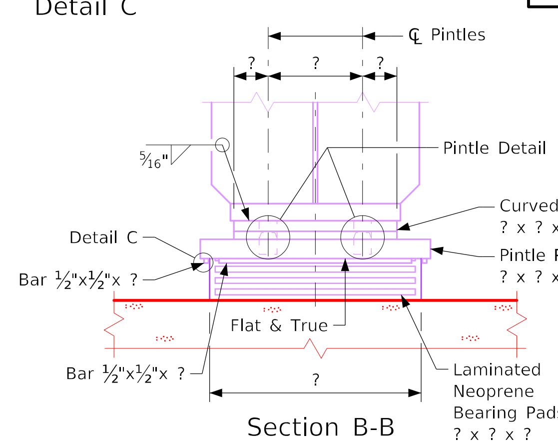
Structural Steel	
Weight	? lbs.

Includes Curved Sole ℙ

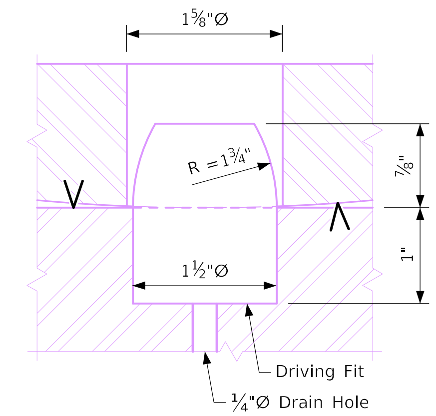
Note: Structural Steel weight is included on the Summary Quantities Sheet.



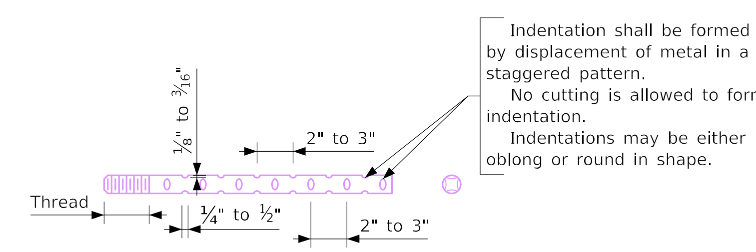
Detail C



Section B-B
Expansion Pier



Pintle Detail



Anchor Bolt Swedge Detail

Bearing Notes:

Surfaces marked "V" shall be finished ANSI 250.

Masonry plates are to be set on a 1⁄8 inch neoprene sheet.

The 1⁄8 inch neoprene sheets are to be 50, 60, or 70 durometer hardness and shall be 1 inch greater in length and width than the bottom surface of the masonry plates or steel bearings.

Pintle plates, sole plates, anchor bolts, and masonry plates are a part of the superstructure structural steel quantity. Cost of neoprene bearing pads and 1⁄8 inch neoprene sheets shall be considered incidental to the bid item "Structural Steel".

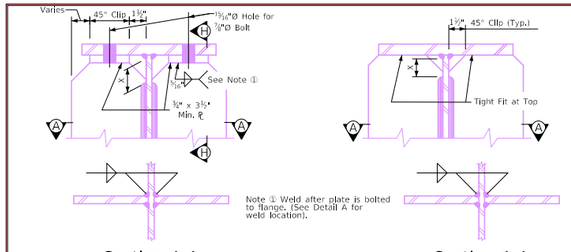
The pintles, pintle plates, keeper bars, and masonry plates shall be galvanized. Welding shall be completed prior to galvanizing. The pintles and pintle plates shall be assembled prior to galvanizing. The surfaces of the pintle plate assembly in contact with the curved sole plate and the laminated neoprene pad shall be free of projections due to galvanizing.

Curved sole plates shall comply with ASTM A709 grade 50W and painted in accordance with the Standard Specifications.

Keeper bars, pintle plates and masonry plates shall comply with ASTM A709 grade 50.

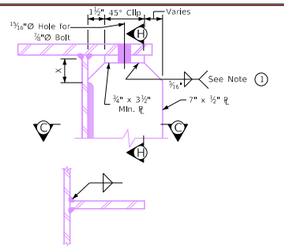
Anchor bolts, nuts and washers shall meet the requirements of I.M. 453.08.

Low Profile Bearing

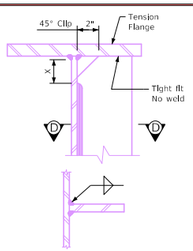


Section A-A

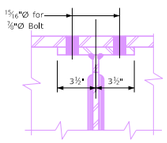
Section A-A



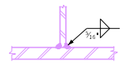
Section C-C



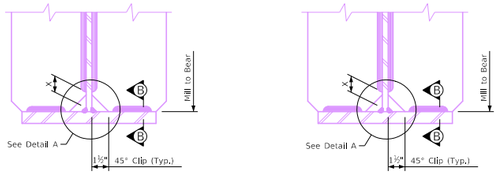
Section D-D



Section H-H

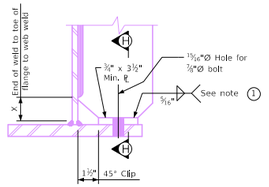


Section B-B

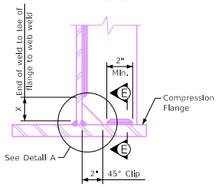


Pier Bearing Stiffener (Skewed Bridges With All Diaphragms Prependicular to Girders)

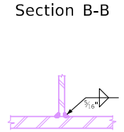
All Abutment Bearing Stiffeners Pier Bearing Stiffener (0° Skew or Bridges With Pier Diaphragms Parallel to ℄ of Pier)



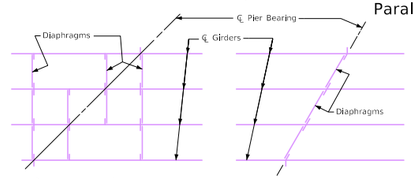
Intermediate Diaphragm Stiffener Bolted Attachment to Flanges



Intermediate Stiffener



Section E-E

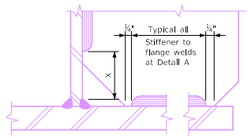


Diaphragms Perpendicular to Girders

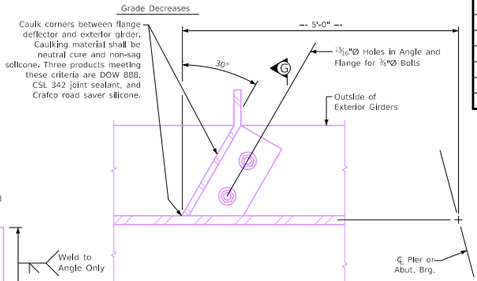
Diaphragms Parallel to ℄ of Pier

Types of Diaphragm Framing

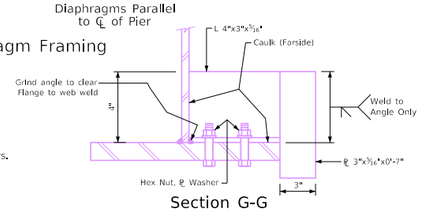
T = Web Thickness	X = ST with 2" Minimum
7/16"	2"
9/16"	2"
11/16"	2"
13/16"	2 1/16"
15/16"	3"
1 1/16"	3 1/16"
1 3/16"	3"



Detail A



Flange Deflector Details (? Required Per Bridge)



Section G-G

Flange deflectors are requlred on the outside of the exterior girders at the ? abutments and the ? side of all piers.

Note:

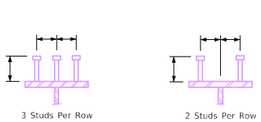
This sheet is primarily for the use of Fabricator's Workmen and Iowa Department of Transportation Inspectors In interpreting plan details. It covers the locations of weld terminl that are not specified by typical weld symbols.

The acceptability and use of the weld treatment shown on this sheet for any specific project is the responsibility of the Designing Engineer.

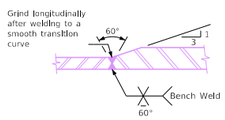
Welding Details

Revised Longitudinal Stiffener Detail Changed, Arch. Taper, 9 No. 9 Date
Revised Miscellaneous Details Changed, Taper No. 11 Dated 10-25-91
Revised Longitudinal Stiffener Weld Details Changed, Taper No. 14 Dated 07-27-92
Revised Diaphragm Connection Detail Changed, Taper No. 15 Dated 10-26-93
Revised 10-10-94: Pier and Abutment Bearing Stiffener Weld Details Changed.
Revised 10-10-95: Flange Deflector Detail Changed.
Revised 09-01: Flange Deflector Detail Changed.
Correction 09-01: Fabricating Note on Flange Deflector Detail Changed.
Correction 10-01: Fabricating Note on Flange Deflector Detail Changed.
Revised 04-02: Changed Note On Flange Deflector Detail.
Revised 03-12: Revised the Description for Intermediate Diaphragm Stiffeners to Eliminate Case I and II Live Load Descriptions.
Revised 04-12: Added a Third Caulking Company for the Listing for the Flange Deflector.
Issued 11-03-98.
Issues.dgn - 1021 - This Sheet Reissued 04-2024, Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Welding Details For Welded Girder Bridges	Standard Sheet 1021	COUNTY	PROJECT NUMBER	SHEET NUMBER	
4:06:24 PM 4/9/2024	bkloss	pw:\NTPwJnt1,dot,Int,lanzPWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn						



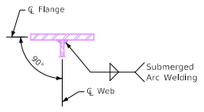
Shear Stud Details



Flange Plate Transition Detail

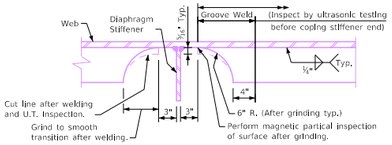
All flange butt welded joints subject to tension or reversal of stress are to be radiographed full width. All butt welded joints subject to compression only are to be radiographed for a minimum of 50 percent of the width.

For tension and compression limits see Design Sheet ???

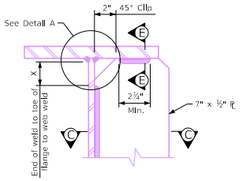


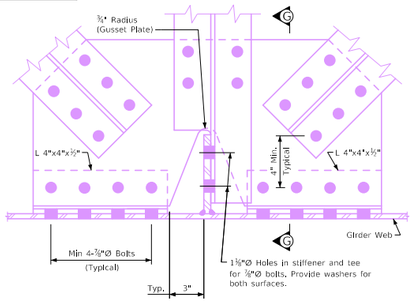
Flange to Web Details

Flange to Web Weld Size	
Size of Weld	Flange Thickness

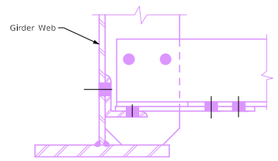


Longitudinal Stiffener (at Cross Frame)

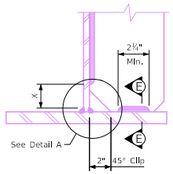




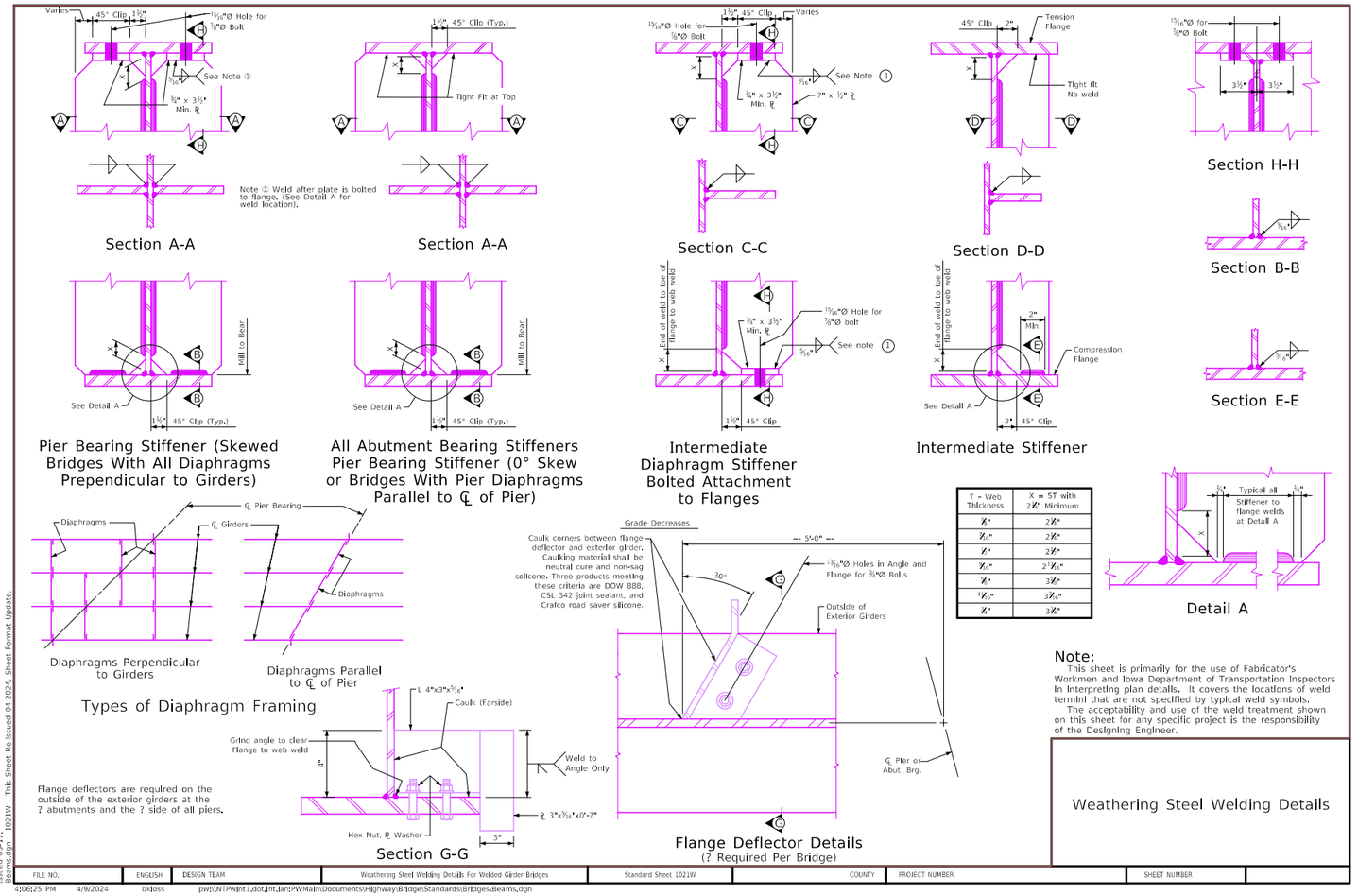
Gusset Plate to Web Detail

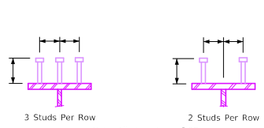


Section G-G

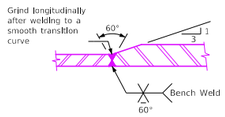


Intermediate Diaphragm Stiffener Welded Attachment to Flanges





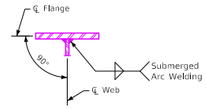
Shear Stud Details



Flange Plate Transition Detail

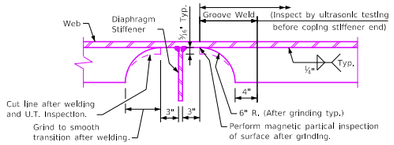
All flange butt welded joints subject to tension or reversal of stress are to be radiographed full width. All butt welded joints subject to compression only are to be radiographed for a minimum of 50 percent of the width.

For tension and compression limits see Design Sheet ???

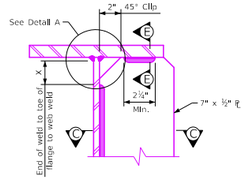


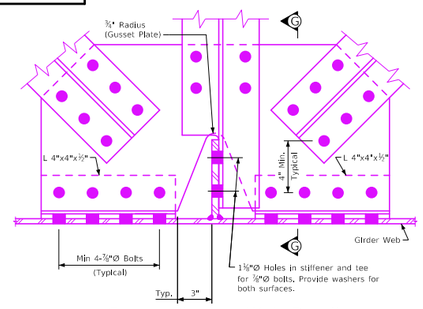
Flange to Web Details

Flange to Web Weld Size	
Size of Weld	Flange Thickness

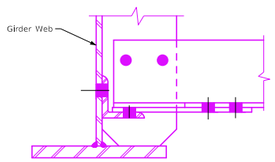


Longitudinal Stiffener
(at Cross Frame)

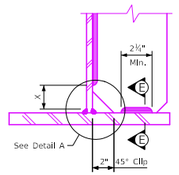




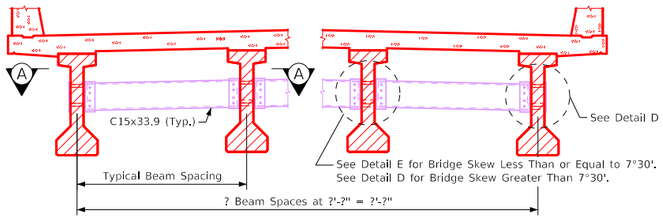
Gusset Plate to Web Detail



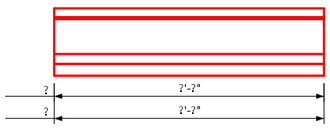
Section G-G



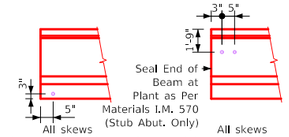
Intermediate Diaphragm Stiffener Welded Attachment to Flanges



Section Showing Intermediate Diaphragms



Intermediate Diaphragm Bolt Hole Locations



Beam Coil Tie Locations

Notes:

All diaphragm materials, including bolts, nuts and washers shall be galvanized.

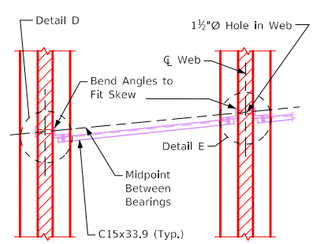
Shop drawings of the steel diaphragms showing layout and details of the diaphragms shall be submitted for approval.

All costs for furnishing and installing steel intermediate diaphragms shall be included in the price bid for Structural Steel.

The 1½"Ø holes for the ⅞"Ø H.S. bolts shall be cast into the web. Drilling is not allowed.

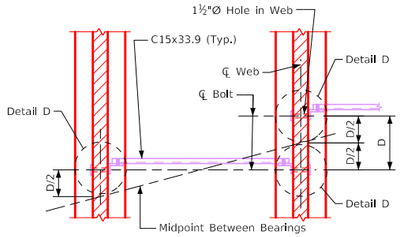
The ⅞"Ø H.S. bolts through the web shall have a thread length of 3 inch min. and 4 inch max. and shall meet the requirements of ASTM A449.

All bolts are to be tightened prior to placing bridge floor concrete with the following exception: bolts in diaphragms located under longitudinal bridge floor construction joints shall not be tightened until stage two of the bridge floor has been placed.



Section A-A

For Bridges Skewed Less Than or Equal to 7°30'



Section A-A

For Bridges Skewed Greater Than 7°30'

Intermediate Diaphragm Structural Steel

One Connection Detail "E"				Weight
Two - ⅞"Ø X Length H.S. Bolts with Nuts and Washers				
Web Thickness	Length of H.S. Bolts	Weight per Detail "E"	Number of Detail "E"	
6"	9"	4.30 lbs	?	?
7"	10"	4.66 lbs	?	?
9"	12"	5.34 lbs	?	?
Two - L 6" x 4" x ½" x 1'-3¼" = 41.2 lbs			?	?

One Connection Detail "D"				
Two - ⅞"Ø X Length H.S. Bolts with Nuts and Washers				
Web Thickness	Length of H.S. Bolts	Weight per Detail "E"	Number of Detail "E"	
6"	9"	4.30 lbs	?	?
7"	10"	4.66 lbs	?	?
9"	12"	5.34 lbs	?	?
One - Backing ℄ 4"x⅜"x1'-3¼" = 6.5 lbs			?	?
One - L 6" x 4" x ½" x 1'-3¼" = 20.6 lbs			?	?

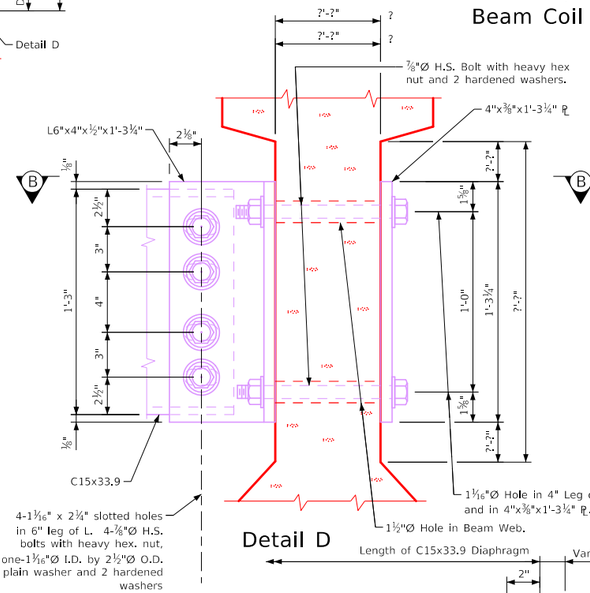
One C15 x 33.9 Diaphragm

Web Thickness	Beam Spacing	6'-9"		6'-10"		6'-7⅜"		7'-3"		7'-4¹³⁄₁₆"	
		* Length	Unit Weight (lbs)	* Length	Unit Weight (lbs)	* Length	Unit Weight (lbs)	* Length	Unit Weight (lbs)	* Length	Unit Weight (lbs)
6"		5'-11¾"	202.3	6'-0⅝"	205.2	5'-9⅜"	197.2	6'-5⅝"	219.3	6'-7⅞"	224.4
7"		5'-10⅝"	199.5	5'-11⅝"	202.3	5'-8¾"	194.4	6'-4⅝"	216.5	6'-6⅞"	221.5
9"		5'-8⅝"	193.9	5'-9⅝"	196.7	5'-6¾"	188.7	6'-2⅝"	210.8	6'-4⅞"	215.5

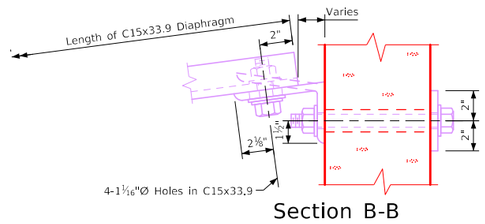
*The Length of The C15 X 33.9 Shown in the Table is Based on a Variable Clearance of 1¹³⁄₁₆" To 2⅛" Between The Face of Beam Web and End of C15 X 33.9.

Diaphragm Weights		
Unit Weight	Number of Diaphragms	
? lbs	?	?
? lbs	?	?

Diaphragm Connection Bolts		
Eight - ⅞"Ø x 0'-2⅞" H.S. Bolts with Nuts and Washers, per Unit Diaphragm	Number of Diaphragms	
10.3 lbs	?	?
Intermediate Diaphragm Structural Steel - Total (lbs)		



Note to Designer: See alternate Section B-B when skew is 7°30' or less. Located outside of border.



Steel Interm. Diaphragm - PC Beam

Revised 09-12: Alternate Section B-B Added Outside of Border Sheet.
Issued 09-08-88.
Beams.dgn - 1036 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Steel Intermediate Diaphragms For PC BM. Bridges	Standard Sheet 1036	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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STEEL INTERMEDIATE DIAPHRAGMS FOR PC BM. BRIDGES STANDARD SHEET 1036

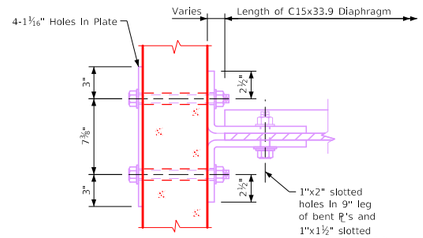
Bulb Tee "B" Beam Intermediate Diaphragm Structural Steel

One Beam Connection Information		
Beam Spacing	Diaphragm Length	C15x33.9 Weight (Lbs.)
6'-6½"	5'-4¼"	182
7'-2 13/16"	6'-0 5/16"	205
8'-0 3/16"	6'-10 1/16"	232
8'-8 5/16"	7'-6 3/16"	255
9'-0½"	7'-10¼"	266

Bulb Tee "B" Beam Intermediate Diaphragm Structural Steel

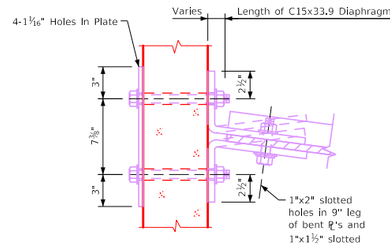
One Beam Connection (Detail "F" and/or Detail "G")			Weight
		No. of Beam Connections	
Four - 7/8"Ø X 9¼" H.S. Bolts with Nuts & Washers = 9.6 Lbs.		?	?
One Detail "G"	Four - Bent PL 9" x 6" x ½" x 0'-11" = 93.6 Lbs.	?	?
One Detail "F"	One - Backing PL 5" x ⅜" x 1'-1 5/16" = 7.1 Lbs.	?	?
	Two - Bent PL 9" x 6" x ½" x 0'-11" = 46.8 Lbs.	?	?
One Diaphragm			
		Number of Diaphragms	
Six - 7/8"Ø X 3" H.S. Bolts with Nuts & Washers = 7.8 Lbs.		?	?
	Length of Member		
One - C15 x 33.9 = 33.9 Lbs./Ft.	?'-?"	?	?
Intermediate Diaphragm Structural Steel - Total (Lbs.)			?

Note to Designer: Chart outside of border contains diaphragm lengths



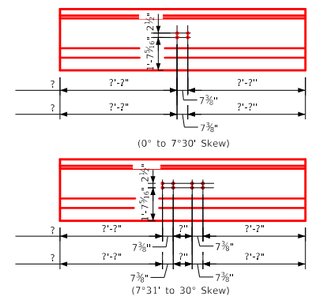
Section C-C

Note to Designer: Delete or Cross-Out non-applicable section C-C detail.



Section C-C

Note to Designer: Use when skew is 7°30' or less.



Intermediate Diaphragm Bolt Hole Locations

Notes:

All diaphragm materials, including bolts, nuts and washers shall be galvanized.

Shop drawings of the steel diaphragms showing layout and details of the diaphragms shall be submitted for approval.

All costs for furnishing and installing steel intermediate diaphragms shall be included in the price bid for Structural Steel.

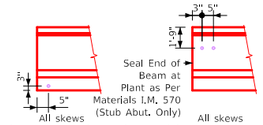
The 1⅛"Ø holes for the ⅞"Ø H.S. bolts shall be cast into the web. Drilling is not allowed.

The ⅞"Ø H.S. bolts through the web shall have a thread length of 3" min. and 4" max. and shall meet the requirements of ASTM A449.

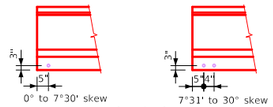
All bolts are to be tightened prior to placing bridge deck concrete with the following exception: Bolts in diaphragms located under longitudinal bridge deck construction joints shall not be tightened until stage two of the bridge deck has been placed.

STRUCTURAL STEEL	
Weight	? lbs.

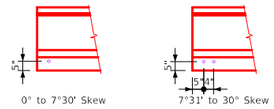
NOTE: Structural Steel weight is included on the Summary Quantities Sheet.



Integral Abutment Stub Abutment



Fixed Pier



Expansion Pier

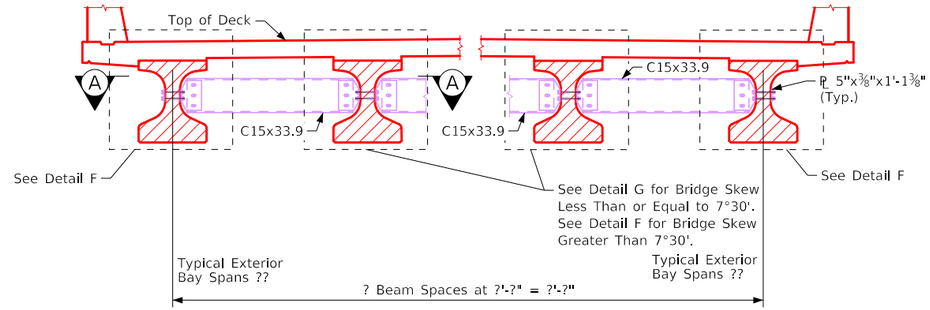
Beam Coil Tie Locations

Steel Interm. Diaphragm - BTB Beam

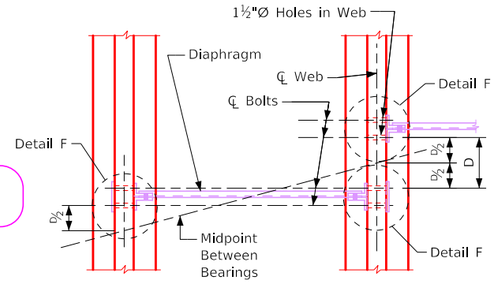
FILE NO.	ENGLISH	DESIGN TEAM	Steel Intermediate Diaphragms for "BTB" Beam Bridges - Sheet 1 of 2	Standard Sheet 1036-1-BTB	COUNTY	PROJECT NUMBER	SHEET NUMBER	
4:06:27 PM 4/9/2024	bkloss	pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn						

Revision 12-10: Alternate Section C-c Added Outside of Border Sheet.
Revision 04-13: Corrected the 'D' Dimensions Locating the Holes in the Beam Web in Part Section A-A.
Revision 11-24: Added Detail F Outside of Sheet to be Used when Skew is Greater than 7°30'.
ENGLISHBEAMS.DGN - 1036-BTBR. - This Sheet Issued 02-08

This Sheet Issued 06-14, Sheet 1 of 2.
Beams.dgn - 1036-1-BTB - This Sheet Re-Issued 04-2024, Sheet Format Update.

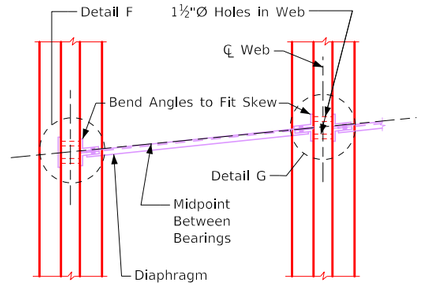


Section Showing Intermediate Diaphragms



Part Section A-A

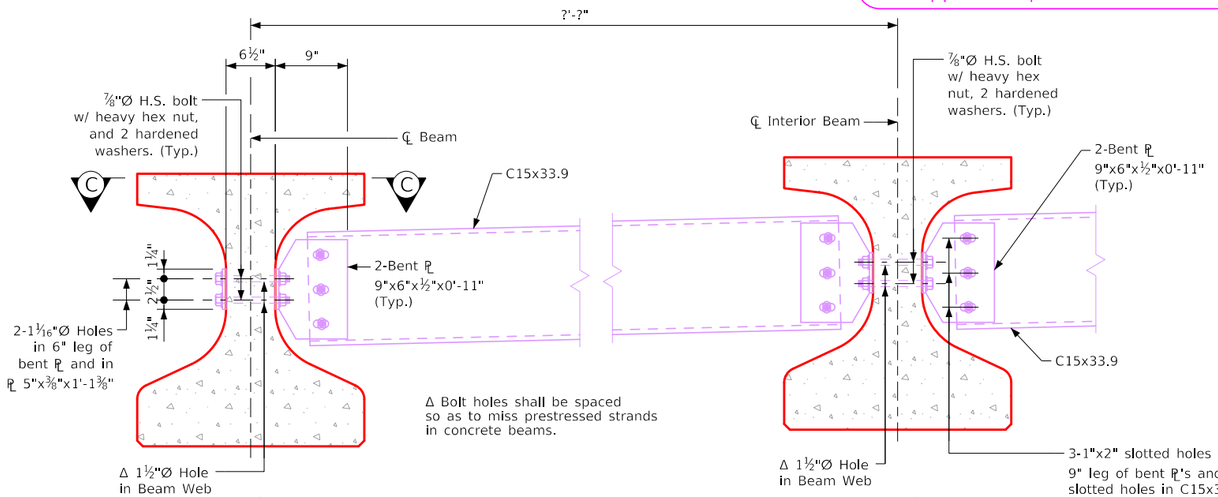
For Bridges Skewed Greater Than 7°30'



Part Section A-A

For Bridges Skewed Less Than or Equal to 7°30'

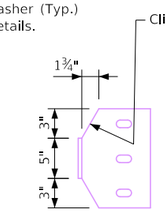
Note to Designer: Delete or Cross-Out non-applicable part section A-A detail.



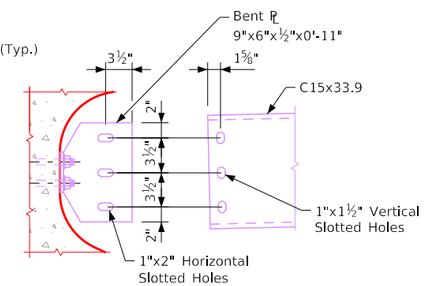
Detail F

Detail G

Section Showing Intermediate Diaphragms At Exterior Bay



Bent PL Detail



Slotted Hole Details

Steel Interm. Diaphragm - BTB Beam

FILE NO.	ENGLISH	DESIGN TEAM	Steel Intermediate Diaphragms for "BTB" Beam Bridges - Sheet 2 of 2	Standard Sheet 1036-2-BTB	COUNTY	PROJECT NUMBER	SHEET NUMBER	

This Sheet Issued 06-14. Sheet 2 of 2.
Beams.dgn - 1036-2-BTB - This Sheet Re-Issued 04-2024. Sheet Format Update.

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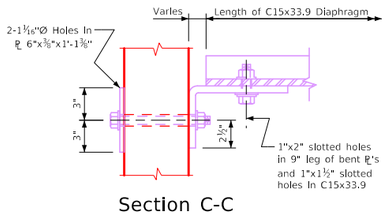
Bulb Tee "C" Beam Intermediate Diaphragm Structural Steel

One Beam Connection (Detail "F" and/or Detail "G")			Weight
		No. of Beam Connections	
Two - ⅞"Ø X 9¼" H.S. Bolts with Nuts & Washers = 4.8 Lbs.		?	?
One Detail "G"	Two - Bent PL 9" x 6" x ½" x 1'-1⅜" = 57.0 Lbs.	?	?
One Detail "F"	One - Backing PL 6" x ⅜" x 1'-1⅜" = 8.5 Lbs.	?	?
	Two - Bent PL 9" x 6" x ½" x 1'-1⅞" = 28.5 Lbs.	?	?
One Diaphragm			
		Number of Diaphragms	
Eight - ⅞"Ø X 2½" H.S. Bolts with Nuts & Washers = 10.3 Lbs.		?	?
	Length of Member		
One - C15 x 33.9 = 33.9 Lbs./Ft.	7'-2"	?	?
Intermediate Diaphragm Structural Steel - Total (Lbs.)			?

Note to Designer: Chart outside of border contains diaphragm lengths

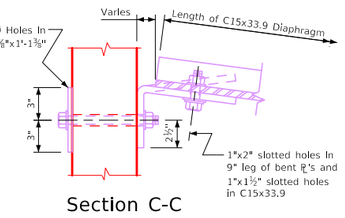
Bulb Tee "C" Beam Intermediate Diaphragm Structural Steel

One Beam Connection Information		
Beam Spacing	Diaphragm Length	C15x33.9 Weight (Lbs.)
6'-6½"	5'-4½"	182
7'-2 13/16"	6'-0 5/16"	205
8'-0 5/16"	6'-10 1/16"	232
8'-8½"	7'-6½"	255
9'-0½"	7'-10¼"	266



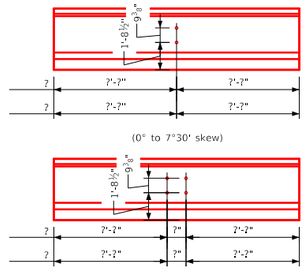
Section C-C

Note to Designer: Delete or Cross-Out non-applicable section C-C detail.



Section C-C

Note to Designer: Use when skew is 7°30' or less.



Intermediate Diaphragm Bolt Hole Locations

STRUCTURAL STEEL	
Weight	? lbs.

NOTE: Structural Steel weight Is Included on the Summary Quantities Sheet.

Notes:

All diaphragm materials, including bolts, nuts and washers shall be galvanized.

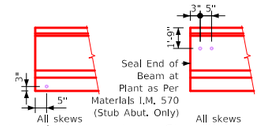
Shop drawings of the steel diaphragms showing layout and details of the diaphragms shall be submitted for approval.

All costs for furnishing and installing steel intermediate diaphragms shall be included in the price bid for Structural Steel.

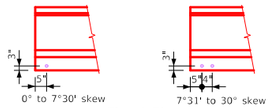
The 1⅛"Ø holes for the ⅞"Ø H.S. bolts shall be cast into the web. Drilling is not allowed.

The ⅞"Ø H.S. bolts through the web shall have a thread length of 3" min. and 4" max. and shall meet the requirements of ASTM A449.

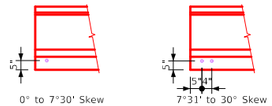
All bolts are to be tightened prior to placing bridge deck concrete with the following exception: Bolts in diaphragms located under longitudinal bridge deck construction joints shall not be tightened until stage two of the bridge deck has been placed.



Integral Abutment — Stub Abutment



Fixed Pier



Expansion Pier

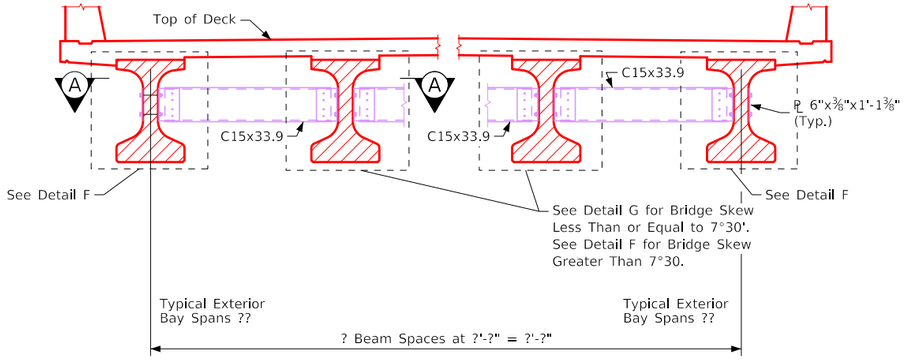
Beam Coil Tie Locations

Steel Interm. Diaphragm - BTC Beam

FILE NO.	ENGLISH	DESIGN TEAM	Steel Intermediate Diaphragms for "BTC" Beam Bridges - Sheet 1 of 2	Standard Sheet 1036-1-BTC	COUNTY	PROJECT NUMBER	SHEET NUMBER	
4:06:28 PM 4/9/2024	bkloss	pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn						

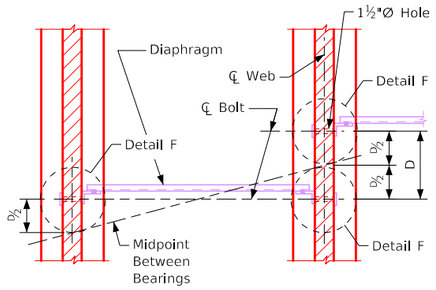
This Sheet Issued 06-14, Sheet 1 of 2. Beams.dgn - 1036-1-BTC - This Sheet Re-Issued 04-2024, Sheet Format Update.

STEEL INTERM. DIAPHS. FOR "BTC" BEAM BRIDGES - SHT. 1 OF 2 STANDARD SHEET 1036-1-BTC



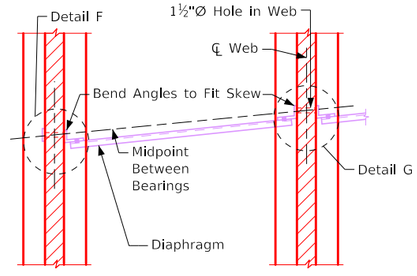
Section Showing Intermediate Diaphragms

Note to Designer: Delete or Cross-Out non-applicable part section A-A detail.



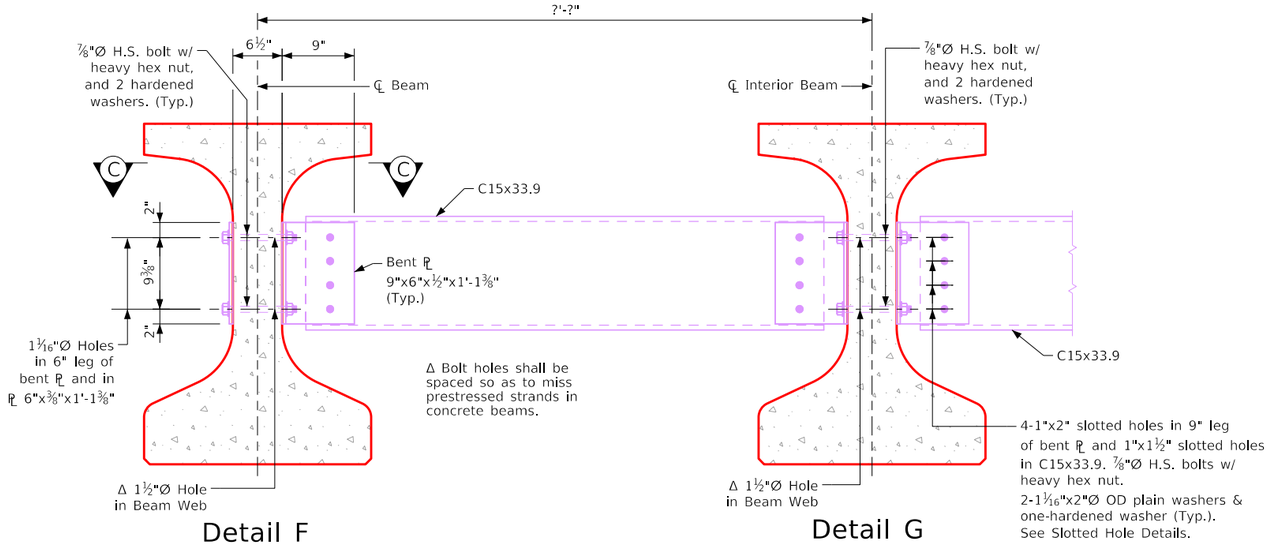
Part Section A-A

For Bridges Skewed Greater Than 7°30'



Part Section A-A

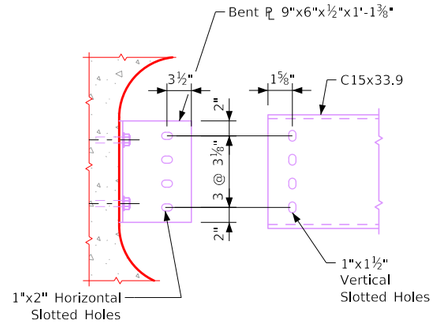
For Bridges Skewed Less Than or Equal to 7°30'



Detail F

Detail G

Section Showing Intermediate Diaphragms At Exterior Bay



Slotted Hole Details

Steel Interm. Diaphragm - BTC Beam

FILE NO.	ENGLISH	DESIGN TEAM	Steel Intermediate Diaphragms for "BTC" Beam Bridges - Sheet 2 of 2	Standard Sheet 1036-2-BTC	COUNTY	PROJECT NUMBER	SHEET NUMBER	

This Sheet Issued 06-14. Sheet 2 of 2.
Beams.dgn - 1036-2-BTC - This Sheet Re-Issued 04-2024. Sheet Format Update.

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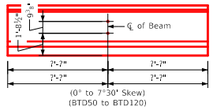
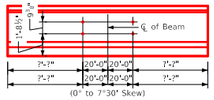
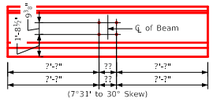


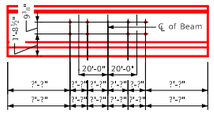
(0° to 7°30' Skew)
(BTD50 to BTD120)



(0° to 7°30' Skew)
(BTD125 to BTD135)



(7°31' to 30° Skew)
(BTD50 to BTD120)



(7°31' to 30° Skew)
(BTD125 to BTD135)

Intermediate Diaphragm
Bolt Hole Locations

Bulb Tee "D" Beam Intermediate Diaphragm Structural Steel

One Beam Connection (Detail "F" and/or Detail "G")

		No. of Beam Connections	Weight
Two - ⅞"Ø X 9½" H.S. Bolts with Nuts & Washers = 4.8 Lbs.		?	?
One Detail "G"	Two - Bent ℞ 9" x 6" x ½" x 1'-1¼" = 57.0 Lbs.	?	?
One Detail "F"	One - Backing ℞ 6" x ⅜" x 1'-1½" = 8.5 Lbs.	?	?
	One - Bent ℞ 9" x 6" x ½" x 1'-1¼" = 28.5 Lbs.	?	?

One Diaphragm

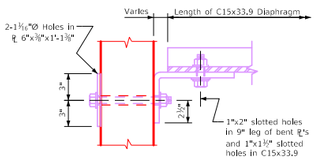
	Number of Diaphragms	
Eight - ¾"Ø X 2¼" H.S. Bolts with Nuts & Washers = 10.3 Lbs.	?	?

	Length of Member		
One - C15 x 33.9 = 33.9 Lbs./Ft.	?'-?"	?	?
Intermediate Diaphragm Structural Steel - Total (Lbs.)			?

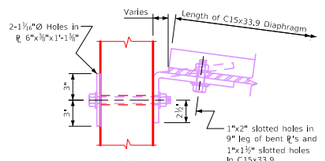
Bulb Tee "D" Beam Intermediate Diaphragm Structural Steel

One Beam Connection Information

Beam Spacing	Diaphragm Length	C15x33.9 Weight (Lbs.)
6'-6½"	5'-4½"	182
7'-2½"	6'-0½"	205
8'-0½"	6'-10½"	232
8'-8½"	7'-6½"	255
9'-0½"	7'-10½"	266



Section C-C



Section C-C

Note to Designer: Beam examples are outside of border sheet

Note to Designer: Delete or Cross-Out non-applicable section C-C detail.

Note to Designer: Use when skew is 7°30' or less.

Notes:

All diaphragm materials, including bolts, nuts and washers shall be galvanized.

Shop drawings of the steel diaphragms showing layout and details of the diaphragms shall be submitted for approval.

All costs for furnishing and installing steel intermediate diaphragms shall be included in the price bid for Structural Steel.

The 1½"Ø holes for the ⅞"Ø H.S. bolts shall be cast into the web. Drilling is not allowed.

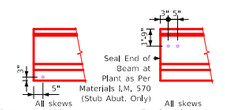
The ⅞"Ø H.S. bolts through the web shall have a thread length of 3" min. and 4" max. and shall meet the requirements of ASTM A449.

All bolts are to be tightened prior to placing bridge deck concrete with the following exception: Bolts in diaphragms located under longitudinal bridge deck construction joints shall not be tightened until stage two of the bridge deck has been placed.

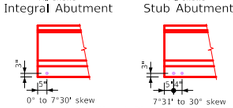
STRUCTURAL STEEL	
Weight	? lbs.

NOTE: Structural Steel weight is included on the Summary Quantities Sheet.

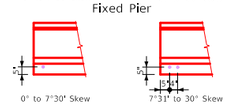
Note to Designer: Chart outside of border contains diaphragm lengths



Integral Abutment
Stub Abutment



Fixed Pier



Expansion Pier

Beam Coil Tie Locations

Steel Interm. Diaphragm - BTD Beam

FILE NO.	ENGLISH	DESIGN TEAM	Steel Intermediate Diaphragms for "BTD" Beam Bridges - Sheet 1 of 2	Standard Sheet 1036-1-BTD	COUNTY	PROJECT NUMBER	SHEET NUMBER	
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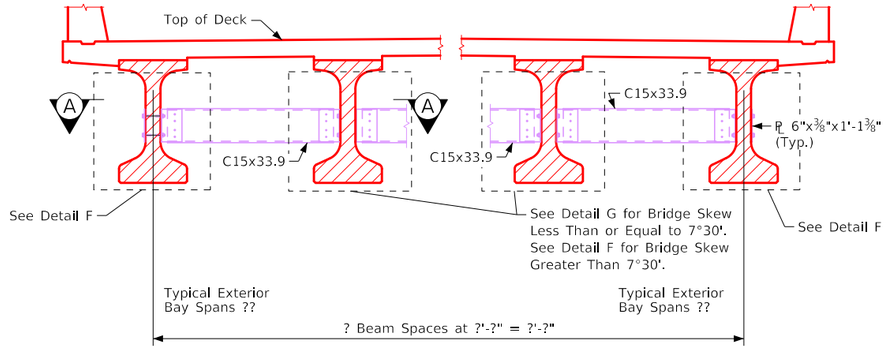
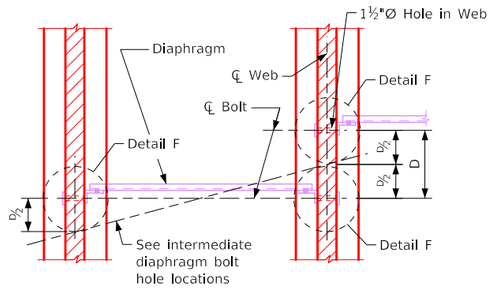
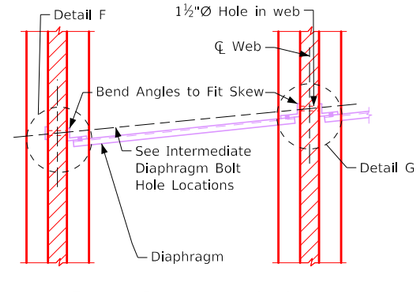
TRN: Sheet Issued 06-24, Sheet 1 of 2.
BeamsLogin: - 1036-1-BTD - This Sheet Re-Issued 04-2024, Sheet Format Update.



Section Showing Intermediate Diaphragms

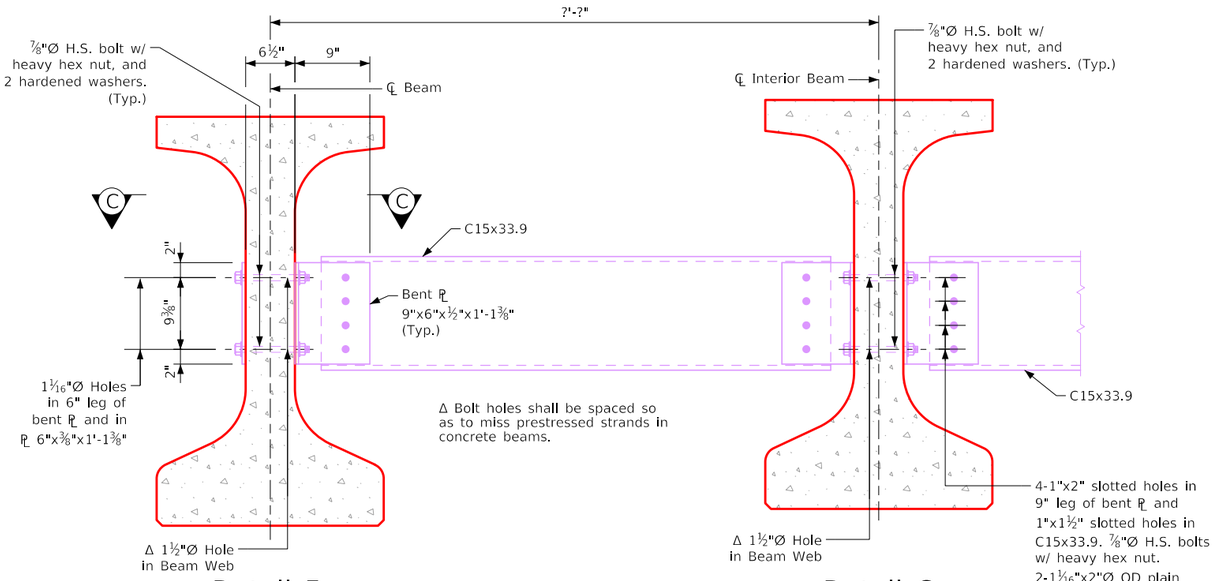


Part Section A-A
For Bridges Skewed Greater Than 7°30'



Part Section A-A
For Bridges Skewed Less Than or Equal to 7°30'

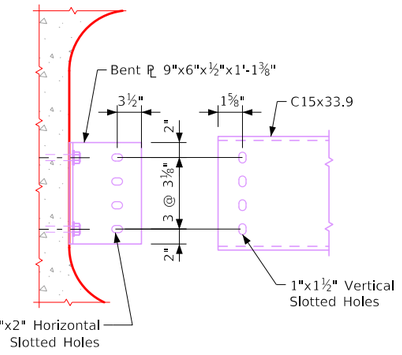
Note to Designer: Delete or Cross-Out non-applicable part section A-A detail.



Detail F

Detail G

Section Showing Intermediate Diaphragms At Exterior Bay



Slotted Hole Details

Steel Interm. Diaphragm - BTD Beam

This Sheet Issued 06-14. Sheet 2 of 2.
Beams.dgn - 1036-2-BTD - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Steel Intermediate Diaphragms for "BTD" Beam Bridges - Sheet 2 of 2	Standard Sheet 1036-2-BTD	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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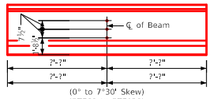
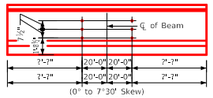
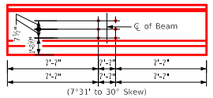


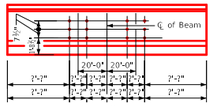
(0° to 7°30' Skew)
(BTE60 to BTE120)



(0° to 7°30' Skew)
(BTE125 to BTE155)



(7°31' to 30° Skew)
(BTE60 to BTE120)

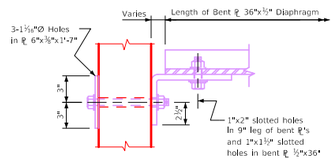


(7°31' to 30° Skew)
(BTE125 to BTE155)

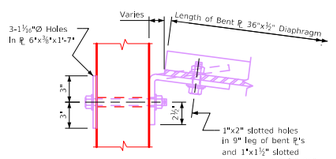
Intermediate Diaphragm
Bolt Hole Locations

Bulb Tee "E" Beam Intermediate Diaphragm Structural Steel			
One Beam Connection (Detail "F" and/or Detail "G")			Weight
		No. of Beam Connections	
Three - ⅞"Ø X 9½" H.S. Bolts with Nuts & Washers = 7.2 Lbs.		?	?
One Detail "G"	Two - Bent ℙ 9" x 6" x ½" x 1'-7" = 80.8 Lbs.	?	?
One Detail "F"	One - Backing ℙ 6" x ⅜" x 1'-7" = 12.1 Lbs.	?	?
	One - Bent ℙ 9" x 6" x ½" x 1'-7" = 40.4 Lbs.	?	?
One Diaphragm			
		Number of Diaphragms	
Ten - ⅞"Ø X 2¼" H.S. Bolts with Nuts & Washers = 9.7 Lbs.		?	?
		Length of Member	
One - Bent ℙ 36x⅜ = 61.3 Lbs./Ft.		?'-?"	?	?
Intermediate Diaphragm Structural Steel - Total (Lbs.)			?

Bulb Tee "E" Beam Intermediate Diaphragm Structural Steel		
One Beam Connection Information		
Beam Spacing	Diaphragm Length	Bent ℙ 36"x⅜" Weight (Lbs.)
6'-6½"	5'-4½"	328
7'-2½"	6'-0⅞"	370
8'-0½"	6'-10½"	419
8'-8½"	7'-6⅜"	461
9'-0½"	7'-10½"	481



Section C-C



Section C-C

Note to Designer: Beam examples are outside of border sheet

Note to Designer: Delete or Cross-Out non-applicable section C-C detail.

Note to Designer: Use when skew is 7°30' or less.

STRUCTURAL STEEL
Weight ? lbs.

NOTE: Structural Steel weight is included on the Summary Quantities Sheet.

Note to Designer: Chart outside of border contains diaphragm lengths

Notes:

All diaphragm materials, including bolts, nuts and washers shall be galvanized.

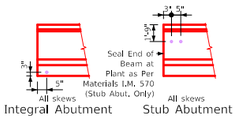
Shop drawings of the steel diaphragms showing layout and details of the diaphragms shall be submitted for approval.

All costs for furnishing and Installing steel Intermediate diaphragms shall be included in the price bid for Structural Steel.

The 1⅛"Ø holes for the ⅞"Ø H.S. bolts shall be cast into the web. Drilling is not allowed.

The ⅞"Ø H.S. bolts through the web shall have a thread length of 3" min. and 4" max. and shall meet the requirements of ASTM A449.

All bolts are to be tightened prior to placing bridge deck concrete with the following exception: Bolts in diaphragms located under longitudinal bridge deck construction joints shall not be tightened until stage two of the bridge deck has been placed.



Beam Coil Tie Locations

Steel Interm. Diaphragm - BTE Beam

7thk Sheet Issued 06-24, Sheet 1 of 2
Beams.dgn - 1036-1-BTE - 7thk Sheet Reissued 04-2024, Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Steel Intermediate Diaphragms for "BTE" Beam Bridges - Sheet 1 of 2	Standard Sheet 1036-1-BTE	COUNTY	PROJECT NUMBER	SHEET NUMBER	
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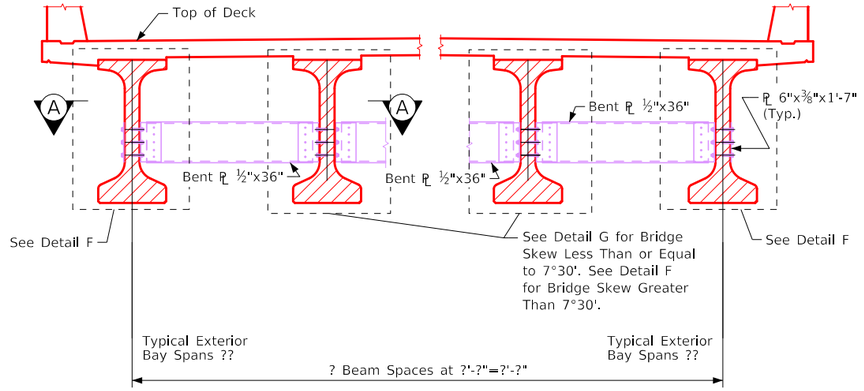
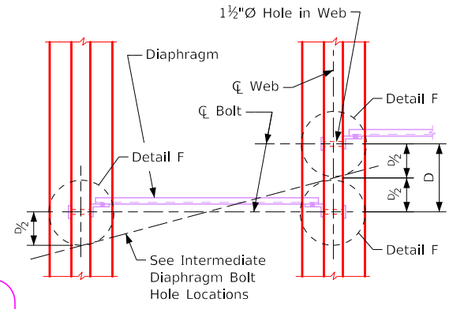
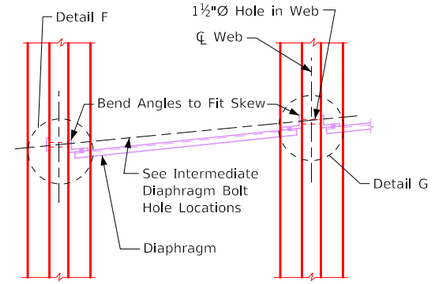


Section Showing Intermediate Diaphragms

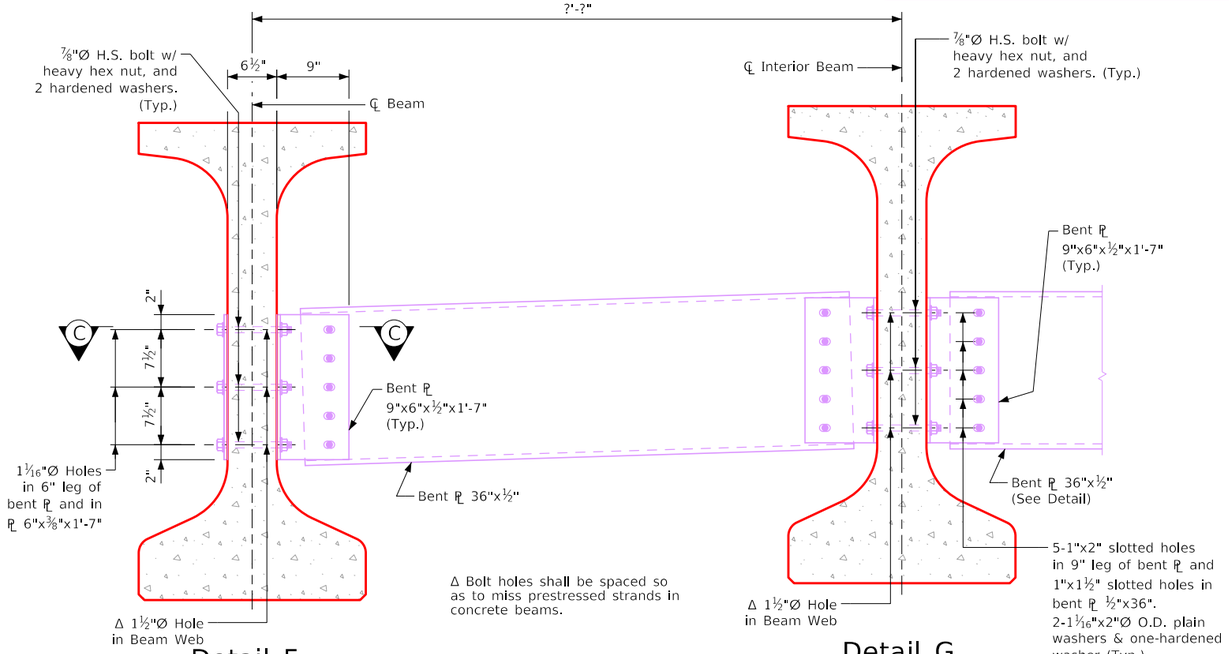


Part Section A-A
For Bridges Skewed Greater Than 7°30'



Part Section A-A
For Bridges Skewed Less Than or Equal to 7°30'

Note to Designer: Delete or Cross-Out non-applicable part section A-A detail.

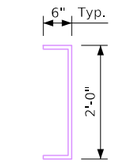


Δ Bolt holes shall be spaced so as to miss prestressed strands in concrete beams.

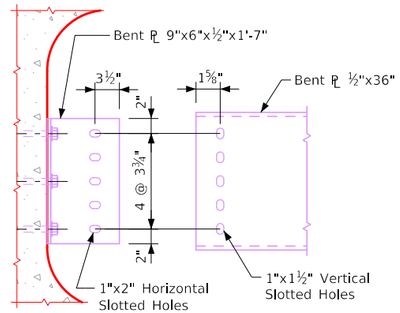
Detail F

Detail G

Section Showing Intermediate Diaphragms At Exterior Bay



Bent PL
36" x ½"



Slotted Hole Details

Steel Interm. Diaphragm - BTE Beam

This Sheet Issued 06-14. Sheet 2 of 2.
Beams.dgn - 1036-2-BTE - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Steel Intermediate Diaphragms for "BTE" Beam Bridges - Sheet 2 of 2	Standard Sheet 1036-2-BTE	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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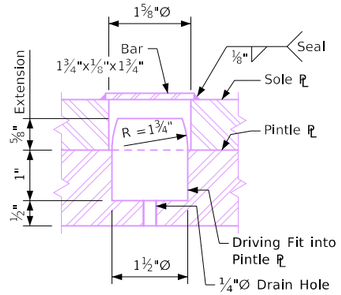
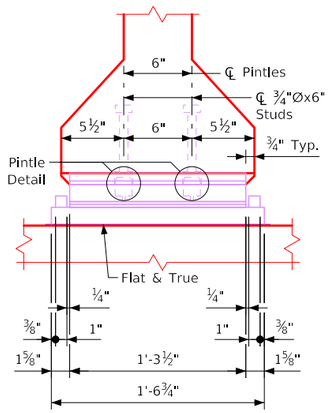
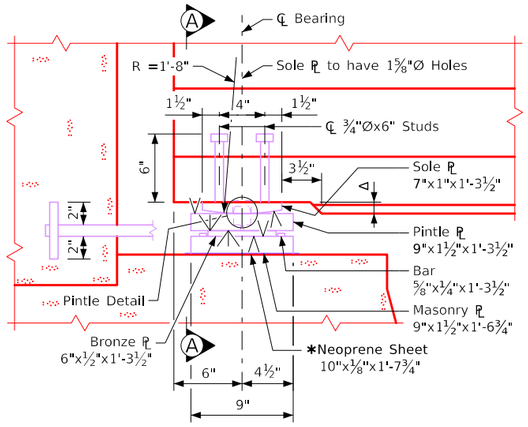


Pintle Detail



Section A-A



Part Elevation

Δ Notch Beam End to Sole ℄ Thickness Maximum 1"

Abutment Bearing Notes:

The sliding surface of the bronze ℄ shall be lubricated in accordance with Article 4190.03, of the Standard Specifications, and the bronze metal shall be cast bronze in accordance with Article 4190.03, of the Standard Specifications. Top edges of bronze ℄ shall be beveled ⅛".

Surfaces marked "V" shall be finished ANSI 250 and surfaces marked "⩛" shall be finished ANSI 125.

Masonry plates are to be set on a ⅛" neoprene sheet.

Pintle plates, masonry plates, and lubricated bronze plates are a part of the superstructure structural steel quantity. Unit price bid for structural steel shall include allowance for cost of bronze plates. Cost of neoprene sheets shall be considered incidental to the structural steel bid item. Cost of the anchored curved sole plates is to be included in the price bid for pretensioned prestressed concrete beams.

The sole plate, pintle, pintle plate and the masonry plate shall be galvanized. The pintle and pintle plate shall be assembled prior to galvanizing. The sole plate and masonry plate shall be fitted up and welded prior to galvanizing. The surface of pintle plate in contact with bronze bearing plate shall be smooth and free of projections due to galvanizing.

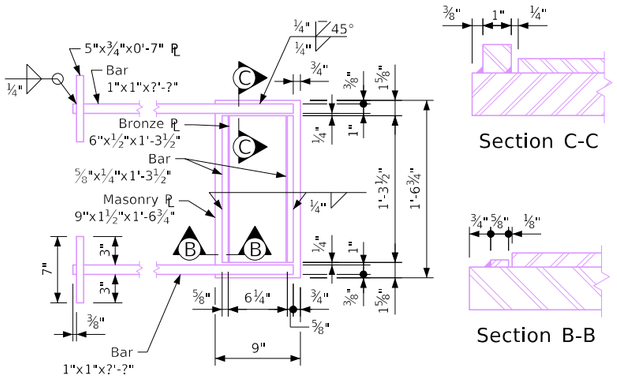
Sole plates are to be set in forms when beams are cast and the bottom of beams formed out as shown to exclude concrete.

Sole plates shall comply with one of the following specifications:

ASTM A514 Grade B
ASTM A709 Grade HPS 70W

Design Note:

1. Total vertical design load (DC+ DW + LL + IM) at service limit state = 177 k.
2. Bearings as designed will allow up to 1.5 inches of movement each way of centerline of bearing.



Plan of Masonry ℄ and Bronze ℄

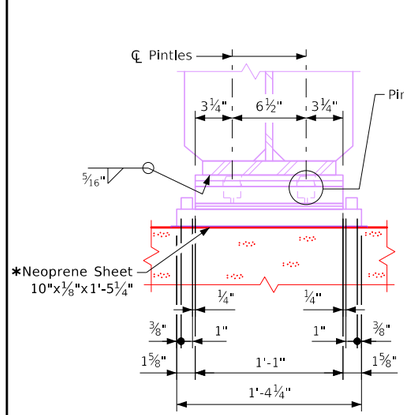
Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole ℄

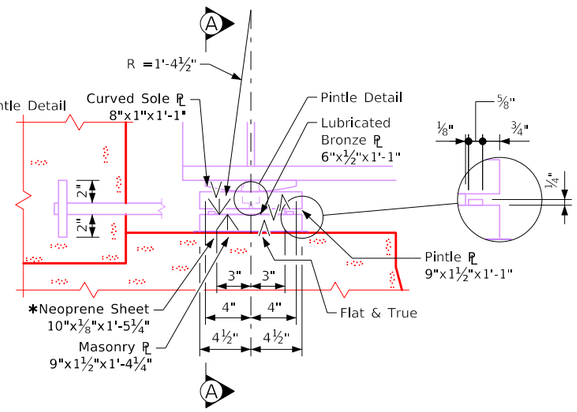
Note: Structural Steel weight is included on the Summary Quantities Sheet.

Pretensioned Prestressed Concrete Beam
Abutment Bearing Details (A & B Beams)
Masonry ℄ / Bronze Bearing Assembly

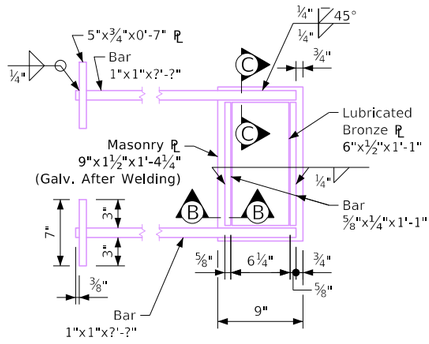
* The ⅛ inch neoprene sheets are to be 50, 60, or 70 durometer hardness and shall be 1 inch greater in length and width than the bottom surface of the masonry plates or steel bearings.



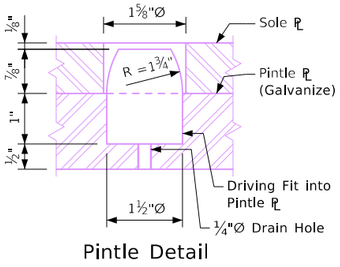
Section A-A



Part Elevation



Plan of Masonry ℄ and Bronze ℄



Pintle Detail

Steel Beam Abutment Bearing Details

Abutment Bearing Notes:

Surfaces marked "V" shall be finished ANSI 250 and surfaces marked "⩛" shall be finished ANSI 125.

The sliding surface of the bronze ℄ shall be lubricated in accordance with Article 4190.03, of the Standard Specifications, and the bronze metal shall be cast bronze in accordance with Article 4190.03, of the Standard Specifications. Top edges of bronze ℄ shall be beveled ⅛".

Masonry plates are to be set on a ⅛" neoprene sheet.

Sole plate, pintle plates, masonry plates, and lubricated bronze plates are a part of the superstructure structural steel quantity. Cost of neoprene sheets shall be considered incidental to the structural steel bid item. The Unit price bid for structural steel shall include allowance for cost of bronze plates.

The pintle plate and masonry plate shall be galvanized. The pintle and pintle plate shall be assembled prior to galvanizing. Welding shall be done before galvanizing.

Design Note:

1. Total vertical design load (DC+ DW + LL + IM) at service limit state = 153 k.
2. Bearings as designed will allow up to 1.5 inches of movement each way of centerline of bearing.

Masonry ℄ / Bronze Bearing Assembly

Structural Steel	
Weight	? lbs.

Includes Curved Sole ℄

Note: Structural Steel weight is included on the Summary Quantities Sheet.

Stub Abutment Bearing Details

Correction 05-14: Added Weight Table & Titles/Descriptions to Agree with Summary Quantities Sheet. Added Note Referring to Summary Quantities Sheet.
Issued 03-08.
Beams.dgn - 4541 - This Sheet Re-Issued 04-2024, Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Stub Abut. Bearing Details - A & B Beam PPCB Bridges / Steel Beam Bridges	Standard Sheet 4541	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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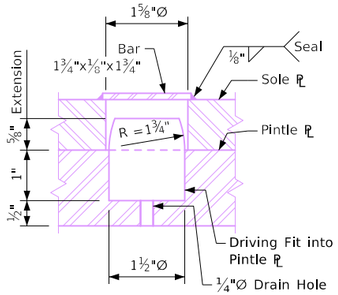
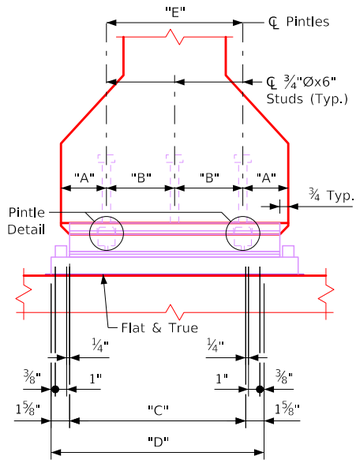
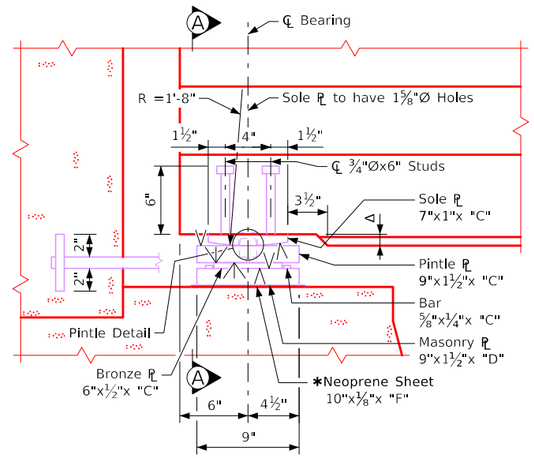


Pintle Detail



Section A-A



Part Elevation

Δ Notch Beam End to Sole PL Thickness Maximum 1"

Variable Dimensions		
Bearing Dimension	Beam Bottom Flange Width	
	1'-8"	1'-10"
"A"	4"	5"
"B"	6"	6"
"C"	1'-6½"	1'-8½"
"D"	1'-9¾"	1'-11¾"
"E"	1'-0"	1'-0"
"F"	1'-10¾"	2'-0¾"

Abutment Bearing Notes:

The sliding surface of the bronze PL shall be lubricated in accordance with Article 4190.03, of the Standard Specifications, and the bronze metal shall be cast bronze in accordance with Article 4190.03, of the Standard Specifications. Top edges of bronze PL shall be beveled ⅛".

Surfaces marked "V" shall be finished ANSI 250 and surfaces marked "▽" shall be finished ANSI 125.

Masonry plates are to be set on a ⅛" neoprene sheet.

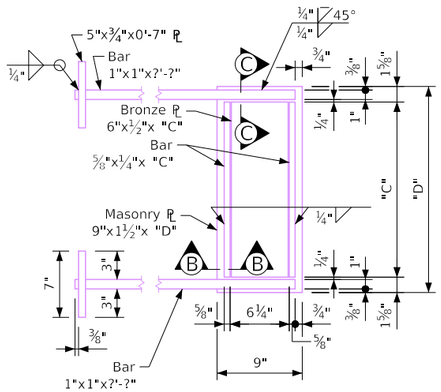
Pintle plates, masonry plates, and lubricated bronze plates are a part of the superstructure Structural Steel quantity. Unit price bid for Structural Steel shall include allowance for cost of bronze plates. Cost of neoprene sheets shall be considered incidental to the Structural Steel bid item. Cost of the anchored curved sole plates is to be included in the price bid for Pretensioned Prestressed Concrete Beams.

The sole plate, pintle, pintle plate and the masonry plate shall be galvanized. The sole plate and masonry plate shall be fitted up and welded prior to galvanizing. The pintle and pintle plate shall be assembled prior to galvanizing. The surface of pintle plate in contact with bronze bearing plate shall be smooth and free of projections due to galvanizing.

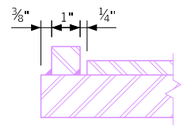
Sole plates are to be set in forms when beams are cast and the bottom of beams formed out as shown to exclude concrete.

Sole plates shall comply with one of the following specifications:

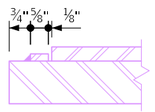
ASTM A514 Grade B
ASTM A709 Grade HPS 70W



Plan of Masonry PL and Bronze PL



Section C-C



Section B-B

Design Note:

1. Total vertical design load (DC+ DW + LL + IM) at service limit state = 205 k for 1'-8" flanges and 224 k for 1'-10" flanges.
2. Bearings as designed will allow up to 1.5 inches of movement each way of centerline of bearing.

Pretensioned Prestressed Concrete Beam Abutment Bearing Details
(C & D BeamS)

*The ⅛ inch neoprene sheets are to be 50, 60, or 70 durometer hardness and shall be 1 inch greater in length and width than the bottom surface of the masonry plates or steel bearings.

Masonry PL / Bronze Bearing Assembly

Structural Steel
Weight ? lbs.

Does Not Include Curved Sole PL

Note: Structural Steel weight is included on the Summary Quantities Sheet.

Stub Abutment Bearing Details

Correction 05-14: Added Weight Table & Titles/Descriptions to Agree with Summary Quantities Sheet. Added Note Referring to Summary Quantities Sheet.
Issued 03-08.
Beams.dgn - 4541A - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Stub Abut. Bearing Details - C & D PPCB Bridges	Standard Sheet 4541A	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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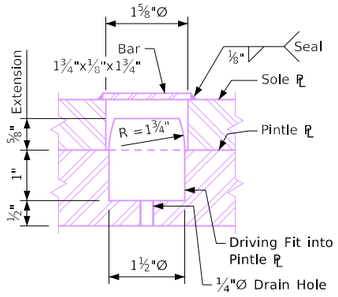
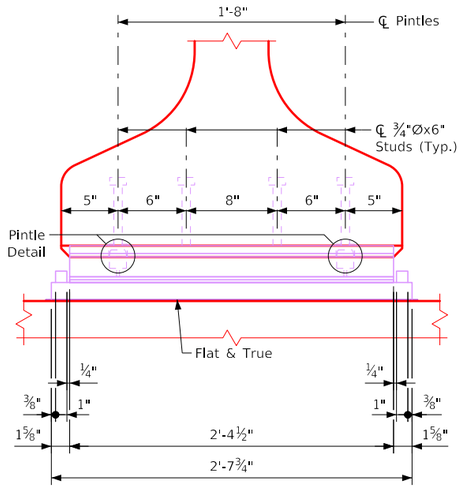
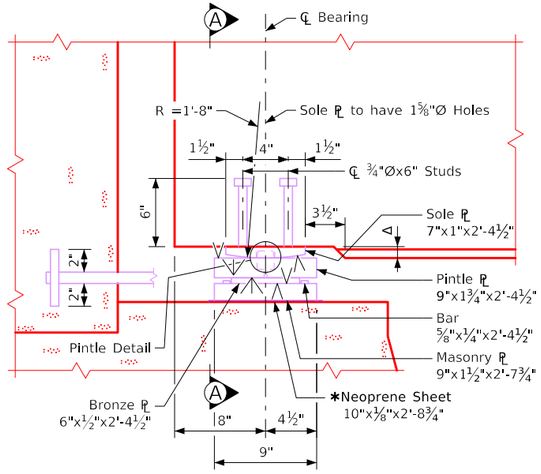


Pintle Detail



Section A-A



Part Elevation

Δ Notch Beam End to Sole PL Thickness Maximum 1"

Abutment Bearing Notes:

The sliding surface of the bronze PL shall be lubricated in accordance with Article 4190.03, of the Standard Specifications, and the bronze metal shall be cast bronze in accordance with Article 4190.03, of the Standard Specifications. Top edges of bronze PL shall be beveled ⅛".

Surfaces marked "V" shall be finished ANSI 250 and surfaces marked "V" shall be finished ANSI 125.

Masonry plates are to be set on a ⅛" neoprene sheet.

Pintle plates, masonry plates, and lubricated bronze plates are a part of the superstructure Structural Steel quantity. Unit price bid for Structural Steel shall include allowance for cost of bronze plates. Cost of neoprene sheets shall be considered incidental to the Structural Steel bid item. Cost of the anchored curved sole plates is to be included in the price bid for Pretensioned Prestressed Concrete Beams.

The sole plate, pintle, pintle plate and the masonry plate shall be galvanized. The sole plate and masonry plate shall be fitted up and welded prior to galvanizing. The pintle and pintle plate shall be assembled prior to galvanizing. The surface of pintle plate in contact with bronze bearing plate shall be smooth and free of projections due to galvanizing.

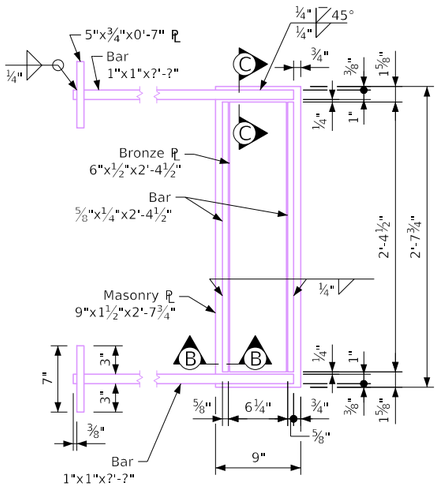
Sole plates are to be set in forms when beams are cast and the bottom of beams formed out as shown to exclude concrete.

Sole plates shall comply with one of the following specifications:

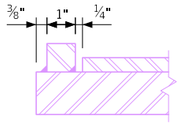
ASTM A514 Grade B
ASTM A709 Grade HPS 70W

Design Note:

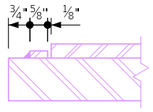
1. Total vertical design load (DC+ DW + LL + IM) at service limit state = 300 k.
2. Bearings as designed will allow up to 1.5 inches of movement each way of centerline of bearing.



Plan of Masonry PL and Bronze PL



Section C-C



Section B-B

Pretensioned Prestressed Concrete Beam Abutment Bearing Details
(BTB, BTC, BTD & BTE Beams)

*The ⅛ inch neoprene sheets are to be 50, 60, or 70 durometer hardness and shall be 1 inch greater in length and width than the bottom surface of the masonry plates or steel bearings.

Masonry PL / Bronze Bearing Assembly

Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole PL

Note: Structural Steel weight is included on the Summary Quantities Sheet.

Stub Abutment Bearing Details

Correction 05-14: Added Weight Table & Titles/Descriptions to Agree with Summary Quantities Sheet. Added Note Referring to Summary Quantities Sheet.
Issued 03-08.
Beams.dgn - 4541B - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Stub Abut. Bearing Details - BTB, BTC, BTD, BTE Beam PPCB Bridges	Standard Sheet 4541B	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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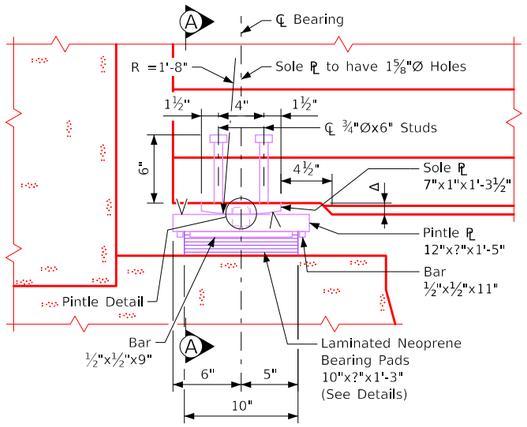
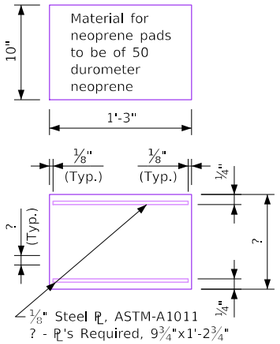
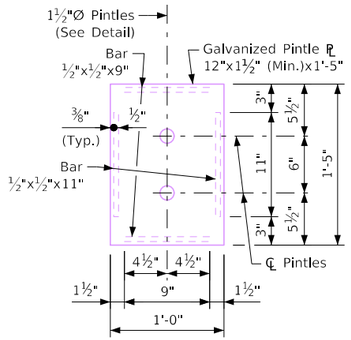


Part Elevation

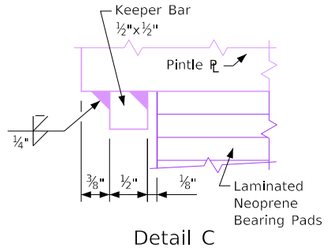
Δ Notch Beam End to Sole ℙ Thickness Maximum 1"



Laminated Neoprene Pad

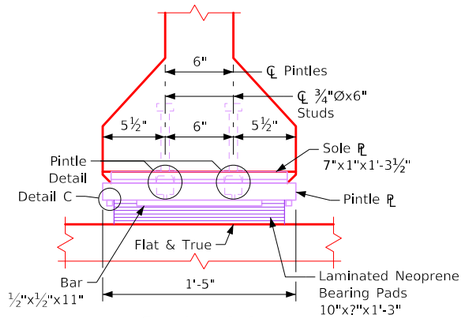


Plan OF
Pintle Plate

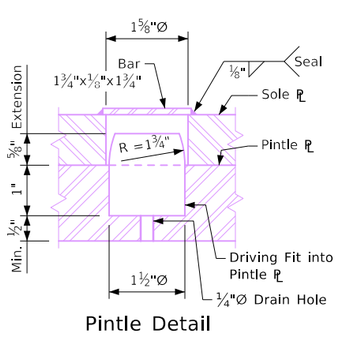


Detail C

Allowable Pintle ℙ Thickness	
Allow Thickness Inches	Maximum Service Vertical Load, k
1.5	83
2.0	147



Section A-A
Abutment Bearing (A & B Beams)



Pintle Detail

Laminated Neoprene Pad / Curved Sole ℙ Assembly

Abutment Bearing Notes:

Surfaces marked "V" shall be finished ANSI 250.

Pintle plates are a part of the superstructure Structural Steel quantity.

Cost of anchored curved sole plates is to be included in the price bid for Pretensioned Prestressed Concrete Beams.

Cost of neoprene bearing pads shall be considered incidental to the bid item for Pretensioned Prestressed Concrete Beams.

The sole plates, pintle, and pintle plates shall be galvanized. All welding shall be completed prior to galvanizing. The pintle and pintle plate shall be assembled prior to galvanizing. The surface of the pintle plate in contact with the laminated neoprene pads shall be free of projections due to the galvanizing.

Sole plates are to be set in forms when beams are cast and the bottom of beams formed out as shown to exclude concrete.

Sole plates shall comply with one of the following specifications:

- ASTM A514 Grade B
- ASTM A709 Grade HPS 70W

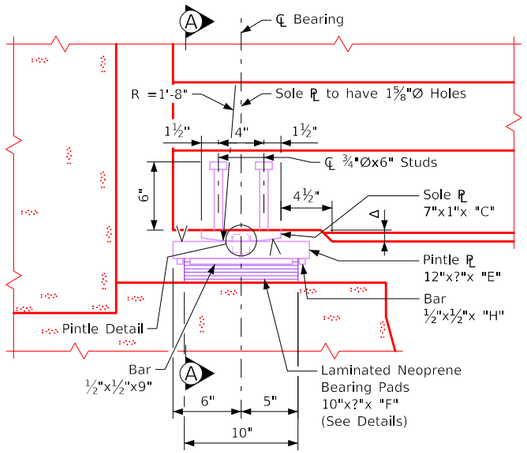
Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole ℙ

Note: Structural Steel weight is included on the Summary Quantities Sheet.

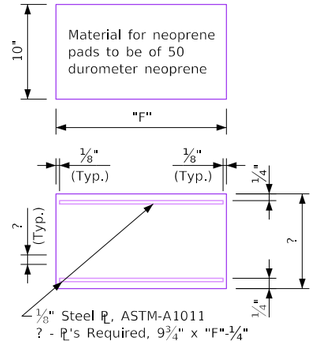
Stub Abutment Bearing Details

Correction 05-14: Added Weight Table & Titles/Descriptions to Agree with Summary Quantities Sheet. Added Note Referring to Summary Quantities Sheet.
Issued 03-08.
Beams.dgn - 4541C - This Sheet Re-Issued 04-2024, Sheet Format Update.

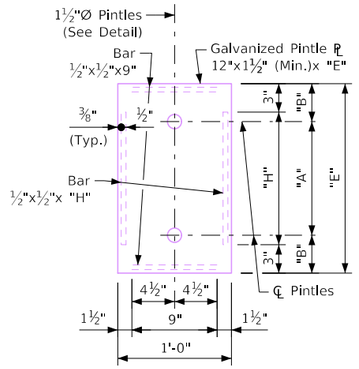


Part Elevation

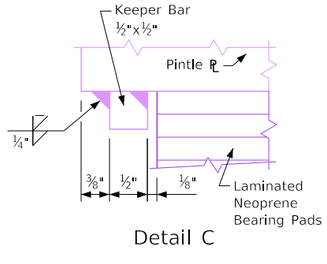
Δ Notch Beam End to Sole ℙ Thickness Maximum 1"



Laminated Neoprene Pad

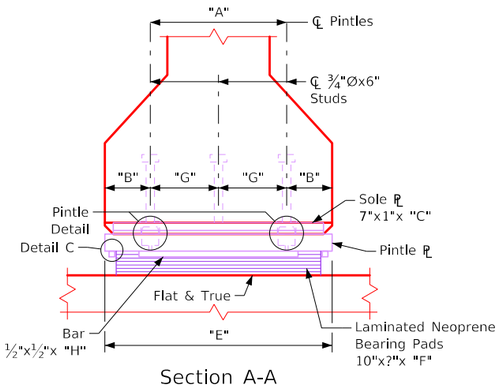


Plan OF
Pintle Plate

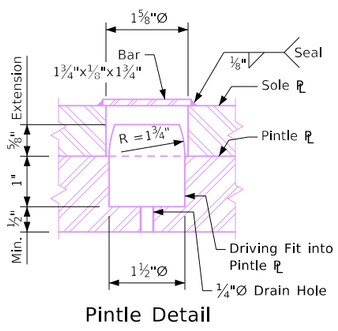


Detail C

Allowable Pintle ℙ Thickness		
Allow Thickness Inches	Maximum Service Vertical Load, k	
	1'-8" Flange	1'-10" Flange
1.5	101	112
2.0	179	200
2.5	280	315



Section A-A
Abutment Bearing (C & D Beams)



Pintle Detail

Variable Dimensions		
Bearing Dimension	Beam Bottom Flange Width	
	1'-8"	1'-10"
"A"	1'-0"	1'-0"
"B"	4"	5"
"C"	1'-6½"	1'-8½"
"D"	3¼"	4¼"
"E"	1'-8"	1'-10"
"F"	1'-6"	1'-8"
"G"	6"	6"
"H"	1'-2"	1'-4"

Laminated Neoprene Pad / Curved Sole ℙ Assembly

Abutment Bearing Notes:

Surfaces marked "V" shall be finished ANSI 250.

Pintle plates are a part of the superstructure Structural Steel quantity.

Cost of anchored curved sole plates is to be included in the price bid for Pretensioned Prestressed Concrete Beams.

Cost of neoprene bearing pads shall be considered incidental to the bid item for Pretensioned Prestressed Concrete Beams.

The sole plates, pintle, and pintle plates shall be galvanized. All welding shall be completed prior to galvanizing. The pintle and pintle plate shall be assembled prior to galvanizing. The surface of the pintle plate in contact with the laminated neoprene pads shall be free of projections due to the galvanizing.

Sole plates are to be set in forms when beams are cast and the bottom of beams formed out as shown to exclude concrete.

Sole plates shall comply with one of the following specifications:

ASTM A514 Grade B

ASTM A709 Grade HPS 70W

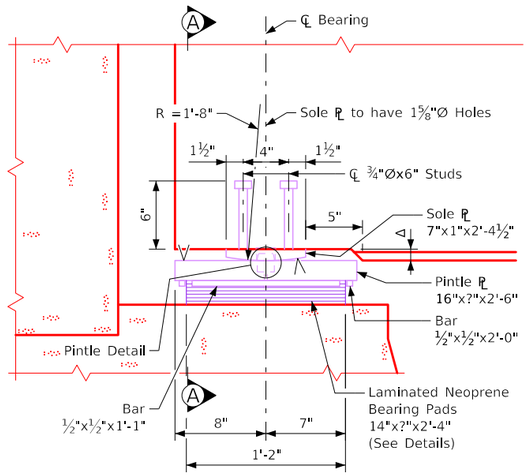
Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole ℙ

Note: Structural Steel weight is included on the Summary Quantities Sheet.

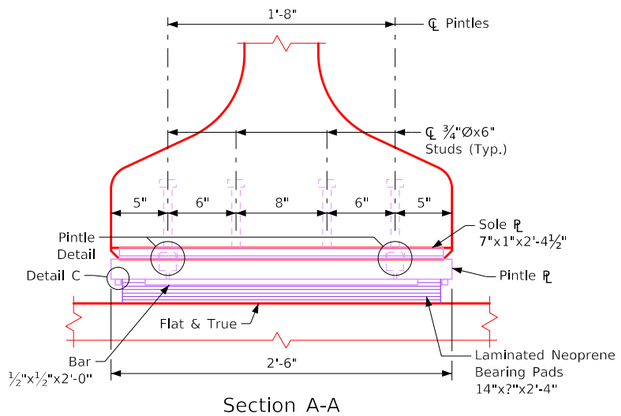
Stub Abutment Bearing Details

Correction 05-14: Added Weight Table & Titles/Descriptions to Agree with Summary Quantities Sheet. Added Note Referring to Summary Quantities Sheet.
Issued 03-08.
Beams.dgn - 4541D - This Sheet Re-issued 04-2024. Sheet Format Update.

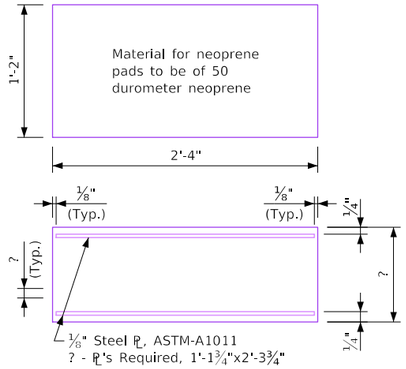


Part Elevation

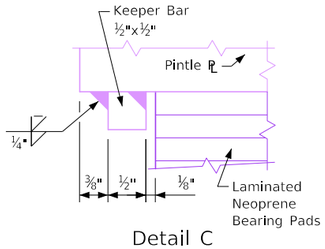
Δ Notch Beam End to Sole ℄ Thickness Maximum 1"



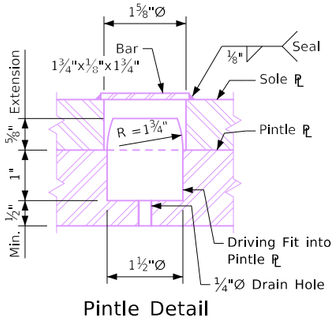
Section A-A
Abutment Bearing Bulb Tee Beams



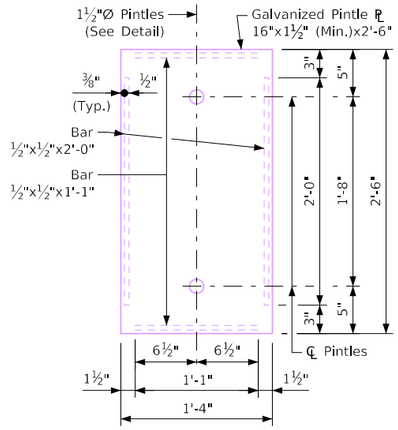
Laminated Neoprene Pad



Detail C



Pintle Detail



Plan OF
Pintle Plate

ALLOWABLE PINTLE ℄ THICKNESS	
Allow Thickness Inches	Maximum Service Vertical Load, k
1.5	114
2.0	203
2.5	318

Laminated Neoprene Pad / Curved Sole ℄ Assembly

Abutment Bearing Notes:

Surfaces marked "V" shall be finished ANSI 250.

Pintle plates are a part of the superstructure Structural Steel quantity.

Cost of anchored curved sole plates is to be included in the price bid for Pretensioned Prestressed Concrete Beams.

Cost of neoprene bearing pads shall be considered incidental to the bid item for Pretensioned Prestressed Concrete Beams.

The sole plates, pintle, and pintle plates shall be galvanized. All welding shall be completed prior to galvanizing. The pintle and pintle plate shall be assembled prior to galvanizing. The surface of the pintle plate in contact with the laminated neoprene pads shall be free of projections due to the galvanizing.

Sole plates are to be set in forms when beams are cast and the bottom of beams formed out as shown to exclude concrete.

Sole plates shall comply with one of the following specifications:

ASTM A514 Grade B
ASTM A709 Grade HPS 70W

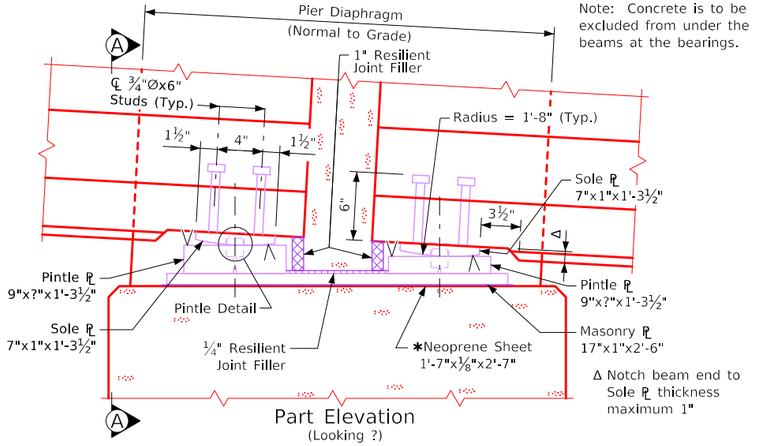
Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole ℄

Note: Structural Steel weight is included on the Summary Quantities Sheet.

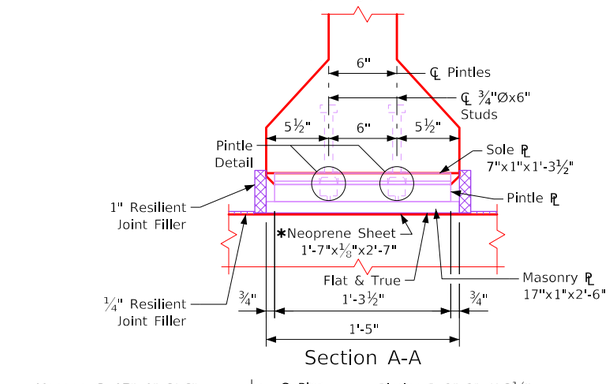
Stub Abutment Bearing Details

Correction 05-14: Added Weight Table & titles/descriptions to agree with Summary Quantities Sheet. Added note referring to Summary Quantities Sheet.
Issued 03-08.
Beams.dgn - 4541E - This Sheet Re-Issued 04-2024, Sheet Format Update.

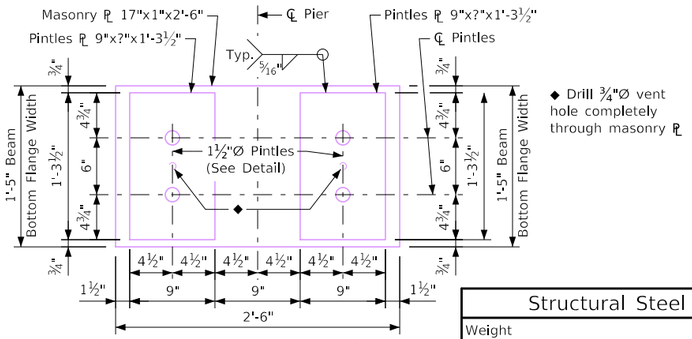


Note: Concrete is to be excluded from under the beams at the bearings.

Part Elevation
(Looking ?)



Section A-A



◆ Drill ¾"Ø vent hole completely through masonry ℄

Plan View of Masonry & Pintle ℄

Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole ℄

Fixed Pier Bearing Notes:

Surfaces marked "V" shall be finished ANSI 250.

Masonry plates are to be set on a ⅛" neoprene sheet.

Pintle plates, and masonry plates are a part of the superstructure Structural Steel quantity. Cost of neoprene sheets shall be considered incidental to the Structural Steel bid item.

Cost of anchored curved sole plates is to be included in the price bid for Pretensioned Prestressed Concrete Beams.

The sole plates, pintle, pintle plates, and masonry plates shall be galvanized. The pintle and pintle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The pintle and pintle plate shall be assembled prior to galvanizing. The surface of the pintle plate in contact with the masonry plate shall be free of projections due to galvanizing.

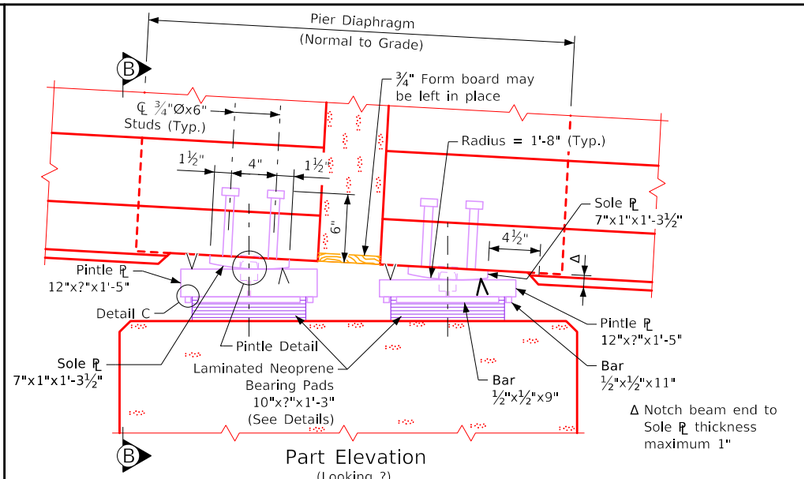
Sole plates are to be set in forms when beams are cast and the bottom of beams formed out as shown to exclude concrete.

Sole plates shall comply with one of the following specifications:

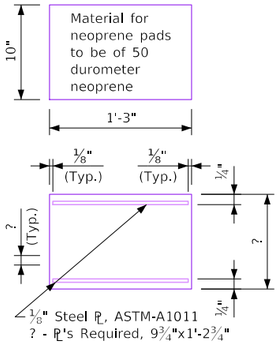
ASTM A514 Grade B
ASTM A709 Grade HPS 70W

Fixed Pier (A & B Beams)

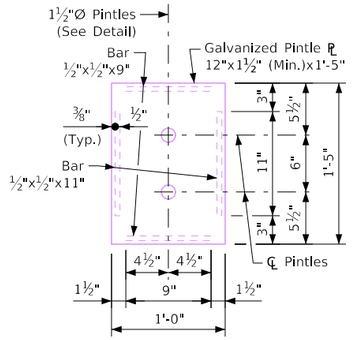
Masonry ℄/Curved Sole ℄ Assembly



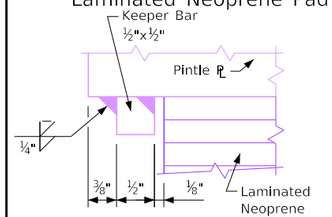
Part Elevation
(Looking ?)



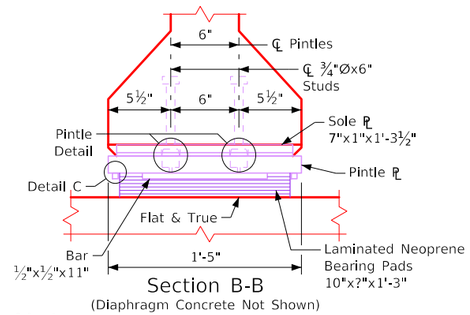
Laminated Neoprene Pad



Plan OF Pintle Plate



Detail C



Section B-B
(Diaphragm Concrete Not Shown)

Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole ℄

Expansion Pier Bearing Notes:

Surfaces marked "V" shall be finished ANSI 250.

Pintle plates are a part of the superstructure Structural Steel quantity.

Cost of anchored curved sole plates is to be included in the price bid for Pretensioned Prestressed Concrete Beams. Cost for neoprene pads shall be considered incidental to the Pretensioned Prestressed Concrete Beams bid item.

The sole plates, pintle, and pintle plates shall be galvanized. The pintle and pintle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The surface of the pintle plate in contact with the laminated neoprene pads shall be free of projections due to the galvanizing.

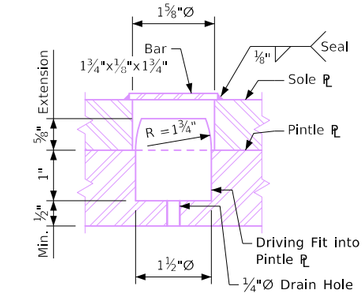
Sole plates are to be set in forms when beams are cast and the bottom of beams formed out as shown to exclude concrete.

Sole plates shall comply with one of the following specifications:

ASTM A514 Grade B
ASTM A709 Grade HPS 70W

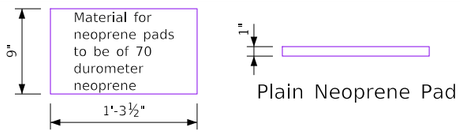
Expansion Pier (A & B Beams)

Laminated Neoprene Pad / Curved Sole ℄ Assembly



Pintle Detail

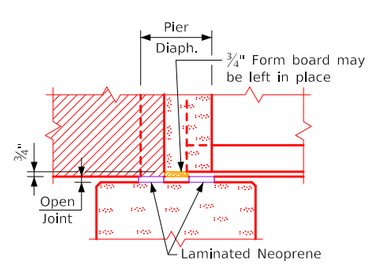
Allowable Pintle ℄ Thickness	
Allow Thickness Inches	Maximum Service Vertical Load, k
1.5	83
2.0	147



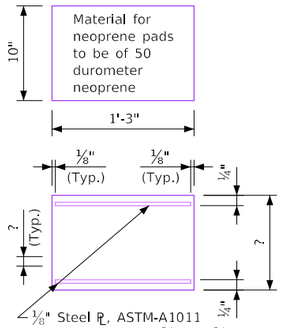
Plain Neoprene Pad

Note:
Cost of neoprene pads shall be included in the price bid for "Pretensioned Prestressed Concrete Beams".

Fixed Pier



Part Section Through Expansion Pier Diaphragm



Laminated Neoprene Pad

Note: Cost of neoprene pads shall be included in the price bid for "Pretensioned Prestressed Concrete Beams".

Expansion Pier

* The ⅛ inch neoprene sheets are to be 50, 60, or 70 durometer hardness and shall be 1 inch greater in length than the bottom surface of the masonry plates or steel bearings.

Note: Structural Steel weight is included on the Summary Quantities Sheet.

Pier Bearing Details

Correction 05-14: Added Weight Table & Titles/Descriptions to Agree with Summary Quantities Sheet. Added Note Referring to Summary Quantities Sheet.
Issued 03-08.
Beams.dgn - 4541F - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	A & B Beam PPC Bridges - Pier Bearing Details	Standard Sheet 4541F	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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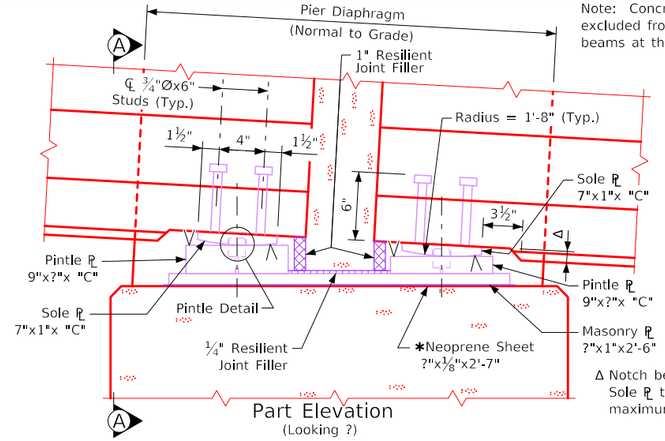
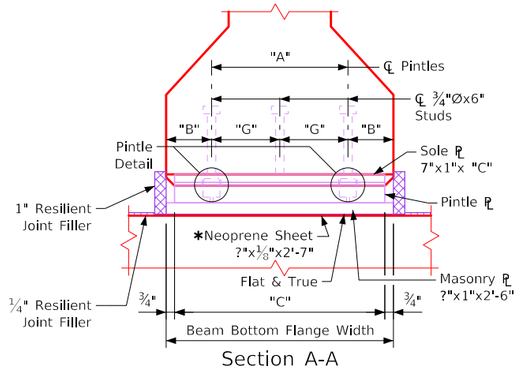
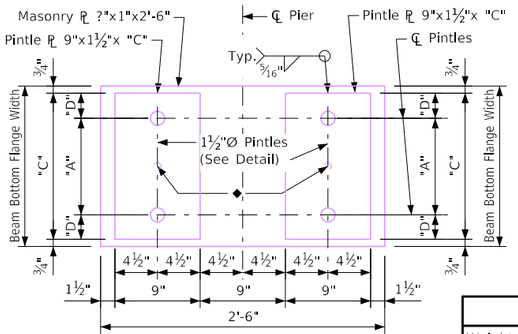


Note: Concrete is to be excluded from under the beams at the bearings.

Part Elevation
(Looking ?)



Section A-A



◆ Drill ¾"Ø vent hole completely through masonry ℄

Plan View Of Masonry & Pintle ℄

Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole ℄

Fixed Pier Bearing Notes:

Surfaces marked "V" shall be finished ANSI 250.

Masonry plates are to be set on a ⅛" neoprene sheet.

Pintle plates, and masonry plates are a part of the superstructure Structural Steel quantity. Cost of neoprene sheets shall be considered incidental to the Structural Steel bid item.

Cost of anchored curved sole plates is to be included in the price bid for Pretensioned Prestressed Concrete Beams.

The sole plates, pintle, pintle plates, and masonry plates shall be galvanized. The pintle and pintle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The surface of the pintle plate in contact with the masonry plate shall be free of projections due to galvanizing.

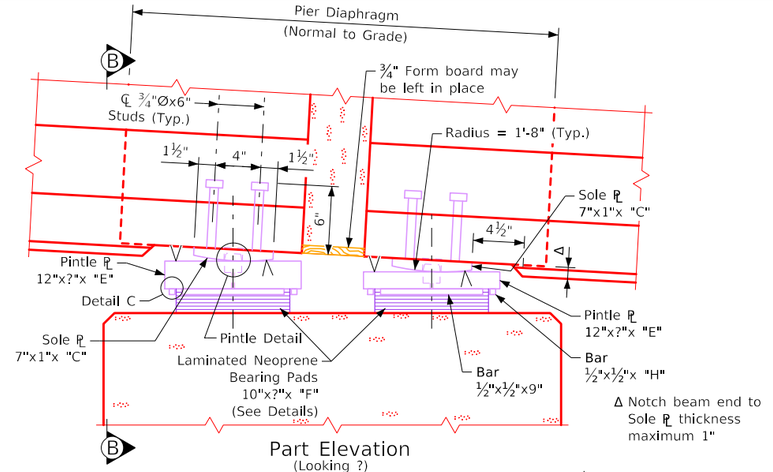
Sole plates are to be set in forms when beams are cast and the bottom of beams formed out as shown to exclude concrete.

Sole plates shall comply with one of the following specifications:

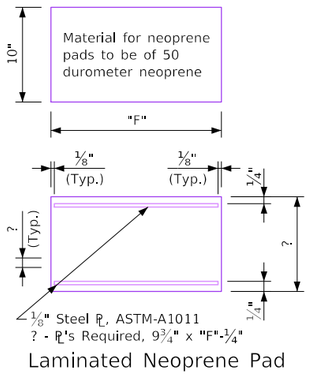
ASTM A514 Grade B
ASTM A709 Grade HPS 70W

Fixed Pier (C & D Beams)

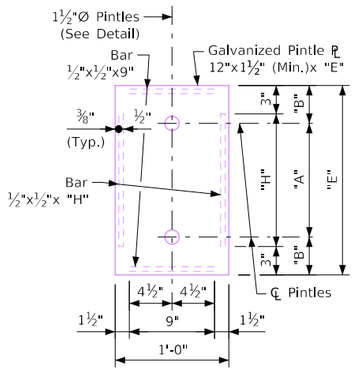
Masonry ℄ / Curved Sole ℄ Assembly



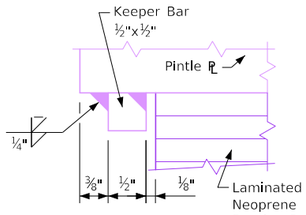
Part Elevation
(Looking ?)



Laminated Neoprene Pad



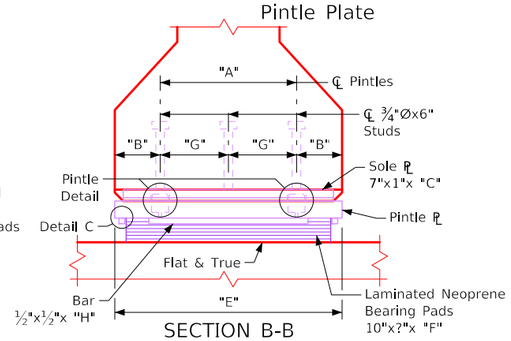
Plan OF Pintle Plate



Detail C

Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole ℄



SECTION B-B
(Diaphragm Concrete Not Shown)

Expansion Pier Bearing Notes:

Surfaces marked "V" shall be finished ANSI 250.

Pintle plates are a part of the superstructure Structural Steel quantity.

Cost of anchored curved sole plates is to be included in the price bid for Pretensioned Prestressed Concrete Beams. Cost for neoprene pads shall be considered incidental to the Pretensioned Prestressed Concrete Beams bid item.

The sole plates, pintle, and pintle plates shall be galvanized. The pintle and pintle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The surface of the pintle plate in contact with the laminated neoprene pads shall be free of projections due to the galvanizing.

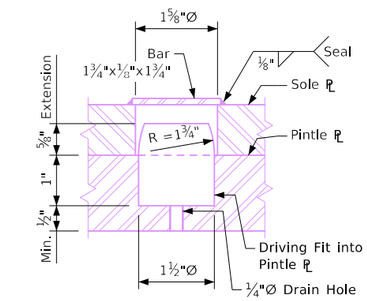
Sole plates are to be set in forms when beams are cast and the bottom of beams formed out as shown to exclude concrete.

Sole plates shall comply with one of the following specifications:

ASTM A514 Grade B
ASTM A709 Grade HPS 70W

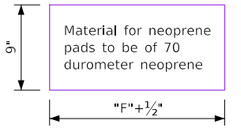
Expansion Pier (C & D Beams)

Laminated Neoprene Pad / Curved Sole ℄ Assembly



Pintle Detail

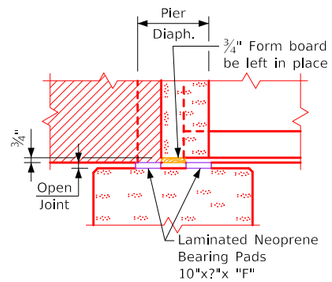
Variable Dimensions		
Bearing Dimension	Beam Bottom Flange Width	
	1'-8"	1'-10"
"A"	1'-0"	1'-0"
"B"	4"	5"
"C"	1'-6½"	1'-8½"
"D"	3¼"	4¼"
"E"	1'-8"	1'-10"
"F"	1'-6"	1'-8"
"G"	6"	6"
"H"	1'-2"	1'-4"



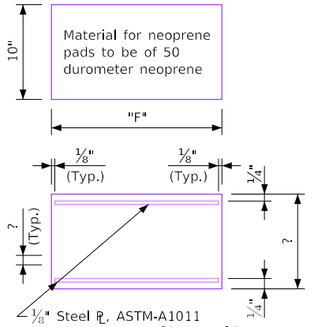
Plain Neoprene Pad

Note:
Cost of neoprene pads shall be included in the price bid for "Pretensioned Prestressed Concrete Beams".

Fixed Pier



Part Section Through Expansion Pier Diaphragm



Laminated Neoprene Pad

Note: Cost of neoprene pads shall be included in the price bid for "Pretensioned Prestressed Concrete Beams".

Expansion Pier

*The ⅛ inch neoprene sheets are to be 50, 60, or 70 durometer hardness and shall be 1 inch greater in length than the bottom surface of the masonry plates or steel bearings.

Note: Structural Steel weight is included on the Summary Quantities Sheet.

Allowable Pintle ℄ Thickness		
Allow Thickness Inches	Maximum Service Vertical Load, k	
	1'-8" Flange	1'-10" Flange
1.5	101	112
2.0	179	200
2.5	280	300

Pier Bearing Details

Correction 05-14: Added Weight Table & Titles/Descriptions to Agree with Summary Quantities Sheet. Added Note Referring to Summary Quantities Sheet.
Issued 03-08.
Beams.dgn - 4541G - This Sheet Re-Issued 04-2024, Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	C & D Beam PPC Bridges - Pier Bearing Details	Standard Sheet 4541G	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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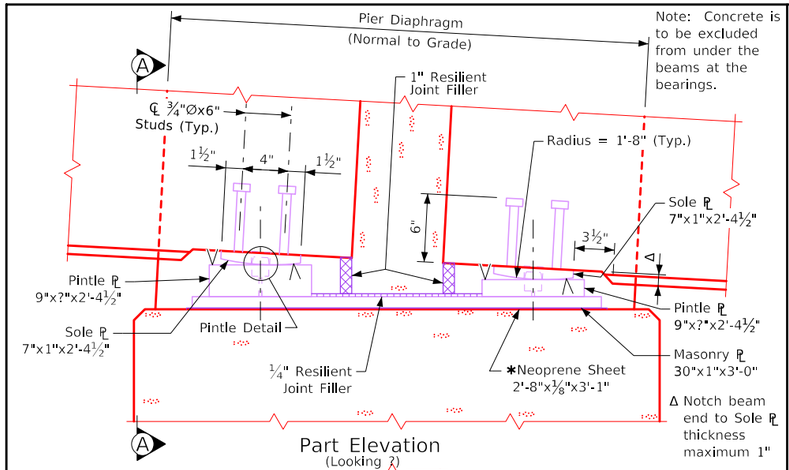
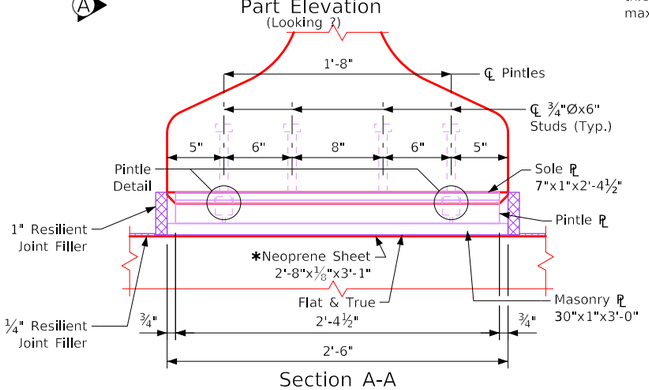
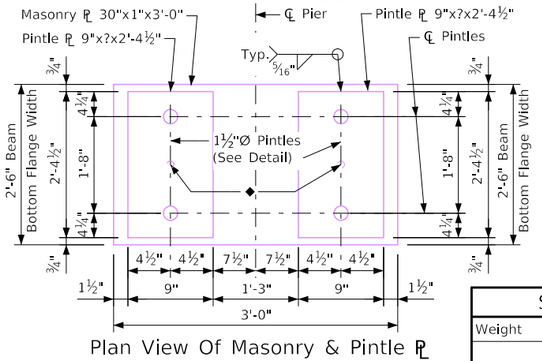


Part Elevation
(Looking ?)



Section A-A



◆ Drill ¾"Ø vent hole completely through masonry ℙ

Plan View Of Masonry & Pintle ℙ

Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole ℙ

Fixed Pier Bearing Notes:

Surfaces marked "V" shall be finished ANSI 250.

Masonry plates are to be set on a ⅛" neoprene sheet.

Pintle plates, and masonry plates are a part of the superstructure Structural Steel quantity. Cost of neoprene sheets shall be considered incidental to the Structural Steel bid item.

Cost of anchored curved sole plates is to be included in the price bid for Pretensioned Prestressed Concrete Beams.

The sole plates, pintle, pintle plates, and masonry plates shall be galvanized. The pintle and pintle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The surface of the pintle plate in contact with the masonry plate shall be free of projections due to galvanizing.

Sole plates are to be set in forms when beams are cast and the bottom of beams formed out as shown to exclude concrete.

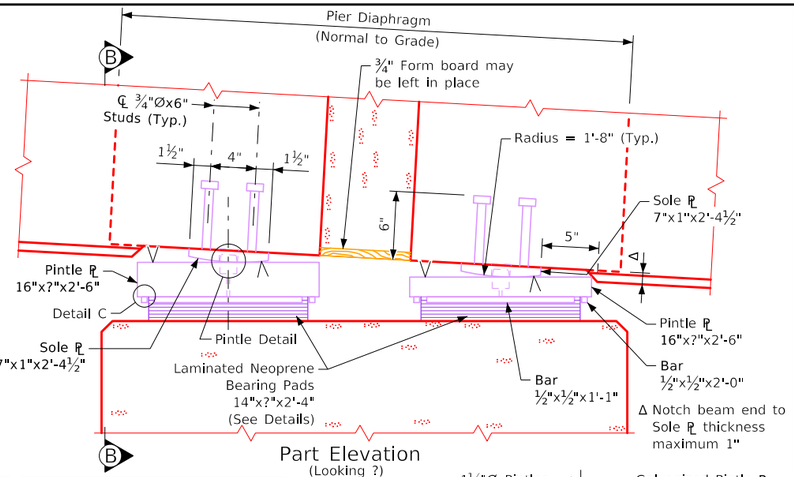
Sole plates shall comply with one of the following specifications:

ASTM A514 Grade B

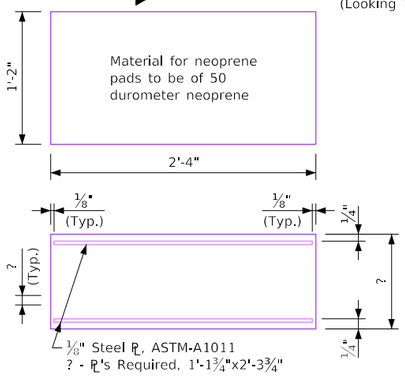
ASTM A709 Grade HPS 70W

Fixed Pier

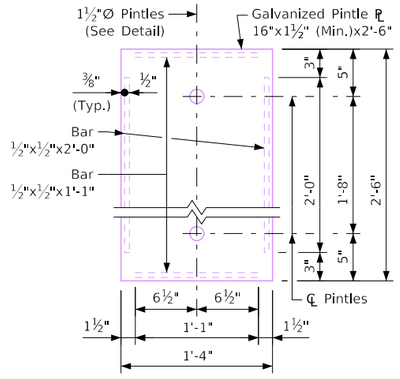
Masonry ℙ / Curved Sole ℙ Assembly



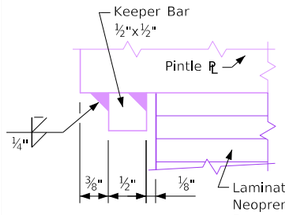
Part Elevation
(Looking ?)



Laminated Neoprene Pad



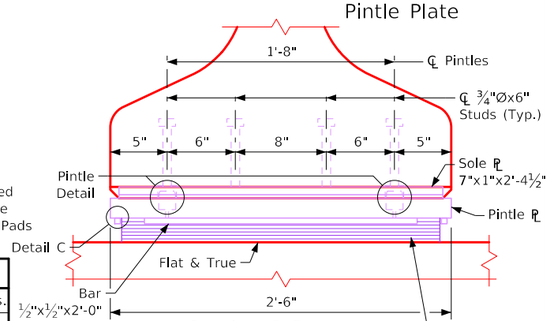
Plan Of Pintle Plate



Detail C

Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole ℙ



Section B-B
(Diaphragm Concrete Not Shown)

Expansion Pier Bearing Notes:

Surfaces marked "V" shall be finished ANSI 250.

Pintle plates are a part of the superstructure Structural Steel quantity.

Cost of anchored curved sole plates is to be included in the price bid for Pretensioned Prestressed Concrete Beams. Cost for neoprene pads shall be considered incidental to the Pretensioned Prestressed Concrete Beams bid item.

The sole plates, pintle, and pintle plates shall be galvanized. The pintle and pintle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The surface of the pintle plate in contact with the laminated neoprene pads shall be free of projections due to the galvanizing.

Sole plates are to be set in forms when beams are cast and the bottom of beams formed out as shown to exclude concrete.

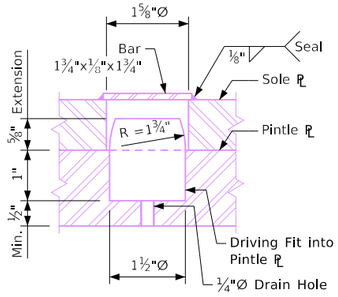
Sole plates shall comply with one of the following specifications:

ASTM A514 Grade B

ASTM A709 Grade HPS 70W

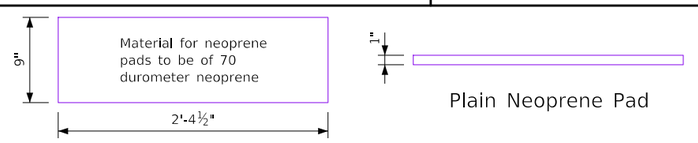
Expansion Pier

Laminated Neoprene Pad / Curved Sole ℙ Assembly



Pintle Detail

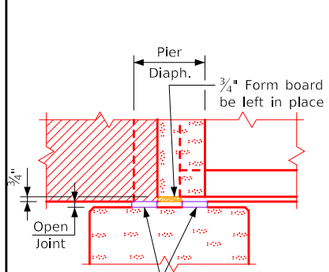
Allowable Pintle ℙ Thickness	
Allow Thickness Inches	Maximum Service Vertical Load, k
1.5	114
2.0	203
2.5	318



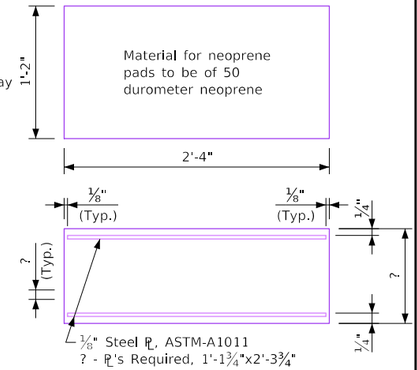
Plain Neoprene Pad

Note:
Cost of neoprene pads shall be included in the price bid for "Pretensioned Prestressed Concrete Beams".

Fixed Pier



Part Section Through Expansion Pier Diaphragm



Laminated Neoprene Pad

Note:
Cost of neoprene pads shall be included in the price bid for "Pretensioned Prestressed Concrete Beams".

Expansion Pier

*The ⅛ inch neoprene sheets are to be 50, 60, or 70 durometer hardness and shall be 1 inch greater in length than the bottom surface of the masonry plates or steel bearings.

Note: Structural Steel weight is included on the Summary Quantities Sheet.

Pier Bearing Details

FILE NO.	ENGLISH	DESIGN TEAM	BTB, BTC, BTD, BTE Beam PPC Bridges - Pier Bearing Details	Standard Sheet 4541H	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Correction 05-14: Added Weight Table & Titles/Descriptions to Agree with Summary Quantities Sheet. Added Note Referring to Summary Quantities Sheet.
Issued 03-08.
Beams.dgn - 4541H - This Sheet Re-Issued 04-2024, Sheet Format Update.

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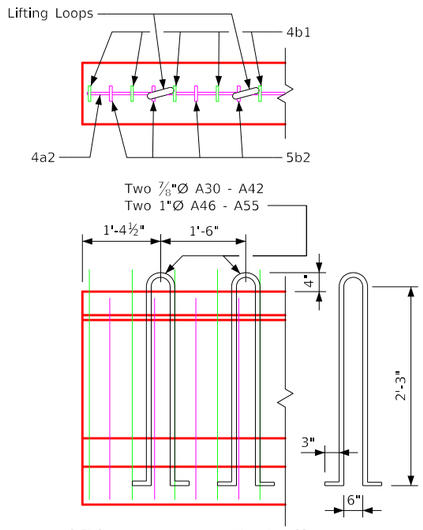


Lifting Loop Detail

Alternate types may be substituted with the approval of the Engineer. Lifting loops are to be structural grade.

Lifting Loop And Overhang Table

Beams	Lifting Loops Each End	Beam Overhang (ft.)
A30-A42	2 - ⅞"∅	*
A46-A55	2 - 1"∅	*

* In accordance with Article 2407.03, K of the Standard Specifications.

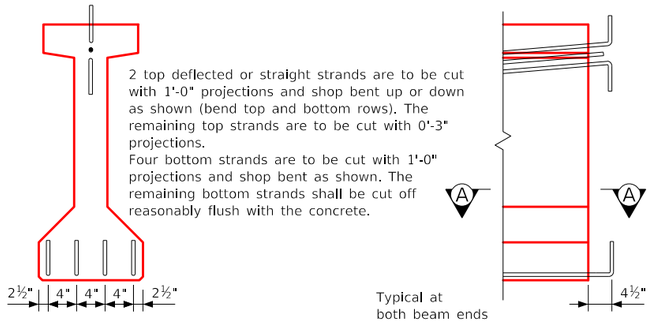
Coil Tie Detail

Number and exact location of coil ties to be as detailed on specific bridge design.

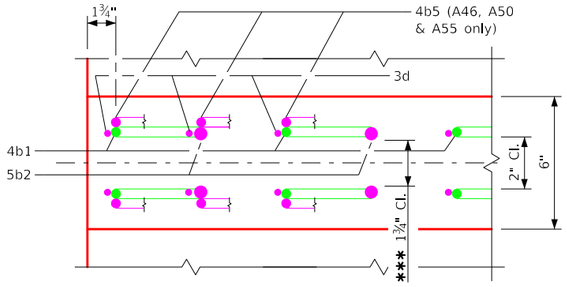
ΔΔ 4b1 bars to be epoxy coated.

** Where deflecting strands interfere with placement, some in-place bending may be necessary.

Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.



Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms



Section A-A Showing Placement of Stirrups Near End of Beam

*** 1¾" Cl. for 5b2 bars at A46, A50, and A55 beam ends only.

A Beam Data

A Beam	Span Length ℄-℄ Bearing	Overall Beam Length (L)	Concrete Strength f'ci (ksi.)	Concrete Strength f'c (ksi.)	Strand Size Dia. (in.)	Number of Strands Straight	Number of Strands Deflected	Total Initial Prestress (kips) ③	Hold Down Force (kips)	Camber (in.) ④ At Release	Camber (in.) ④ After Losses	Deflection (in.) Δ_D Immediate ① (elastic) Δ_I Steel Diaphragm	Deflection (in.) Δ_D Time ② (plastic) Δ_T Steel Diaphragm	Permissible Maximum Spacing HL-93 Loading Steel Diaphragm	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight-lb.)
A30	30'-0"	31'-0"	4.5	5.0	0.60"	8	—	340	—	0.13"	0.24"	0.11"	0.03"	7'-6"	5.0	2.48	493
A34	34'-2"	35'-2"	4.5	5.0	0.60"	9	—	383	—	0.21"	0.39"	0.19"	0.05"	7'-6"	5.7	2.82	547
A38	38'-4"	39'-4"	4.5	5.0	0.60"	10	—	426	—	0.30"	0.55"	0.30"	0.07"	7'-6"	6.4	3.15	622
A42	42'-6"	43'-6"	4.5	5.0	0.60"	7	2	383	9.3	0.59"	1.09"	0.44"	0.11"	7'-6"	7.1	3.49	716
A46	46'-8"	47'-8"	6.0	7.0	0.60"	8	2	426	8.5	0.60"	1.10"	0.54"	0.14"	7'-6"	7.7	3.82	836
A50	50'-10"	51'-10"	6.0	7.0	0.60"	9	3	511	10.7	0.88"	1.62"	0.75"	0.19"	7'-6"	8.4	4.15	846
A55	55'-0"	56'-0"	6.0	7.0	0.60"	10	3	553	10.8	1.17"	2.17"	1.03"	0.26"	7'-6"	9.1	4.49	974

① Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.0") weight of:
0.81 kips/ft. for 7'-6" beam spacing and one steel diaphragm (0.285 kips) at ℄ of span. For different deck and diaphragm weights, deflections will be directly proportional.

② Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.
Total beam deflections at ℄ of span, Δ_D , due to weight of deck and diaphragms for detailing purpose:
(A) $\Delta_D=\Delta_I + \Delta_T$ for simple span.
(B) $\Delta_D=\Delta_I + \frac{3}{4}\Delta_T$ for end spans of continuous bridge.
(C) $\Delta_D=\Delta_I + \frac{1}{2}\Delta_T$ for interior spans of continuous bridge.

③ Total initial prestress is based on 72.6% f's. f's = 270 ksi. and As = 0.217 sq. in.

④ Calculated design cambers are based on multipliers developed from research in Iowa.

Design Stresses:

Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications, Series of 2017.
Reinforcing steel in accordance with Section 5, Grade 60.
Concrete in accordance with Section 5.
Prestressing steel in accordance with Section 5, Grade 270.

Specifications:

Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications.
Design: AASHTO LRFD, Series of 2017, with minor modifications.

Beam Notes:

These beams are designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.

All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.

Hold down points for deflected strands may be moved toward ends of beam a distance of 0.05 L maximum at producer's option.

All prestressing strands except lifting loop strands shall be 0.60 in nominal diameter (nominal steel area = 0.217 in.²) and conform to ASTM A416 Grade 270 Low Relaxation Strands. Minimum strand breaking strength shall be 58.6 kips.

Tops of beams are to be struck off level and finished as per Materials I.M.570.

Bearings shall be as detailed on other design sheets.

Beams to be used in bridges made continuous by the poured in place deck, are to be at least 28 days old before the deck is placed unless a shorter curing time is approved by the Bridge Engineer.

The portions of the prestressed beams that are to be embedded in the abutment and pier diaphragms shall be roughened for a distance of 10" from the beam end by sanddblasting or other approved methods to provide suitable bond between the beam and the diaphragm in accordance with Article 2403.03, I, of the Standard Specifications.

All beams are to be increased in length to compensate for elastic shortening, creep and shrinkage.

For transporting, the allowable overhang is shown in the "Lifting Loop and Overhang Table".

If the precast panel option is allowed and used for bridge deck formation, the beam stirrups will need to be extended and top flange beam finish shall be modified as per details on the Precast Deck Panel Sheet.

Minimum concrete f'c (at 28 days) and minimum f'ci at release are located in the A Beam Data Table above.

0.6" diameter strands stressed to not more than 5,000 lbs. each may be used in lieu of the a bars which run the full length of the beam in the top flange.

Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet.

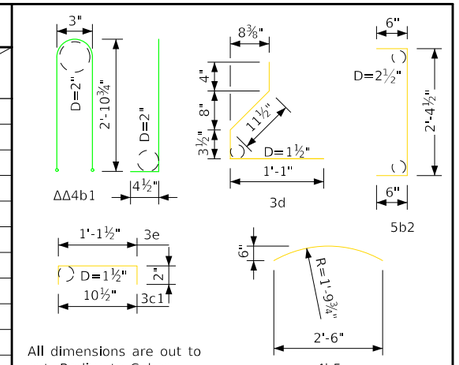
If sole plate is required for bearing, sole plate is to be set in forms when beam is cast and formed out below to exclude concrete as detailed on the Bearing Sheet.

If stub abutments are used, all strands at the ends of beams at stub abutments shall be cut off reasonably flush with the concrete.

When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with Materials I.M. 570 (Fabricator Application) and I.M. 491.12 (Contractor Application).

Reinforcing Bar List

	Beam / Span		A30 30'-0" No.	A30 30'-0" Length	A34 34'-2" No.	A34 34'-2" Length	A38 38'-4" No.	A38 38'-4" Length	A42 42'-6" No.	A42 42'-6" Length	A46 46'-8" No.	A46 46'-8" Length	A50 50'-10" No.	A50 50'-10" Length	A55 55'-0" No.	A55 55'-0" Length
	Bar	Shape														
	5a1		2	30'-9"	2	34'-11"	2	39'-1"	4	23'-4"	4	25'-5"	4	27'-6"	4	29'-7"
	4a2		2	3'-3"	2	3'-3"	2	3'-3"	2	3'-3"	2	3'-3"	2	3'-3"	2	3'-3"
ΔΔ	4b1		28	6'-8"	32	6'-8"	36	6'-8"	42	6'-8"	46	6'-8"	49	6'-8"	53	6'-8"
	5b2		48	3'-5"	52	3'-5"	60	3'-5"	68	3'-5"	80	3'-5"	76	3'-5"	96	3'-5"
	4b5		—	—	—	—	—	—	—	—	16	2'-9"	16	2'-9"	16	2'-9"
	3c1		28	1'-3"	32	1'-3"	36	1'-3"	42	1'-3"	46	1'-3"	49	1'-3"	53	1'-3"
**	3d		104	2'-8"	116	2'-8"	132	2'-8"	152	2'-8"	172	2'-8"	174	2'-8"	202	2'-8"
	3e		20	1'-6"	20	1'-6"	22	1'-6"	22	1'-6"	22	1'-6"	20	1'-6"	20	1'-6"



All dimensions are out to out. Radius to ℄ bar.
D = Pin diameter.

A Beam - Data Details

FILE NO.	ENGLISH	DESIGN TEAM	A Beams - LRFD Design	Standard Sheet 4600	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Revised 08-12: I.M. Reference Note for Sealing Beam Ends Distinguishes Between the Fabricator and Contractor.
Re-Issued 09-06.
Beams.dgn - 4600 - This Sheet Re-Issued 04-2024, Sheet Format Update.

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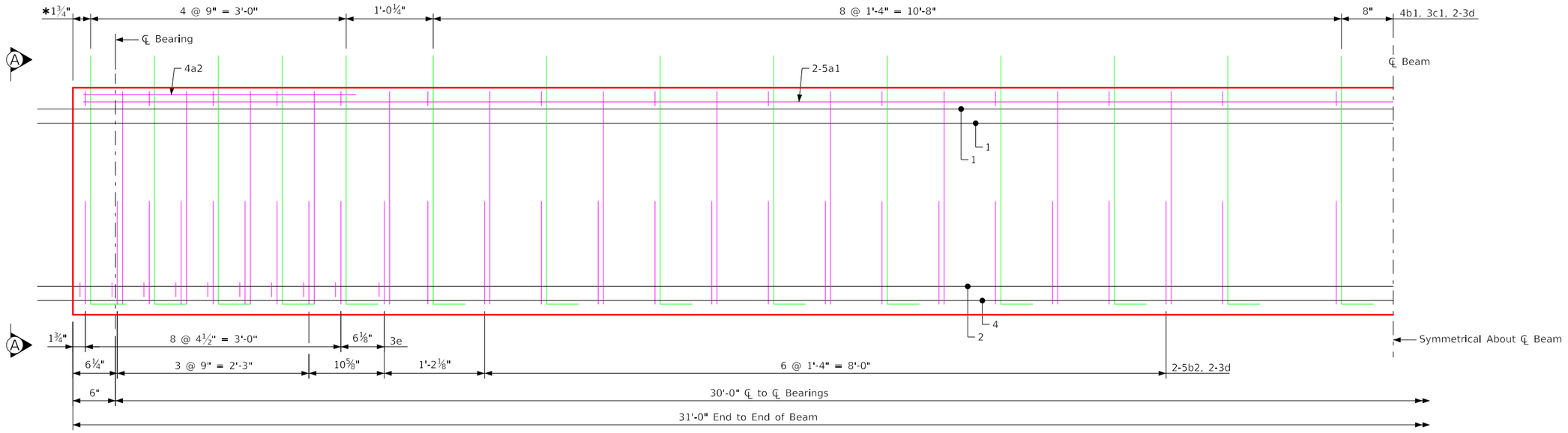
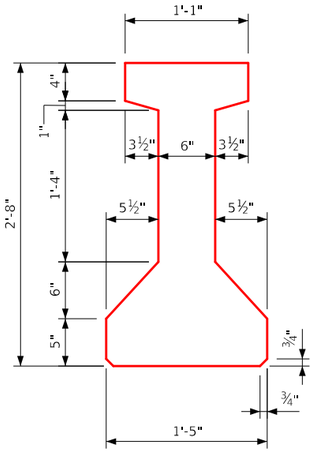


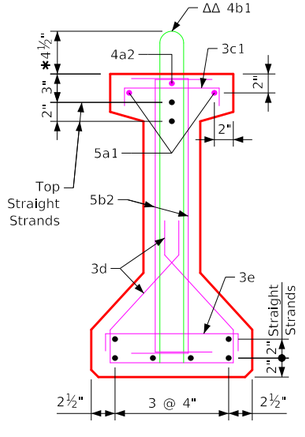
A30 Beam



"A" Beam
Cross Section

Area = 311.5 in.^{2}
$\bar{y}_b$ = 14.05 in.
I = 34,082 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 3d and 5b2
are to be placed in pairs.

* Keep
ΔΔ Epoxy Coated Bars

A30 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"A" Beam - 30'-0" Span	Standard Sheet 4601-A30	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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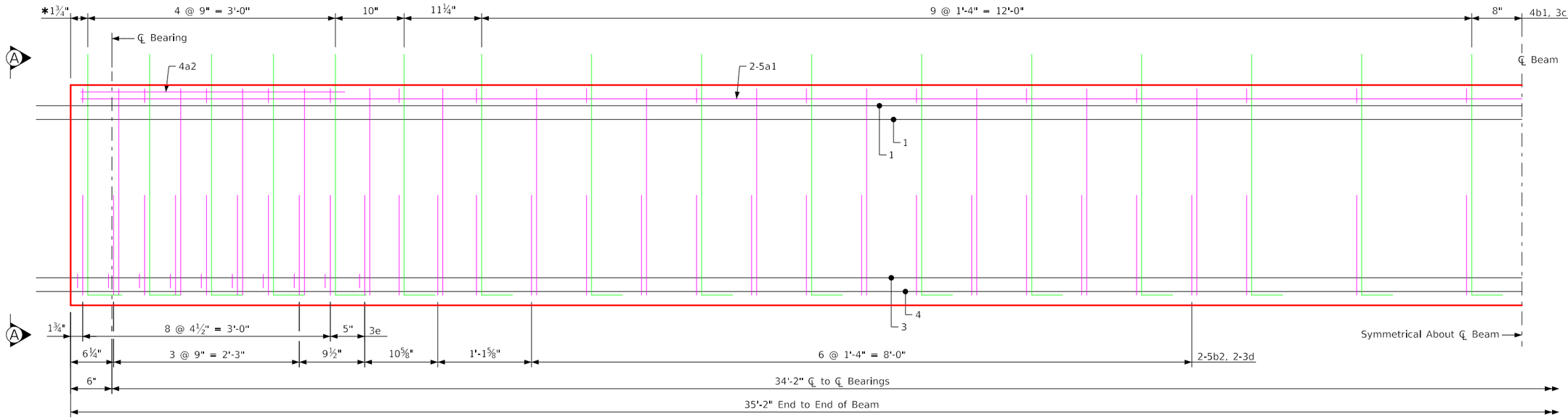
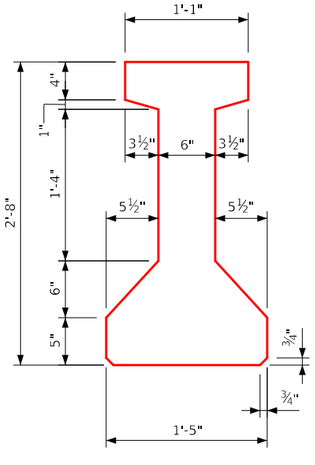
Beams.dgn - 4601-A30 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4601).



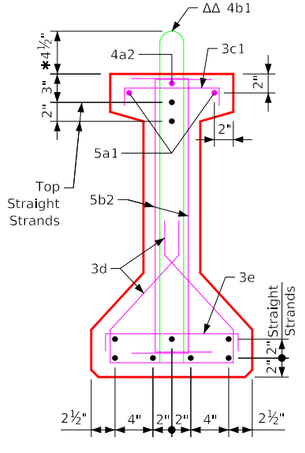
A34 Beam



"A" Beam
Cross Section

Area = 311.5 in.^{2}
$\bar{y}_b$ = 14.05 in.
I = 34,082 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 3d and 5b2
are to be placed in pairs.

* Keep
ΔΔ Epoxy Coated Bars

A34 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"A" Beam - 34'-2" Span	Standard Sheet 4601-A34	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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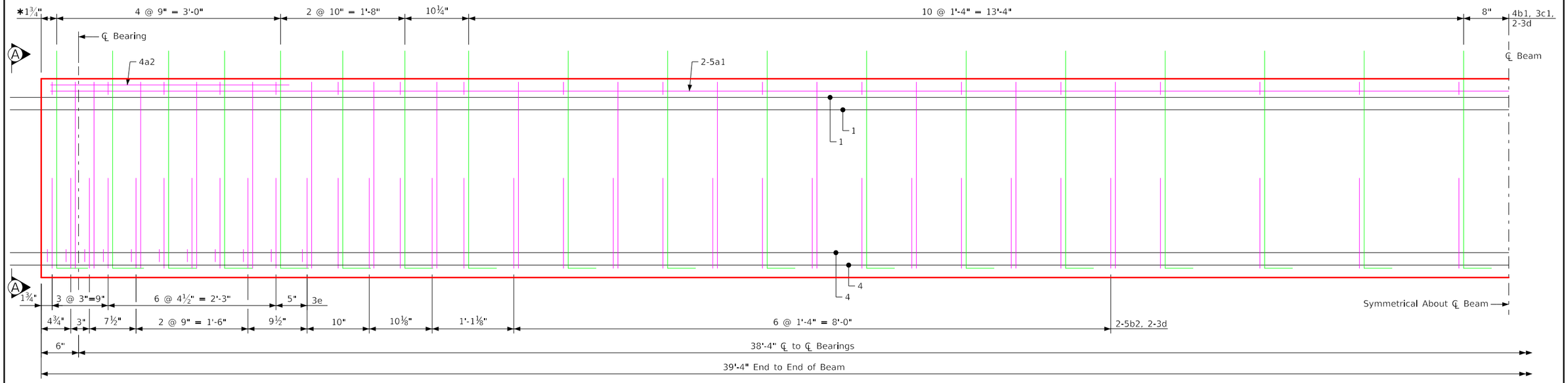
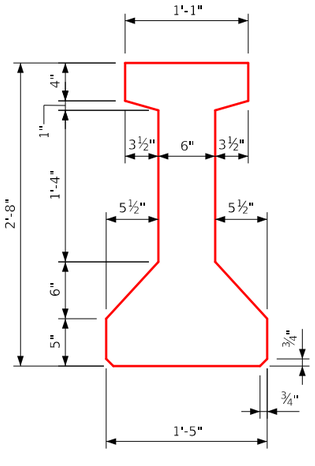
Beams.dgn - 4601-A34 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4601).



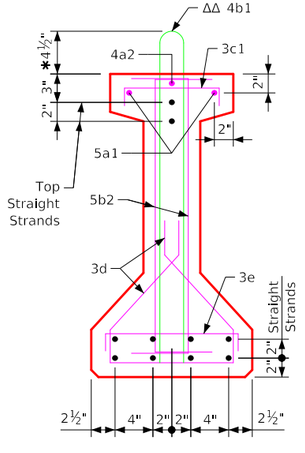
A38 Beam



"A" Beam
Cross Section

Area = 311.5 in.^{2}
$\bar{y}_b$ = 14.05 in.
I = 34,082 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 3d and 5b2
are to be placed in pairs.

* Keep
ΔΔ Epoxy Coated Bars

A38 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"A" Beam - 38'-4" Span	Standard Sheet 4601-A38	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Beams.dgn - 4601-A38 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4601).

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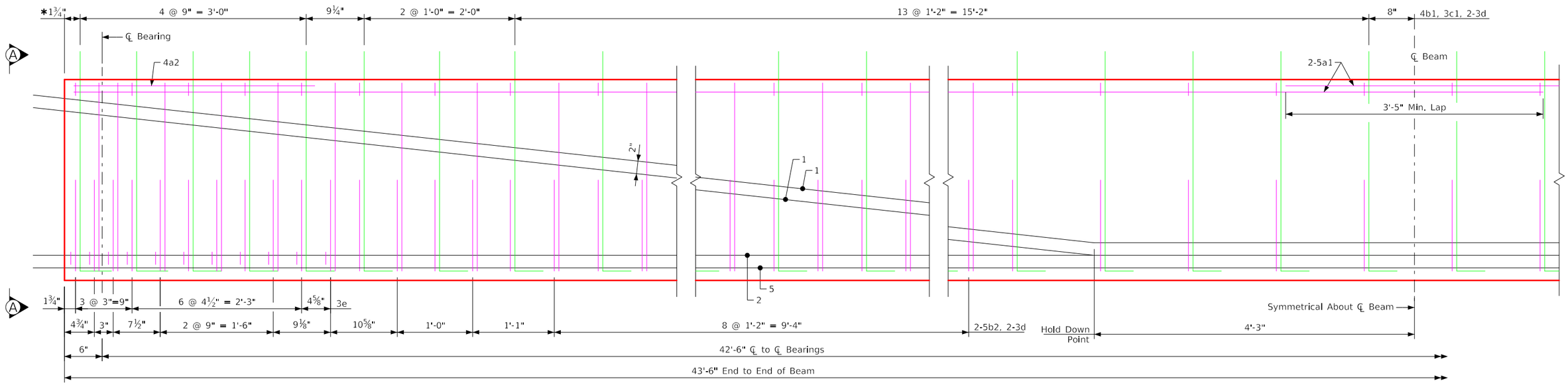
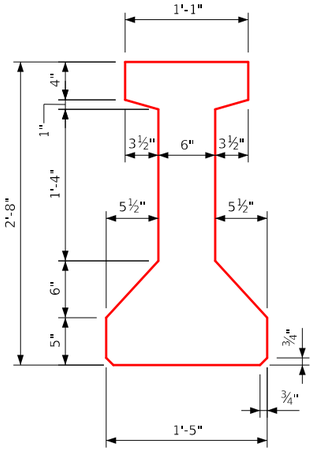


A42 Beam



"A" Beam Cross Section

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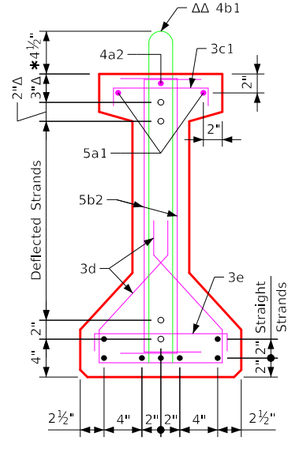
$\bar{y}_b$ = 14.05 in.
I = 34,082 in.^{4}

Beam Section Properties



View A-A

Note: Bars 3d and 5b2 are to be placed in pairs.

° Deflected Strands
* Keep
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

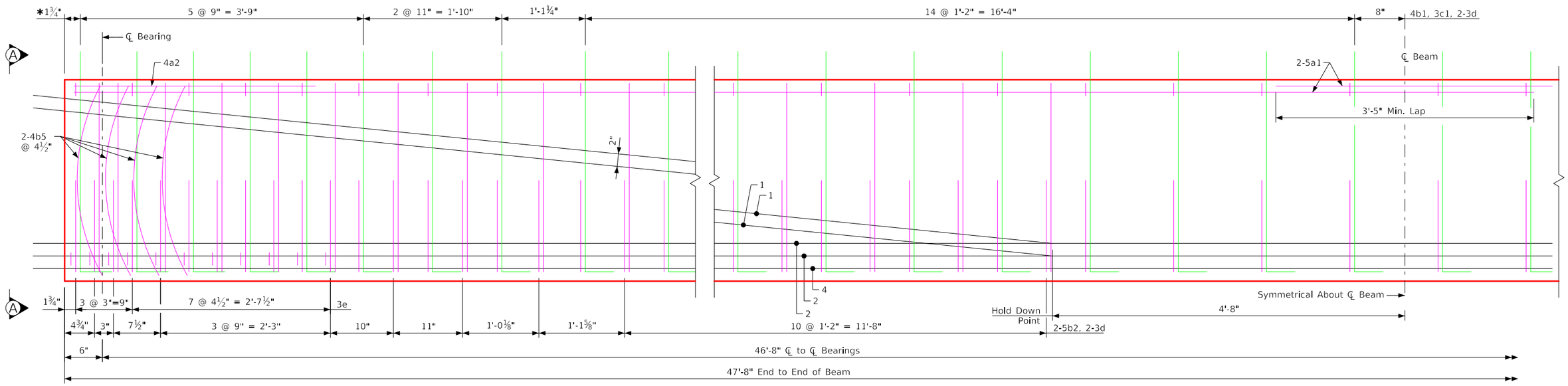
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

A42 Beam Details

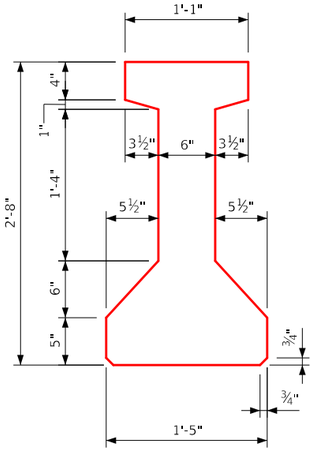
FILE NO.	ENGLISH	DESIGN TEAM	"A" Beam - 42'-6" Span	Standard Sheet 4601-A42	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:06:44 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Revised 05-09: A42 Bar Spacings were Changed.
Beams.dgn - 4601-A42 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4601).



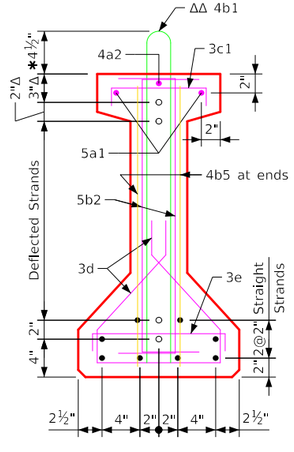
A46 Beam



"A" Beam
Cross Section

Area = 311.5 in.^{2}
$\bar{y}_b$ = 14.05 in.
I = 34,082 in.^{4}

Beam Section Properties



View A-A

Note: Bars 3d, 4b5, and 5b2 are to be placed in pairs.

- ° Deflected Strands
- * Keep
- Δ Dimensions at End of Beam
- ΔΔ Epoxy Coated Bars

Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

A46 Beam Details

Revised 05-09: A46 Bar Spacings were Changed.
Beams.dgn - 4601-A46 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4601).

FILE NO.	ENGLISH	DESIGN TEAM	"A" Beam - 46'-8" Span	Standard Sheet 4601-A46	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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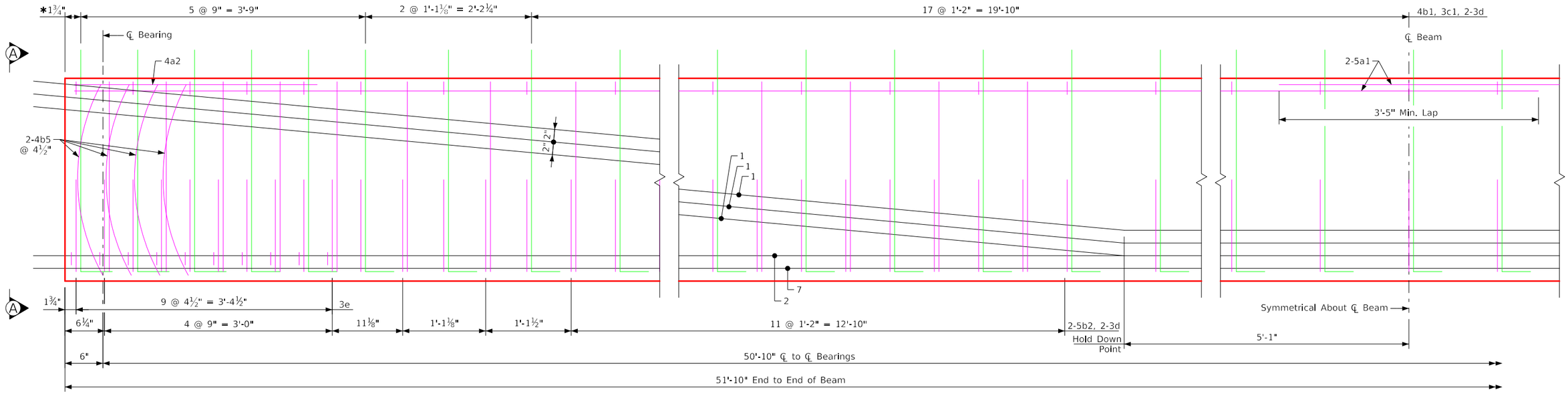
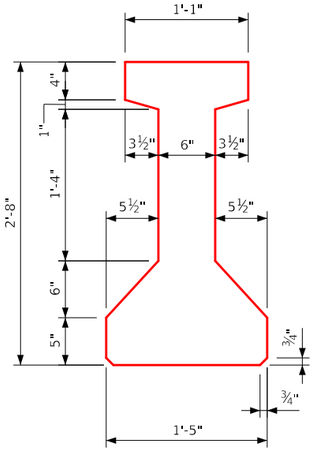


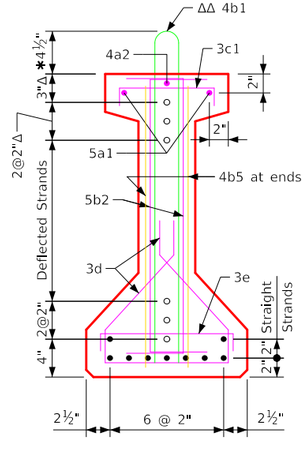
A50 Beam



"A" Beam
Cross Section

Area = 311.5 in.^{2}
$\bar{y}_b$ = 14.05 in.
I = 34,082 in.^{4}

Beam Section Properties



View A-A

Note: Bars 3d, 4b5, and 5b2 are to be placed in pairs.

° Deflected Strands
✱ Keep
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

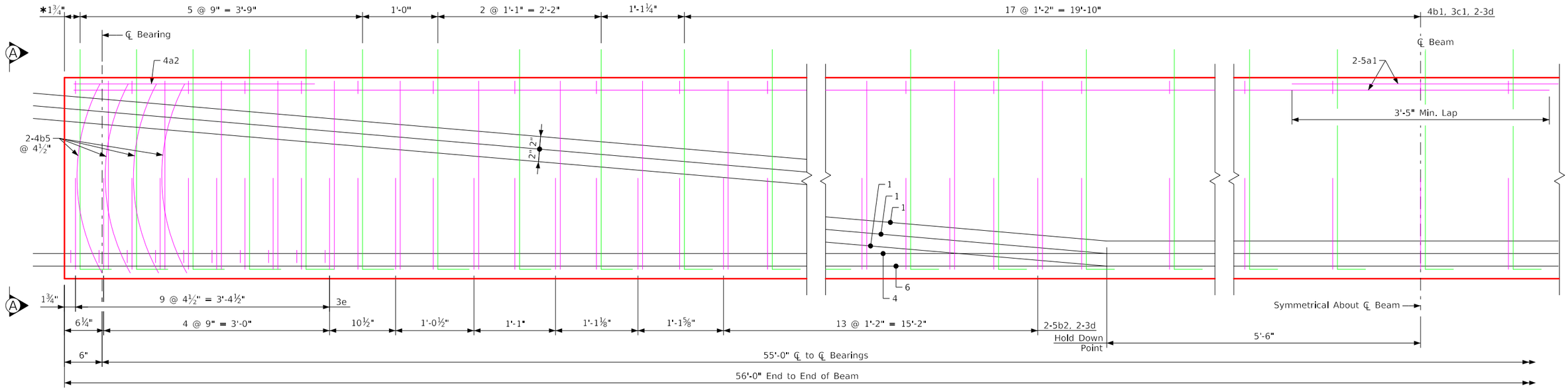
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

A50 Beam Details

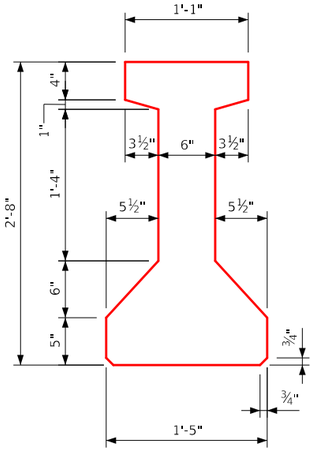
FILE NO.	ENGLISH	DESIGN TEAM	"A" Beam - 50'-10" Span	Standard Sheet 4602-A50	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:06:45 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Revised 05-09: A50 Bar Spacings were Changed.
Beams.dgn - 4602-A50 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4602).



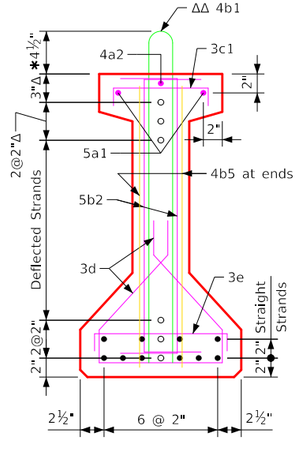
A55 Beam



"A" Beam
Cross Section

Area = 311.5 in.^{2}
$\bar{y}_b$ = 14.05 in.
I = 34,082 in.^{4}

Beam Section Properties



View A-A

Note: Bars 3d, 4b5, and 5b2 are to be placed in pairs.

- ° Deflected Strands
- * Keep
- Δ Dimensions at End of Beam
- ΔΔ Epoxy Coated Bars

Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

A55 Beam Details

Revised 05-09: A55 Bar Spacings were Changed.
Beams.dgn - 4602-A55 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4602).

FILE NO.	ENGLISH	DESIGN TEAM	"A" Beam - 55'-0" Span	Standard Sheet 4602-A55	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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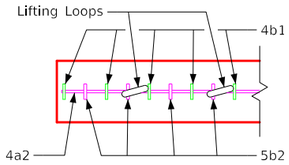
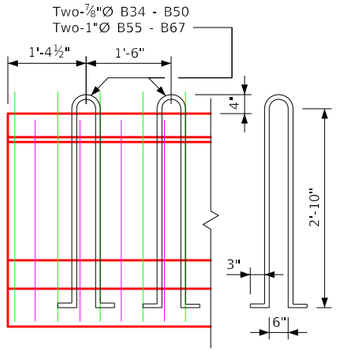
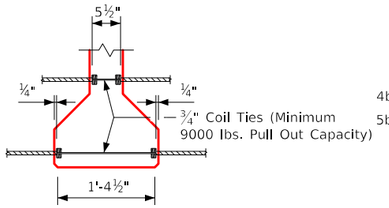




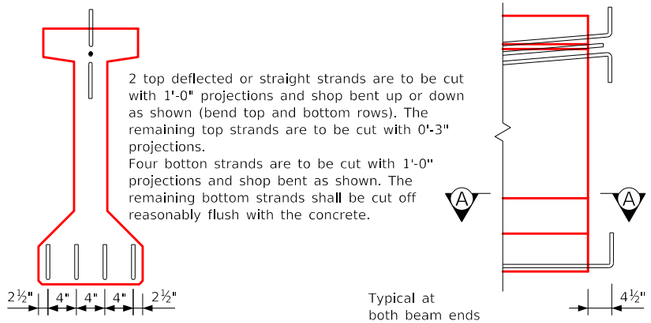
Lifting Loop Detail

Alternate types may be substituted with the approval of the Engineer. Lifting loops are to be structural grade.



Coil Tie Detail

Number and exact location of coil ties to be as detailed on specific bridge design.



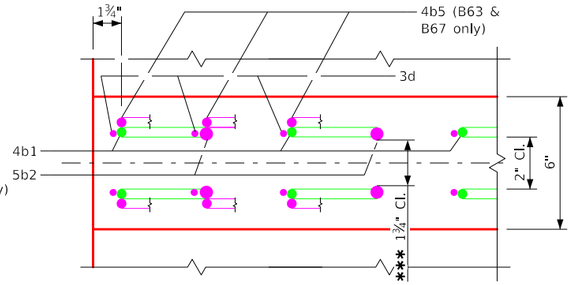
2 top deflected or straight strands are to be cut with 1'-0" projections and shop bent up or down as shown (bend top and bottom rows). The remaining top strands are to be cut with 0'-3" projections.
Four botton strands are to be cut with 1'-0" projections and shop bent as shown. The remaining bottom strands shall be cut off reasonably flush with the concrete.

Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms

Lifting Loop And Overhang Table

Beams	Lifting Loops Each End	Beam Overhang (ft.)
B34-B50	2 - ⅞"○	*
B55-B67	2 - 1"○	*

* In accordance with Article 2407.03, K of the Standard Specifications.



Section A-A Showing Placement of Stirrups Near End of Beam

*** 1¾" Cl. for 5b2 bars at B63, and B67 beam ends only.

ΔΔ 4b1 bars to be epoxy coated.

** Where deflecting strands interfere with placement, some in-place bending may be necessary.

Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.

B Beam Data

B Beam	Span Length ℄-℄ Bearing	Overall Beam Length (L)	Concrete strength		Strand Size Dia. (in.)	No. of Strands		③ Total Initial Prestress (kips)	Hold Down Force (kips)	Camber (in.) ④		Deflection (in.) Δ_D		Permissible Maximum Spacing	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight-lb.)
			f'ci (ksi.)	f'c (ksi.)		Straight	Deflected			At Release	After Losses	Immediate ① (elastic) Δ_I	Time ② (plastic) Δ_T	HL-93 Loading			
												Steel Diaphragm	Steel Diaphragm	Steel Diaphragm			
B34	34'-2"	35'-2"	4.5	5.0	0.60"	8	—	340	—	0.10"	0.18"	0.11"	0.03"	7'-6"	7.0	3.46	599
B38	38'-4"	39'-4"	4.5	5.0	0.60"	8	—	340	—	0.11"	0.20"	0.17"	0.04"	7'-6"	7.8	3.87	719
B42	42'-6"	43'-6"	4.5	5.0	0.60"	10	—	425	—	0.23"	0.43"	0.25"	0.06"	7'-6"	8.7	4.28	736
B46	46'-8"	47'-8"	4.5	5.0	0.60"	7	2	383	10.3	0.42"	0.78"	0.35"	0.09"	7'-6"	9.5	4.69	875
B50	50'-10"	51'-10"	4.5	5.0	0.60"	8	2	425	10.2	0.55"	1.02"	0.47"	0.12"	7'-6"	10.3	5.10	950
B55	55'-0"	56'-0"	6.0	7.0	0.60"	8	3	468	14.1	0.62"	1.14"	0.58"	0.14"	7'-6"	11.2	5.51	1044
B59	59'-2"	60'-2"	6.0	7.0	0.60"	10	3	553	13.2	0.85"	1.57"	0.77"	0.19"	7'-6"	12.0	5.92	1080
B63	63'-4"	64'-4"	6.0	7.0	0.60"	12	3	638	12.3	1.12"	2.08"	1.01"	0.25"	7'-6"	12.8	6.33	1172
B67	67'-6"	68'-6"	6.0	7.0	0.60"	14	3	723	11.6	1.43"	2.65"	1.29"	0.32"	7'-6"	13.6	6.74	1258

① Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.0") weight of:
0.81 kips/ft. for 7'-6" spacing and one steel diaphragm (0.285 kips) at ℄ of span. For different deck and diaphragm weights, deflections will be directly proportional.

② Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.
Total beam deflections at ℄ of span, Δ_D , due to weight of deck and diaphragms for detailing purpose:
(A) $\Delta_D=\Delta_I + \Delta_T$ for simple span.
(B) $\Delta_D=\Delta_I + \frac{3}{4}\Delta_T$ for end spans of continuous bridge.
(C) $\Delta_D=\Delta_I + \frac{1}{2}\Delta_T$ for interior spans of continuous bridge.

③ Total initial prestress is based on 72.6% f's. f's = 270 ksi. and As = 0.217 sq. in.

④ Calculated design cambers are based on multipliers developed from research in Iowa.

Design Stresses:

Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications Series of 2017.
Reinforcing steel in accordance with Section 5, Grade 60.
Concrete in accordance with Section 5.
Prestressing steel in accordance with Section 5, Grade 270

Specifications:

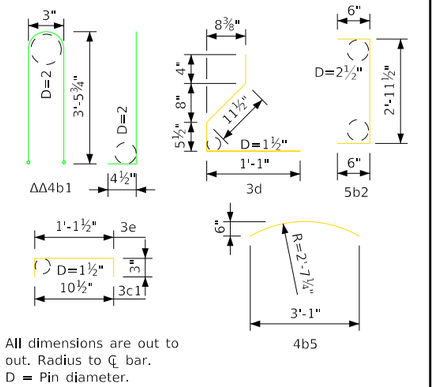
Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications.
Design: AASHTO LRFD, Series of 2017, with minor modifications.

Beam Notes:

These beams are designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.
All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.
Hold down points for deflected strands may be moved toward ends of beam a distance of 0.05 L maximum at producer's option.
All prestressing strands except lifting loop strands shall be 0.60 in nominal diameter (nominal steel area = 0.217 in.²) and conform to ASTM A416 Grade 270 Low Relaxation Strands. Minimum strand breaking strength shall be 58.6 kips.
Tops of beams are to be struck off level and finished as per Materials I.M.570.
Bearings shall be as detailed on other design sheets.
Beams to be used in bridges made continuous by the poured in place deck, are to be at least 28 days old before the deck is placed unless a shorter curing time is approved by the Bridge Engineer.
The portions of the prestressed beams that are to be embedded in the abutment and pier diaphragms shall be roughened for a distance of 10" from the beam end by sandblasting or other approved methods to provide suitable bond between the beam and the diaphragm in accordance with Article 2403.03, I, of the Standard Specifications.
All beams are to be increased in length to compensate for elastic shortening, creep and shrinkage.
For transporting, the allowable overhang is shown in the "Lifting Loop and Overhang Table".
If the precast panel option is allowed and used for bridge deck formation, the beam stirrups will need to be extended and top flange beam finish shall be modified as per details on the Precast Deck Panel Sheet.
Minimum concrete f'c (at 28 days) and minimum f'ci at release are located in the B Beam Data Table above.
0.6" diameter strands stressed to not more than 5,000 lbs. each may be used in lieu of the a bars which run the full length of the beam in the top flange.
Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet.
If sole plate is required for bearing, sole plate is to be set in forms when beam is cast and formed out below to exclude concrete as detailed on the Bearing Sheet.
If stub abutments are used, all strands at the ends of beams at stub abutments shall be cut off reasonably flush with the concrete.
When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with Materials I.M. 570 (Fabricator Application) and I.M. 491.12 (Contractor Application).

Reinforcing Bar List

	Beam / Span		B34 34'-2"		B38 38'-4"		B42 42'-6"		B46 46'-8"		B50 50'-10"		B55 55'-0"		B59 59'-2"		B63 63'-4"		B67 67'-6"	
	Bar	Shape	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length
	6a1		2	34'-11"	2	39'-1"	4	23'-8"	4	25'-9"	4	27'-10"	4	29'-11"	4	32'-0"	4	34'-1"	4	36'-2"
	4a2		2	4'-2"	2	4'-2"	2	4'-2"	2	4'-2"	2	4'-2"	2	4'-2"	2	4'-2"	2	4'-2"	2	4'-2"
ΔΔ	4b1		31	7'-10"	34	7'-10"	38	7'-10"	41	7'-10"	46	7'-10"	51	7'-10"	54	7'-10"	58	7'-10"	62	7'-10"
	5b2		44	4'-0"	60	4'-0"	52	4'-0"	72	4'-0"	76	4'-0"	84	4'-0"	84	4'-0"	88	4'-0"	96	4'-0"
	4b5		—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	3'-3"	12	3'-3"
	3c1		31	1'-5"	34	1'-5"	38	1'-5"	41	1'-5"	46	1'-5"	51	1'-5"	54	1'-5"	58	1'-5"	62	1'-5"
**	3d		106	2'-10"	128	2'-10"	128	2'-10"	154	2'-10"	168	2'-10"	186	2'-10"	192	2'-10"	204	2'-10"	220	2'-10"
	3e		22	1'-8"	22	1'-8"	26	1'-8"	26	1'-8"	26	1'-8"	26	1'-8"	26	1'-8"	26	1'-8"	26	1'-8"



All dimensions are out to out. Radius to ℄ bar.
D = Pin diameter.

B Beam - Data Details

FILE NO.	ENGLISH	DESIGN TEAM	B Beams – LRFD Design	Standard Sheet 4610	COUNTY	PROJECT NUMBER	SHEET NUMBER

Revised 08-12: I.M. reference not for sealing beam ends distinguishes between the Fabricator and Contractor.
Re-Issued 09-06.
Beams.dgn - 4610 - This Sheet Re-Issued 04-2024, Sheet Format Update.

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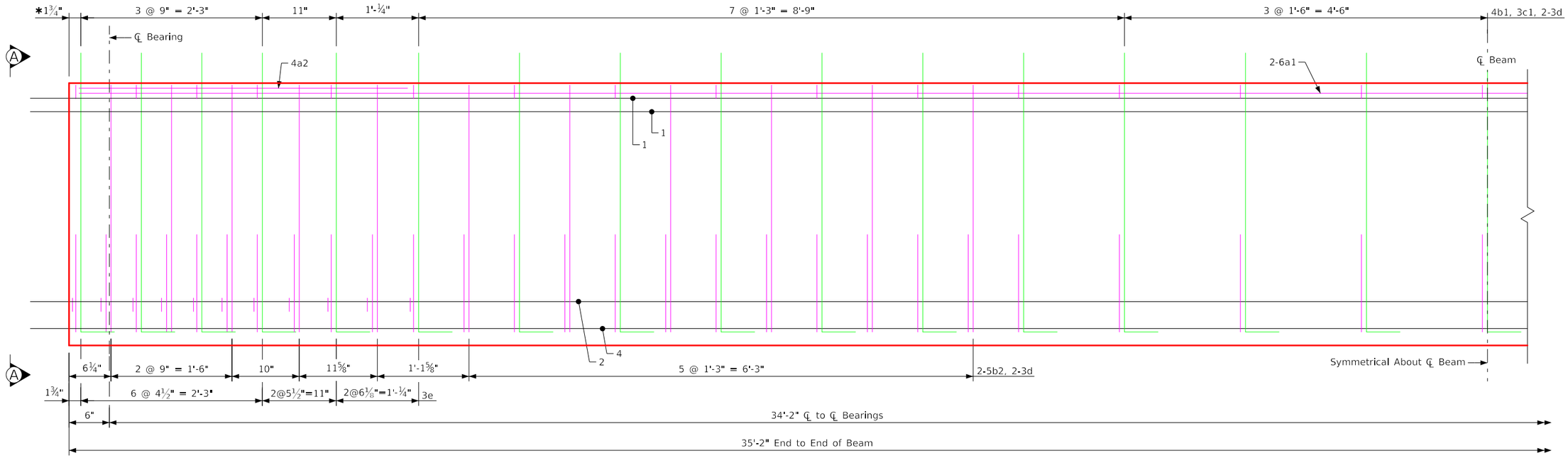
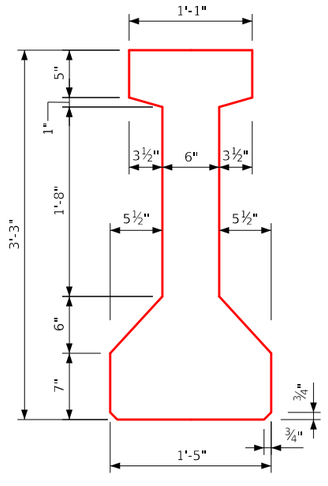


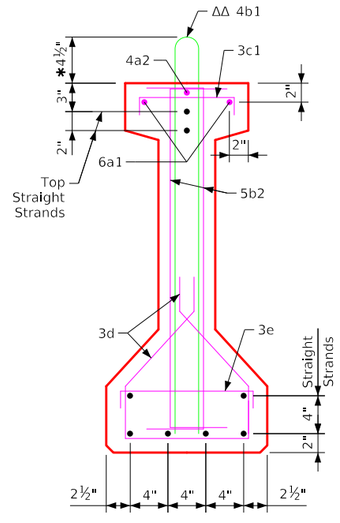
B34 Beam



"B" Beam
Cross Section

Area = 382.5 in.^{2}
$\bar{y}_b$ = 17.06 in.
I = 62,000 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 5b2 and 3d are to be placed in pairs.

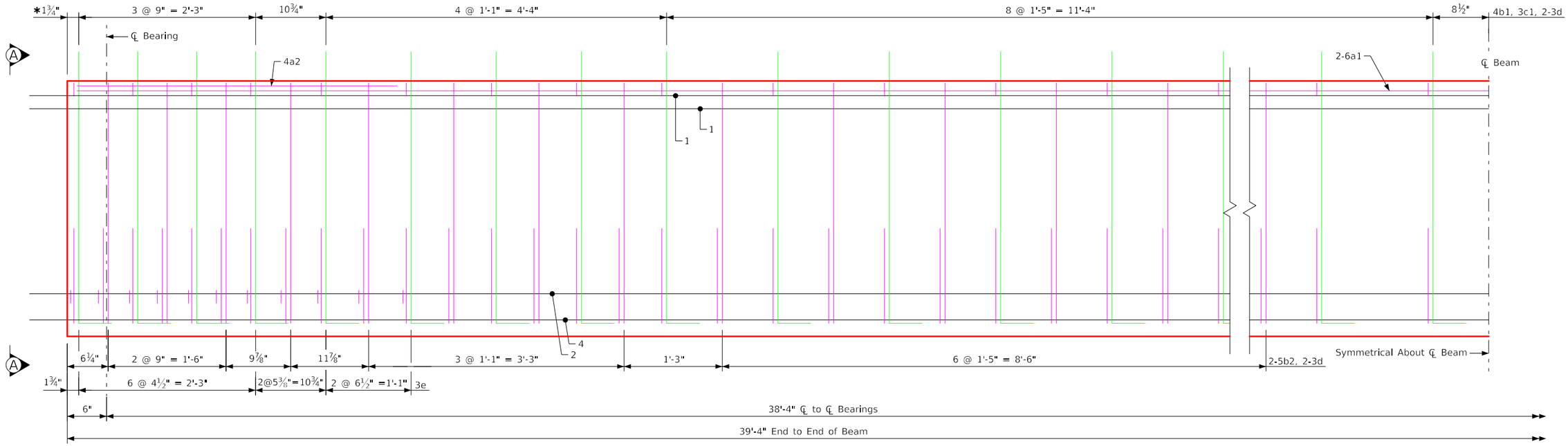
* Keep
ΔΔ Epoxy Coated Bars

B34 Beam Details

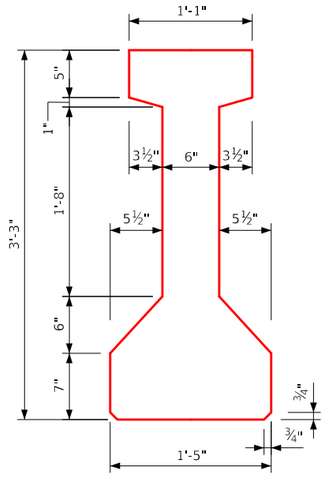
FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 34'-2" Span	Standard Sheet 4611-B34	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:06:48 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Revised 05-09: B34 Bar Spacings were Changed.
Beams.dgn - 4611-B34 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4611).



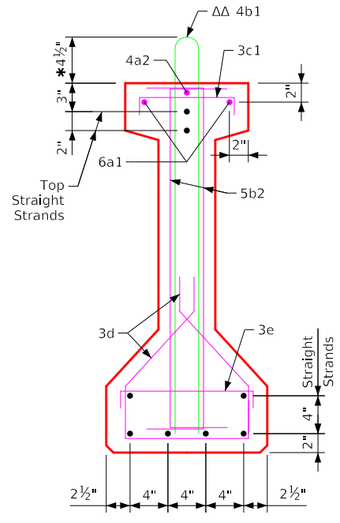
B38 Beam



"B" Beam
Cross Section

Area = 382.5 in.^{2}
$\bar{y}_b$ = 17.06 in.
I = 62,000 in.^{4}

Beam Section Properties



View A-A

Note: Bars 5b2 and 3d are to be placed in pairs.

* Keep
ΔΔ Epoxy Coated Bars

B38 Beam Details

Revised 05-09: B38 Bar Spacings were Changed.
Beams.dgn - 4611-B38 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4611).

FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 38'-4" Span	Standard Sheet 4611-B38	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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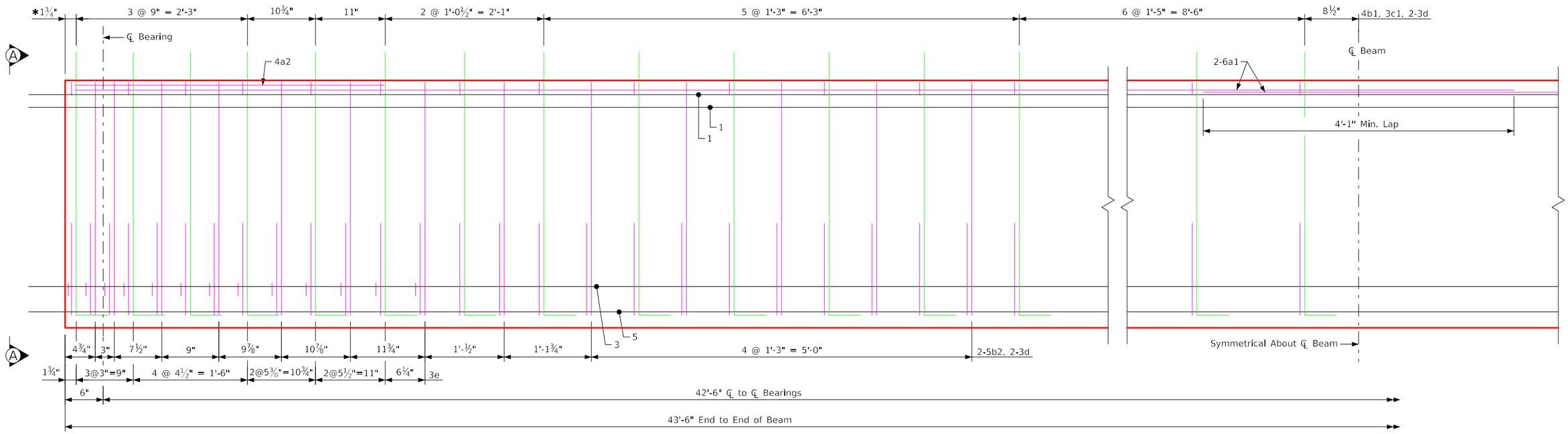
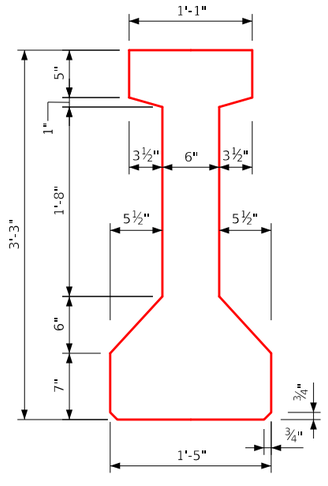


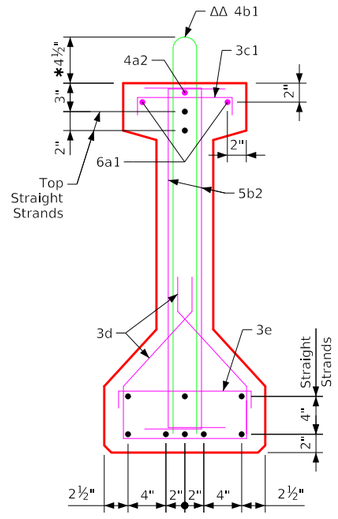
B42 Beam



"B" Beam
Cross Section

Area = 382.5 in.^{2}
$\bar{y}_b$ = 17.06 in.
I = 62,000 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 5b2 and 3d are to be placed in pairs.

✱ Keep
ΔΔ Epoxy Coated Bars

B42 Beam Details

Revised 05-09: B42 bar spacings were changed.
Beams.dgn - 4611-B42 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4611).

FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 42'-6" Span	Standard Sheet 4611-B42	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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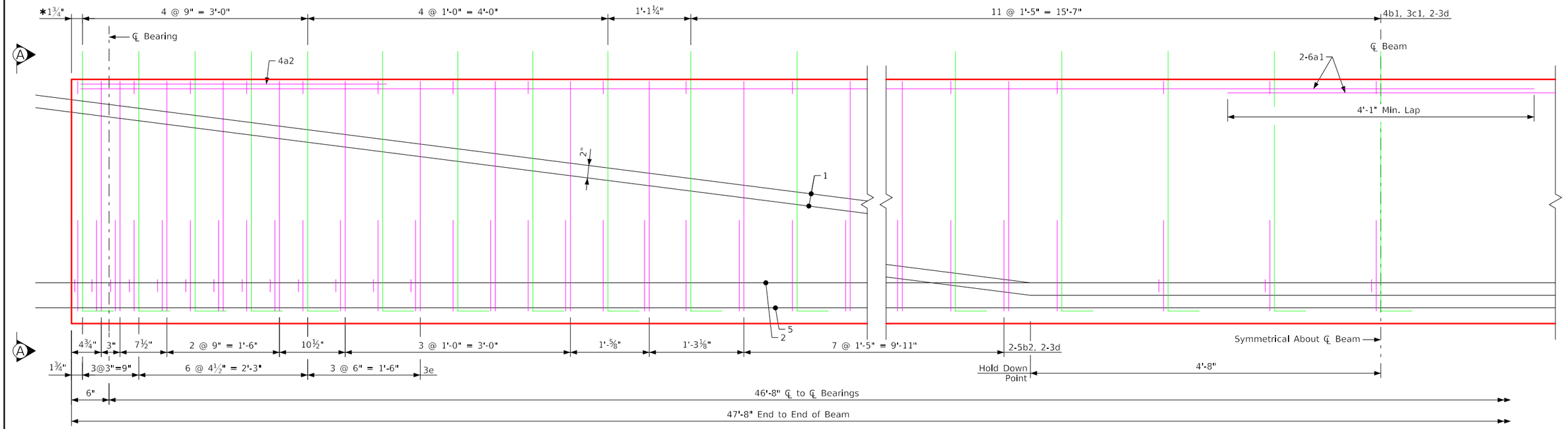
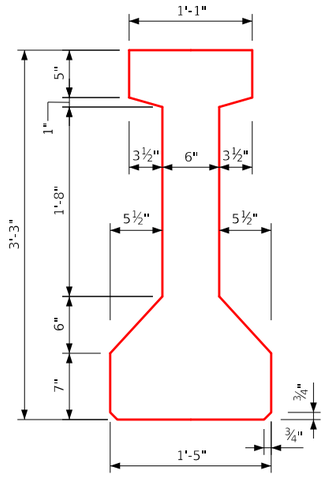


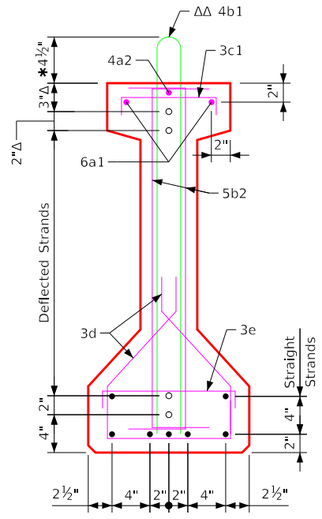
B46 Beam



"B" Beam
Cross Section

Area = 382.5 in.^{2}
$\bar{y}_b$ = 17.06 in.
I = 62,000 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 5b2 and 3d are to be placed in pairs.

° Deflected Strands
* Keep
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

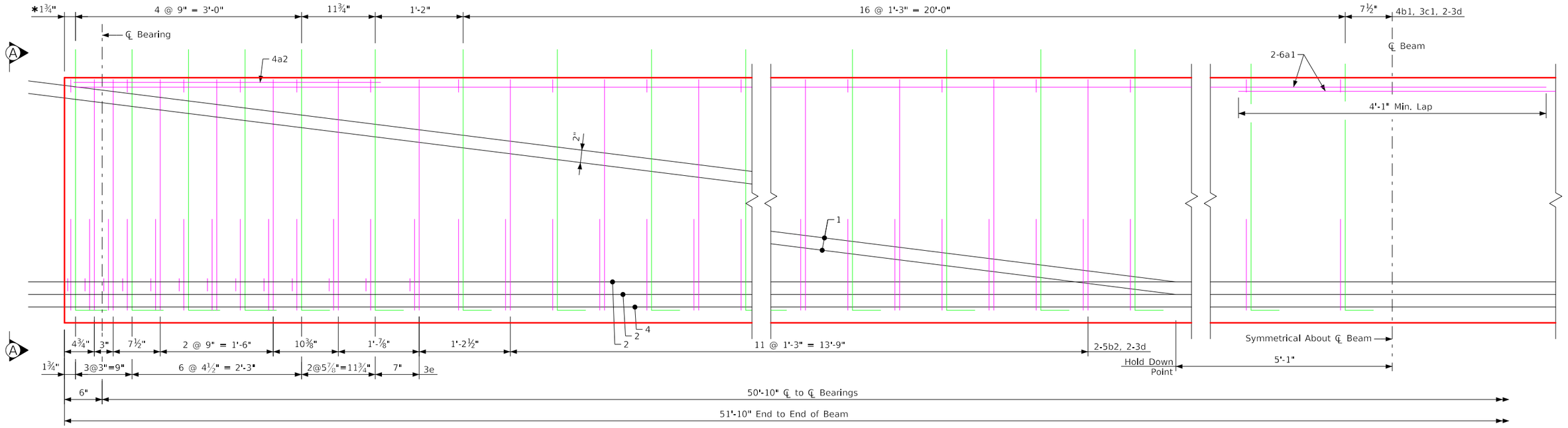
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

B46 Beam Details

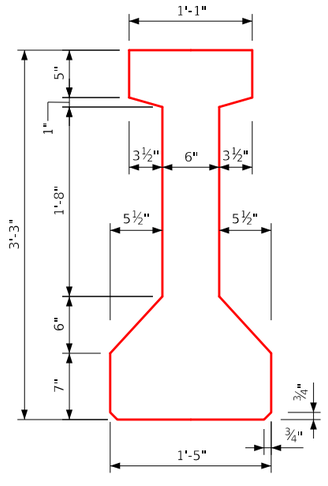
FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 46'-8" Span	Standard Sheet 4611-B46	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:06:50 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Revised 05-09: B46 Bar Spacings were Changed.
Beams.dgn - 4611-B46 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4611).



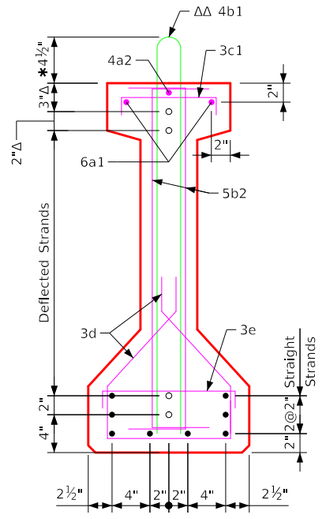
B50 Beam



"B" Beam Cross Section

Area = 382.5 in.^{2}
$\bar{y}_b$ = 17.06 in.
I = 62,000 in.^{4}

Beam Section Properties



View A-A

Note: Bars 5b2 and 3d are to be placed in pairs.

- ◦ Deflected Strands
- * Keep
- Δ Dimensions at End of Beam
- ΔΔ Epoxy Coated Bars

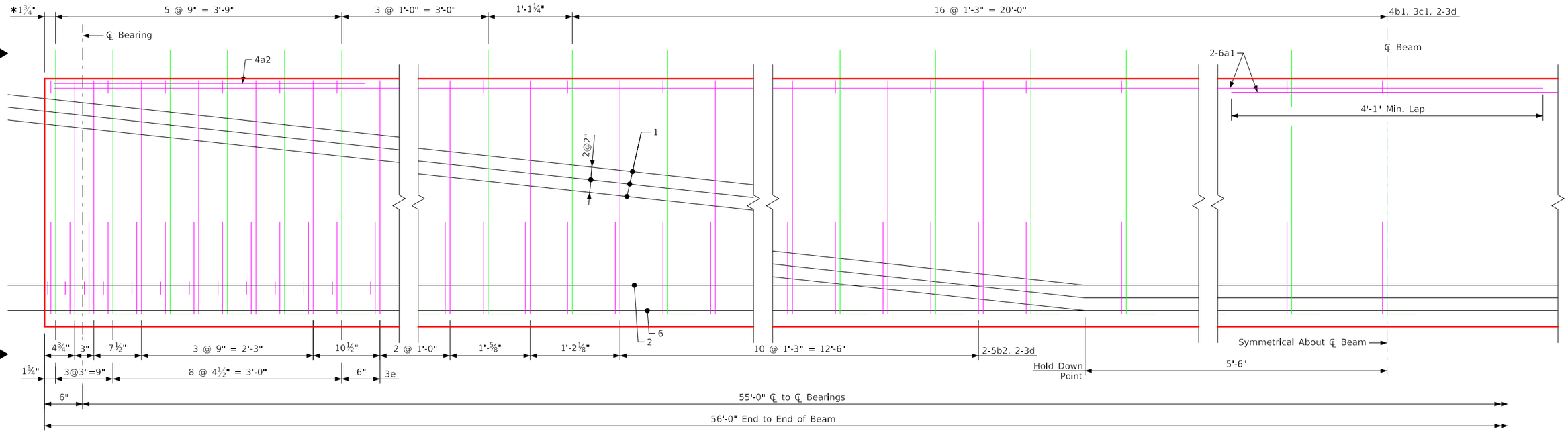
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

B50 Beam Details

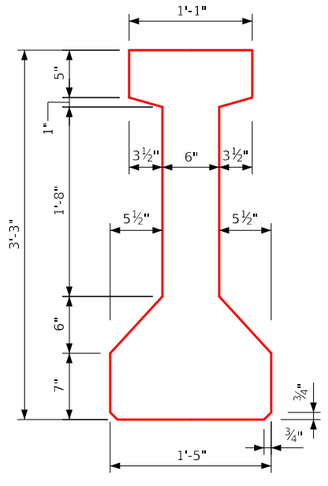
FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 50'-10" Span	Standard Sheet 4611-B50	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:06:50 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Revised 05-09: B50 bar spacings were changed.
Beams.dgn - 4611-B50 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4611).



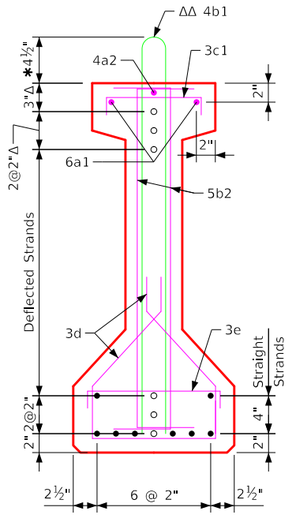
B55 Beam



"B" Beam
Cross Section

Area = 382.5 in.^{2}
$\bar{y}_b$ = 17.06 in.
I = 62,000 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 5b2 and 3d are to be placed in pairs.

° Deflected Strands
* Keep
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

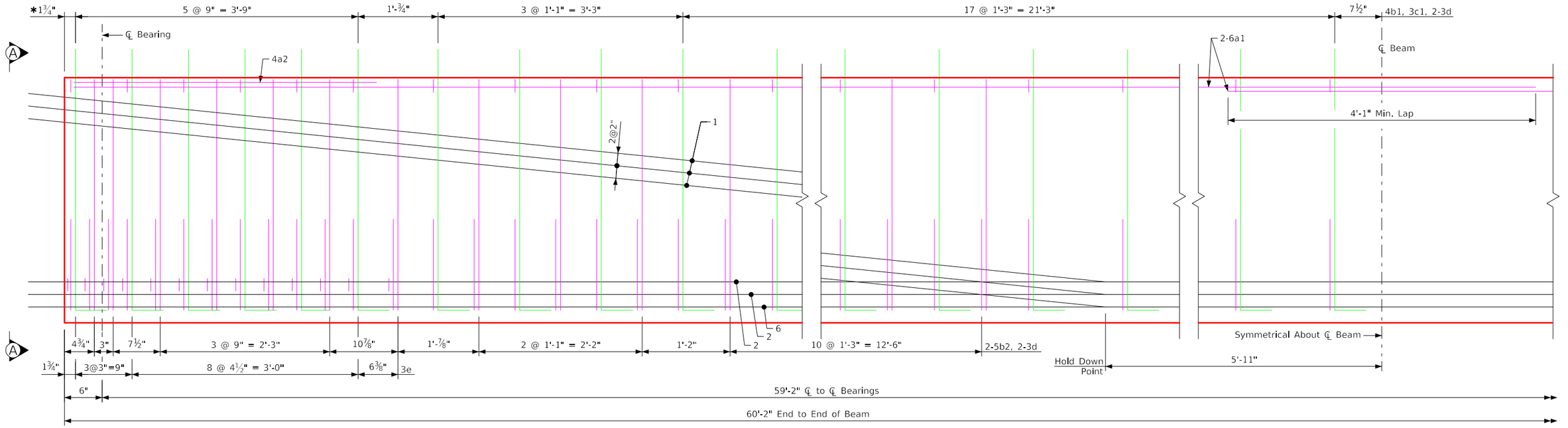
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

B55 Beam Details

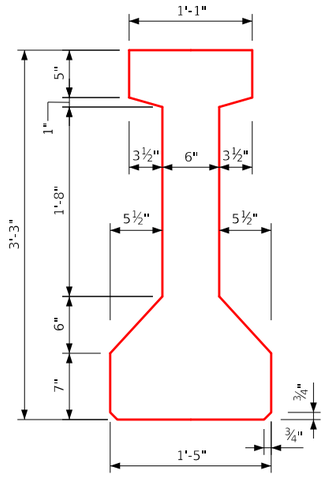
FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 55'-0" Span	Standard Sheet 4612-B55	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:06:51 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Revised 05-09: B55 Bar Spacings were Changed.
Beams.dgn - 4612-B55 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4612).



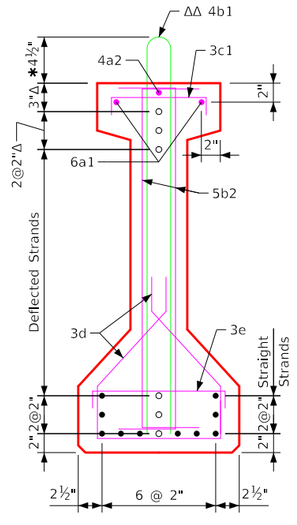
B59 Beam



"B" Beam
Cross Section

Area = 382.5 in.^{2}
$\bar{y}_b$ = 17.06 in.
I = 62,000 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 5b2 and 3d are to be placed in pairs.

° Deflected Strands
✱ Keep
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

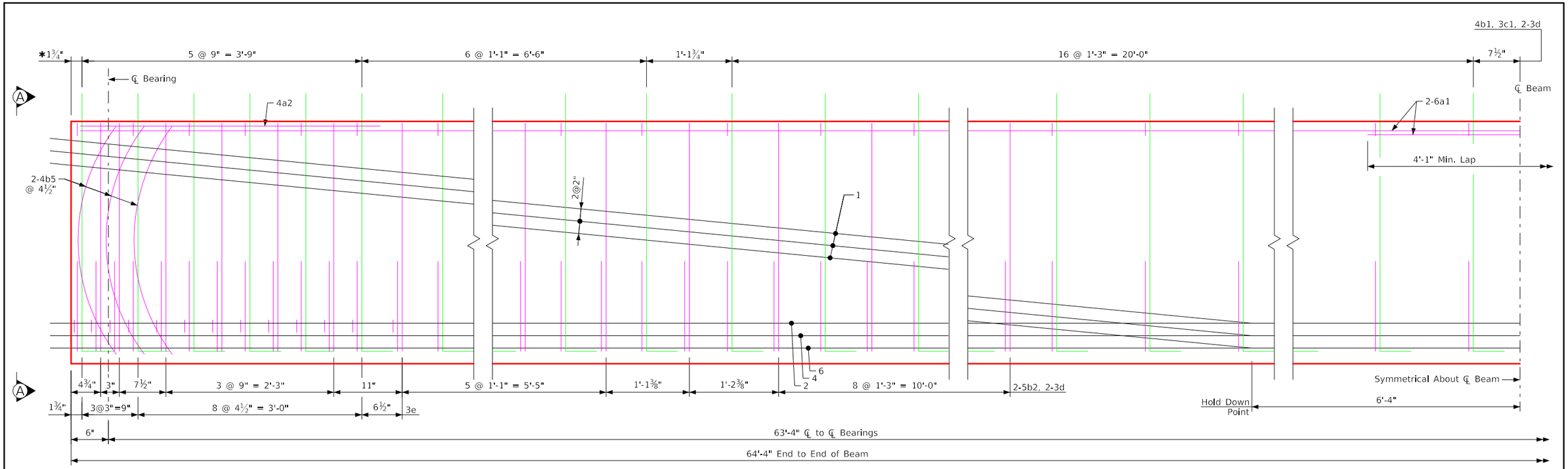
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

B59 Beam Details

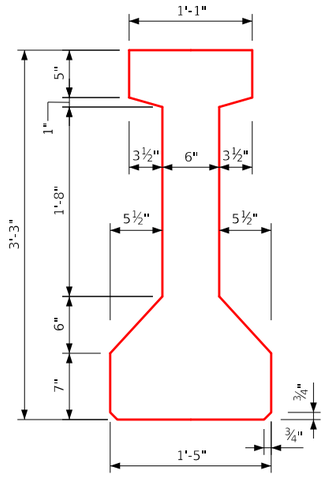
FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 59'-2" Span	Standard Sheet 4612-B59	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:06:52 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Revised 05-09: B59 Bar Spacings were Changed.
Beams.dgn - 4612-B59 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4612).



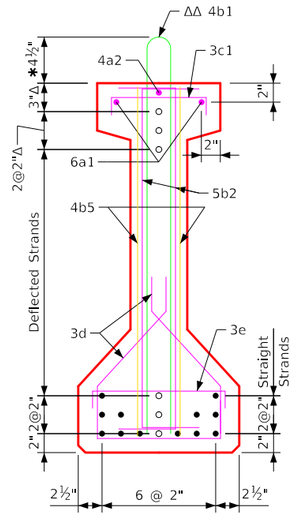
B63 Beam



"B" Beam
Cross Section

Area = 382.5 in.^{2}
$\bar{y}_b$ = 17.06 in.
I = 62,000 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 4b5, 5b2 and 3d are to be placed in pairs. Tie 4b5 bars to 4b1 & 4b2.

◦ Deflected Strands
✱ Keep
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

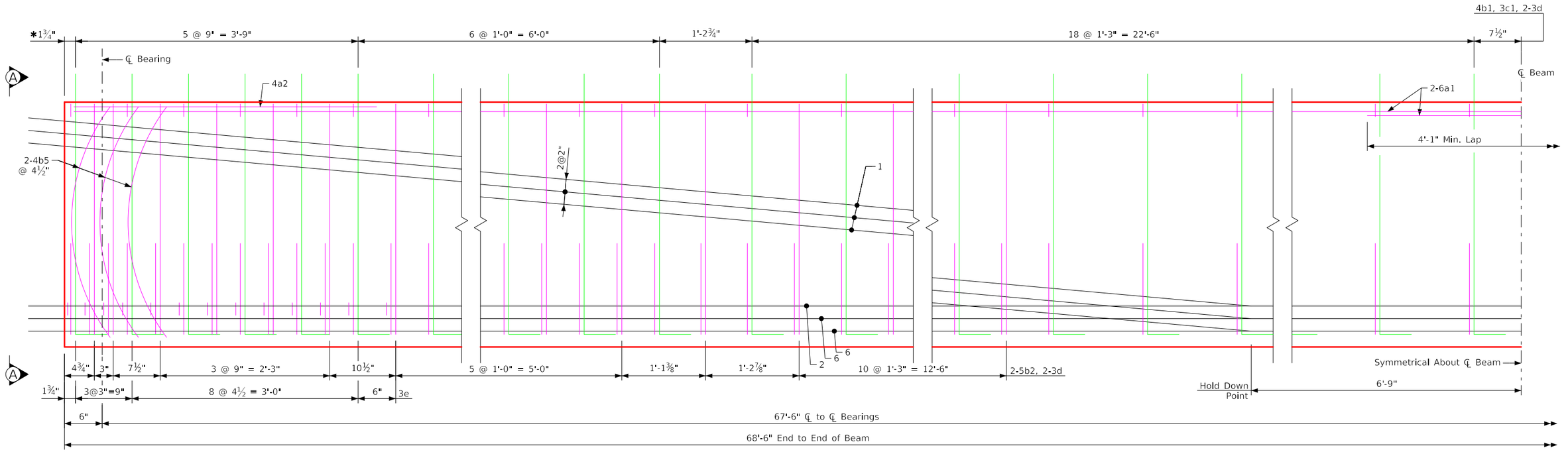
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

B63 Beam Details

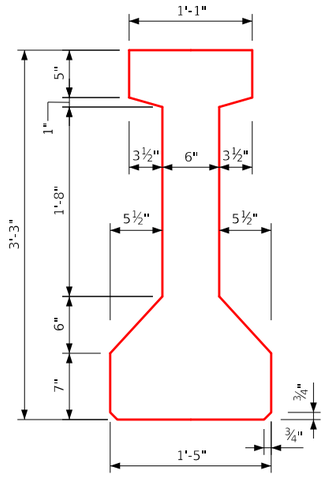
FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 63'-4" Span	Standard Sheet 4612-B63	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:06:52 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Revised 05-09: B63 Bar Spacings were Changed.
Beams.dgn - 4612-B63 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4612).



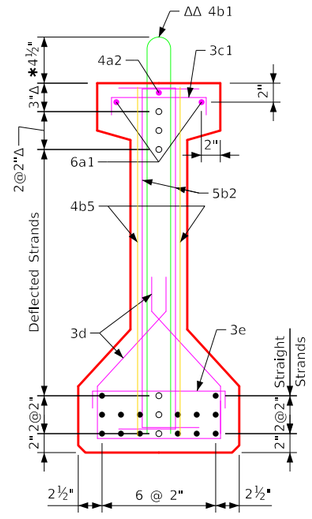
B67 Beam



"B" Beam
Cross Section

Area = 382.5 in.^{2}
$\bar{y}_b$ = 17.06 in.
I = 62,000 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 4b5, 5b2 and 3d are to be placed in pairs. Tie 4b5 bars to 4b1 & 4b2.

° Deflected Strands
* Keep
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

B67 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 67'-6" Span	Standard Sheet 4612-B67	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Revised 05-09: B67 Bar Spacings were Changed.
Beams.dgn - 4612-B67 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4612).

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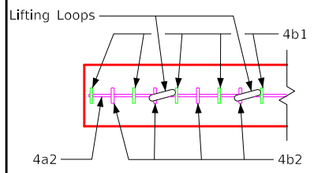
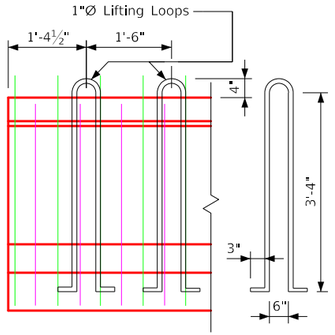


Lifting Loop And Overhang Table

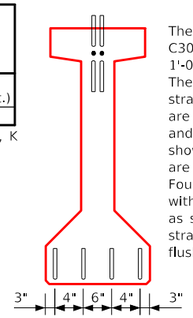
Beams	Lifting Loops Each End	Beam Overhang (ft.)
C30-C80	2 - 1"∅	*

* In accordance with Article 2407.03, K of the Standard Specifications.

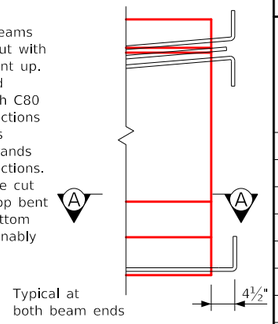


Lifting Loop Detail

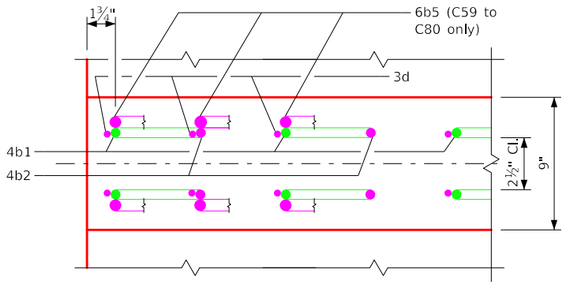
Alternate types may be substituted with the approval of the Engineer. Lifting loops are to be structural grade.



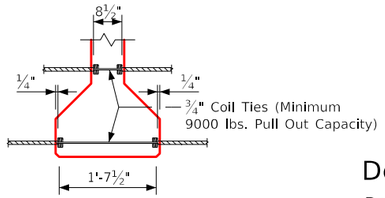
The top straight strands of beams C30 through C67 are to be cut with 1'-0" projections and shop bent up. The top and bottom deflected strands of beams C71 through C80 are to be cut with 1'-0" projections and shop bent up or down as shown. The remaining top strands are to be cut with 0'-3" projections. Four bottom strands are to be cut with 1'-0" projections and shop bent as shown. The remaining bottom strands shall be cut off reasonably flush with the concrete.



Strand Projection At Beam Ends When Embedded In Concrete End Diaphragms



Section A-A Showing Placement Of Stirrups Near End Of Beam



Coil Tie Detail

Number and exact location of coil ties to be as detailed on specific bridge design.

ΔΔ 4b1 bars to be epoxy coated.

** Where deflecting strands interfere with placement, some in-place bending may be necessary.

Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.

Design Stresses:

Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications Series of 2017.
Reinforcing steel in accordance with Section 5, Grade 60.
Concrete in accordance with Section 5.
Prestressing steel in accordance with Section 5, Grade 270.

Specifications:

Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications.
Design: AASHTO LRFD, Series of 2017, with minor modifications.

C Beam Data

C Beam	Span Length ℄-℄ Bearing	Overall Beam Length (L)	Concrete Strength f'ci (ksi.)	Concrete Strength f'c (ksi.)	Strand Size Dia. (in.)	No. of Strands Straight	No. of Strands Deflected	Total Initial Prestress ③ (kips)	Hold Down Force (kips)	Camber (in.) ④ At Release	Camber (in.) ④ After Losses	Deflection (in.) Δ_D Immediate ① (elastic) Δ_I Steel Diaphragm	Deflection (in.) Δ_D Time ② (plastic) Δ_T Steel Diaphragm	Permissible Maximum Spacing HL-93 Loading Steel Diaphragm	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight-lb.)
C30	30'-0"	31'-0"	4.5	5.0	0.60"	8	—	340	—	0.05"	0.09"	0.03"	0.01"	7'-6"	9.1	4.50	336
C34	34'-2"	35'-2"	4.5	5.0	0.60"	10	—	426	—	0.10"	0.18"	0.06"	0.01"	7'-6"	10.3	5.11	336
C38	38'-4"	39'-4"	4.5	5.0	0.60"	10	—	426	—	0.11"	0.20"	0.09"	0.02"	7'-6"	11.6	5.71	415
C42	42'-6"	43'-6"	4.5	5.0	0.60"	10	—	426	—	0.13"	0.24"	0.14"	0.03"	7'-6"	12.8	6.32	463
C46	46'-8"	47'-8"	4.5	5.0	0.60"	10	—	426	—	0.14"	0.26"	0.20"	0.05"	7'-6"	14.0	6.92	551
C50	50'-10"	51'-10"	4.5	5.0	0.60"	12	—	510	—	0.26"	0.47"	0.28"	0.07"	7'-6"	15.2	7.53	556
C55	55'-0"	56'-0"	4.5	5.0	0.60"	14	—	595	—	0.37"	0.69"	0.39"	0.10"	7'-6"	16.5	8.13	633
C59	59'-2"	60'-2"	4.5	5.0	0.60"	14	—	595	—	0.39"	0.73"	0.51"	0.13"	7'-6"	17.7	8.74	750
C63	63'-4"	64'-4"	4.5	5.0	0.60"	16	—	681	—	0.56"	1.04"	0.66"	0.17"	7'-6"	18.9	9.34	799
C67	67'-6"	68'-6"	4.5	5.0	0.60"	18	—	766	—	0.73"	1.35"	0.85"	0.21"	7'-6"	20.1	9.95	711
C71	71'-8"	72'-8"	5.0	6.0	0.60"	14	4	766	16	1.01"	1.86"	0.94"	0.24"	7'-6"	21.4	10.55	1030
C75	75'-10"	76'-10"	5.0	6.0	0.60"	14	6	851	22	1.20"	2.22"	1.17"	0.29"	7'-6"	22.6	11.16	1106
C80	80'-0"	81'-0"	5.0	6.0	0.60"	16	6	936	21	1.40"	2.60"	1.45"	0.36"	7'-6"	23.8	11.76	1395

① Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.0") weight of:
0.81 kips/ft. for 7'-6" beam spacing and one steel diaphragm (0.285 kips) at ℄ of span. For different deck and diaphragm weights, deflections will be directly proportional.

② Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.
Total beam deflections at ℄ of span, Δ_D , due to weight of deck and diaphragms for detailing purpose:
(A) $\Delta_D=\Delta_I + \Delta_T$ for simple span.
(B) $\Delta_D=\Delta_I + \frac{3}{4}\Delta_T$ for end spans of continuous bridge.
(C) $\Delta_D=\Delta_I + \frac{1}{2}\Delta_T$ for interior spans of continuous bridge.

③ Total initial prestress is based on 72.6% f's. f's = 270 ksi. and As = 0.217 sq. in.

④ Calculated design cambers are based on multipliers developed from research in Iowa.

Beam Notes: (continued)

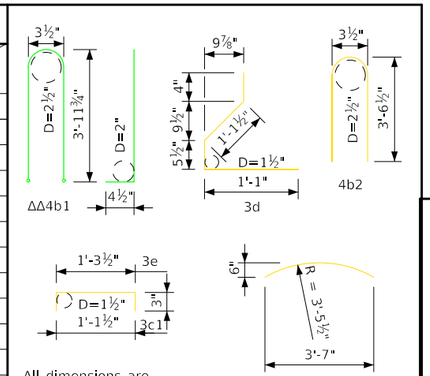
If stub abutments are used, all strands at the ends of beams at stub abutments shall be cut off reasonably flush with the concrete.
When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with Materials I.M. 570 (Fabricator Application) and I.M. 491.12 (Contractor Application).

Beam Notes:

These beams are designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.
All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.
Hold down points for deflected strands may be moved toward ends of beam a distance of 0.05 L maximum at producer's option.
All prestressing strands except lifting loop strands shall be 0.60 in nominal diameter (nominal steel area = 0.217 in.²) and conform to ASTM A416 Grade 270 Low Relaxation Strands. Minimum strand breaking strength shall be 58.6 kips.
Tops of beams are to be struck off level and finished as per Materials I.M.570.
Bearings shall be as detailed on other design sheets.
Beams to be used in bridges made continuous by the poured in place deck, are to be at least 28 days old before the deck is placed unless a shorter curing time is approved by the Bridge Engineer.
The portions of the prestressed beams that are to be embedded in the abutment and pier diaphragms shall be roughened for a distance of 10" from the beam end by sandblasting or other approved methods to provide suitable bond between the beam and the diaphragm in accordance with Article 2403.03, I, of the Standard Specifications.
All beams are to be increased in length to compensate for elastic shortening, creep and shrinkage.
For transporting, the allowable overhang is shown in the "Lifting Loop and Overhang Table".
If the precast panel option is allowed and used for bridge deck formation, the beam stirrups will need to be extended and top flange beam finish shall be modified as per details on the Precast Deck Panel Sheet.
Minimum concrete f'c (at 28 days) and minimum f'ci at release are located in the C Beam Data Table above.
0.6" diameter strands stressed to not more than 5,000 lbs. Each may be used in lieu of the a bars which run the full length of the beam in the top flange.
Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet.
If sole plate is required for bearing, sole plate is to be set in forms when beam is cast and formed out below to exclude concrete as detailed on the Bearing Sheet.

Reinforcing Bar List

	Beam / Span	Bar Shape	C30 31'-0" No.	C30 31'-0" Length	C34 34'-2" No.	C34 34'-2" Length	C38 38'-4" No.	C38 38'-4" Length	C42 42'-6" No.	C42 42'-6" Length	C46 46'-8" No.	C46 46'-8" Length	C50 50'-10" No.	C50 50'-10" Length	C55 55'-0" No.	C55 55'-0" Length	C59 59'-2" No.	C59 59'-2" Length	C63 63'-4" No.	C63 63'-4" Length	C67 67'-6" No.	C67 67'-6" Length	C71 71'-8" No.	C71 71'-8" Length	C75 75'-10" No.	C75 75'-10" Length	C80 80'-0" No.	C80 80'-0" Length	Beam / Span
	6a1		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	38'-3"	4	40'-4"	4	42'-5"	6a1
	4a2		2	5'-0"	2	5'-0"	2	5'-0"	2	5'-0"	2	5'-0"	2	5'-0"	2	5'-0"	2	5'-0"	2	5'-0"	2	5'-0"	2	5'-0"	2	5'-0"	2	5'-0"	4a2
	8a3		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	40'-0"	8a3
ΔΔ	4b1		26	8'-10"	26	8'-10"	30	8'-10"	34	8'-10"	36	8'-10"	38	8'-10"	42	8'-10"	44	8'-10"	50	8'-10"	56	8'-10"	54	8'-10"	58	8'-10"	62	8'-10"	4b1
	4b2		12	7'-2"	12	7'-2"	18	7'-2"	20	7'-2"	30	7'-2"	28	7'-2"	34	7'-2"	36	7'-2"	38	7'-2"	18	7'-2"	30	7'-2"	34	7'-2"	38	7'-2"	4b2
	6b5		—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	3'-9"	12	3'-9"	12	3'-9"	16	3'-9"	16	3'-9"	16	3'-9"	6b5
	3c1		26	1'-8"	26	1'-8"	30	1'-8"	34	1'-8"	36	1'-8"	38	1'-8"	42	1'-8"	44	1'-8"	50	1'-8"	56	1'-8"	54	1'-8"	58	1'-8"	62	1'-8"	3c1
**	3d		76	3'-0"	76	3'-0"	96	3'-0"	108	3'-0"	132	3'-0"	132	3'-0"	152	3'-0"	160	3'-0"	176	3'-0"	148	3'-0"	168	3'-0"	184	3'-0"	200	3'-0"	3d
	3e		24	1'-10"	24	1'-10"	26	1'-10"	24	1'-10"	24	1'-10"	26	1'-10"	26	1'-10"	26	1'-10"	26	1'-10"	26	1'-10"	26	1'-10"	26	1'-10"	26	1'-10"	3e



All dimensions are out to out. Radius to ℄ bar.
D = Pin diameter.

C Beam - Data Details

FILE NO.	ENGLISH	DESIGN TEAM	C Beams - LRFD Design	Standard Sheet 4620	COUNTY	PROJECT NUMBER	SHEET NUMBER

Revised 08-12; I.M. Reference Note for Sealing Beam Ends Distinguishes Between the Fabricator and Contractor.
Re-Issued 09-06.
Beams.dgn - 4620 - This Sheet Issued 04-2024, Sheet Format Update.

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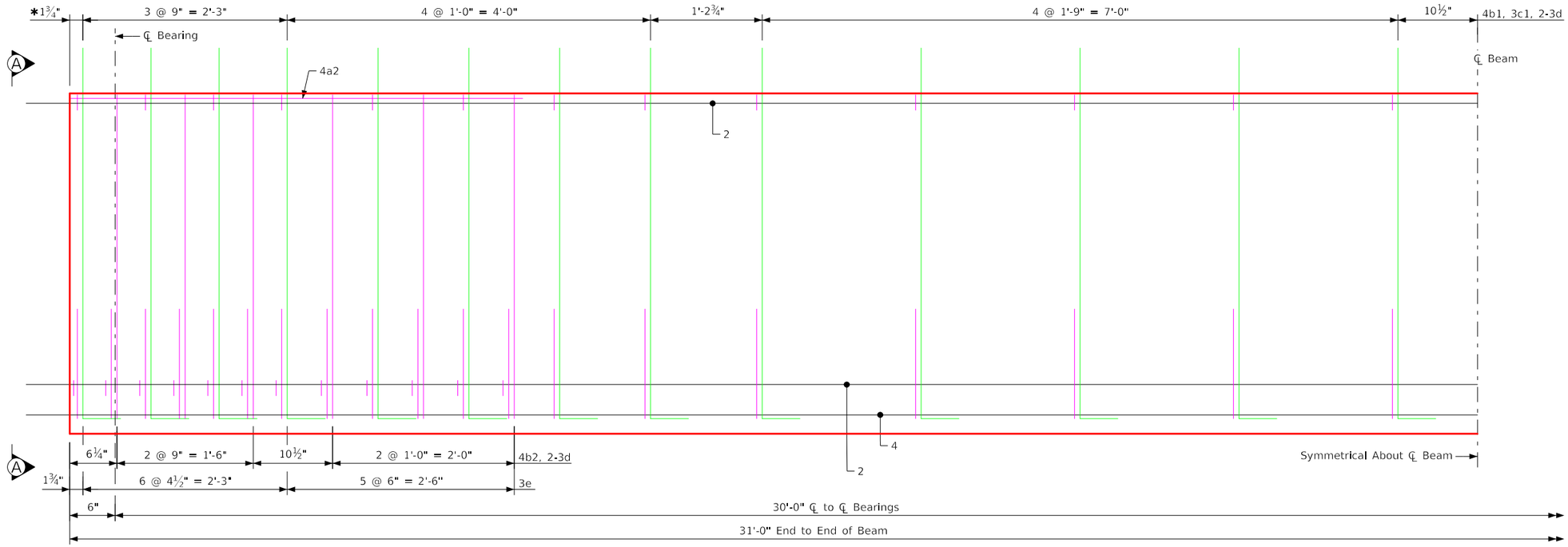
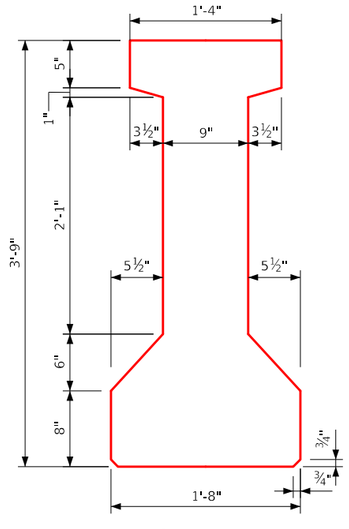


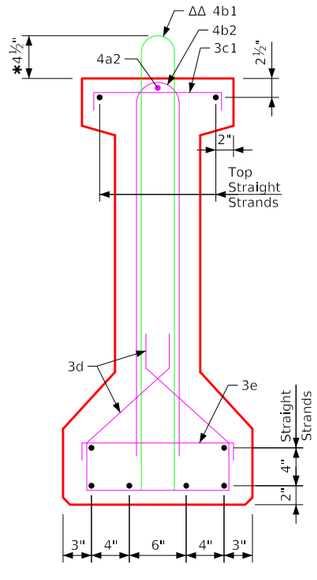
C30 Beam



"C" Beam
Cross Section

Area = 564.5 in.^{2}
y_b = 20.23 in.
I = 116,354 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 3d
are to be placed in pairs.

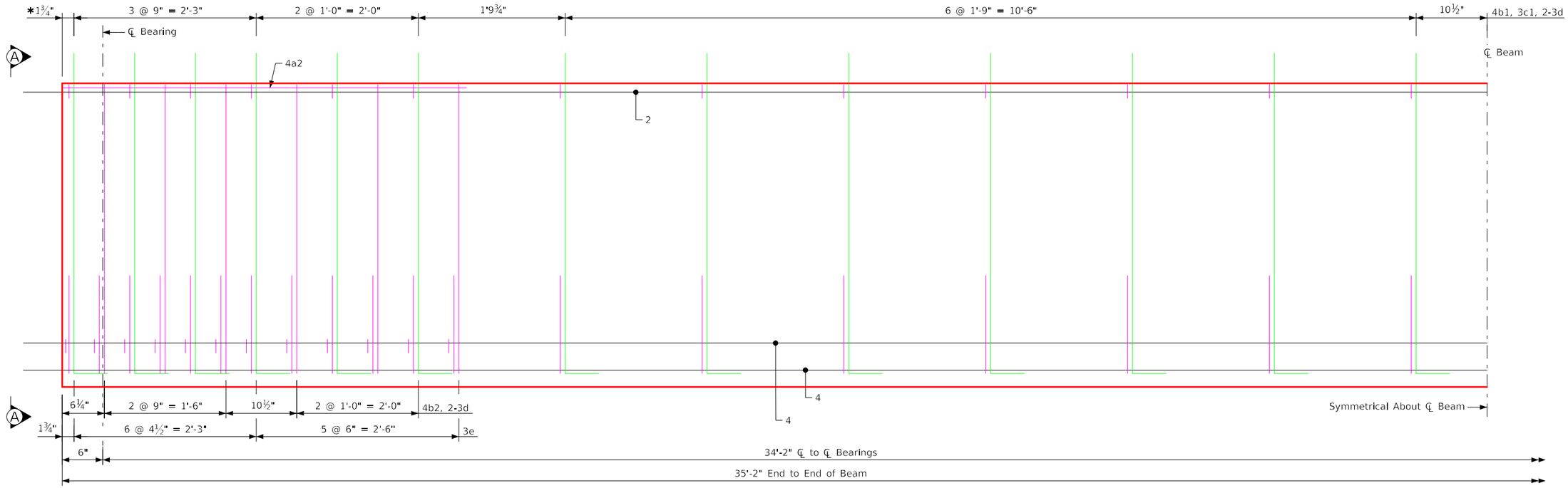
* Keep
ΔΔ Epoxy Coated Bars

C30 Beam Details

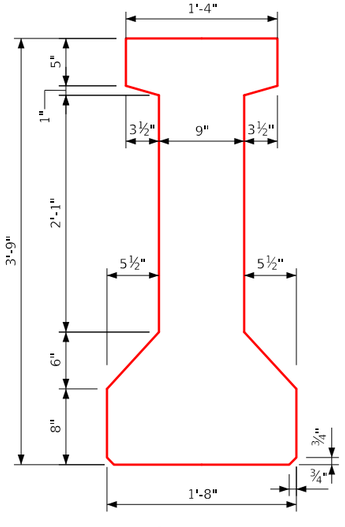
FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 30'-0" Span	Standard Sheet 4621-C30	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:06:55 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Beams.dgn - 4621-C30 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4621).



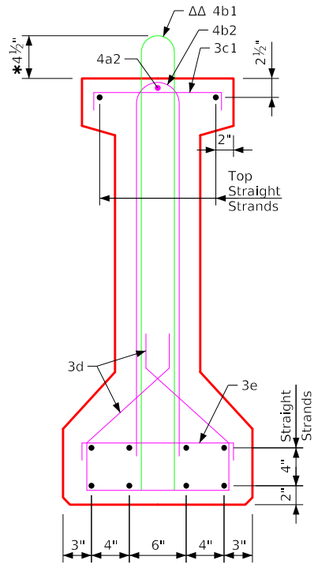
C34 Beam



"C" Beam
Cross Section

Area = 564.5 in.^{2}
y_b = 20.23 in.
I = 116,354 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 3d
are to be placed in pairs.

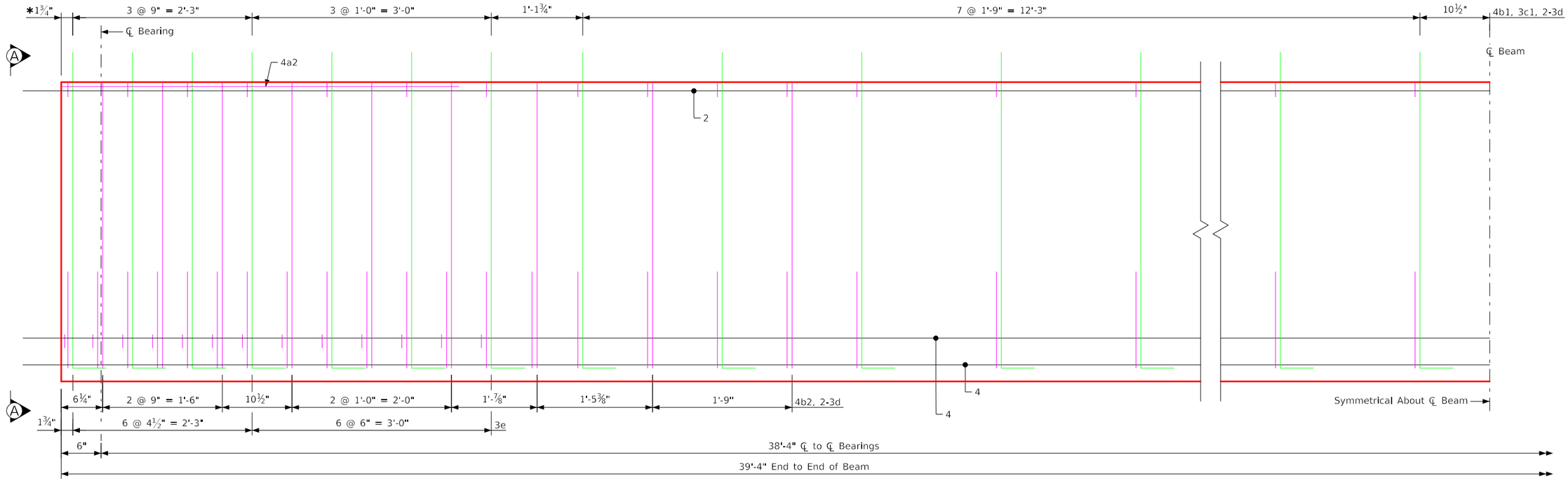
* Keep
ΔΔ Epoxy Coated Bars

C34 Beam Details

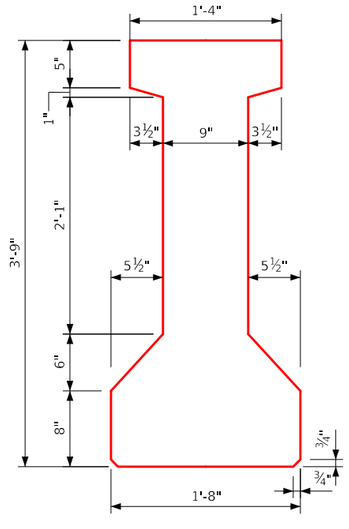
FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 34'-2" Span	Standard Sheet 4621-C34	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:06:55 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Revised 08-09: Added Prestressed Strands to C34 Beam X-Sections.
Beams.dgn - 4621-C34 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4621).



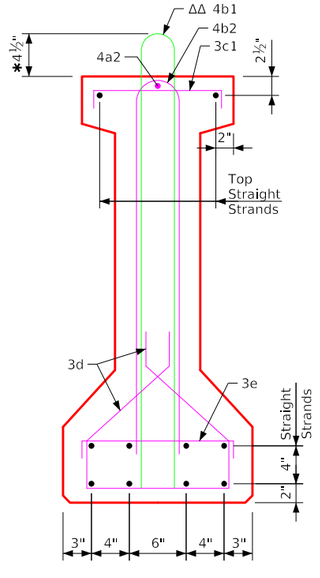
C38 Beam



"C" Beam
Cross Section

Area = 564.5 in.^{2}
y_b = 20.23 in.
I = 116,354 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 3d
are to be placed in pairs.

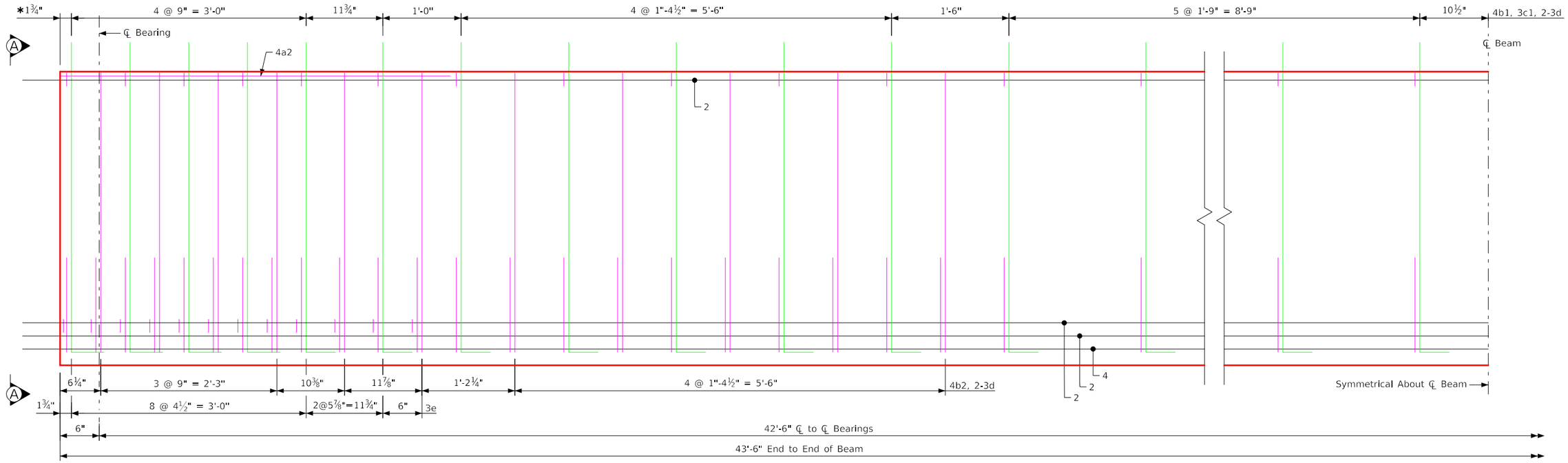
* Keep
ΔΔ Epoxy Coated Bars

C38 Beam Details

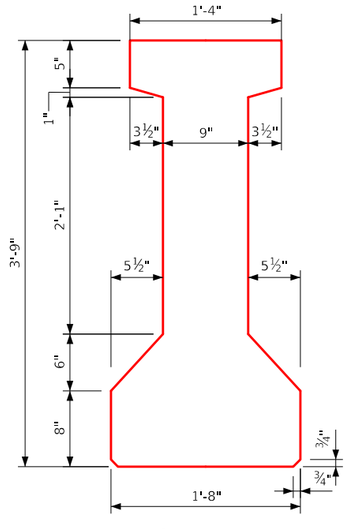
FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 38'-4" Span	Standard Sheet 4621-C38	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Revised 08-09: Added Prestressed Strands to C38 Beam X-Sections.
Beams.dgn - 4621-C38 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4621).

4:06:56 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



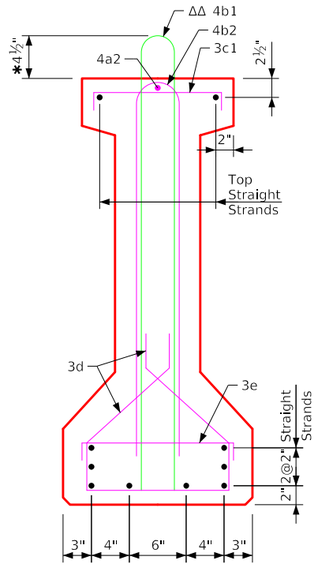
C42 Beam



"C" Beam
Cross Section

Area = 564.5 in.^{2}
y_b = 20.23 in.
I = 116,354 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 3d
are to be placed in pairs.

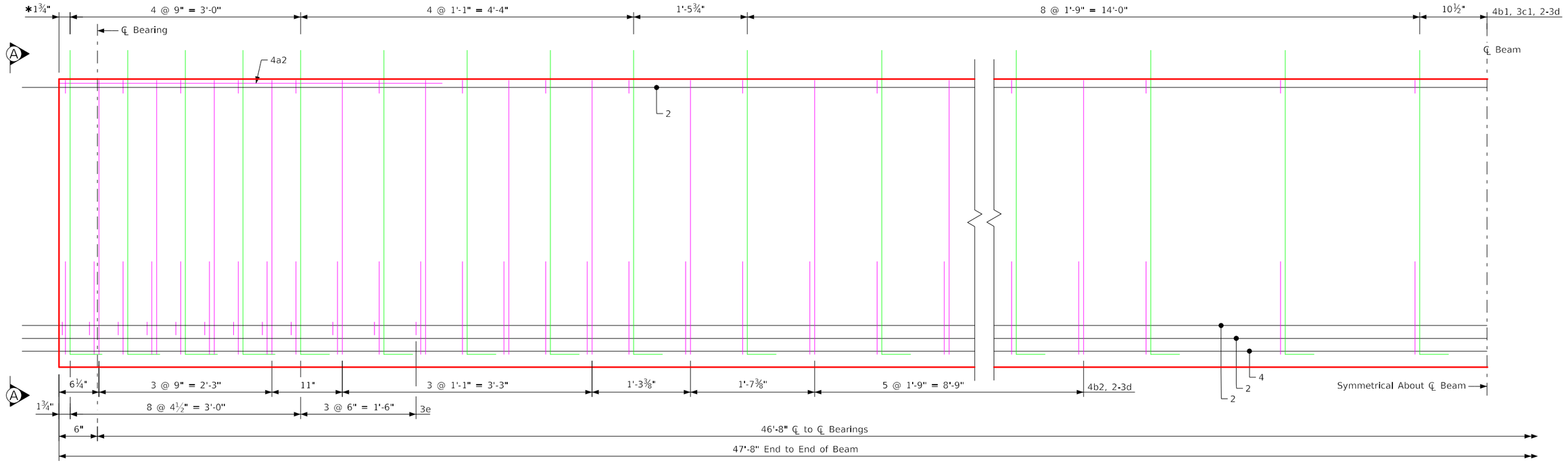
✱ Keep
ΔΔ Epoxy Coated Bars

C42 Beam Details

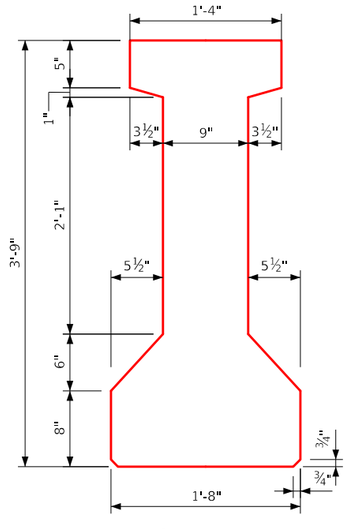
FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 42'-6" Span	Standard Sheet 4621-C42	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Beams.dgn - 4621-C42 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4621).

4:06:57 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



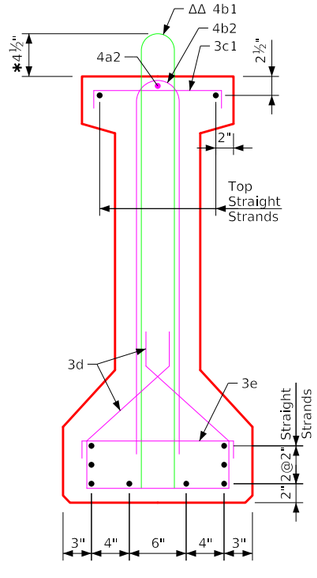
C46 Beam



"C" Beam
Cross Section

Area = 564.5 in.^{2}
y_b = 20.23 in.
I = 116,354 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 3d
are to be placed in pairs.

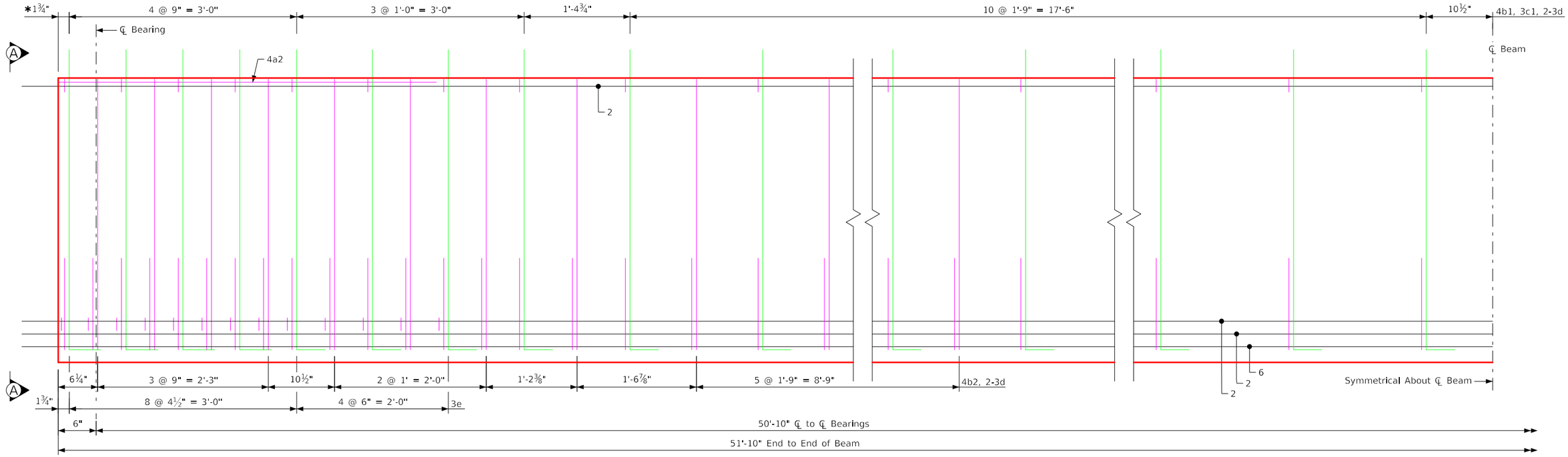
* Keep
ΔΔ Epoxy Coated Bars

C46 Beam Details

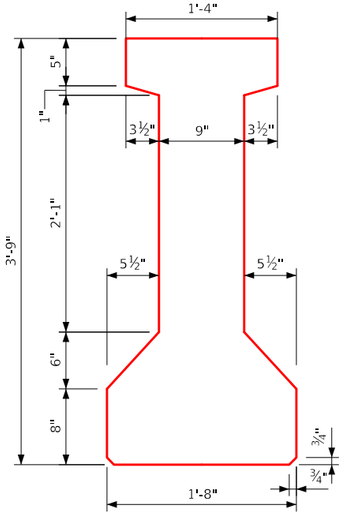
FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 46'-8" Span	Standard Sheet 4621-C46	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:06:57 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Beams.dgn - 4621-C46 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4621).



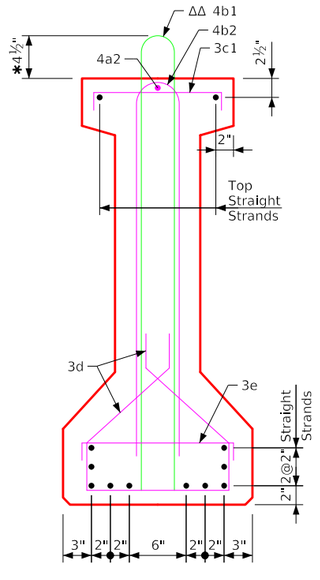
C50 Beam



"C" Beam
Cross Section

Area = 564.5 in.^{2}
y_b = 20.23 in.
I = 116,354 in.^{4}

Beam Section Properties



View A-A

Note: Bars 3d
are to be placed in pairs.

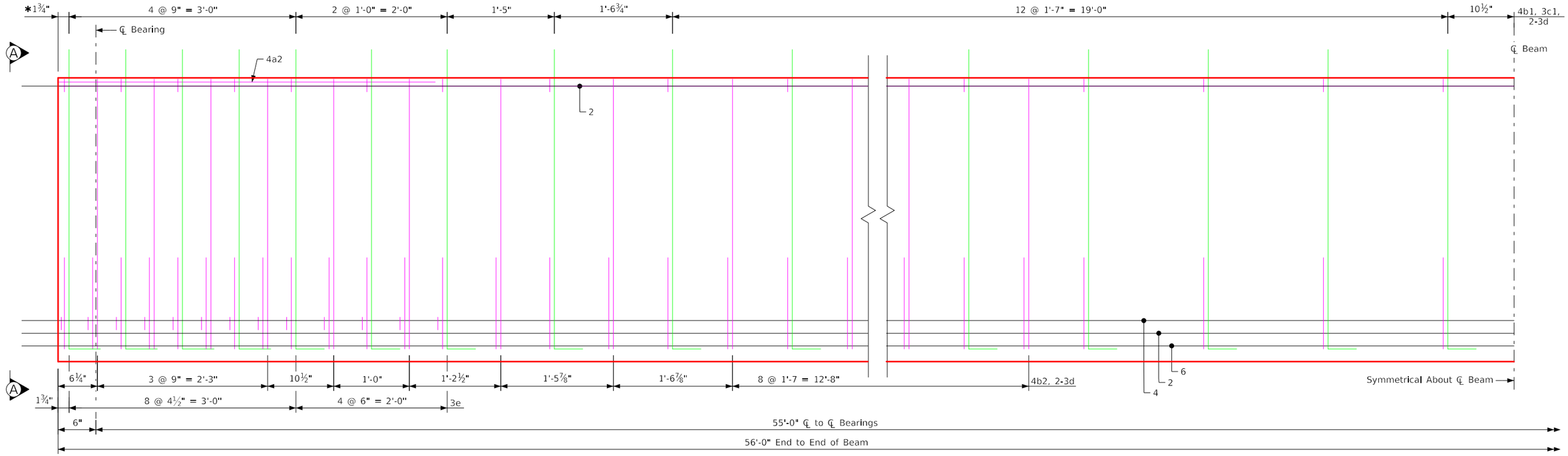
* Keep
ΔΔ Epoxy Coated Bars

C50 Beam Details

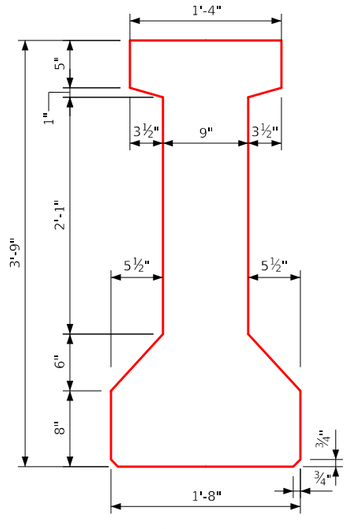
Correction 07-08: Removed the Duplicate 4b2 Bar Labelling in the Cross Sections for C50 Beams.
Beams.dgn - 4622-C50 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4622).

FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 50'-10" Span	Standard Sheet 4622-C50	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:06:58 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



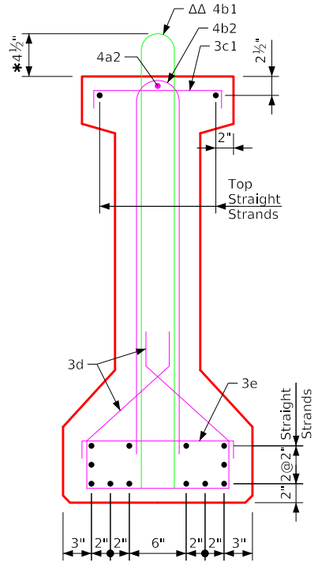
C55 Beam



"C" Beam
Cross Section

Area = 564.5 in.^{2}
y_b = 20.23 in.
I = 116,354 in.^{4}

Beam Section Properties



View A-A

Note: Bars 3d
are to be placed in pairs.

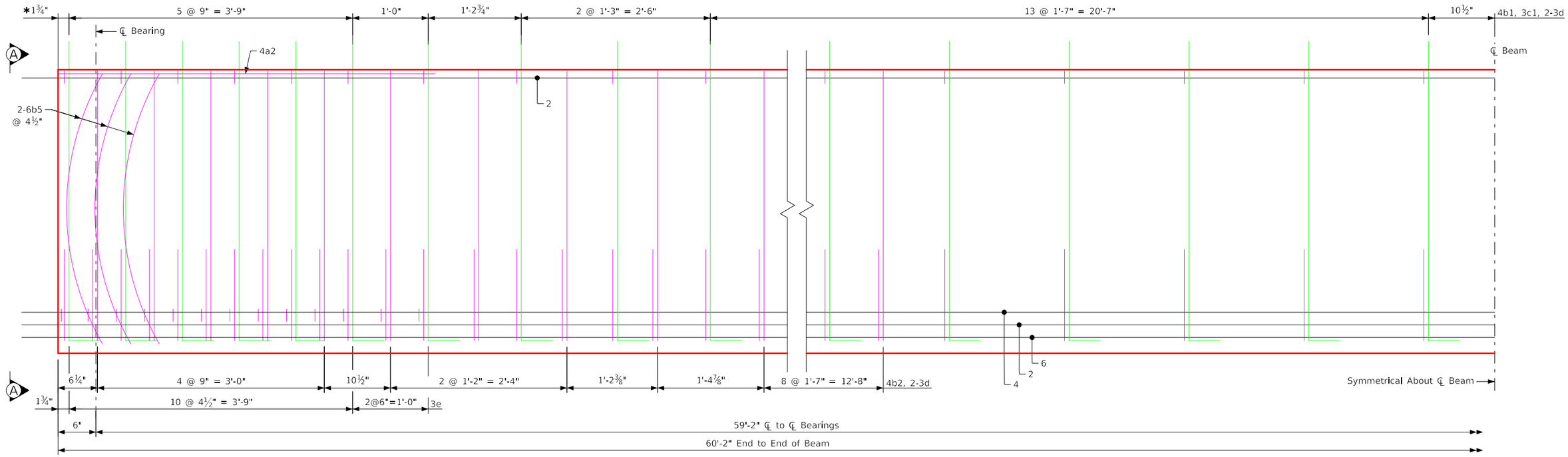
* ΔΔ Keep Epoxy Coated Bars

C55 Beam Details

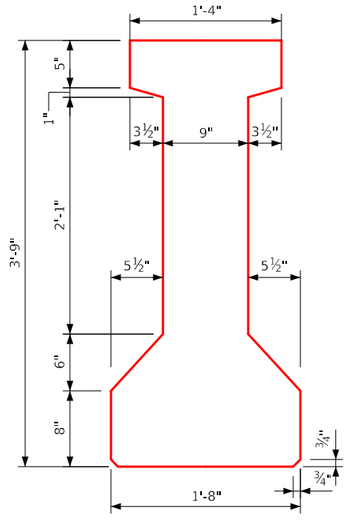
Correction 07-08: Removed the Duplicate 4b2 Bar Labelling in the Cross Sections for C55 Beams.
Beams.dgn - 4622-C55 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4622).

FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 55'-0" Span	Standard Sheet 4622-C55	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:06:59 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



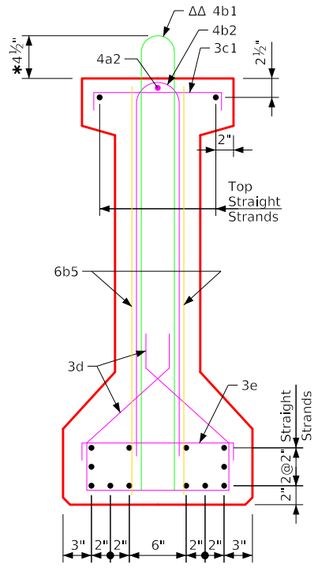
C59 Beam



"C" Beam
Cross Section

Area = 564.5 in.^{2}
y_b = 20.23 in.
I = 116,354 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 6b5 and 3d
are to be placed in pairs.
Tie 6b5 bars to 4b1 & 4b2.

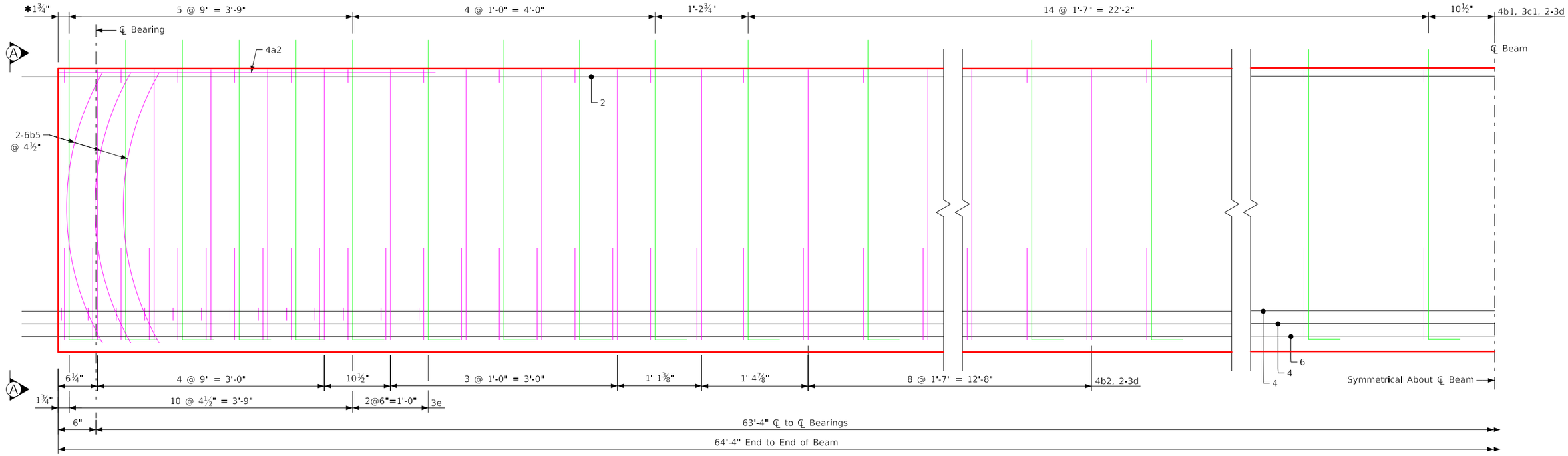
✱ Keep
ΔΔ Epoxy Coated Bars

C59 Beam Details

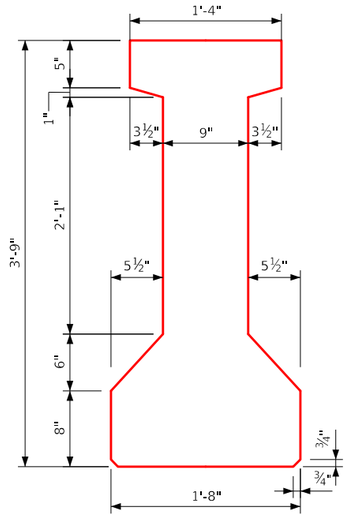
FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 59'-2" Span	Standard Sheet 4622-C59	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Correction 07-08: Removed the Duplicate 4b2 Bar Labelling in the Cross Sections for C59 Beams.
Beams.dgn - 4622-C59 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4622).

4:07:00 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



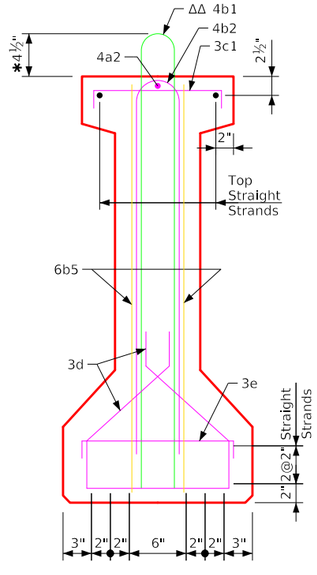
C63 Beam



"C" Beam
Cross Section

Area = 564.5 in.^{2}
y_b = 20.23 in.
I = 116,354 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 6b5 and 3d
are to be placed in pairs.
Tie 6b5 bars to 4b1 & 4b2.

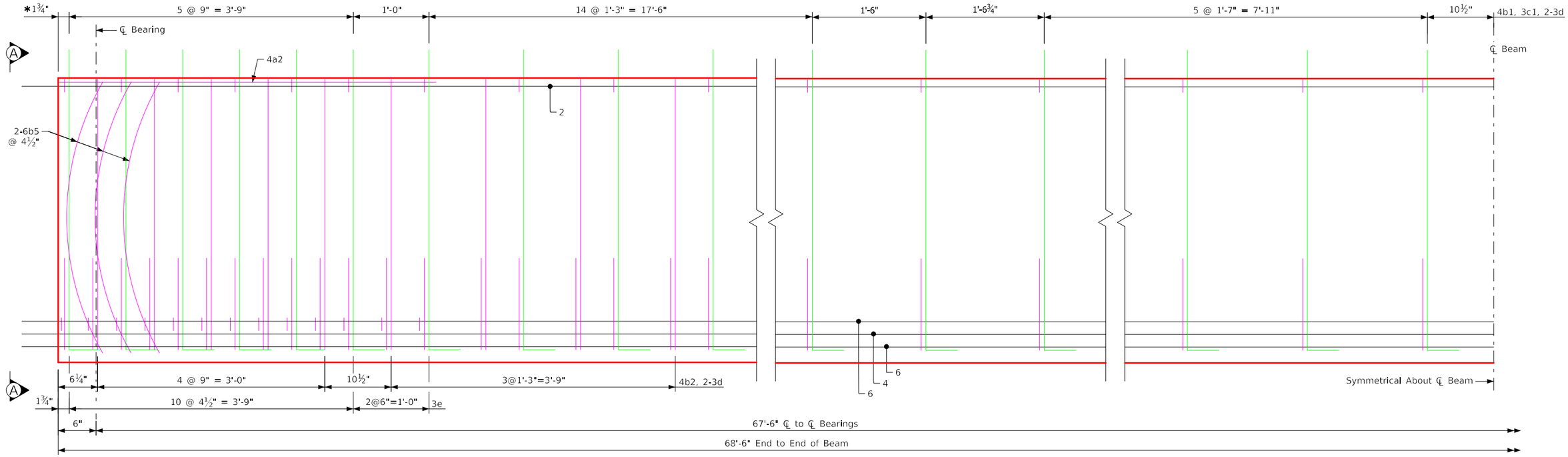
✱ Keep
ΔΔ Epoxy Coated Bars

C63 Beam Details

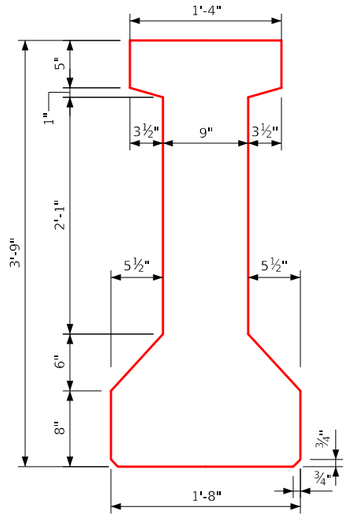
FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 63'-4" Span	Standard Sheet 4622-C63	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Correction 07-08: Corrected the 4b2 Bars to 6b5 Bars for C63 Beams.
Beams.dgn - 4622-C63 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4622).

4:07:01 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



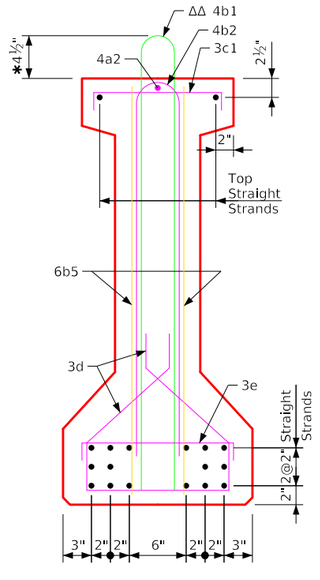
C67 Beam



"C" Beam
Cross Section

Area = 564.5 in.^{2}
y_b = 20.23 in.
I = 116,354 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 6b5 and 3d
are to be placed in pairs.
Tie 6b5 bars to 4b1 & 4b2.

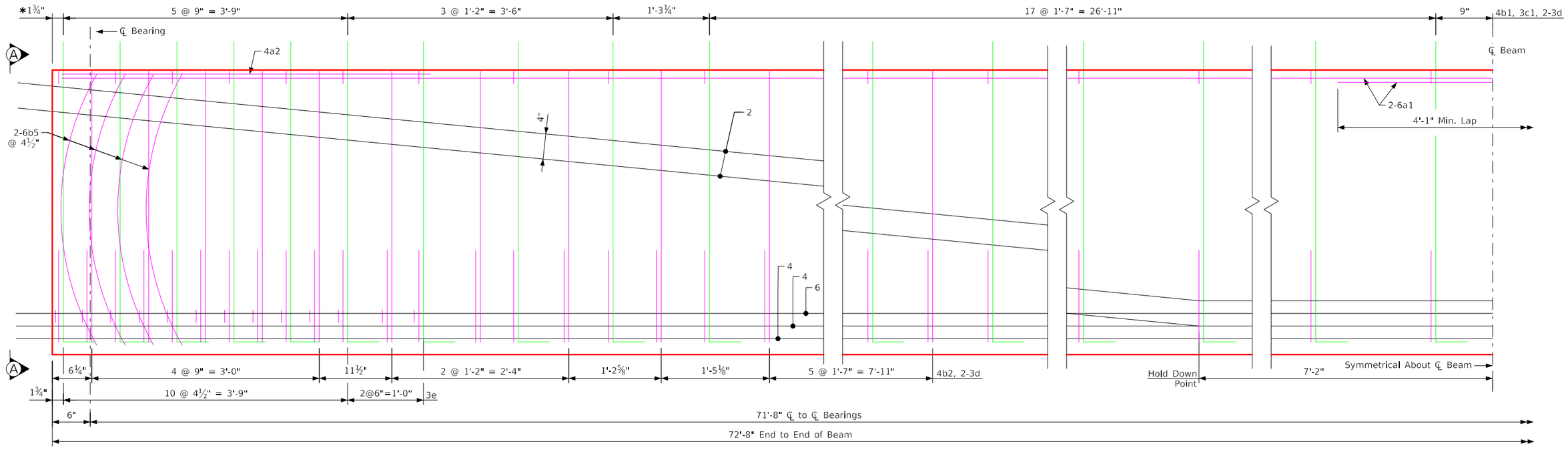
* Keep
ΔΔ Epoxy Coated Bars

C67 Beam Details

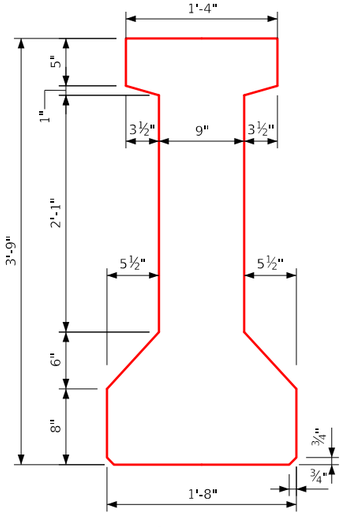
Correction 07-08: Corrected the 4b2 Bars to 6b5 Bars for C67 Beams.
Beams.dgn - 4622-C67 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4622).

FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 67'-6" Span	Standard Sheet 4622-C67	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:01 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



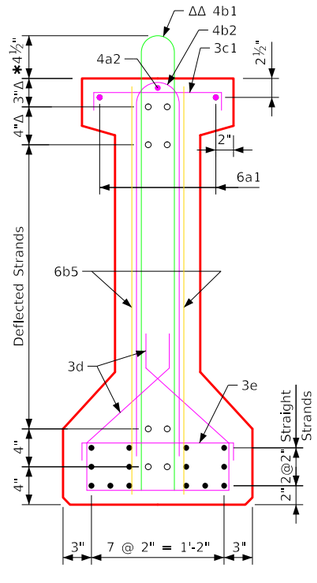
C71 Beam



"C" Beam
Cross Section

Area = 564.5 in.^{2}
y_b = 20.23 in.
I = 116,354 in.^{4}

Beam Section Properties



View A-A

Note: Bars 6b5 and 3d
are to be placed in pairs.
Tie 6b5 bars to 4b1 & 4b2.

° Deflected Strands
✱ Keep
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

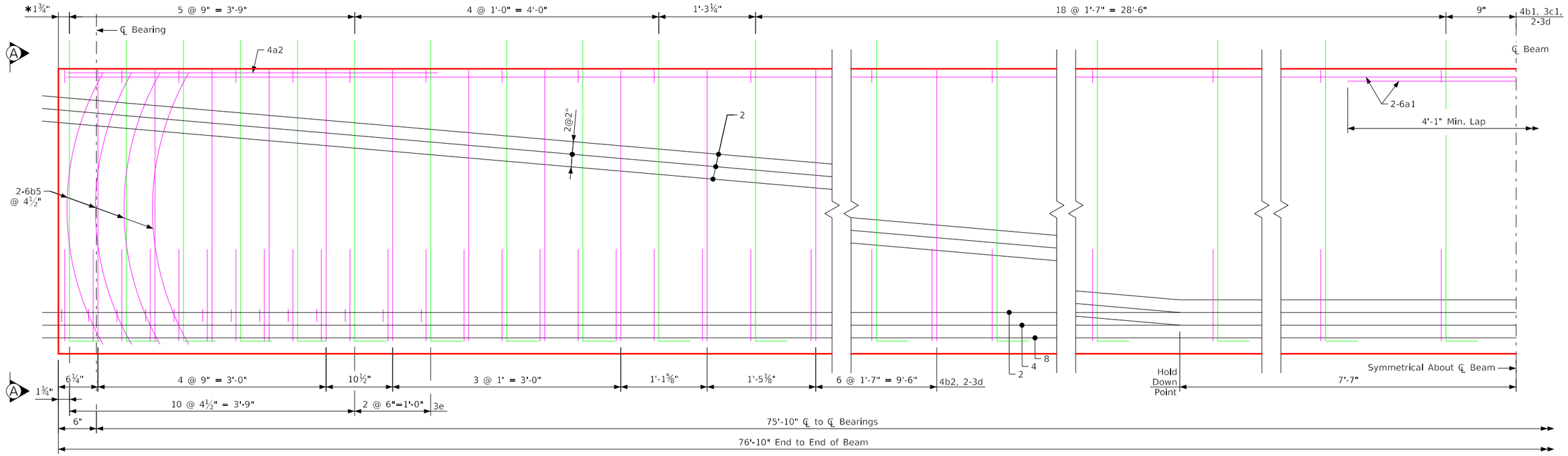
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

C71 Beam Details

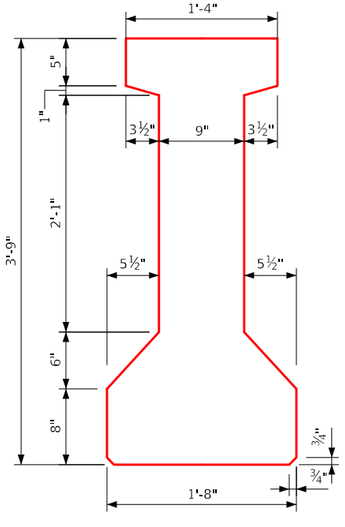
Correction 07-08: The 6d5 Bars Were Corrected to 6b5.
Beams.dgn - 4623-C71 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4623).

FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 71'-8" Span	Standard Sheet 4623-C71	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:02 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



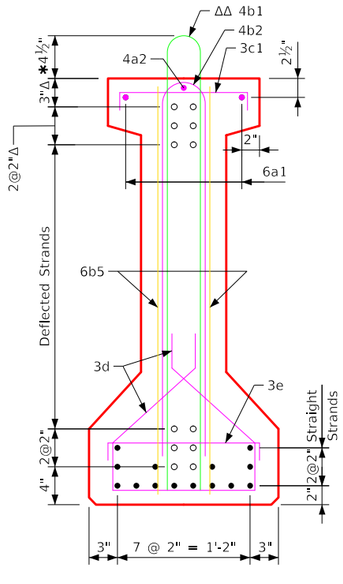
C75 Beam



"C" Beam
Cross Section

Area = 564.5 in.^{2}
y_b = 20.23 in.
I = 116,354 in.^{4}

Beam Section Properties



View A-A

Note: Bars 6b5 and 3d
are to be placed in pairs.
Tie 6b5 bars to 4b1 & 4b2.

° Deflected Strands
✱ Keep
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

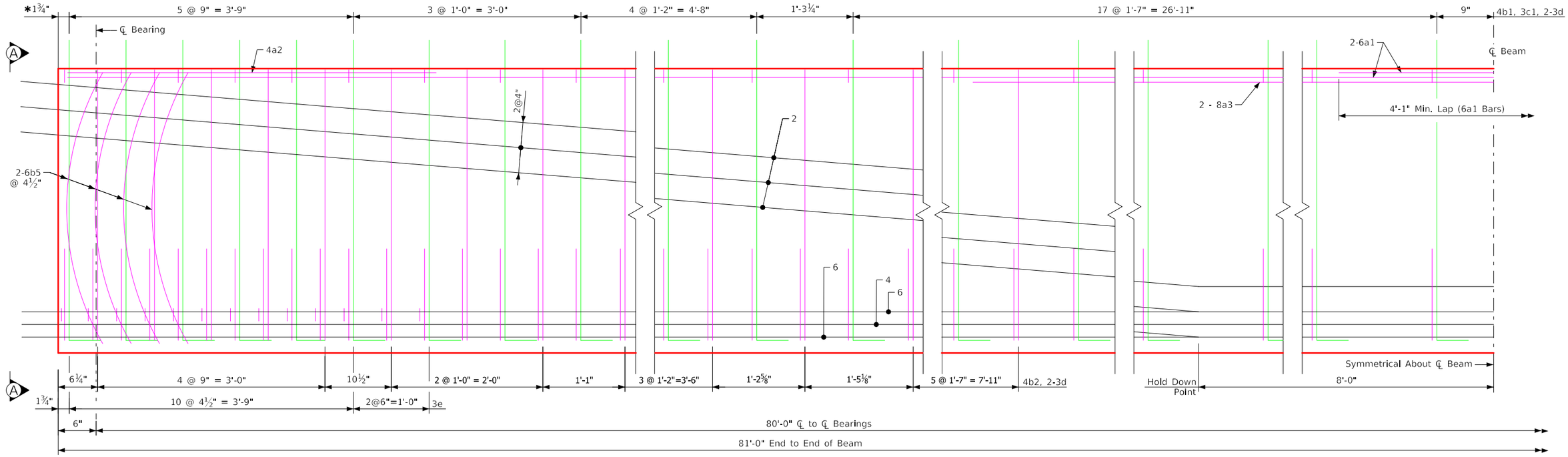
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

C75 Beam Details

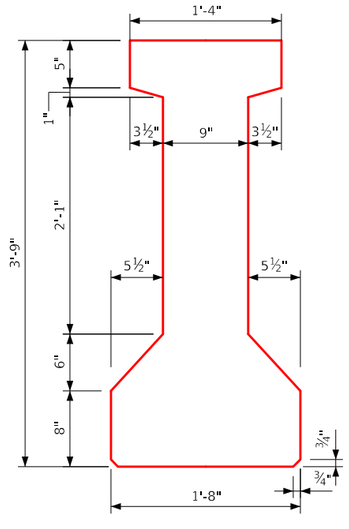
FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 75'-10" Span	Standard Sheet 4623-C75	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Correction 07-08: The 6d5 bars were corrected to 6b5.
Beams.dgn - 4623-C75 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4623).

4:07:03 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



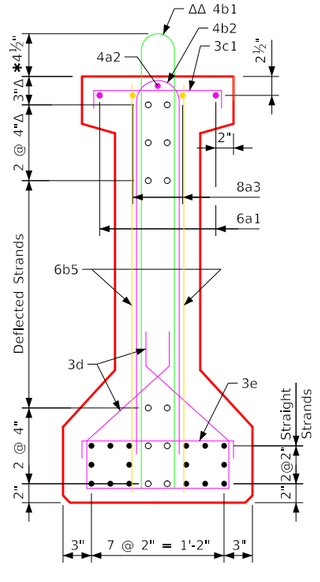
C80 Beam



"C" Beam
Cross Section

Area = 564.5 in.^{2}
y_b = 20.23 in.
I = 116,354 in.^{4}

Beam Section Properties



View A-A

Note: Bars 6b5 and 3d
are to be placed in pairs.
Tie 6b5 bars to 4b1 & 4b2.

° Deflected Strands
✱ Keep
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

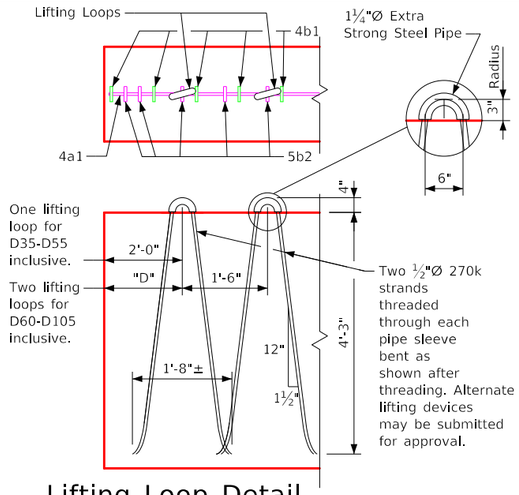
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

C80 Beam Details

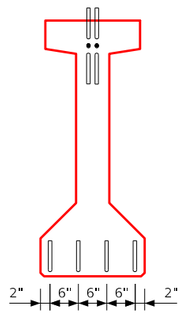
FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 80'-0" Span	Standard Sheet 4623-C80	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:04 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

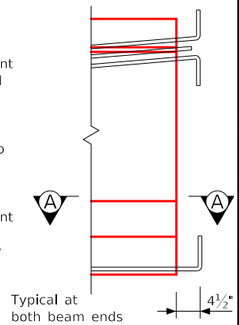
Correction 07-08: The 6d5 Bars were Corrected to 6b5.
Beams.dgn - 4623-C80 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4623).



Lifting Loop Detail



The top straight strands of beams D35 through D60 are to be cut with 1'-0" projections and shop bent up. The top and bottom deflected strands of beams D65 through D105 are to be cut with 1'-0" projections and shop bent up or down as shown. The remaining top strands are to be cut with 0'-3" projections.
Four bottom strands are to be cut with 1'-0" projections and shop bent as shown. The remaining bottom strands shall be cut off reasonably flush with the concrete.



Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms

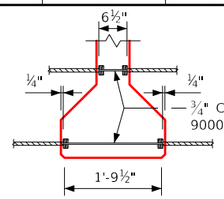
D Beam Data

D Beam	Span Length ℄-℄ Bearing	Overall Beam Length (L)	Concrete Strength f'ci (ksi.)	Concrete Strength f'c (ksi.)	Strand Size Dia. (in.)	No. of Strands Straight	No. of Strands Deflected	Total Initial Prestress ③ (kips)	Hold Down Force (kips)	Camber (in.) ④ At Release	Camber (in.) ④ After Losses	Deflection (in.) Δ_D Immediate ① (elastic) Δ_I Steel Diaphragm	Deflection (in.) Δ_D Time ② (plastic) Δ_T Steel Diaphragm	Permissible Maximum Spacing HL-93 Loading Steel Diaphragm	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight-lb.)
D35	35'-0"	36'-0"	4.5	5.0	0.60"	10	—	425	—	0.07"	0.13"	0.03"	0.01"	7'-6"	12.0	5.9	525
D40	40'-0"	41'-0"	4.5	5.0	0.60"	10	—	425	—	0.08"	0.15"	0.06"	0.02"	7'-6"	13.6	6.7	565
D45	45'-0"	46'-0"	4.5	5.0	0.60"	12	—	510	—	0.14"	0.27"	0.10"	0.02"	7'-6"	15.3	7.6	585
D50	50'-0"	51'-0"	4.5	5.0	0.60"	12	—	510	—	0.17"	0.31"	0.15"	0.04"	7'-6"	17.0	8.4	626
D55	55'-0"	56'-0"	4.5	5.0	0.60"	12	—	510	—	0.19"	0.36"	0.22"	0.04"	7'-6"	18.6	9.2	746
D60	60'-0"	61'-0"	4.5	5.0	0.60"	14	—	596	—	0.28"	0.52"	0.30"	0.08"	7'-6"	20.3	10.0	722
D65	65'-0"	66'-0"	4.5	5.0	0.60"	8	4	510	23.7	0.40"	0.74"	0.41"	0.10"	7'-6"	22.0	10.8	1097
D70	70'-0"	71'-0"	4.5	5.0	0.60"	8	6	596	30.0	0.47"	0.87"	0.55"	0.14"	7'-6"	23.6	11.7	1268
D75	75'-0"	76'-0"	4.5	5.0	0.60"	12	6	766	26.7	0.77"	1.42"	0.72"	0.18"	7'-6"	25.3	12.5	1149
D80	80'-0"	81'-0"	4.5	5.0	0.60"	12	6	766	27.2	0.83"	1.54"	0.92"	0.23"	7'-6"	27.0	13.3	1319
D85	85'-0"	86'-0"	4.5	5.0	0.60"	14	6	851	27.3	1.10"	2.03"	1.17"	0.29"	7'-6"	28.6	14.1	1332
D90	90'-0"	91'-0"	4.5	5.0	0.60"	16	6	936	25.8	1.32"	2.44"	1.46"	0.37"	7'-6"	30.4	15.0	1564
D95	95'-0"	96'-0"	4.5	5.0	0.60"	18	6	1021	24.5	1.61"	2.57"	1.70"	0.43"	7'-6"	31.9	15.8	1635
D100	100'-0"	101'-0"	6.0	7.5	0.60"	22	6	1192	22.3	1.96"	3.14"	2.21"	0.55"	7'-6"	33.6	16.6	1529
D105	105'-0"	106'-0"	6.0	7.5	0.60"	26	6	1362	22.2	2.23"	3.58"	2.23"	0.56"	7'-6"	35.3	17.4	1610

Lifting Loop And Overhang Table

Beams	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
D35-D55	1	2	2'-0"	**
D60-D80	2	2	1'-3"	**
D85	2	2	1'-3"	5.50'
D90	2	2	1'-3"	7.00'
D95	2	2	1'-3"	7.50'
D100	2	2	3'-9"	9.50'
D105	2	2	6'-3"	10.00'

** In accordance with Article 2407.03, K of the Standard Specifications.



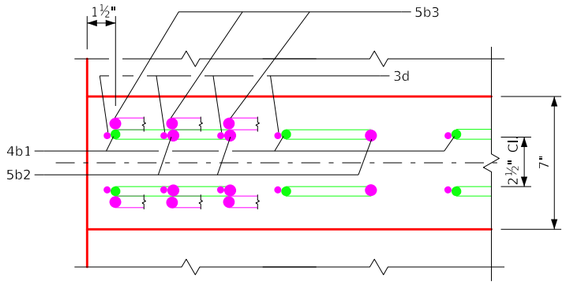
Coil Tie Detail

Number and exact location of coil ties to be as detailed on specific bridge design.

A=Size
B=No.

ΔΔ 4b1 bars to be epoxy coated.

Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.



Section A-A Showing Placement of Stirrups Near End of Beam

Design Stresses:

Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications, Series of 2017.
Reinforcing steel in accordance with Section 5, Grade 60.
Concrete in accordance with Section 5.
Prestressing steel in accordance with Section 5, Grade 270.

Specifications:

Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications.
Design: AASHTO LRFD, Series of 2017, with minor modifications.

① Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.0") weight of:
0.81 kips/ft. for 7'-6" beam spacing and one steel diaphram (0.285 kips) at ℄ of span. For different deck and diaphragm weights, deflections will be directly proportional.

② Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.
Total beam deflections at ℄ of span, Δ_D , due to weight of deck and diaphragms for detailing purpose:
(A) $\Delta_D=\Delta_I + \Delta_T$ for simple span.
(B) $\Delta_D=\Delta_I + \frac{3}{4}\Delta_T$ for end spans of continuous bridge.
(C) $\Delta_D=\Delta_I + \frac{1}{2}\Delta_T$ for interior spans of continuous bridge.

③ Total initial prestress is based on 72.6% f's. f's = 270 ksi. and As = 0.217 sq. in.

④ Calculated design cambers are based on multipliers developed from research in Iowa.

Beam Notes: (continued)

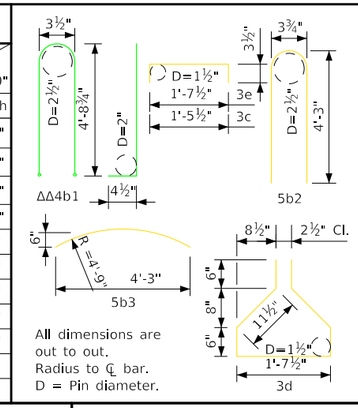
Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet.
If sole plate is required for bearing, sole plate is to be set in forms when beam is cast and formed out below to exclude concrete as detailed on the Bearing Sheet.
If stub abutments are used, all strands at the ends of beams at stub abutments shall be cut off reasonably flush with the concrete.
When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with Materials I.M. 570 (Fabricator Application) and I.M. 491.12 (Contractor Application).

Beam Notes:

These beams are designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.
All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.
Hold down points for deflected strands may be moved toward ends of beam a distance of 0.05 L maximum at producer's option.
All prestressing strands except lifting loop strands shall be 0.60 in nominal diameter (nominal steel area = 0.217 in.²) and conform to ASTM A416 Grade 270 Low Relaxation Strands. Minimum strand breaking strength shall be 58.6 kips.
Tops of beams are to be struck off level and finished as per Materials I.M.570.
Bearings shall be as detailed on other design sheets.
Beams to be used in bridges made continuous by the poured in place deck, are to be at least 28 days old before the deck is placed unless a shorter curing time is approved by the Bridge Engineer.
The portions of the prestressed beams that are to be embedded in the abutment and pier diaphragms shall be roughened for a distance of 10" from the beam end by sandblasting or other approved methods to provide suitable bond between the beam and the diaphragm in accordance with Article 2403.03, I, of the Standard Specifications.
All beams are to be increased in length to compensate for elastic shortening, creep and shrinkage.
For transporting, the allowable overhang is shown in the "Lifting Loop and Overhang Table".
The Contractor shall assure the lateral stability of the D100 and D105 beams during handling, transporting and erection by providing temporary bracing as needed.
If the precast panel option is allowed and used for bridge deck formation, the beam stirrups will need to be extended and top flange beam finish shall be modified as per details on the Precast Deck Panel Sheet.
Minimum concrete f'c (at 28 days) and minimum f'ci at release are located in the D Beam Data Table above.
0.6" diameter strands stressed to not more than 5,000 lbs. each may be used in lieu of the 4 bars which run the full length of the beam in the top flange.

Reinforcing Bar List

Beam / Span		D35 35'-0"		D40 40'-0"		D45 45'-0"		D50 50'-0"		D55 55'-0"		D60 60'-0"		D65 65'-0"		D70 70'-0"		D75 75'-0"		D80 80'-0"		D85 85'-0"		D90 90'-0"		D95 95'-0"		D100 100'-0"		D105 105'-0"	
Bar	Shape	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length
4a1		2	4'-0"	2	4'-0"	2	4'-0"	2	4'-0"	2	4'-0"	2	4'-0"	2	4'-0"	2	4'-0"	2	4'-0"	2	4'-0"	2	16'-0"	2	18'-0"	2	20'-0"	2	22'-0"	2	24'-0"
a2		—	—	—	—	—	—	—	—	—	—	—	—	5/4	23'-10"	5/4	25'-4"	5/4	26'-10"	5/4	28'-4"	5/4	30'-4"	5/4	31'-10"	6/4	34'-0"	6/4	36'-6"	6/4	38'-0"
a3		—	—	—	—	—	—	—	—	—	—	—	—	6/2	25'-0"	6/2	27'-0"	6/2	29'-0"	6/2	31'-0"	6/2	32'-0"	7/2	34'-0"	8/2	36'-0"	8/2	36'-0"	8/2	38'-0"
ΔΔ4b1		33	10'-4"	37	10'-4"	39	10'-4"	43	10'-4"	51	10'-4"	51	10'-4"	51	10'-4"	58	10'-4"	63	10'-4"	70	10'-4"	71	10'-4"	74	10'-4"	80	10'-4"	81	10'-4"	87	10'-4"
5b2		14	8'-8"	14	8'-8"	14	8'-8"	14	8'-8"	16	8'-8"	14	8'-8"	32	8'-8"	38	8'-8"	22	8'-8"	30	8'-8"	28	8'-8"	38	8'-8"	28	8'-8"	16	8'-8"	16	8'-8"
5b3		4	4'-4"	4	4'-4"	4	4'-4"	4	4'-4"	8	4'-4"	8	4'-4"	8	4'-4"	12	4'-4"	12	4'-4"	12	4'-4"	12	4'-4"	20	4'-4"	20	4'-4"	20	4'-4"	20	4'-4"
3c		33	2'-1"	37	2'-1"	39	2'-1"	43	2'-1"	51	2'-1"	51	2'-1"	51	2'-1"	58	2'-1"	63	2'-1"	70	2'-1"	71	2'-1"	74	2'-1"	80	2'-1"	81	2'-1"	87	2'-1"
3d		47	5'-7"	51	5'-7"	53	5'-7"	57	5'-7"	67	5'-7"	65	5'-7"	83	5'-7"	96	5'-7"	85	5'-7"	100	5'-7"	99	5'-7"	112	5'-7"	108	5'-7"	97	5'-7"	103	5'-7"
3e		28	2'-3"	28	2'-3"	28	2'-3"	30	2'-3"	32	2'-3"	30	2'-3"	30	2'-3"	36	2'-3"	34	2'-3"	34	2'-3"	32	2'-3"	36	2'-3"	32	2'-3"	32	2'-3"	32	2'-3"



All dimensions are out to out.
Radius to ℄ bar.
D = Pin diameter.

D Beam - Data Details

FILE NO.	ENGLISH	DESIGN TEAM	D Beams - LRFD Design	Standard Sheet 4630	COUNTY	PROJECT NUMBER	SHEET NUMBER

Revised 08-12: I.M. Reference Not for Sealing Beam Ends. Distinguishes Between the Fabricator and Contractor.
Re-Issued 09-06. - This Sheet Re-Issued 04-2024. Sheet Format Update.
Beams.dgn - 4630

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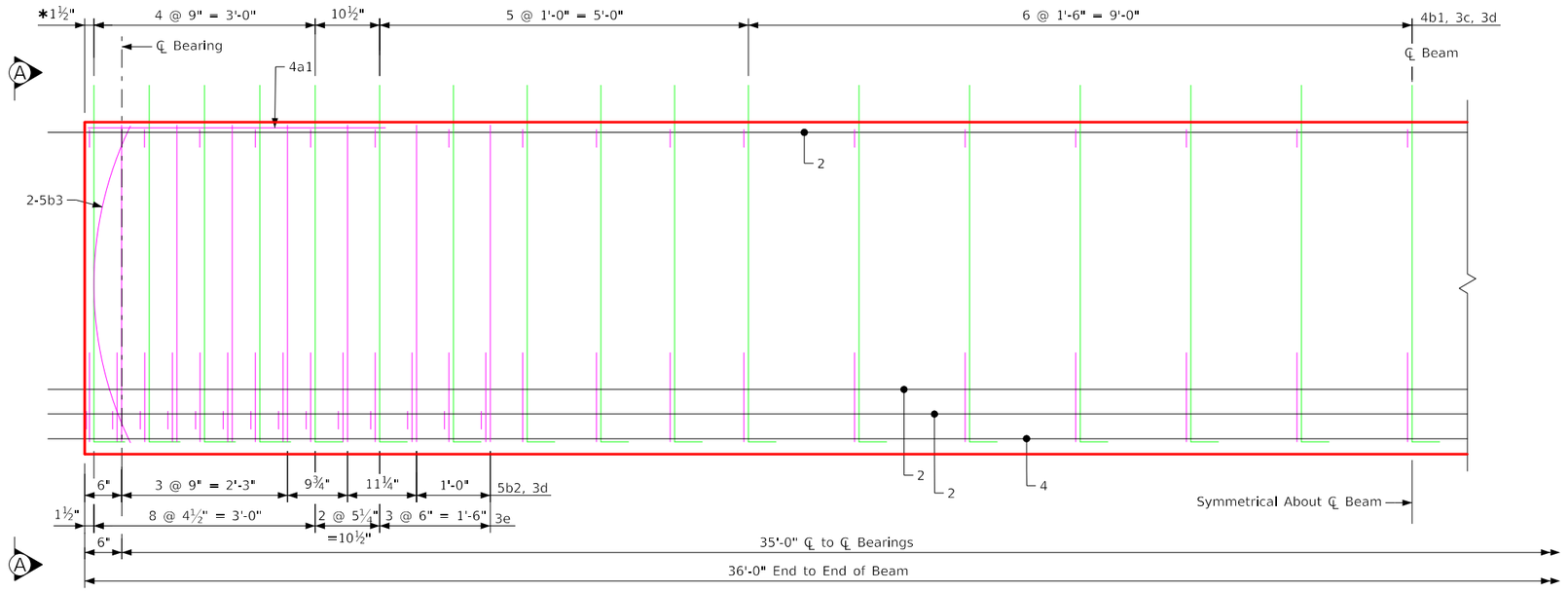
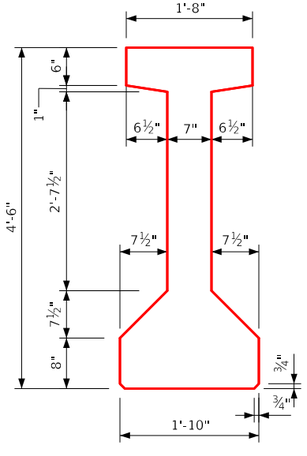


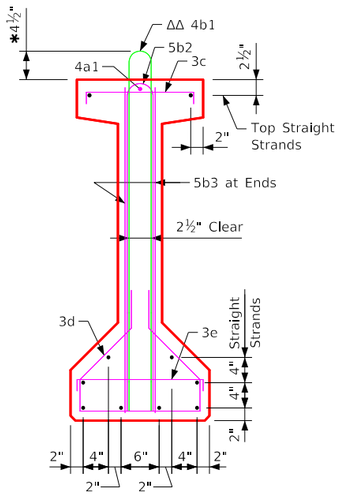
D35 Beam



"D" Beam
Cross Section

Area = 638.75 in.^{2}
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

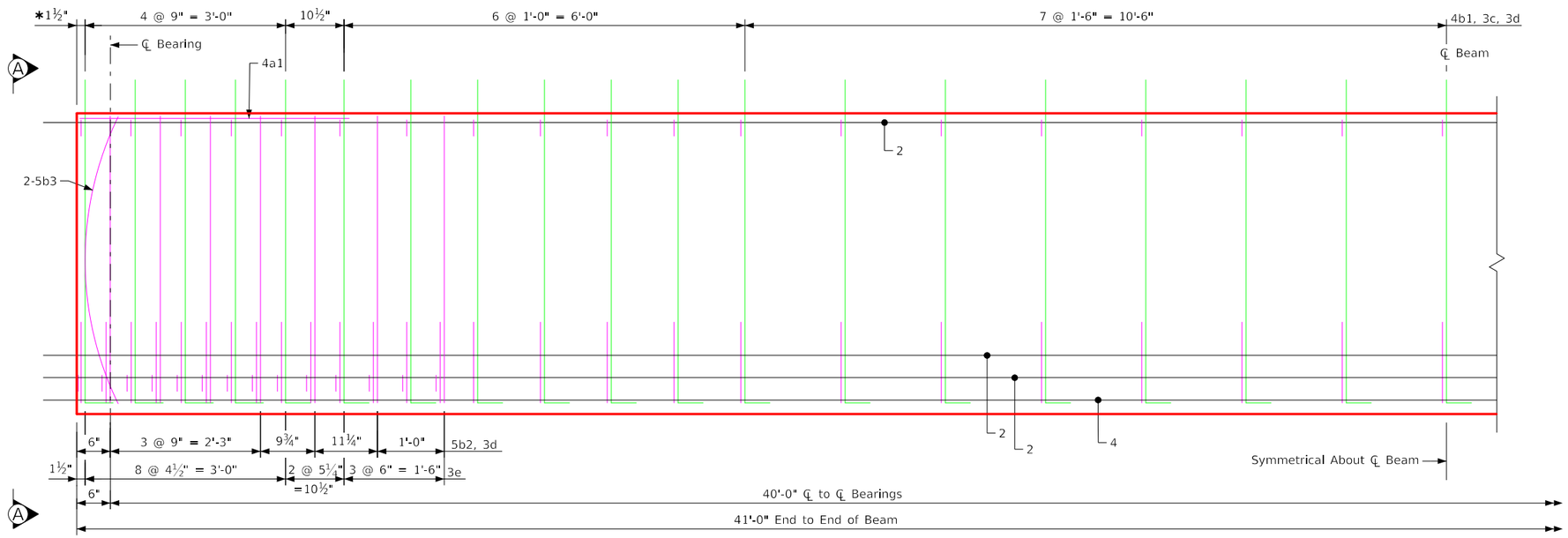
* Keep
ΔΔ Epoxy Coated Bars

D35 Beam Details

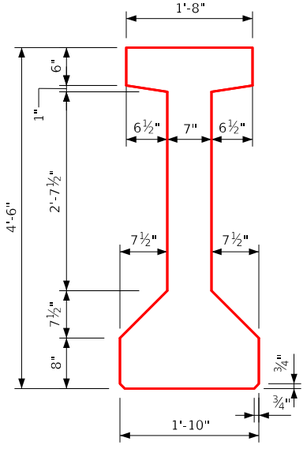
FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 35'-0" Span	Standard Sheet 4631-D35	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:06 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Beams.dgn - 4631-D35 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4631).



D40 Beam



"D" Beam
Cross Section

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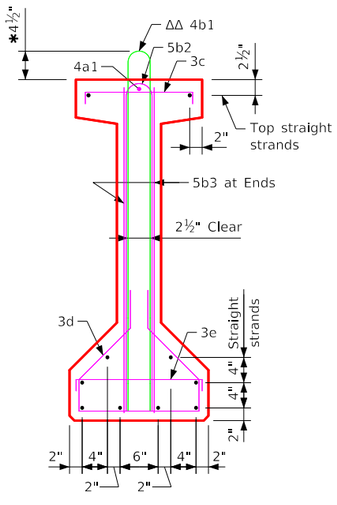
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

* Keep
ΔΔ Epoxy Coated Bars

D40 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 40'-0" Span	Standard Sheet 4631-D40	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Beams.dgn - 4631-D40 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4631).

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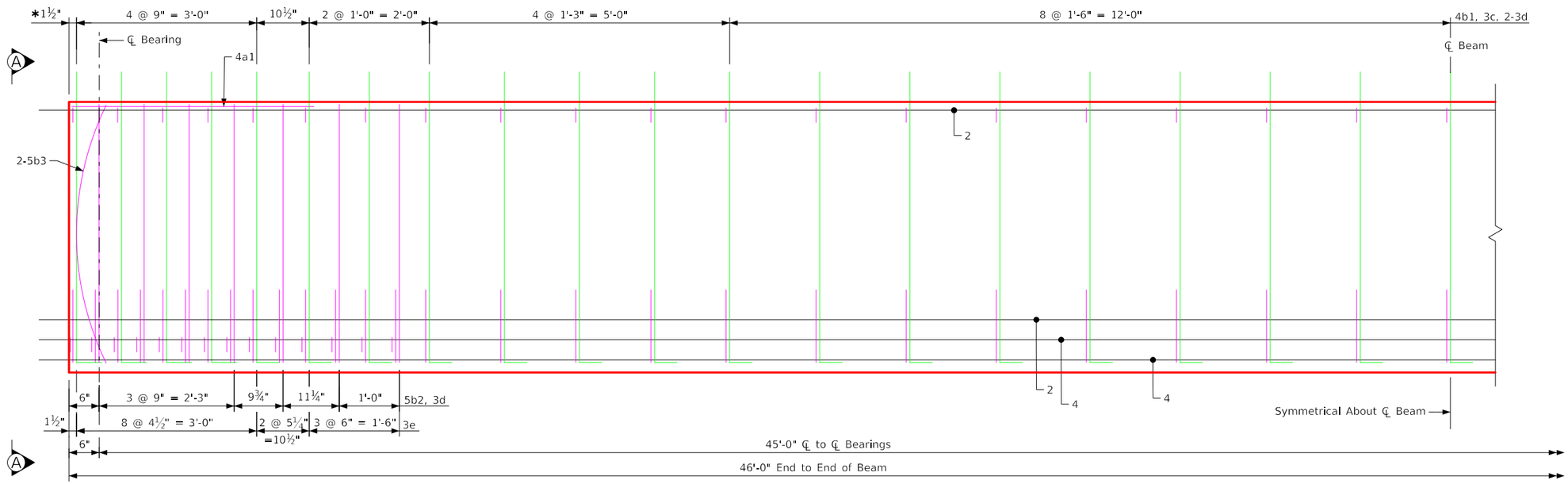
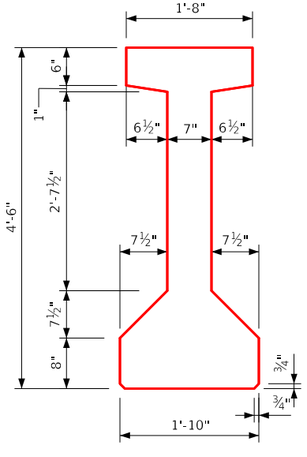


D45 Beam



"D" Beam
Cross Section

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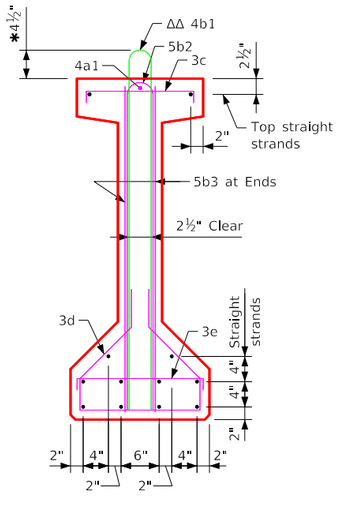
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

* Keep
ΔΔ Epoxy coated bars

D45 Beam Details

Correction 08-09: Added Strands to the D45 Beam X-Section.
Beams.dgn - 4632-D45 -This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4632).

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 45'-0" Span	Standard Sheet 4632-D45	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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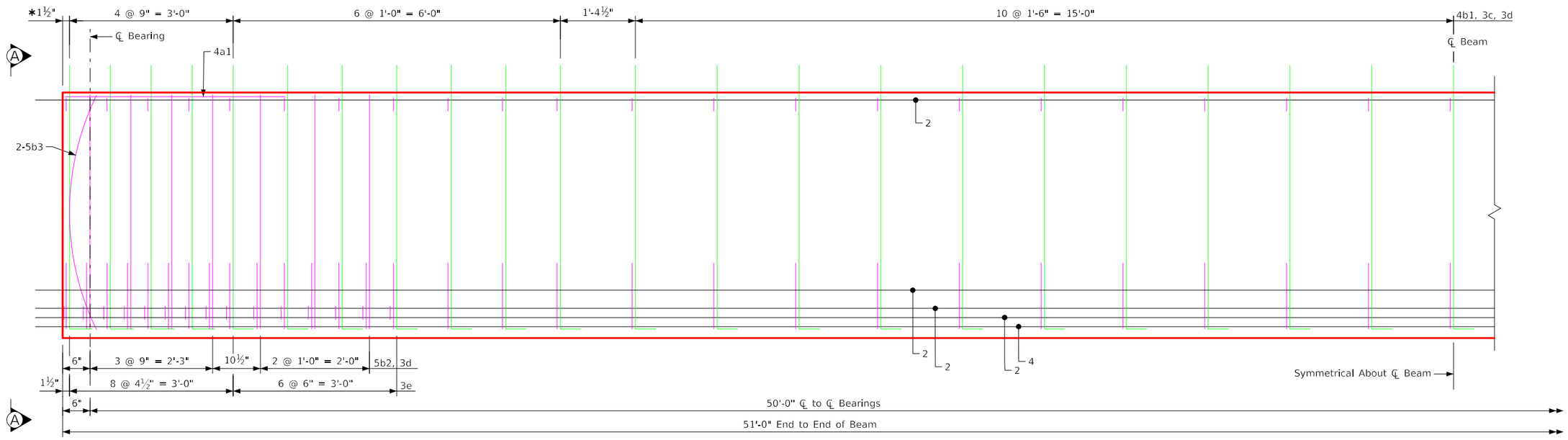
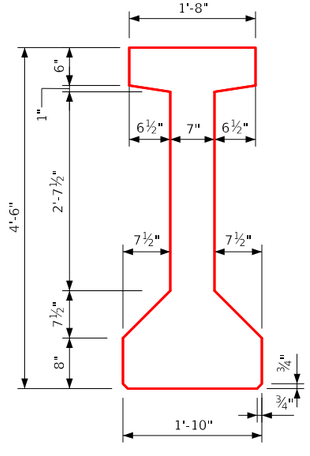


D50 Beam



"D" Beam
Cross Section

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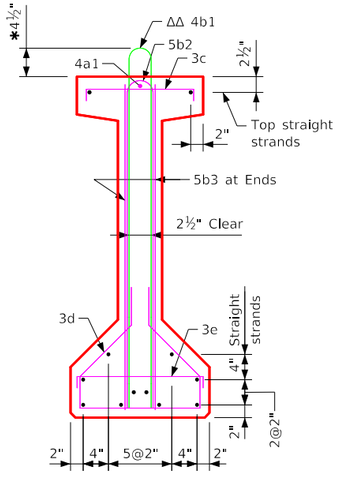
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

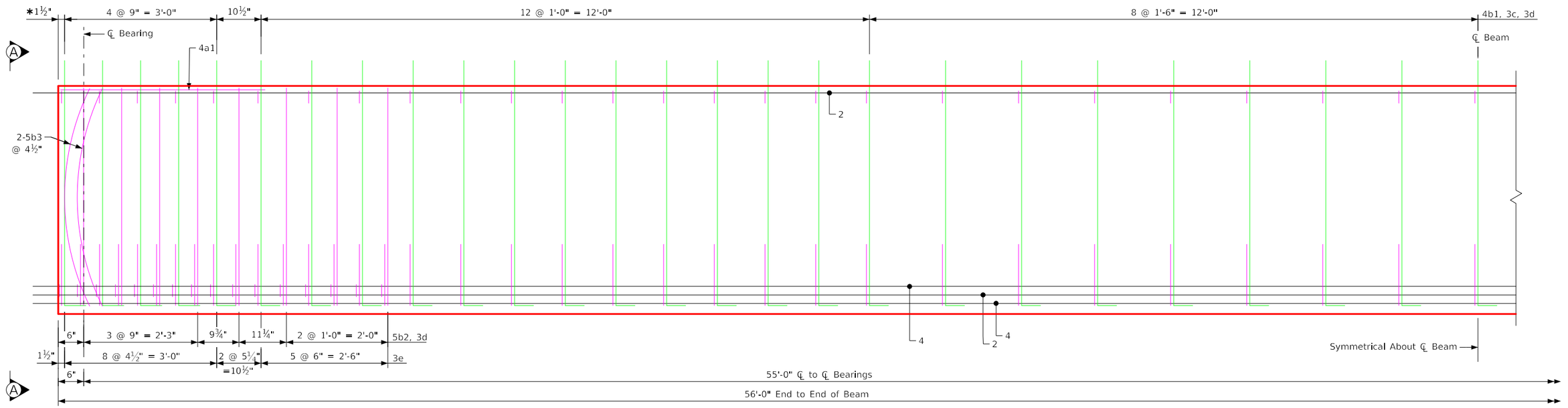
* Keep
ΔΔ Epoxy coated bars

D50 Beam Details

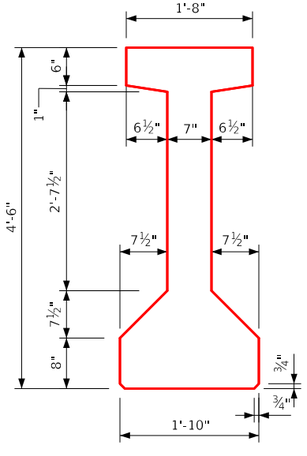
FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 50'-0" Span	Standard Sheet 4632-D50	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:09 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Beams.dgn - 4632-D50 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4632).



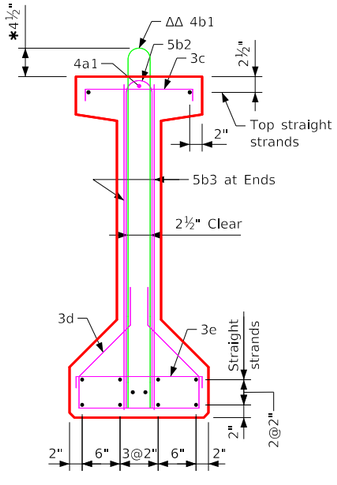
D55 Beam



"D" Beam
Cross Section

Area = 638.75 in.^{2}
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

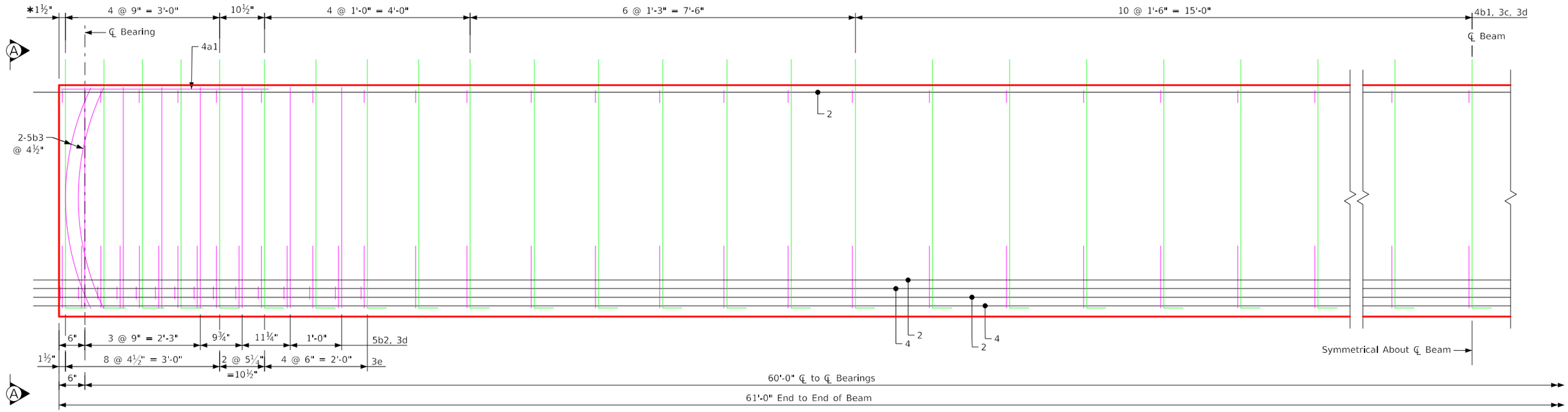
* Keep
ΔΔ Epoxy coated bars

D55 Beam Details

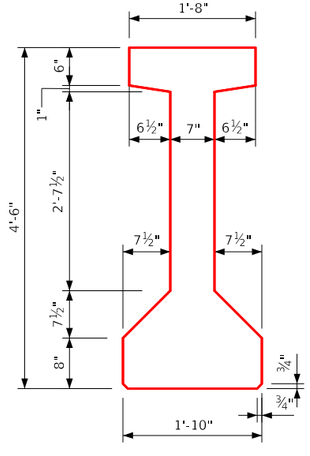
Beams.dgn - 4632-D55 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4632).

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 55'-0" Span	Standard Sheet 4632-D55	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:09 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



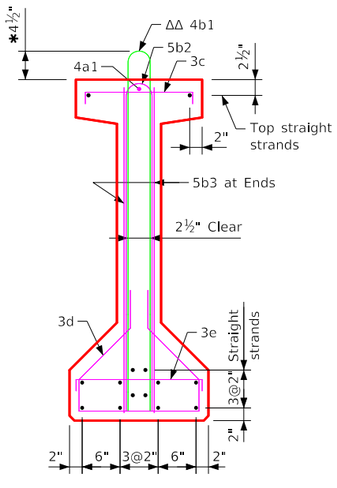
D60 Beam



"D" Beam
Cross Section

Area = 638.75 in.^{2}
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

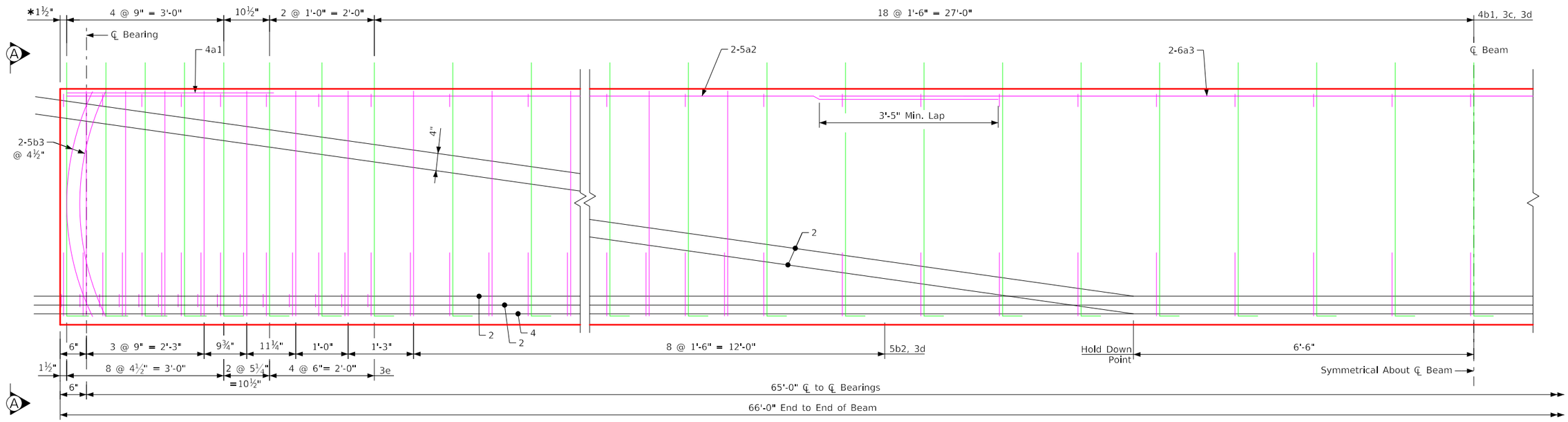
* Keep
ΔΔ Epoxy coated bars

D60 Beam Details

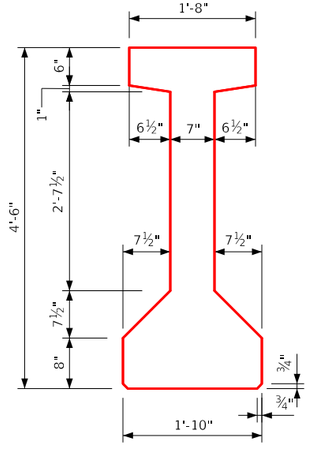
FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 60'-0" Span	Standard Sheet 4632-D60	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:10 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Beams.dgn - 4632-D60 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4632).



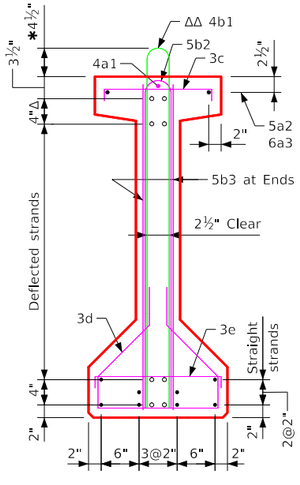
D65 Beam



"D" Beam
Cross Section

Area = 638.75 in.^{2}
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section
Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

° Deflected strands
* Keep
Δ Dimensions at end of beam
ΔΔ Epoxy coated bars

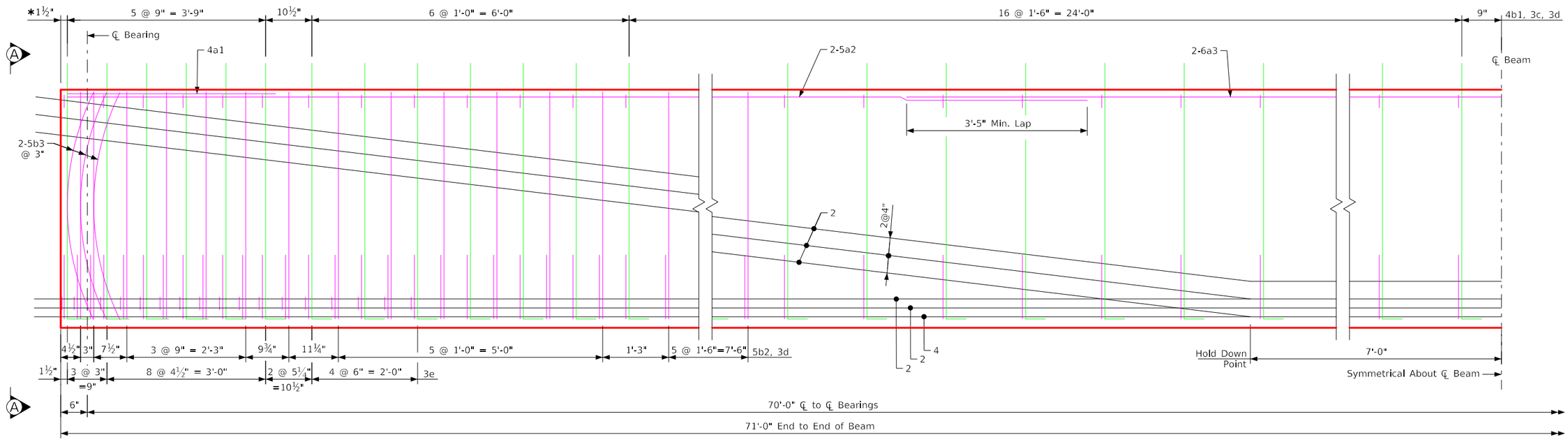
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

D65 Beam Details

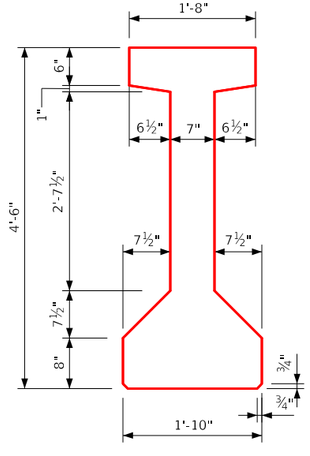
FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 65'-0" Span	Standard Sheet 4633-D65	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:11 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Beams.dgn - 4633-D65 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4633).



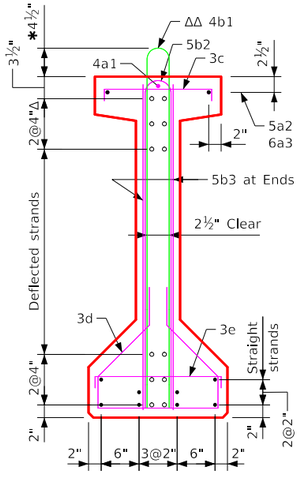
D70 Beam



"D" Beam Cross Section

Area = 638.75 in.^{2}
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

° Deflected strands
* Keep
Δ Dimensions at end of beam
ΔΔ Epoxy coated bars

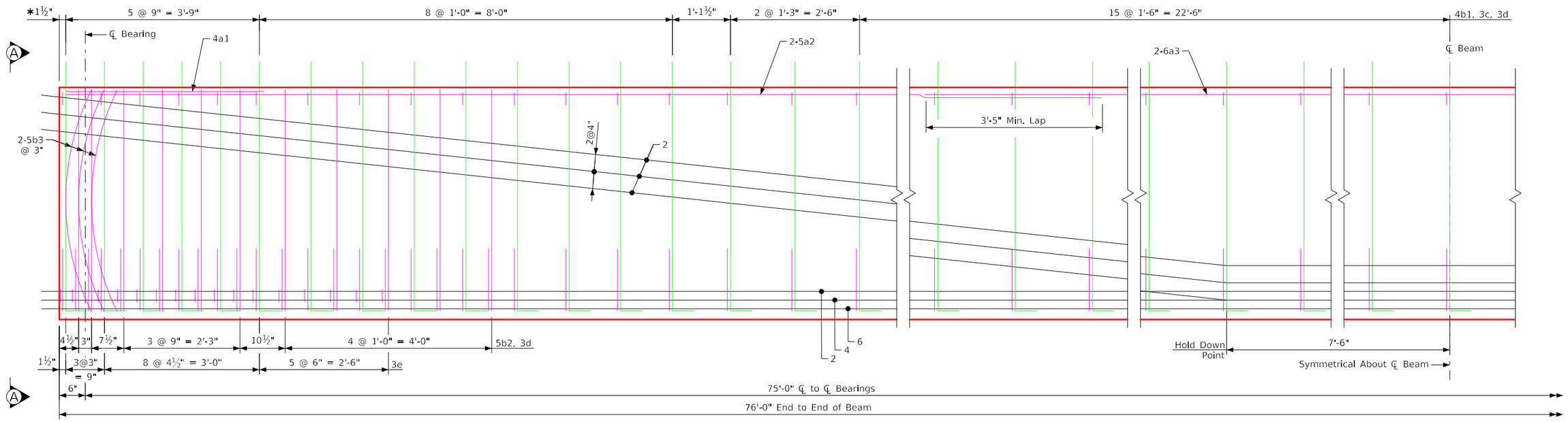
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

D70 Beam Details

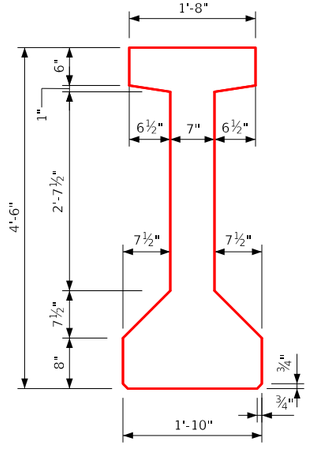
FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 70'-0" Span	Standard Sheet 4633-D70	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:11 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Beams.dgn - 4633-D70 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4633).



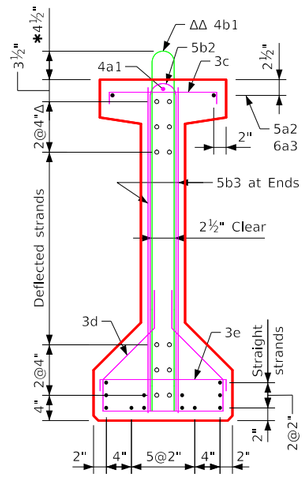
D75 Beam



"D" Beam
Cross Section

Area = 638.75 in.^{2}
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

° Deflected strands
* Keep
Δ Dimensions at end of beam
ΔΔ Epoxy coated bars

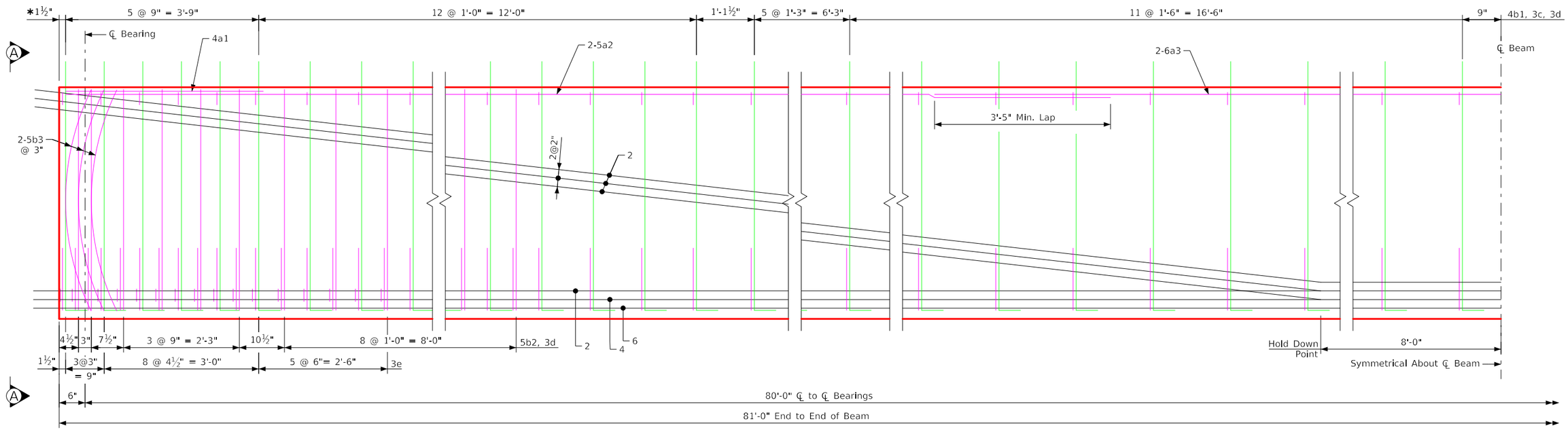
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

D75 Beam Details

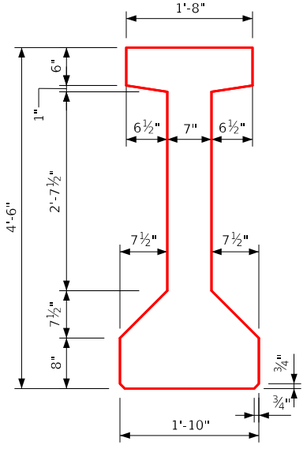
FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 75'-0" Span	Standard Sheet 4633-D75	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:12 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Beams.dgn - 4633-D75 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4633).



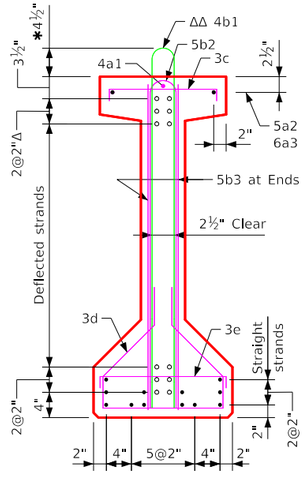
D80 Beam



"D" Beam
Cross Section

Area = 638.75 in.^{2}
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

° Deflected strands
* Keep
Δ Dimensions at end of beam
ΔΔ Epoxy coated bars

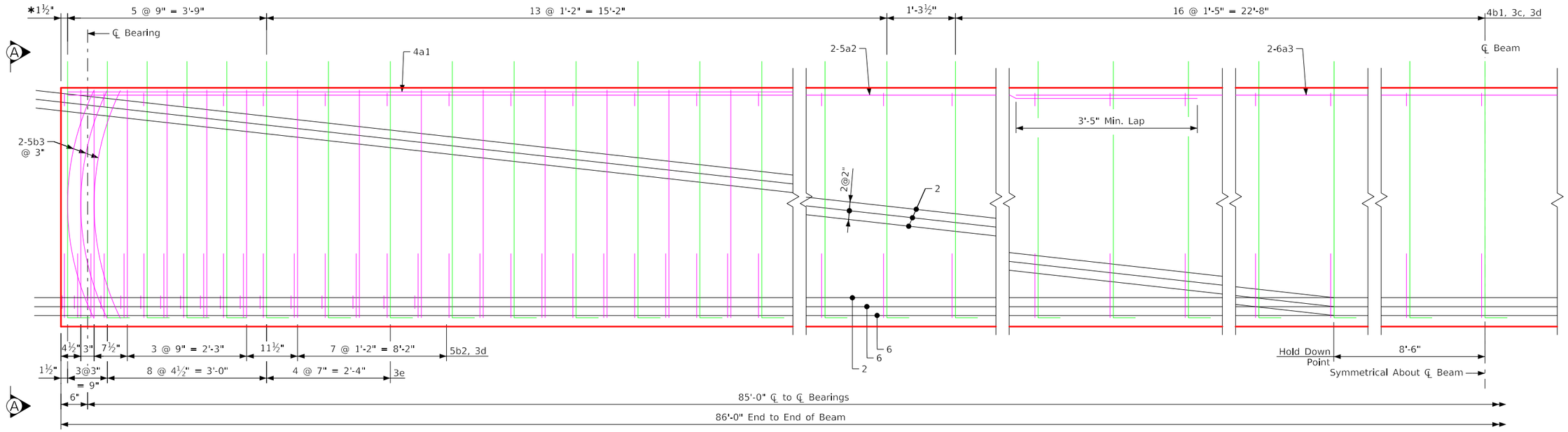
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

D80 Beam Details

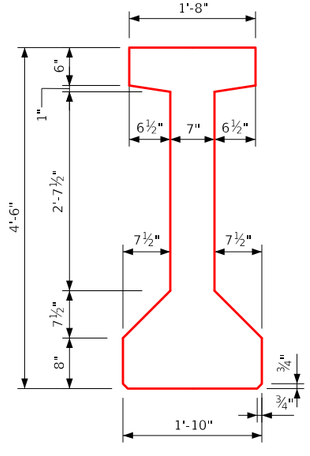
FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 80'-0" Span	Standard Sheet 4633-D80	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:13 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Beams.dgn - 4633-D80 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4633).



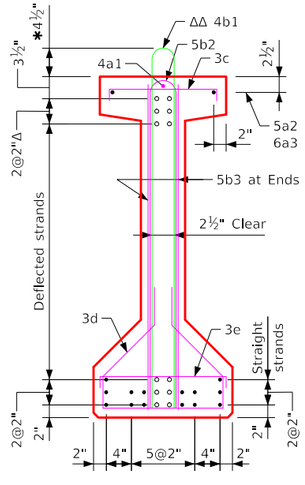
D85 Beam



"D" Beam Cross Section

Area = 638.75 in.^{2}
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

° Deflected strands
* Keep
Δ Dimensions at end of beam
ΔΔ Epoxy coated bars

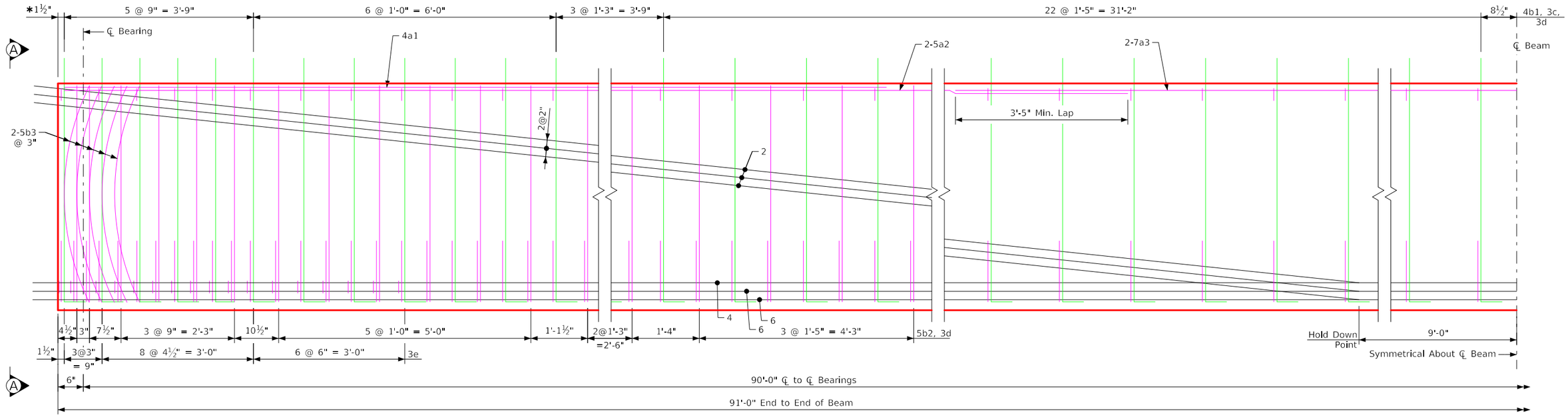
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

D85 Beam Details

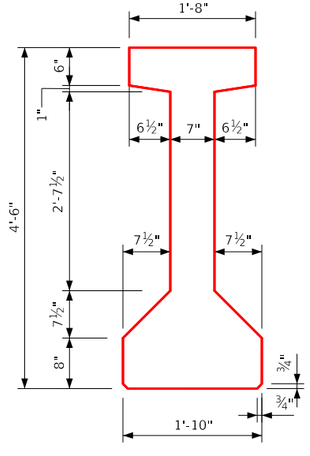
FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 85'-0" Span	Standard Sheet 4634-D85	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:13 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Beams.dgn - 4634-D85 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4634).



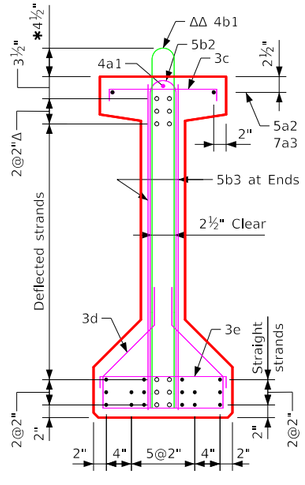
D90 Beam



"D" Beam Cross Section

Area = 638.75 in.^{2}
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

° Deflected strands
* Keep
Δ Dimensions at end of beam
ΔΔ Epoxy coated bars

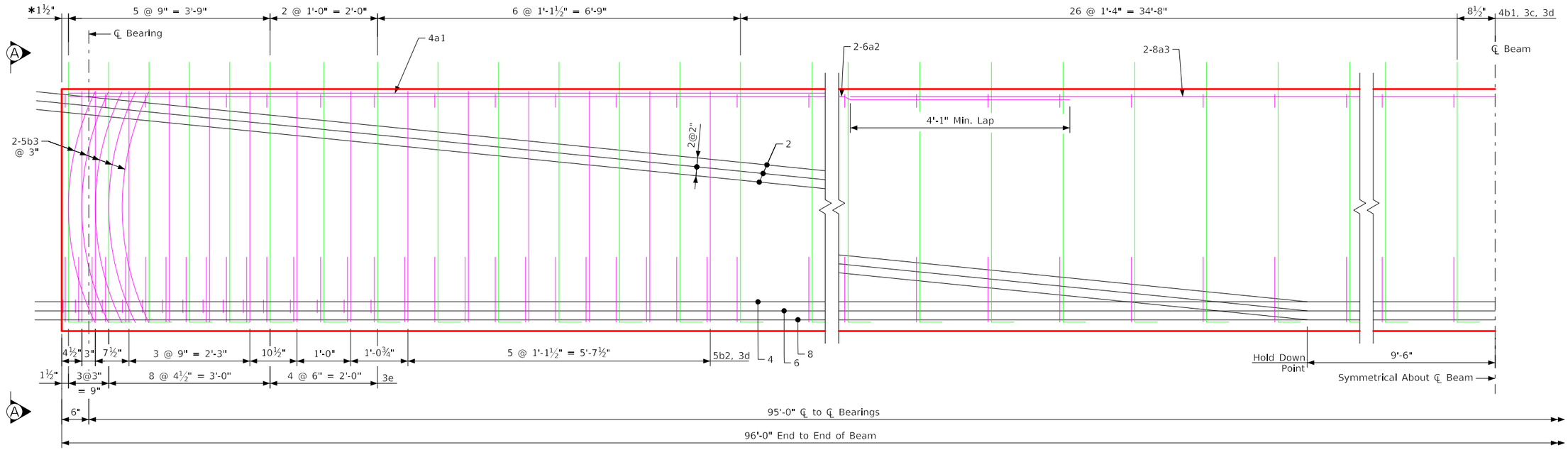
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

D90 Beam Details

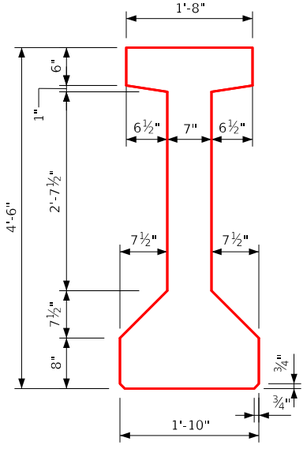
FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 90'-0" Span	Standard Sheet 4634-D90	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:15 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Beams.dgn - 4634-D90 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4634).



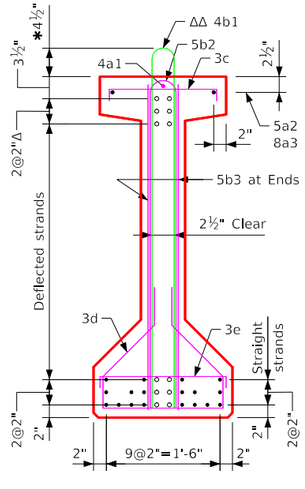
D95 Beam



"D" Beam Cross Section

Area = 638.75 in.^{2}
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

° Deflected strands
* Keep
Δ Dimensions at end of beam
ΔΔ Epoxy coated bars

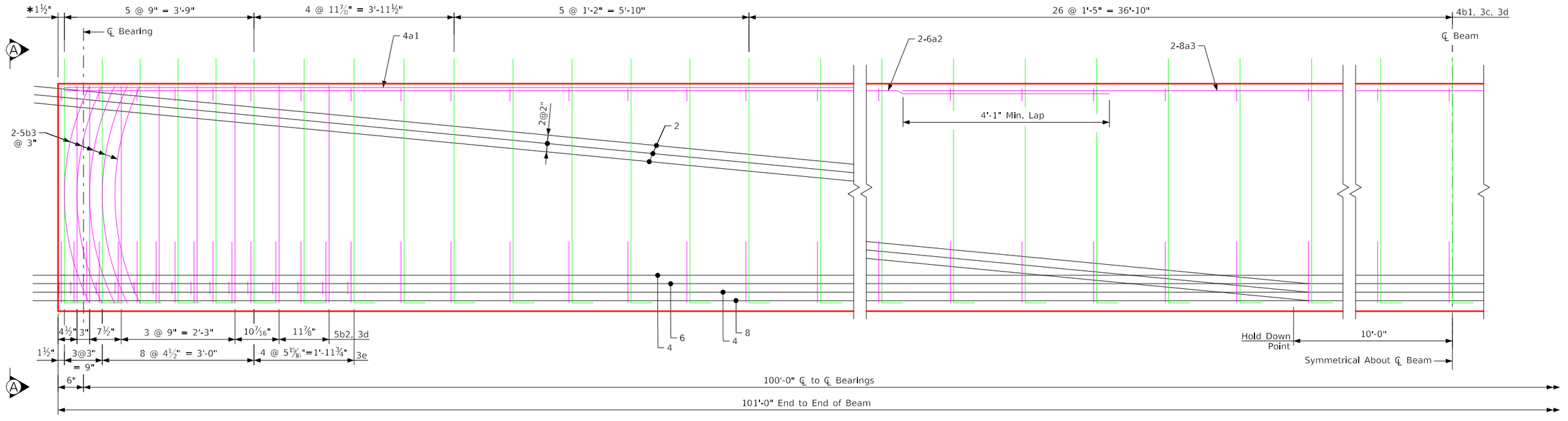
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

D95 Beam Details

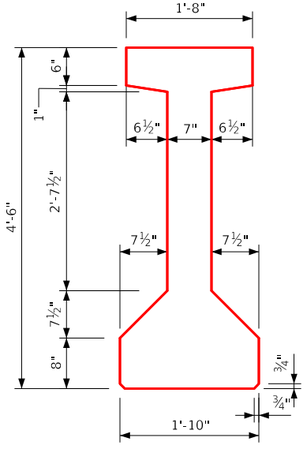
FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 95'-0" Span	Standard Sheet 4634-D95	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:15 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Beams.dgn - 4634-D95 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4634).



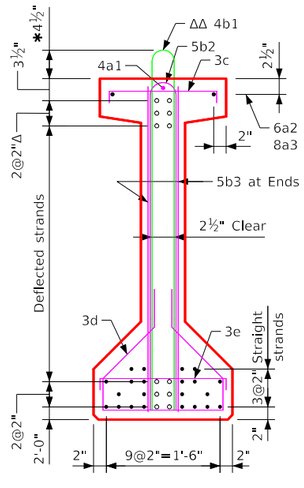
D100 Beam



"D" Beam Cross Section

Area = 638.75 in.^{2}
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

° Deflected strands
* Keep
Δ Dimensions at end of beam
ΔΔ Epoxy coated bars

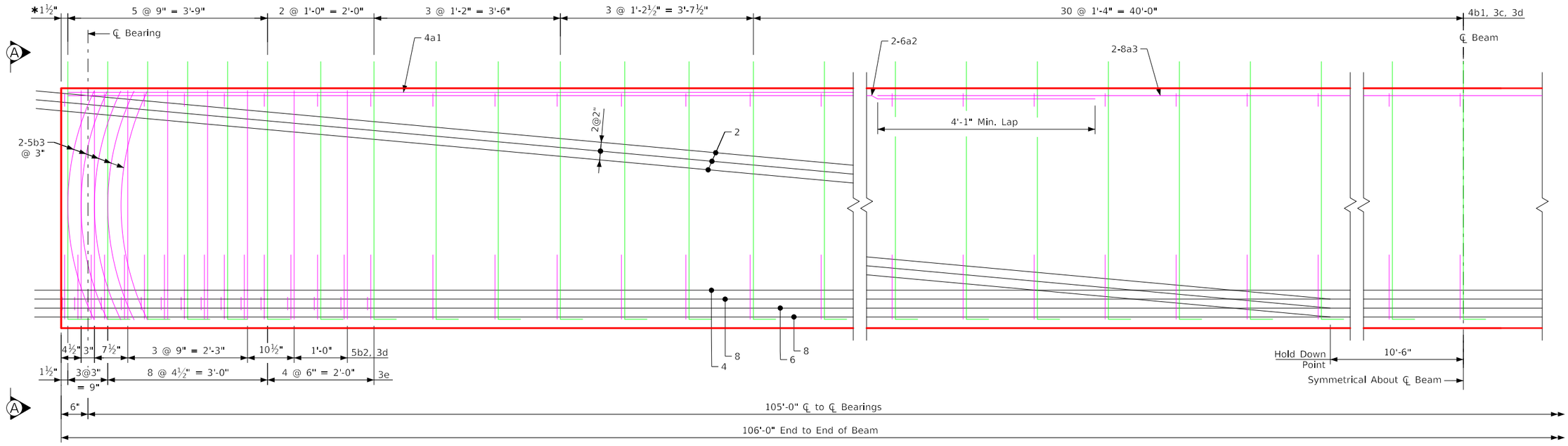
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

D100 Beam Details

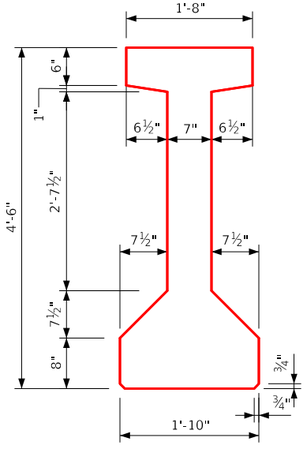
FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 100'-0" Span	Standard Sheet 4635-D100	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:16 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Beams.dgn - 4635-D100 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4635).



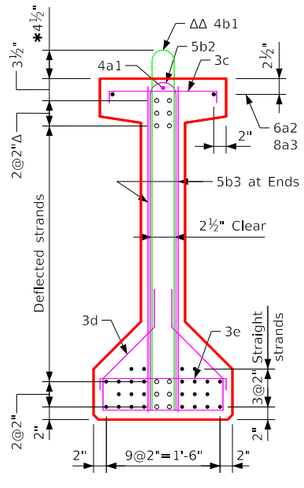
D105 Beam



"D" Beam
Cross Section

Area = 638.75 in.^{2}
y_b = 24.37 in.
I = 214,974 in.^{4}

Beam Section Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

° Deflected strands
* Keep
Δ Dimensions at end of beam
ΔΔ Epoxy coated bars

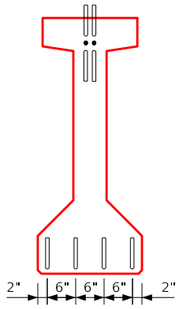
Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

D105 Beam Details

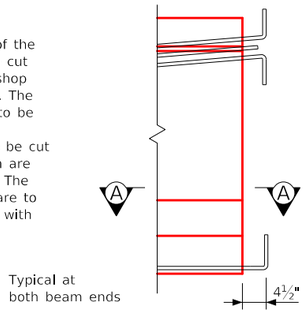
FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 105'-0" Span	Standard Sheet 4635-D105	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:17 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

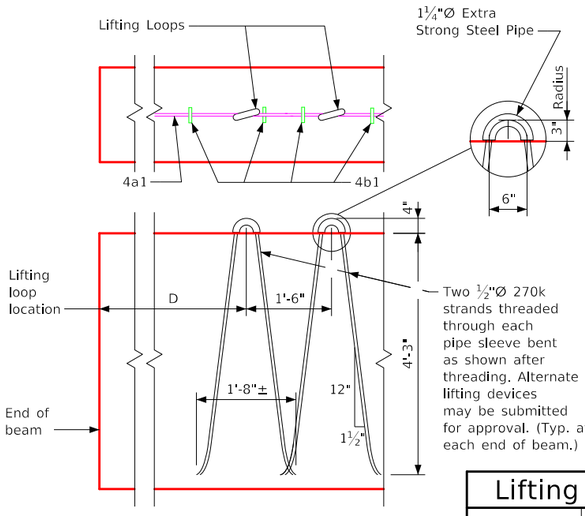
Beams.dgn - 4635-D105 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4635).



The top and bottom rows of the deflected strands are to be cut with 1'-0" projections and shop bent up or down as shown. The remaining top strands are to be cut with 0'-3" projections.
Four bottom strands are to be cut with 1'-0" projections which are to be shop bent as shown. The remaining bottom strands are to be cut off reasonably flush with the concrete.



Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms



Lifting Loop Detail Beam D110

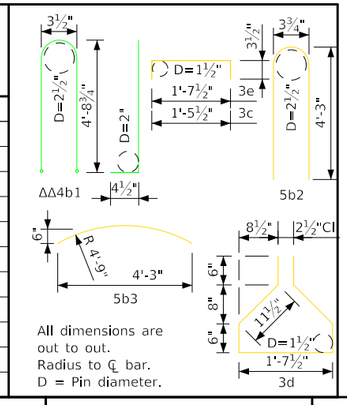
Lifting Loop And Overhang Table

Beams	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
D110	2	2	6'-3"	10.00'

ΔΔ 4b1 bars to be epoxy coated

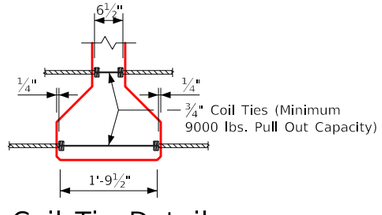
Reinforcing Bar List Beam D110

	Bar	Shape	No.	Length
	4a1		2	26'-6"
	6a2		4	39'-6"
	8a3		2	40'-0"
ΔΔ	4b1		91	10'-4"
	5b2		16	8'-8"
	5b3		20	4'-4"
	3c		91	2'-1"
	3d		107	5'-7"
	3e		32	2'-3"



All dimensions are
out to out.
Radius to ℄ bar.
D = Pin diameter.

Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.



Coil Tie Detail

Number and exact location of coil ties to be as detailed on specific bridge design.

D110 Beam Data

D Beam	Span Length ℄-℄ Bearing	Overall Beam Length (L)	Concrete Strength f'ci (ksi.)	Concrete Strength f'c (ksi.)	Strand Size Dia. (in.)	No. of Strands Straight	No. of Strands Deflected	③ Total Initial Prestress (kips)	Hold Down Force (kips)	Camber (in.) ④ At Release	Camber (in.) ④ After Losses	Deflection (in.) Δ_D Immediate ① (elastic) Δ_I Steel Diaphragm	Deflection (in.) Δ_D Time ② (plastic) Δ_T Steel Diaphragm	Permissible Maximum Spacing HL-93 Loading Steel Diaphragm	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight-lb.)
D110	110'-0"	111'-0"	6.5	7.5	0.60"	28	6	1446	21.2	2.74"	4.38"	2.68"	0.67"	7'-6"	36.9	18.2	1672

① Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.0")weight of: 0.81 kips/ft. for 7'-6" beam spacing and one steel diaphragm (0.285 kips) at ℄ of span.
For different deck and diaphragm weights, deflections will be directly proportional.

② Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.
Total beam deflections at ℄ of span, Δ_D , due to weight of deck and diaphragms for detailing purpose:
(A) $\Delta_D=\Delta_I+\Delta_T$ for simple span.
(B) $\Delta_D=\Delta_I+\frac{3}{4}\Delta_T$ for end spans of continuous bridge.
(C) $\Delta_D=\Delta_I+\frac{1}{2}\Delta_T$ for interior spans of continuous bridge.

③ Total initial prestress is based on 72.6% f's.
f's = 270 ksi. and As = 0.217 sq. in.

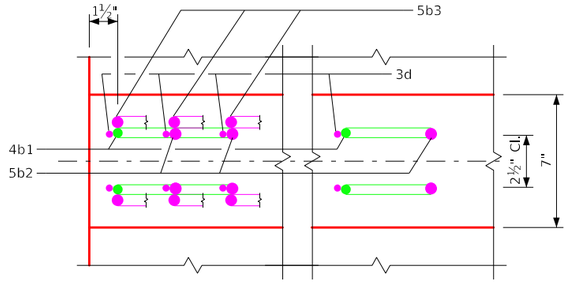
④ Calculated design cambers are based on multipliers developed from research in Iowa.

Specifications:

Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications.
Design: AASHTO LRFD, Series of 2017 with Minor Modifications.

Design Stresses:

Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications Series of 2017.
Reinforcing steel in accordance with Section 5, Grade 60.
Concrete in accordance with Section 5.
Prestressing steel in accordance with Section 5, Grade 270.



Part Section A-A Showing Placement of Stirrups Near End of Beam

Beam Notes:

These beams are designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.

All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.

Hold down points for deflected strands may be moved toward ends of beam a distance of 0.05 L maximum at producer's option.

All prestressing strands except lifting loop strands shall be 0.60 in. nominal diameter (nominal steel area = 0.217 in.²) and conform to ASTM A416 Grade 270 Low Relaxation Strands. Minimum strand breaking strength shall be 58.6 kips.

Tops of beams are to be struck off level and finished as per Materials I.M.570.

Bearings shall be as detailed on other design sheets.

Beams to be used in bridges made continuous by the poured in place deck, are to be at least 28 days old before the deck is placed unless a shorter curing time is approved by the Bridge Engineer.

The portions of the prestressed beams that are to be embedded in the abutment and pier diaphragms shall be roughened for a distance of 10" from the beam end by sandblasting or other approved methods to provide suitable bond between the beam and the diaphragm in accordance with Article 2403.03, I, of the Standard Specifications.

All beams are to be increased in length to compensate for elastic shortening, creep and shrinkage.

For transporting, the allowable overhang is shown in the "Lifting Loop and Overhang Table".

The Contractor shall assure the lateral stability of the D110 beam during handling, transporting and erection by providing temporary bracing as needed.

If the precast panel option is allowed and used for bridge deck formation, the beam stirrups will need to be extended and top flange beam finish shall be modified as per details on the Precast Deck Panel Sheet.

Minimum concrete f'c (at 28 days) and minimum f'ci at release are located in the D Beam Data Table above.

0.6" diameter strands stressed to not more than 5,000 lbs. each may be used in lieu of the a bars which run the full length of the beam in the top flange.

Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet.

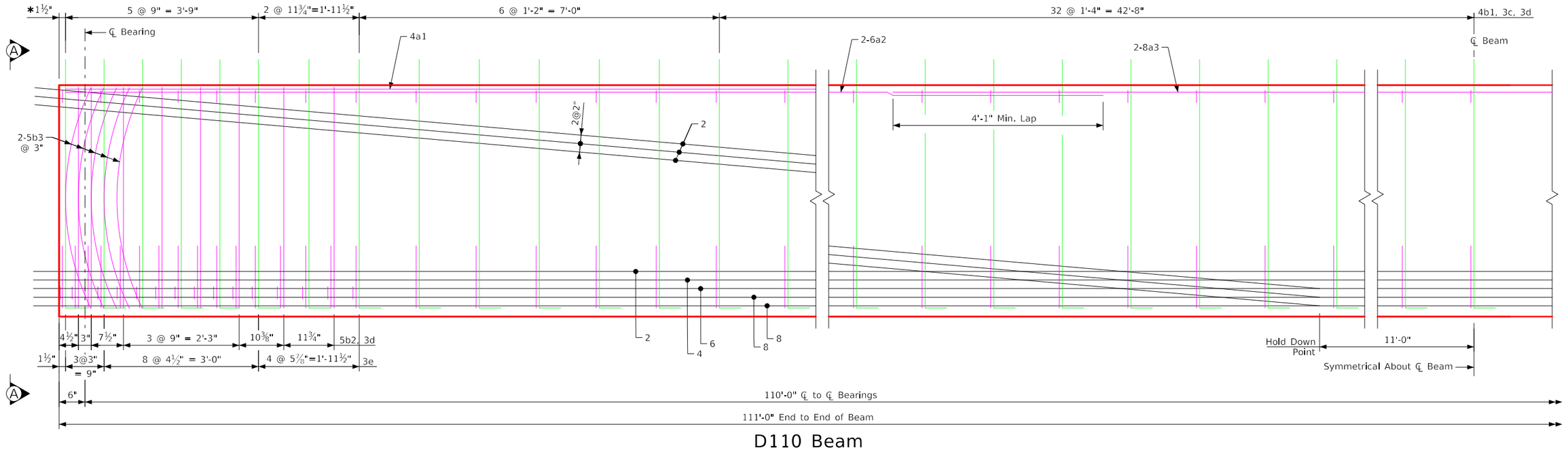
If sole plate is required for bearing, sole plate is to be set in forms when beam is cast and formed out below to exclude concrete as detailed on the Bearing Sheet.

If stub abutments are used, all strands at the ends of beams at stub abutments shall be cut off reasonably flush with the concrete.

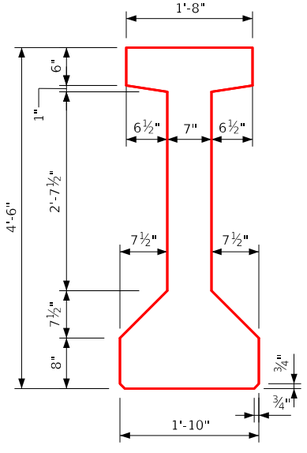
When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with Materials I.M. 570 (Fabricator Application) and I.M. 491.12 (Contractor Application).

D110 Beam - Data Details

Revised 12-99.
Issued 02-92.
Beams.dgn - 4636-D110s1 - This Sheet Issued 04-2024. Additional Sheet For Clarity. (Sheet Number was Originally 4636).



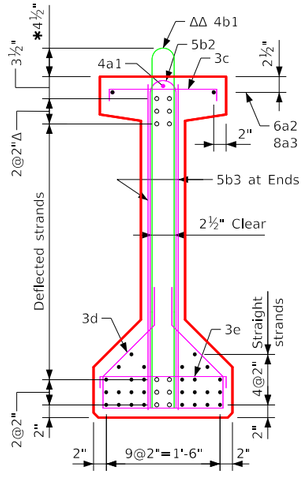
D110 Beam



"D" Beam
Cross Section

Area = 638.75 in.^{2}
$\bar{y}_b$ = 24.37 in.
I = 214,974 in.^{4}

Beam Section Properties



View A-A

Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

° Deflected strands
* Keep
Δ Dimensions at end of beam
ΔΔ Epoxy coated bars

Note: Dimensions for the location of the deflected strands are at ℄ beam and end of beam.

D110 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 110'-0" Span - (Sheet 2 of 2)	Standard Sheet 4636-D110s2	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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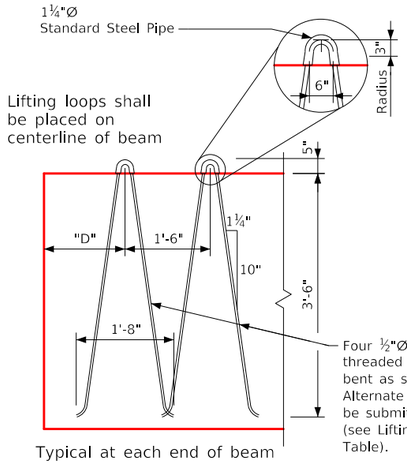
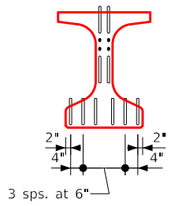
Beams.dgn - 4636-D110s2 - This Sheet Issued 04-2024. Additional Sheet For Clarity. (Sheet Number was Originally 4636).

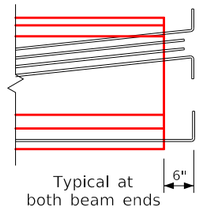


Typical at each end of beam

Lifting Loop Detail



The top and bottom rows of the deflected strands are to be cut with 1'-2" projections which are to be shop bent as shown. The remaining top deflected strands are to be cut with 5" projections. Six bottom strands are to be cut with 1'-6" projections which are to be shop bent as shown. The remaining bottom strands are to be cut off reasonably flush with the concrete.



Typical at both beam ends

Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms

Design Stresses:

Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications, Series of 2017.
Reinforcing steel in accordance with Section 5, Grade 60.
Concrete in accordance with Section 5. ④⑤
Prestressing steel in accordance with Section 5, Grade 270.

Specifications:

Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supple-mental specifications.
Design: AASHTO LRFD, Series of 2017 with minor modifications.

Alternate Bar Notes:

Alternate bars shown in Bent Bar Details may be used in lieu of reinforcing bars shown in bar list. No additional payment shall be made for use of alternate bars.

Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.

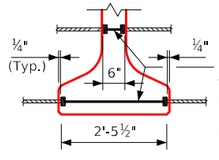
Lifting Loop And Overhang Table

Beams	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
BTC30-BTC45	1	4	2'-0"	**
BTC50-BTC75	1	4	2'-0"	**
BTC80-BTC95	2	4	1'-3"	11
BTC100	2	4	3'-9"	12
BTC105	2	4	6'-3"	12
BTC110	2	4	8'-2"	12
BTC115	2	4	8'-3"	14

** In accordance with Article 2407.03, K of the Standard Specifications.

Lifting loops shall carry loads equally.

Number and exact location of coil ties to be as detailed on specific bridge design.

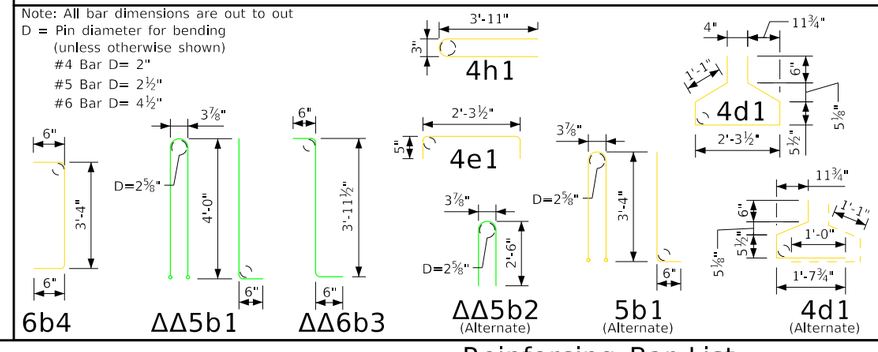


Coil Tie Detail

ΔΔ 5b1 and 6b3 bars to be epoxy coated
✱ 6b3 and 6b4 bars to be used in pairs

Bent Bar Details

Note: All bar dimensions are out to out
D = Pin diameter for bending (unless otherwise shown)
#4 Bar D= 2"
#5 Bar D= 2½"
#6 Bar D= 4½"



BTC Beam Data

BTC Beam	Span Length ℄ to ℄ Bearing	Overall Beam Length (L)	Concrete Strength f'ci (ksi.)	Concrete Strength f'c (ksi.)	Strand Size Dia. (in.)	Number of Strands Straight	Number of Strands Deflected	③ Total Initial Prestress (kips)	Hold Down Force (kips)	Camber (in.) ⑥ At Release	Camber (in.) ⑥ After Losses	Deflection (in.) Δ_D Immediate ① (elastic) Δ_I Steel Diaphragm	Deflection (in.) Δ_D Time ② (plastic) Δ_T Steel Diaphragm	Permissible Maximum Spacing HL-93 Loading Steel Diaphragm	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight-lb.)
BTC30	30'-0"	31'-4"	4.50	5.00	0.60"	8	—	340	—	0.09"	0.16"	0.02"	—	9'-3"	11.3	5.6	1031
BTC35	35'-0"	36'-4"	4.50	5.00	0.60"	8	—	340	—	0.11"	0.20"	0.05"	—	9'-3"	13.1	6.5	1129
BTC40	40'-0"	41'-4"	4.50	5.00	0.60"	10	—	425	—	0.18"	0.34"	0.08"	0.02"	9'-3"	14.9	7.4	1223
BTC45	45'-0"	46'-4"	4.50	5.00	0.60"	10	—	425	—	0.21"	0.40"	0.13"	0.03"	9'-3"	16.7	8.2	1341
BTC50	50'-0"	51'-4"	4.50	5.00	0.60"	12	—	510	—	0.31"	0.58"	0.19"	0.05"	9'-3"	18.5	9.1	1441
BTC55	55'-0"	56'-4"	4.50	5.00	0.60"	14	—	596	—	0.42"	0.77"	0.28"	0.07"	9'-3"	20.3	10.0	1535
BTC60	60'-0"	61'-4"	4.50	5.00	0.60"	14	—	596	—	0.46"	0.85"	0.40"	0.10"	9'-3"	22.1	10.9	1656
BTC65	65'-0"	66'-4"	5.00	6.00	0.60"	14	2	681	11.5	0.54"	1.00"	0.52"	0.13"	9'-3"	23.9	11.8	1753
BTC70	70'-0"	71'-4"	5.00	6.00	0.60"	16	2	766	10.7	0.67"	1.24"	0.69"	0.17"	9'-3"	25.7	12.7	1943
BTC75	75'-0"	76'-4"	5.00	6.00	0.60"	16	4	851	20.0	0.83"	1.53"	0.91"	0.23"	9'-3"	27.5	13.6	2057
BTC80	80'-0"	81'-4"	6.00	7.00	0.60"	20	4	1021	18.8	1.11"	2.04"	1.11"	0.28"	9'-3"	29.3	14.5	2114
BTC85	85'-0"	86'-4"	6.00	7.00	0.60"	22	4	1106	17.7	1.31"	2.43"	1.41"	0.35"	9'-3"	31.1	15.4	2232
BTC90	90'-0"	91'-4"	6.00	7.00	0.60"	24	6	1276	23.8	1.65"	2.64"	1.77"	0.44"	9'-3"	32.9	16.2	2305
BTC95	95'-0"	96'-4"	6.50	7.50	0.60"	28	6	1446	22.6	1.98"	3.17"	2.13"	0.53"	9'-3"	34.7	17.1	2459
BTC100	100'-0"	101'-4"	7.00	8.00	0.60"	30	6	1531	21.5	2.28"	3.65"	2.56"	0.64"	9'-3"	36.5	18.0	2668
BTC105	105'-0"	106'-4"	7.50	8.50	0.60"	34	8	1786	25.8	2.77"	4.44"	3.04"	0.76"	9'-3"	38.3	18.9	2762
BTC110	110'-0"	111'-4"	7.50	9.00	0.60"	38	8	1957	24.6	3.24"	5.18"	3.59"	0.90"	9'-3"	40.1	19.8	2828
BTC115	115'-0"	116'-4"	7.50	9.50	0.60"	40	10	2127	27.7	3.60"	5.76"	4.16"	1.04"	9'-0½"	41.9	20.7	2977

① Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.5") weight of:
1.04 kips/ft. for 9'-3" beam spacing
1.01 kips/ft. for 9'-0½" beam spacing
And one steel diaphragm (0.500 kips) at ℄ of span. For different deck and diapragm weights, deflections will be directly proportional.

② Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.
Total beam deflections at ℄ of span, Δ_D , due to weight of deck and diaphragms for detailing purpose:
(A) $\Delta_D=\Delta_I+\Delta_T$ for simple span.
(B) $\Delta_D=\Delta_I+\frac{3}{4}\Delta_T$ for end spans of continuous bridge.
(C) $\Delta_D=\Delta_I+\frac{1}{2}\Delta_T$ for interior spans of continous bridge.

③ Total initial prestress is based on 72.6% f's, f's= 270 ksi. and As= 0.217 $in.^2$.

④ Requires a 4500 psi., 28 day compressive strength for cast-in-place deck concrete.

⑤ Includes partial length debonded strands, see individual Beam Sheet for locations and details.

⑥ Calculated design cambers are based on multipliers developed from research in Iowa.

Beam Notes:

These beams are designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.
All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.
Hold down points for deflected strands may be moved toward ends of beam a distance of 0.05 L maximum at producer's option.
All prestressing strands except lifting loop strands shall be 0.60 in. nominal diameter (nominal steel area = 0.217 $in.^2$) and conform to ASTM A416 Grade 270 Low Relaxation Strands. Minimum strand breaking strength shall be 58.6 kips.
Tops of beams are to be struck off level and finished as per Materials I.M.570.
Bearings shall be as detailed on other design sheets.
Beams to be used in bridges made continuous by the poured in place deck, are to be at least 28 days old before the deck is placed unless a shorter curing time is approved by the Bridge Engineer.
The portions of the prestressed beams that are to be embedded in the abutment and pier diaphragms shall be roughened for a distance of 10" from the beam end by sandblasting or other approved methods to provide suitable bond between the beam and the diaphragm in accordance with Article 2403.03, I, of the Standard Specifications.
All beams are to be increased in length to compensate for elastic shortening, creep and shrinkage.
For transporting, the allowable overhang is shown in the "Lifting Loop and Overhang Table".
The contractor shall assure the lateral stability of the BTC100 to BTC115 beam during handling, transporting and erection by providing temporary bracing as needed.
Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet.
If sole plate is required for bearing, sole plate is to be set in forms when beam is cast and formed out below to exclude concrete as detailed on the Bearing Sheet.
When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with Materials I.M.570 (Fabricator Application) and I.M.491.12 (Contractor Application).

Beam Notes: (continued)

If stub abutments are used, all strands at the ends of beams at stub abutments shall be cut off reasonably flush with the concrete.
Minimum concrete f'c (at 28 days) and minimum f'ci at release are located in the BTC Beam Data Table above.
Four 0.60 in. diameter strands stressed to not more than 5000 lbs. each may be used in lieu of bars 5a1 and 5a2 in the top flange.

Reinforcing Bar List

	Beam	BTC30		BTC35		BTC40		BTC45		BTC50		BTC55		BTC60		BTC65		BTC70		BTC75		BTC80		BTC85		BTC90		BTC95		BTC100		BTC105		BTC110		BTC115		Beam
	Bar Shape	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	Bar
	5a1	6	31'-1"	6	36'-1"	6	41'-1"	12	24'-9"	12	27'-3"	12	29'-9"	12	32'-3"	12	34'-9"	12	37'-3"	12	39'-9"	12	24'-0"	12	26'-6"	12	29'-0"	12	31'-6"	12	34'-0"	12	36'-6"	12	39'-0"	12	23'-2"	5a1
	5a2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	12	40'-0"	5a2
ΔΔ	5b1	19	9'-2"	23	9'-2"	27	9'-2"	31	9'-2"	35	9'-2"	39	9'-2"	45	9'-2"	49	9'-2"	57	9'-2"	63	9'-2"	61	9'-2"	67	9'-2"	69	9'-2"	71	9'-2"	81	9'-2"	85	9'-2"	89	9'-2"	93	9'-2"	5b1
ΔΔ✱ ✱	6b3	32	5'-0"	32	5'-0"	32	5'-0"	32	5'-0"	32	5'-0"	32	5'-0"	32	5'-0"	32	5'-0"	34	5'-0"	34	5'-0"	34	5'-0"	34	5'-0"	34	5'-0"	40	5'-0"	40	5'-0"	40	5'-0"	40	5'-0"	40	5'-0"	6b3
	6b4	12	4'-4"	12	4'-4"	12	4'-4"	12	4'-4"	12	4'-4"	12	4'-4"	12	4'-4"	12	4'-4"	16	4'-4"	16	4'-4"	16	4'-4"	16	4'-4"	16	4'-4"	20	4'-4"	24	4'-4"	24	4'-4"	24	4'-4"	24	4'-4"	6b4
	4c1	43	2'-7"	49	2'-7"	53	2'-7"	59	2'-7"	67	2'-7"	71	2'-7"	75	2'-7"	81	2'-7"	85	2'-7"	85	2'-7"	103	2'-7"	105	2'-7"	113	2'-7"	127	2'-7"	133	2'-7"	139	2'-7"	145	2'-7"	151	2'-7"	4c1
	4d1	41	6'-5"	45	6'-5"	49	6'-5"	53	6'-5"	57	6'-5"	61	6'-5"	67	6'-5"	71	6'-5"	79	6'-5"	85	6'-5"	83	6'-5"	89	6'-5"	91	6'-5"	93	6'-5"	103	6'-5"	107	6'-5"	111	6'-5"	115	6'-5"	4d1
	4e1	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	4e1
	4h1	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	4h1

ΔΔ
ΔΔ✱
✱

BTC Beam - Data Details

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam – 30'-0" – 115'-0" Spans Data Details	Standard Sheet 4700	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Correction 12-13: Coil Tie Detail was Changed to Reflect the Distance Between Coil Tie Anchors Embedded ¼ inch.
Issued 05-04.
Beams.dgn - 4700 - This Sheet Re-Issued 04-2024. Sheet Format Update.

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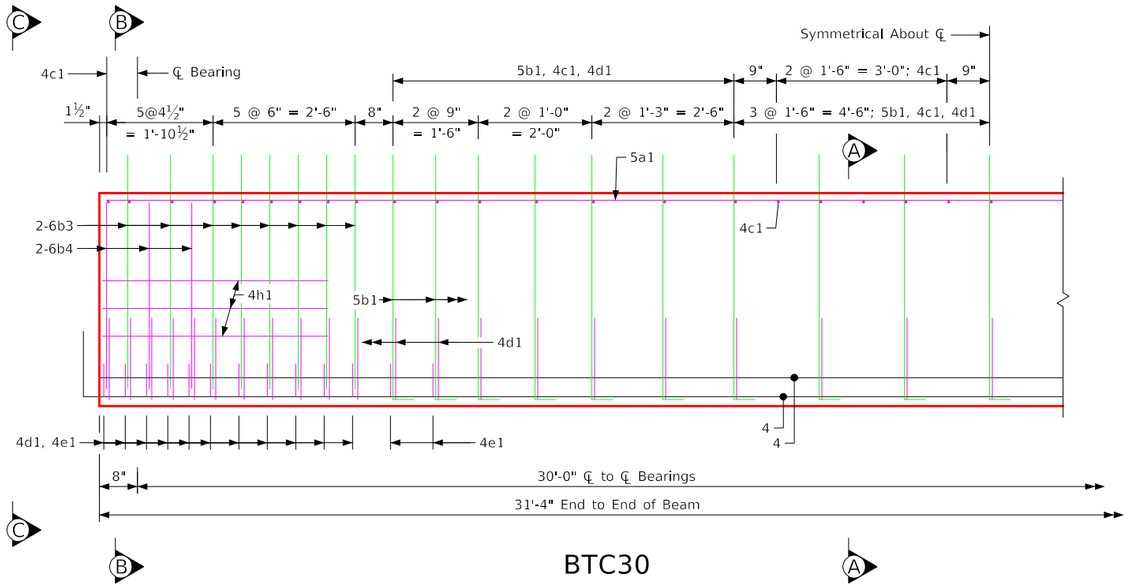
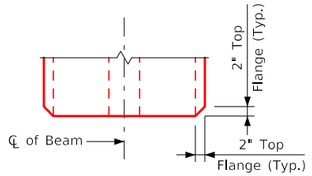
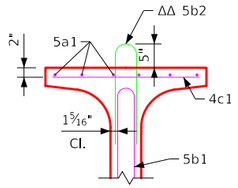


BTC30



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



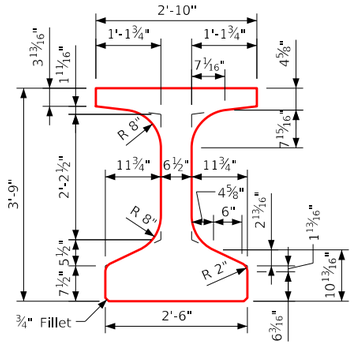
Section A-A
(Alternate)

See Alternate Bar Note on Standard Sheet 4700.

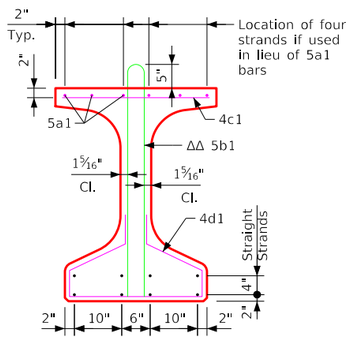
Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

Beam Section Properties

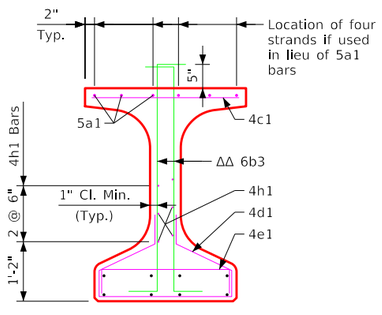
Top Flange Longitudinal Bar Layout



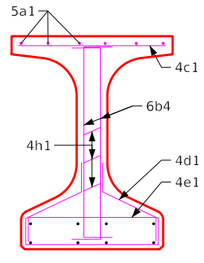
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

ΔΔ Epoxy Coated Bars

BTC30 Beam Details

Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4701 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 30'-0" Span	Standard Sheet 4701	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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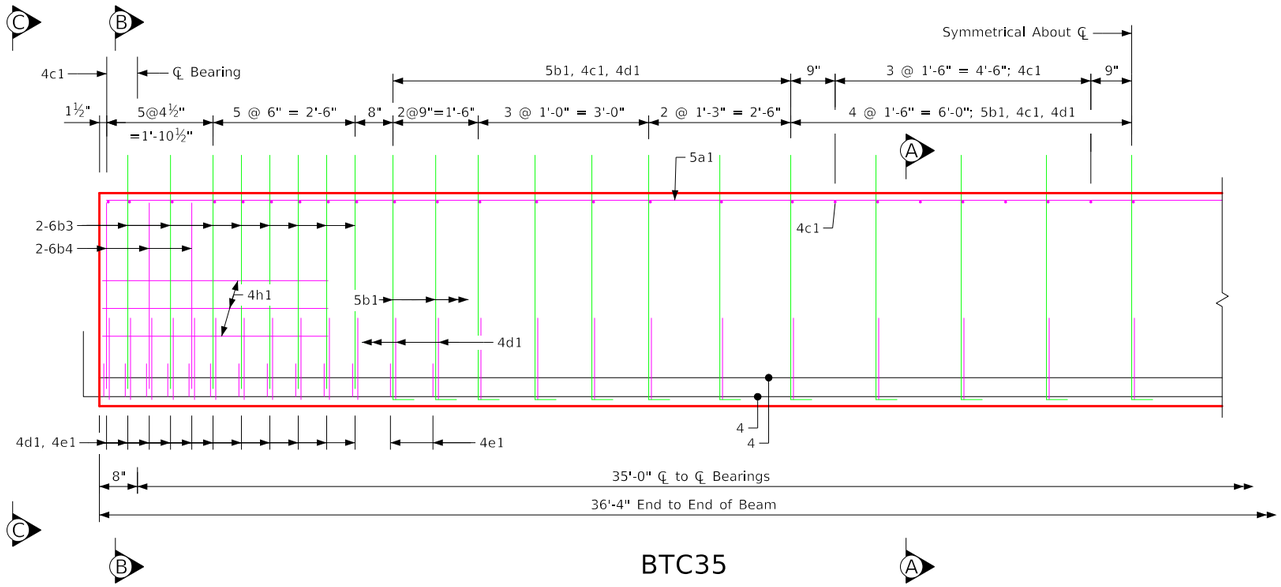
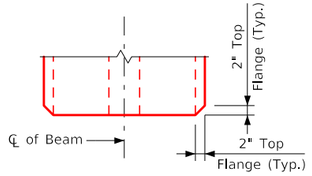
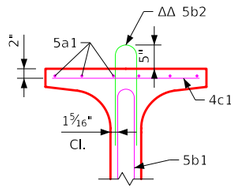


BTC35



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



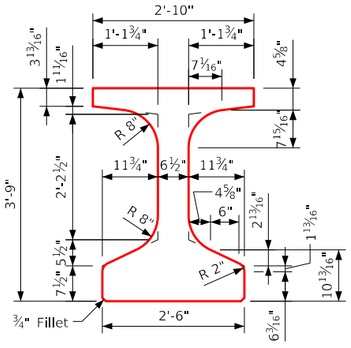
Section A-A
(Alternate)

See Alternate Bar Note on Standard Sheet 4700.

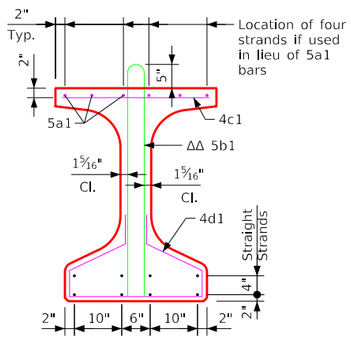
Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

Beam Section Properties

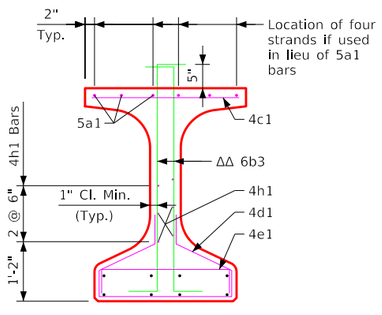
Top Flange Longitudinal Bar Layout



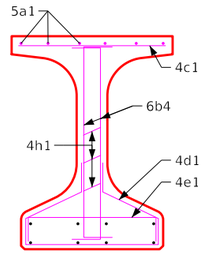
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

ΔΔ Epoxy Coated Bars

BTC35 Beam Details

Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4702 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 35'-0" Span	Standard Sheet 4702	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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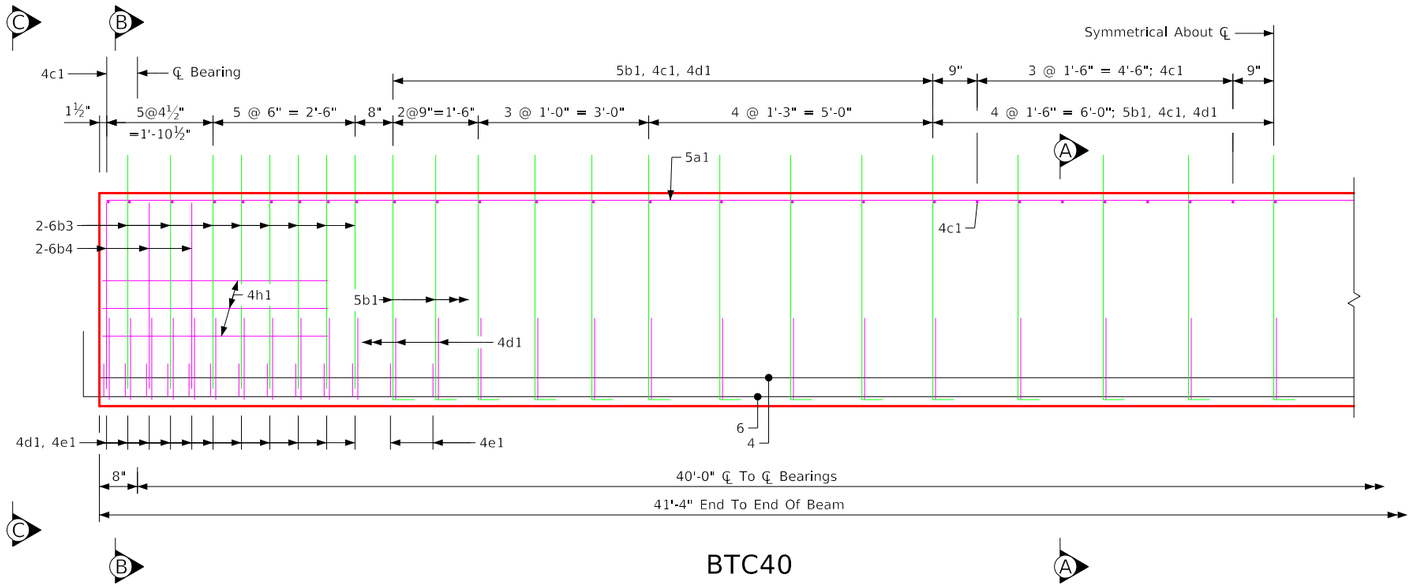
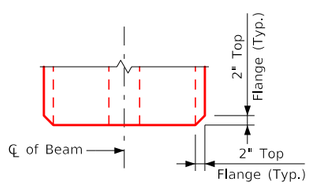
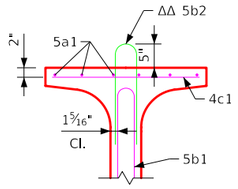


BTC40



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



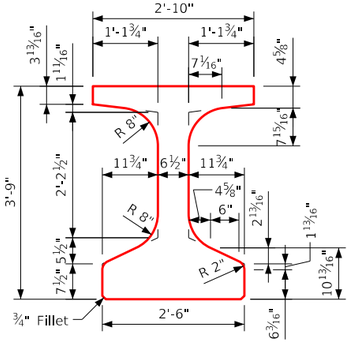
Section A-A
(Alternate)

See Alternate Bar Note on Standard Sheet 4700.

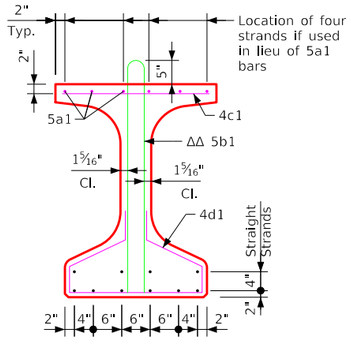
Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

Beam Section Properties

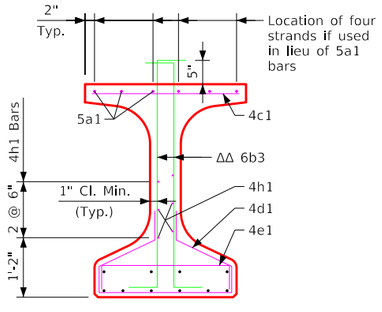
Top Flange Longitudinal Bar Layout



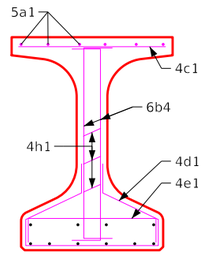
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

ΔΔ Epoxy Coated Bars

BTC40 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 40'-0" Span	Standard Sheet 4703	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.
Issued 05-04.
Beams.dgn - 4703 - This Sheet Re-Issued 04-2024, Sheet Format Update.

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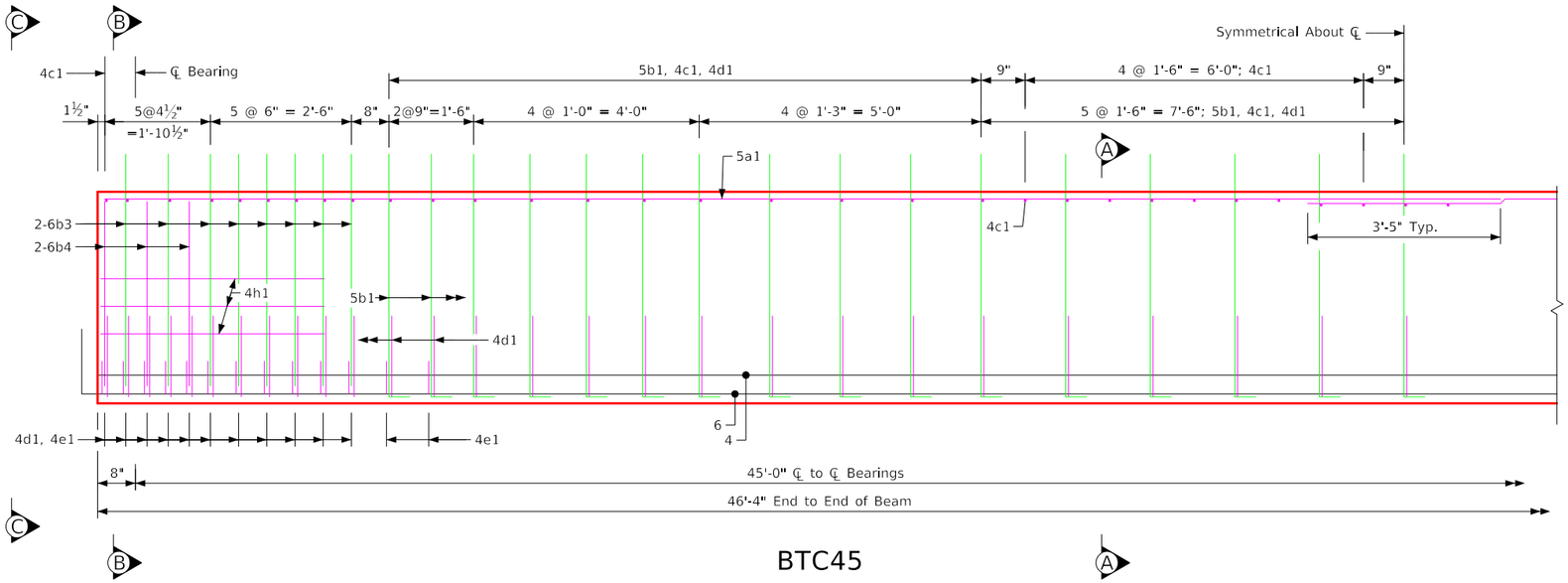
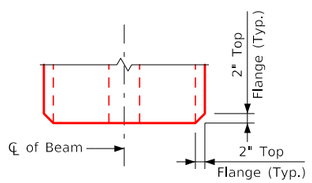
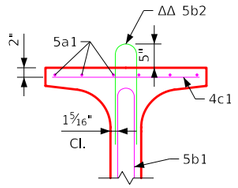


BTC45



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

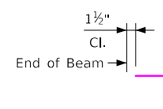


Section A-A (Alternate)

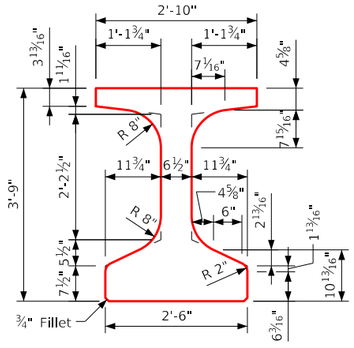
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

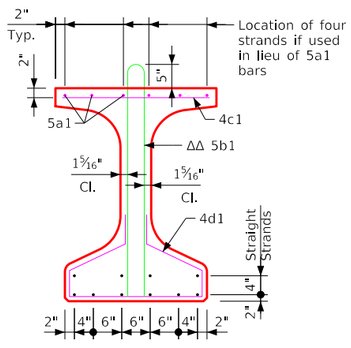
Beam Section Properties



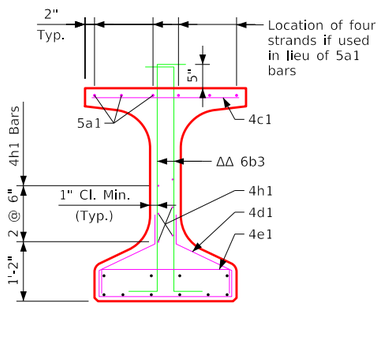
Top Flange Longitudinal Bar Layout



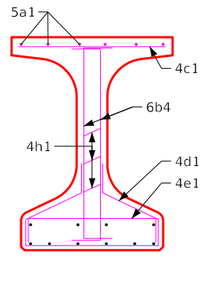
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

ΔΔ Epoxy Coated Bars

BTC45 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 45'-0" Span	Standard Sheet 4704	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4704 - This Sheet Re-Issued 04-2024. Sheet Format Update.

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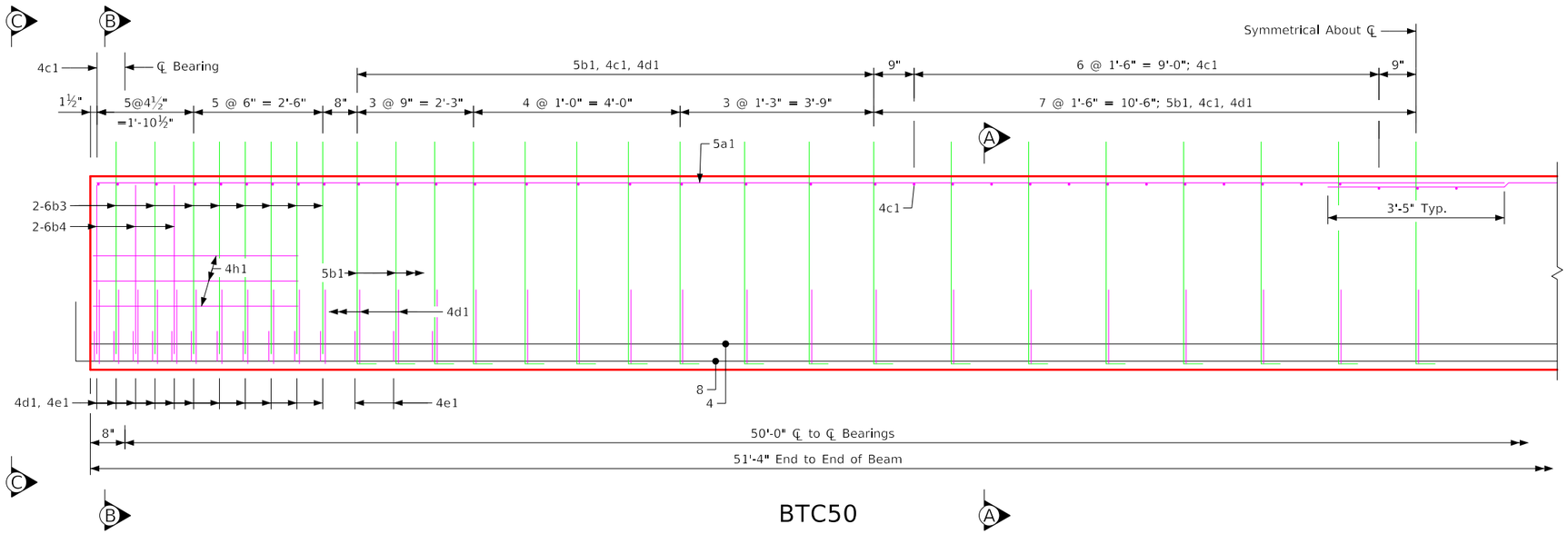
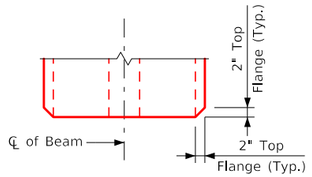
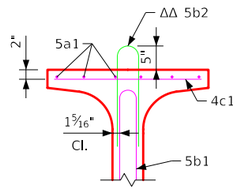




Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

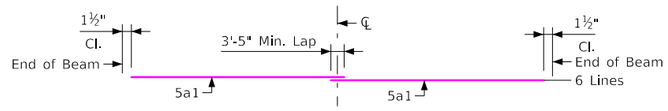


Section A-A
(Alternate)

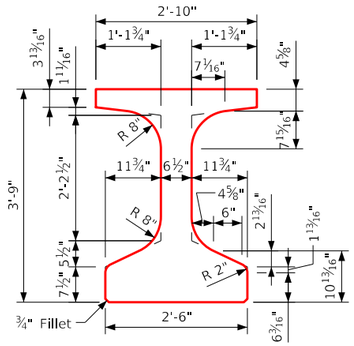
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

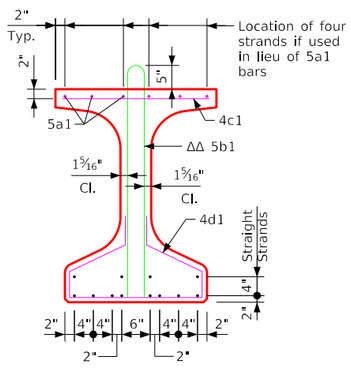
Beam Section Properties



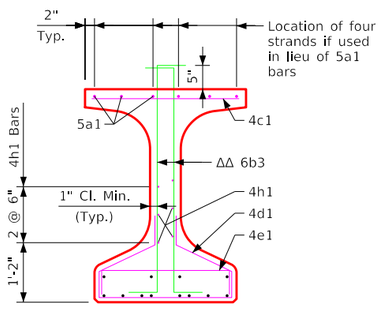
Top Flange Longitudinal Bar Layout



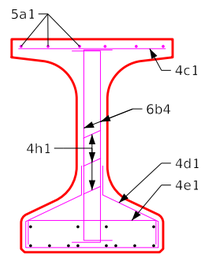
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

ΔΔ Epoxy Coated Bars

BTC50 Beam Details

Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.
Issued 05-04.
Beams.dgn - 4705 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 50'-0" Span	Standard Sheet 4705	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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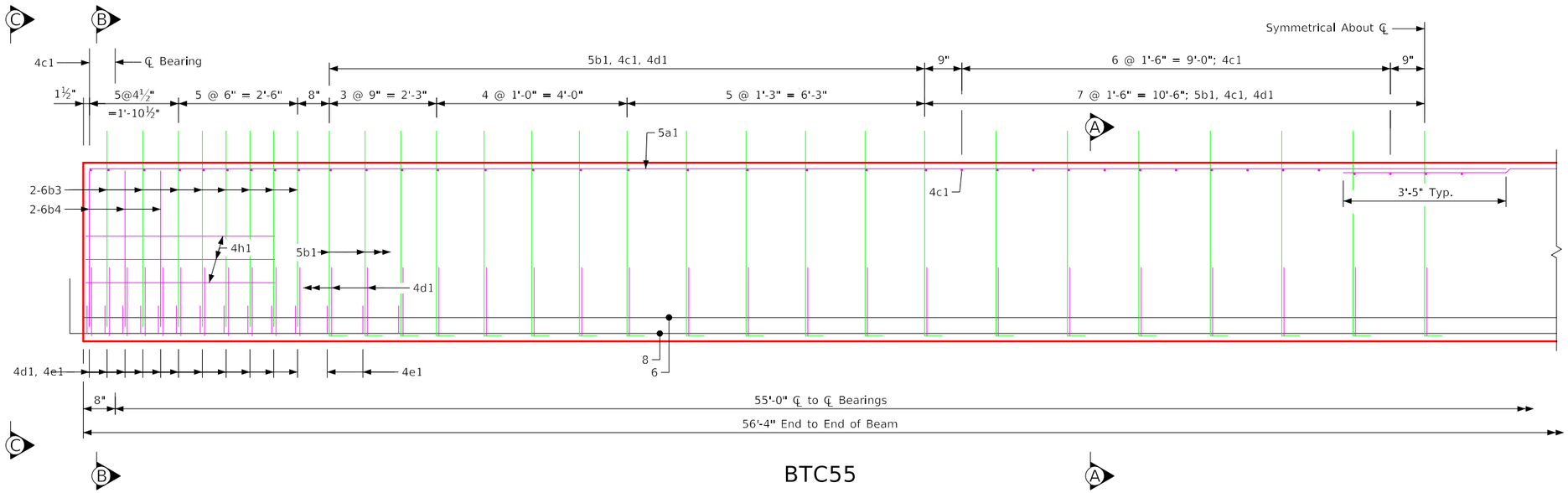
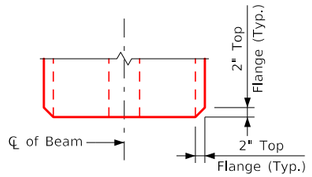
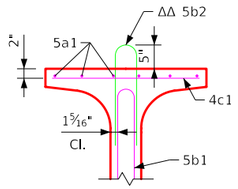


BTC55



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

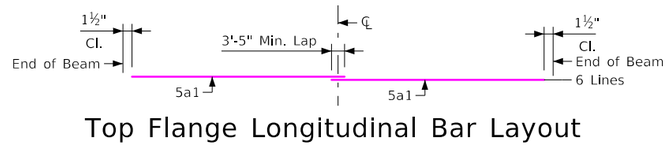


Section A-A (Alternate)

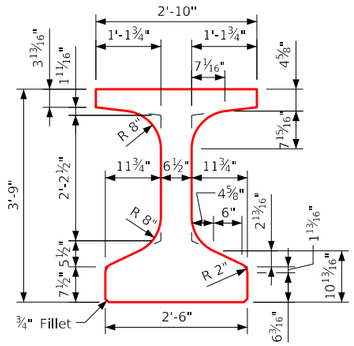
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

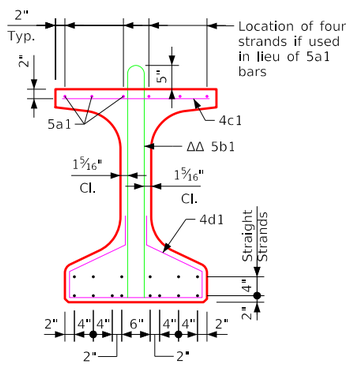
Beam Section Properties



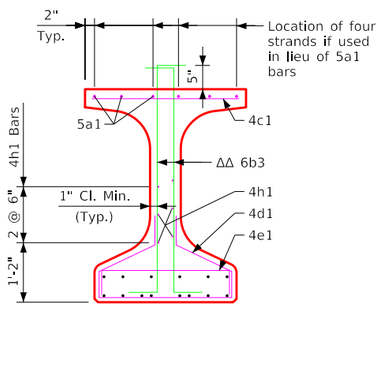
Top Flange Longitudinal Bar Layout



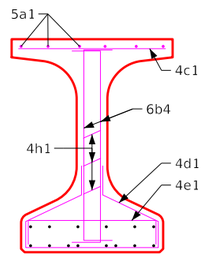
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

ΔΔ Epoxy Coated Bars

BTC55 Beam Details

Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.
Issued 05-04.
Beams.dgn - 4706 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 55'-0" Span	Standard Sheet 4706	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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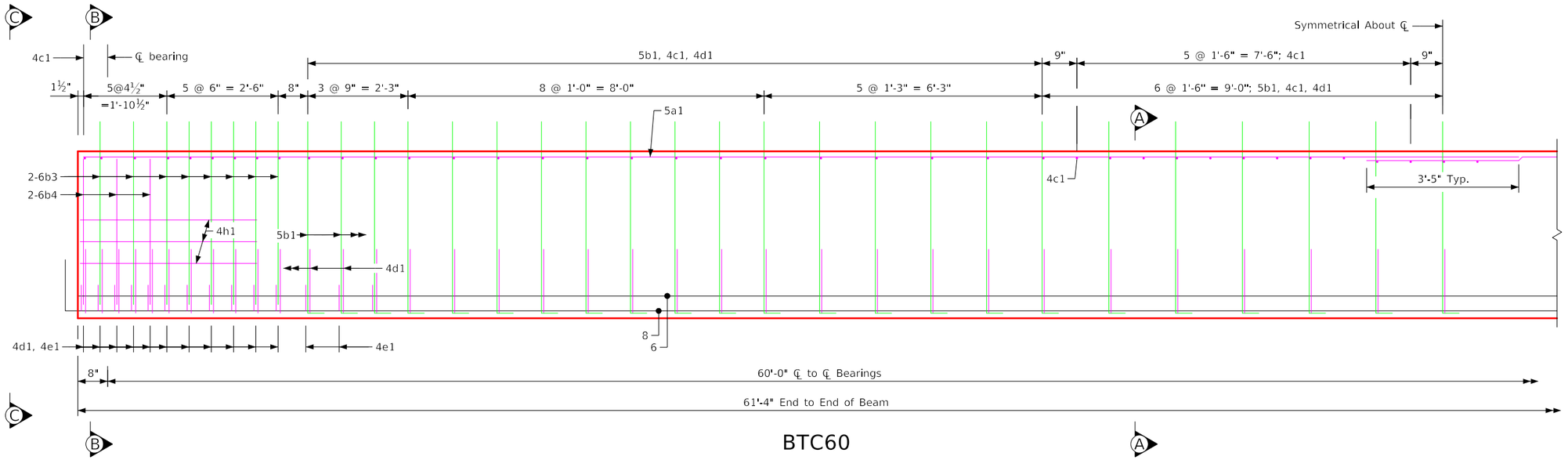
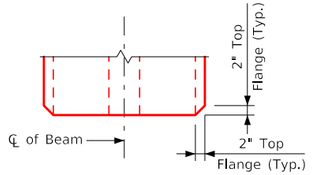
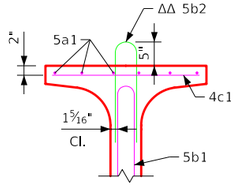


BTC60



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

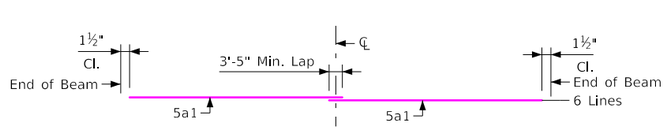


Section A-A
(Alternate)

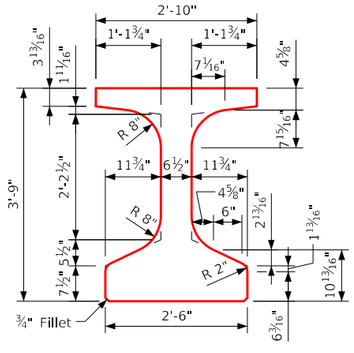
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

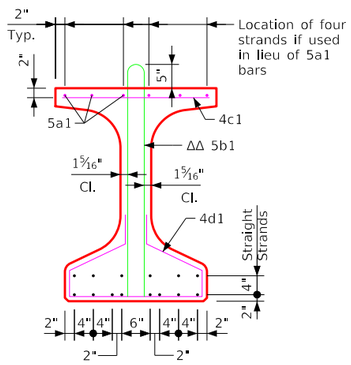
Beam Section Properties



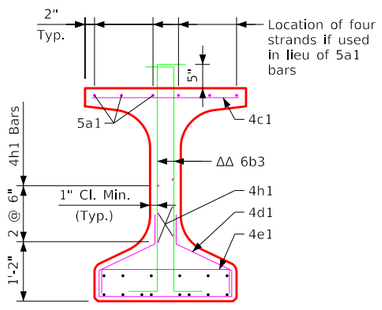
Top Flange Longitudinal Bar Layout



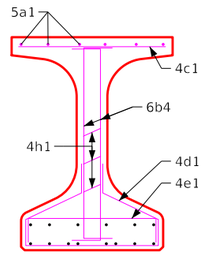
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

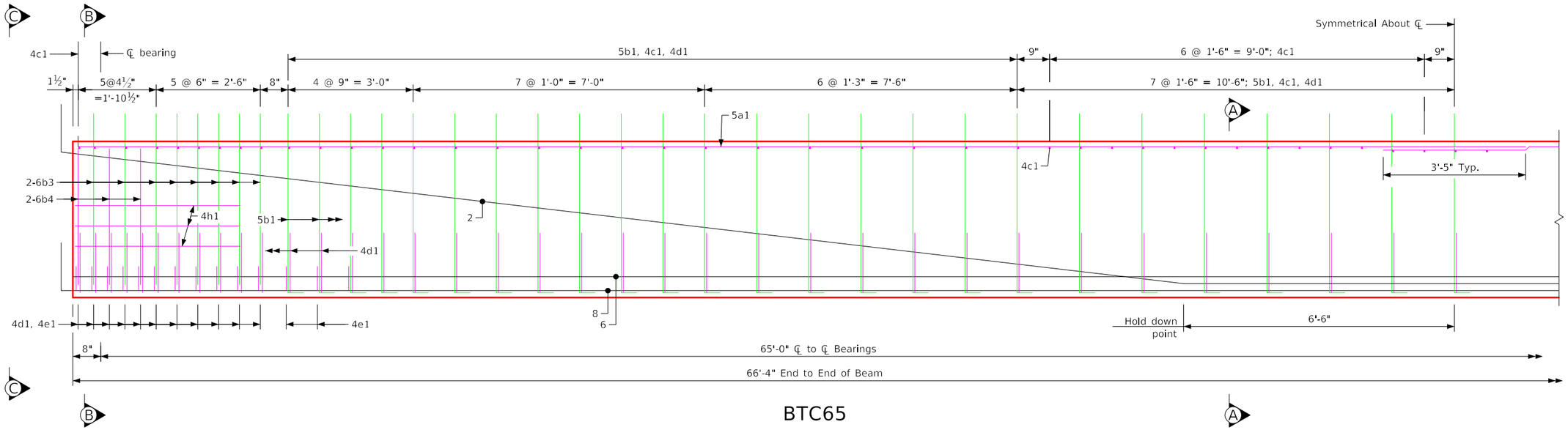
ΔΔ Epoxy coated bars

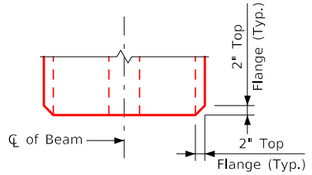
BTC60 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 60'-0" Span	Standard Sheet 4707	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4707 - This Sheet Re-Issued 04-2024. Sheet Format Update.

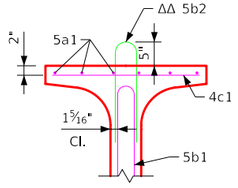
4:07:25 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn





Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

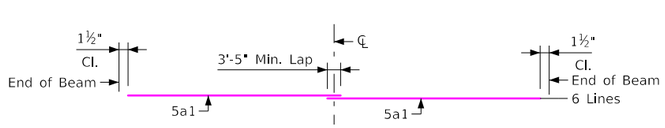


Section A-A
(Alternate)

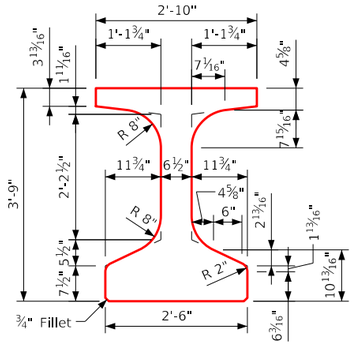
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

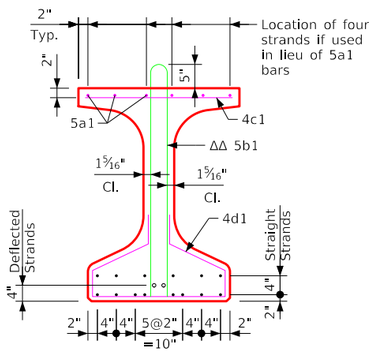
Beam Section Properties



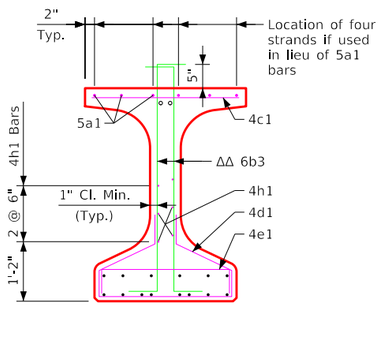
Top Flange Longitudinal Bar Layout



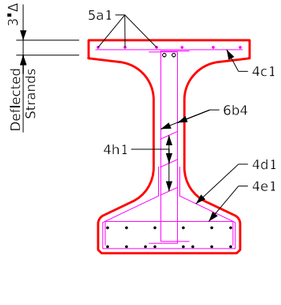
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

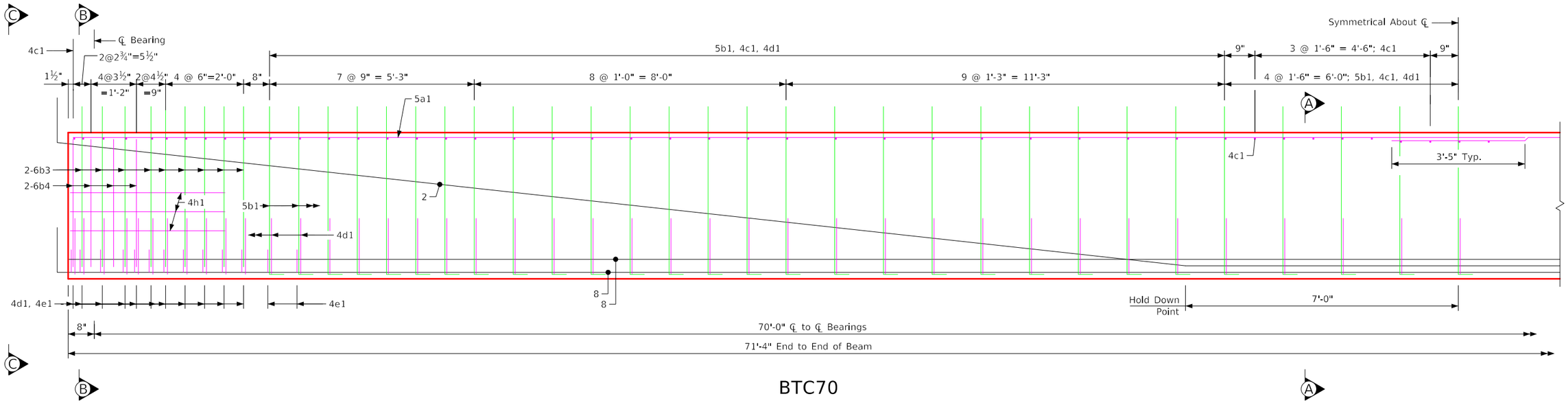
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTC65 Beam Details

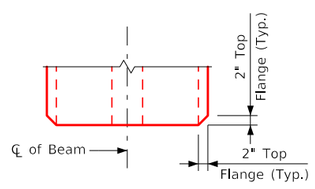
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4708 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 65'-0" Span	Standard Sheet 4708	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:25 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

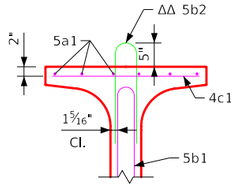


BTC70



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

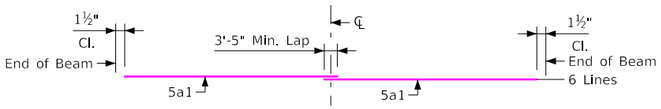


Section A-A
(Alternate)

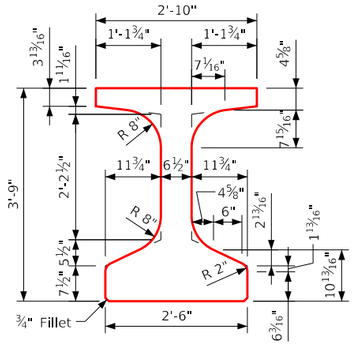
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

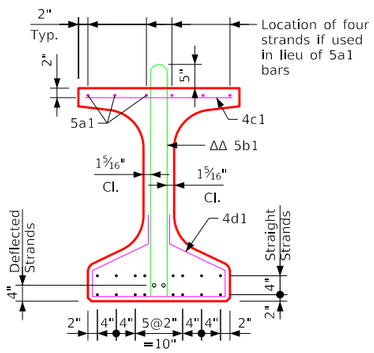
Beam Section Properties



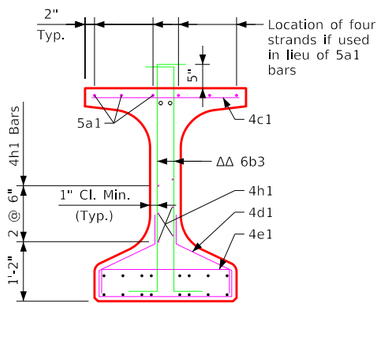
Top Flange Longitudinal Bar Layout



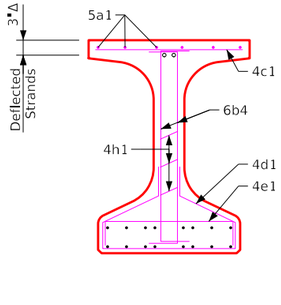
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

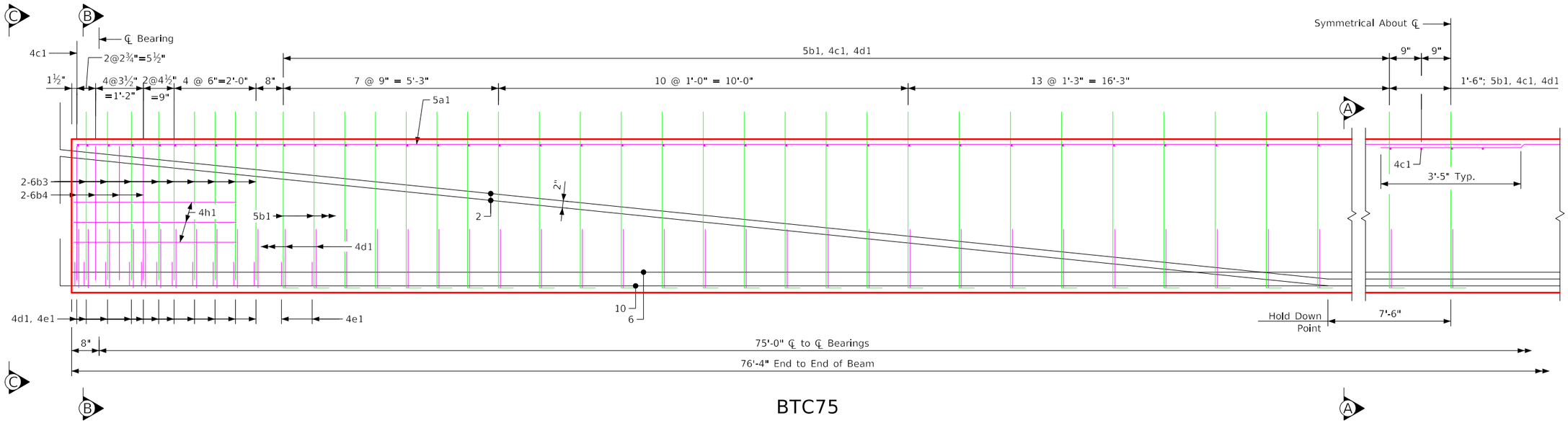
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTC70 Beam Details

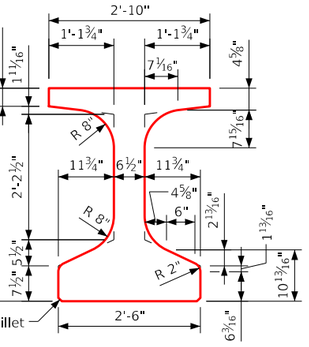
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4709 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 70'-0" Span	Standard Sheet 4709	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:26 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



BTC75



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

Section A-A (Alternate)

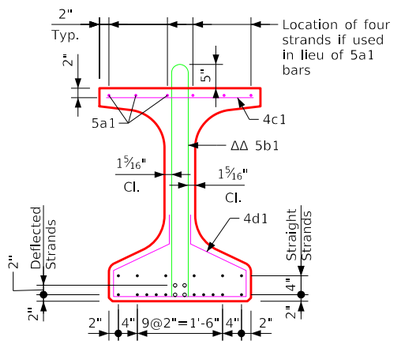
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

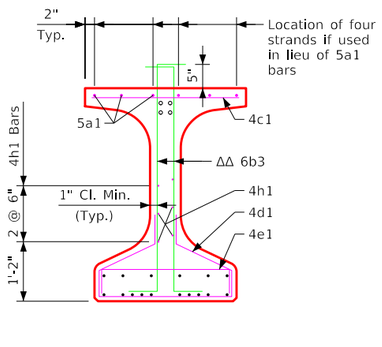
Beam Section Properties

Top Flange Longitudinal Bar Layout

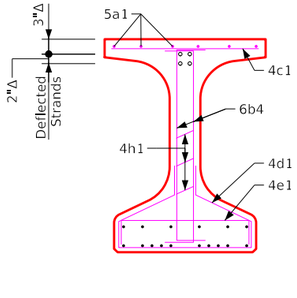
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

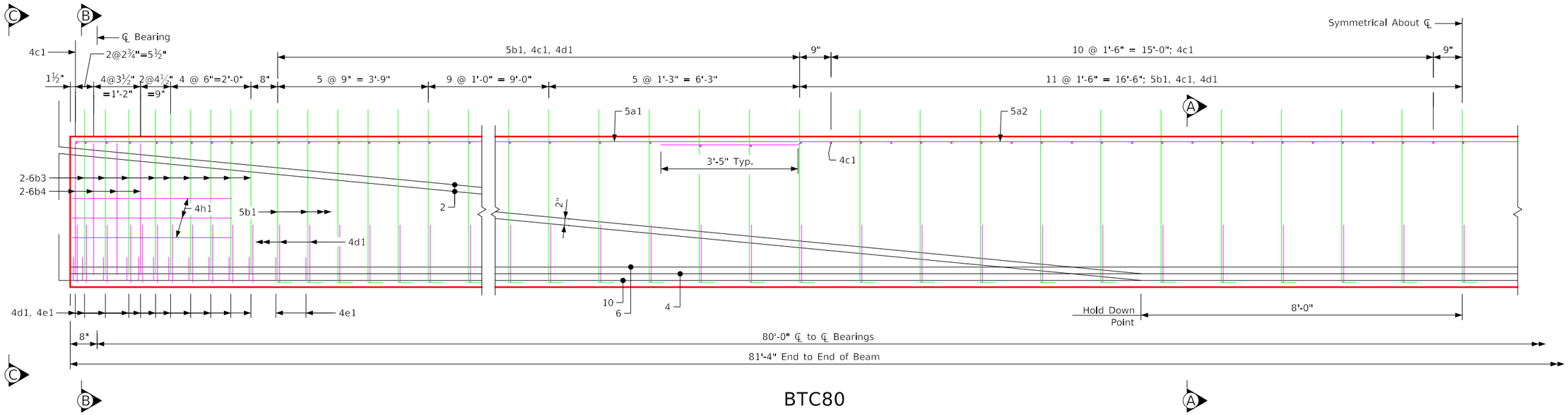
- ◦ Deflected Strands
- Δ Dimensions at End of Beam
- ΔΔ Epoxy Coated Bars

BTC75 Beam Details

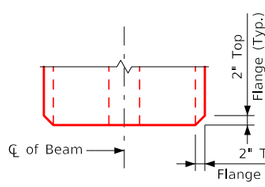
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4710 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 75'-0" Span	Standard Sheet 4710	COUNTY	PROJECT NUMBER	SHEET NUMBER

4:07:27 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

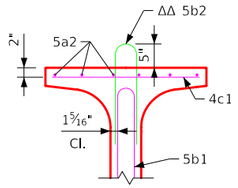


BTC80



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

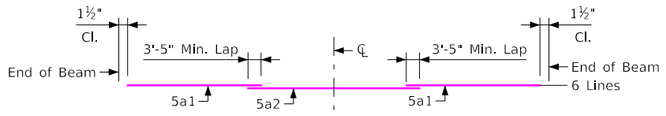


Section A-A (Alternate)

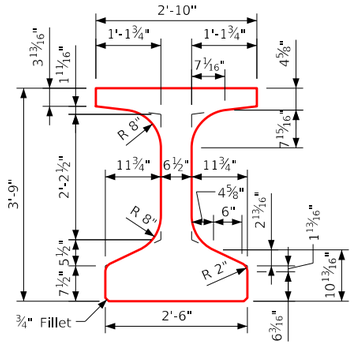
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

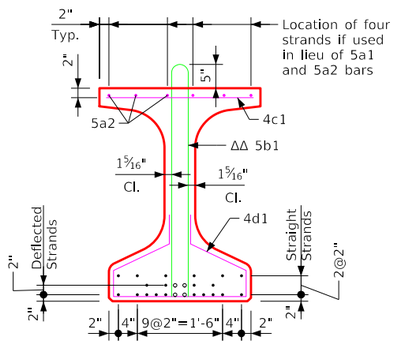
Beam Section Properties



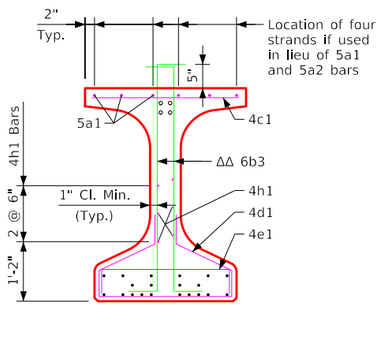
Top Flange Longitudinal Bar Layout



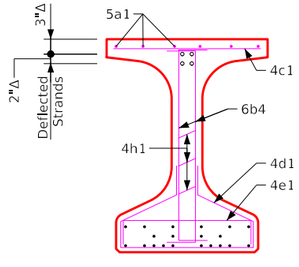
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

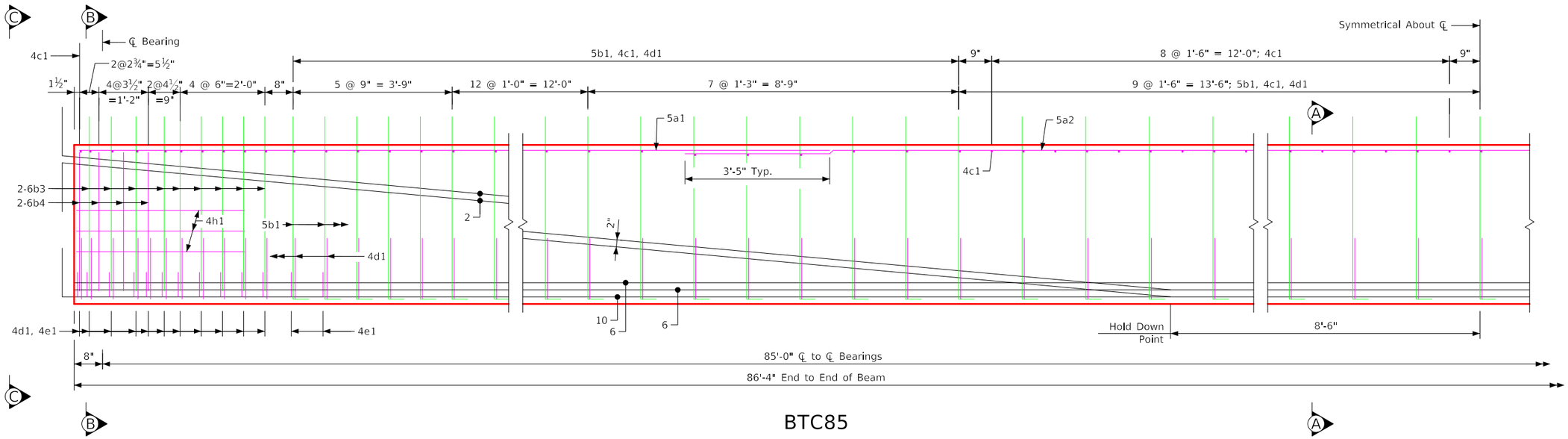
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTC80 Beam Details

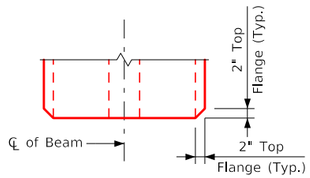
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4711 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 80'-0" Span	Standard Sheet 4711	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:28 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

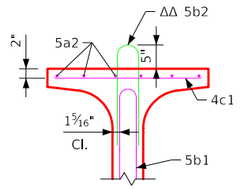


BTC85



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

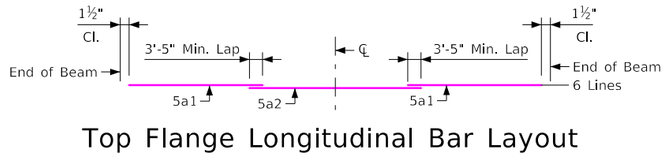


Section A-A
(Alternate)

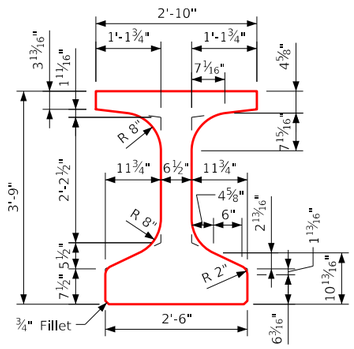
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

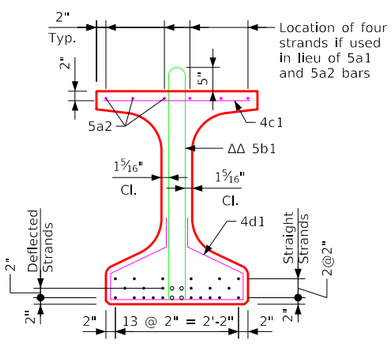
Beam Section Properties



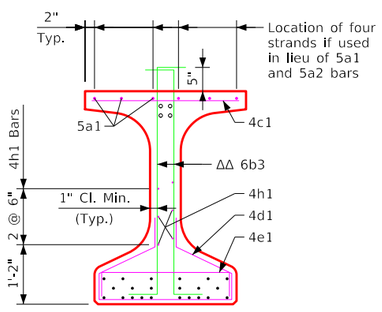
Top Flange Longitudinal Bar Layout



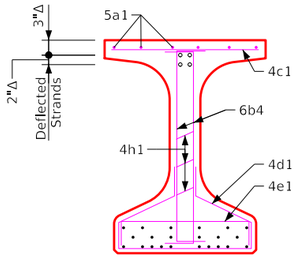
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

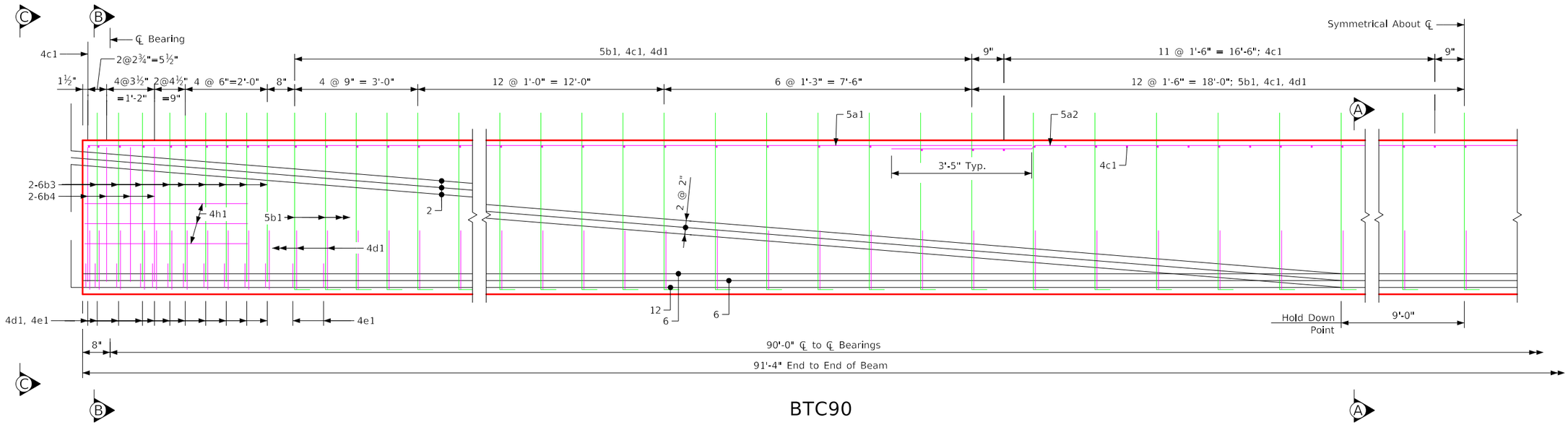
◦ Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTC85 Beam Details

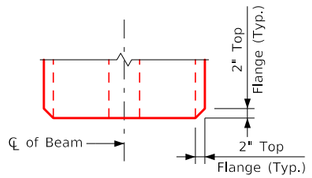
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 85'-0" Span	Standard Sheet 4712	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:28 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4712 - This Sheet Re-Issued 04-2024. Sheet Format Update.

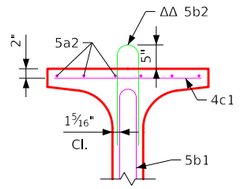


BTC90



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

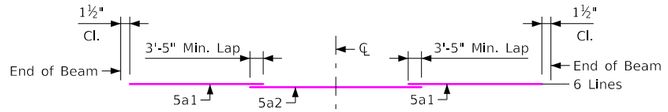


Section A-A (Alternate)

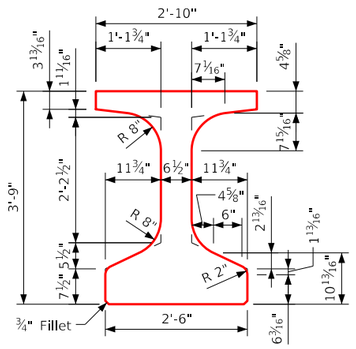
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

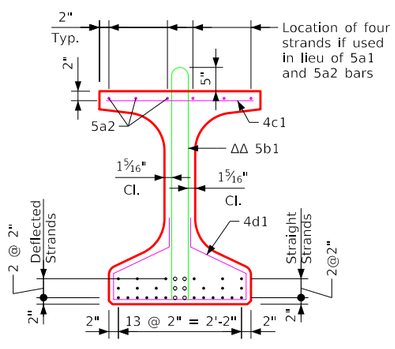
Beam Section Properties



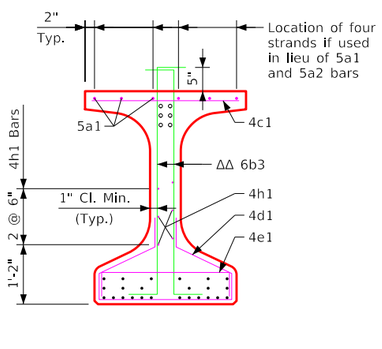
Top Flange Longitudinal Bar Layout



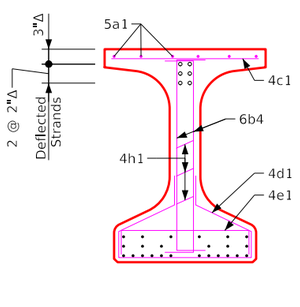
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

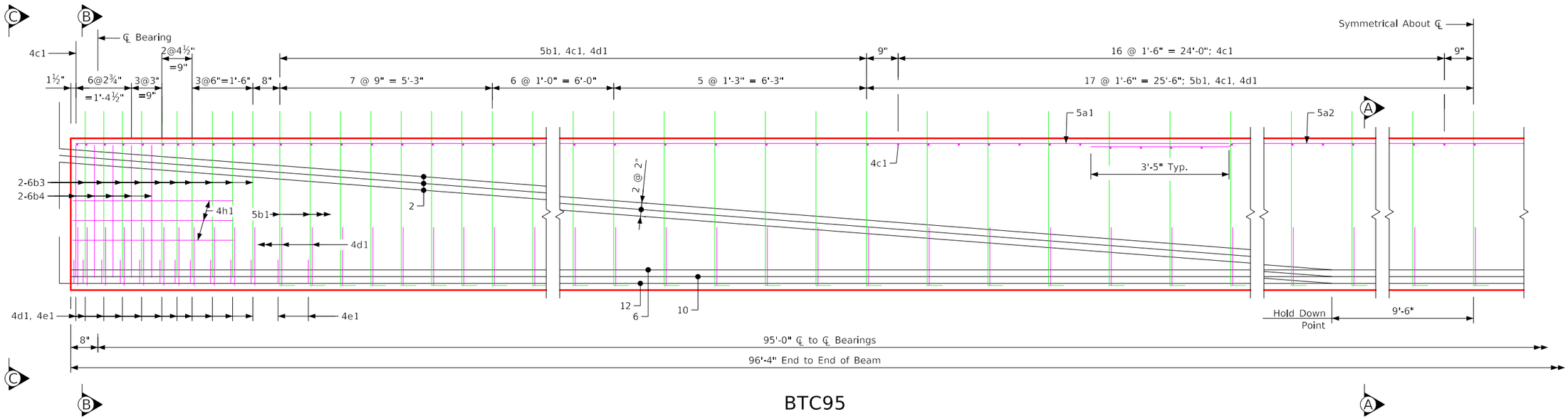
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTC90 Beam Details

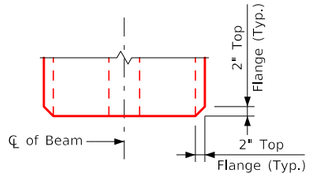
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4713 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 90'-0" Span	Standard Sheet 4713	COUNTY	PROJECT NUMBER	SHEET NUMBER

4:07:29 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

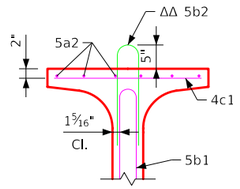


BTC95



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

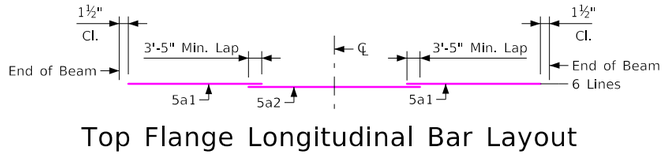


Section A-A (Alternate)

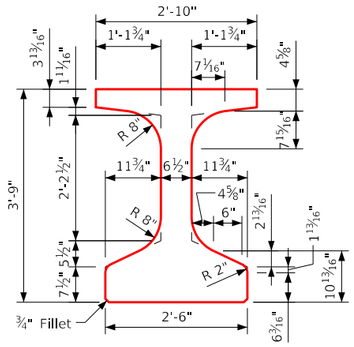
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

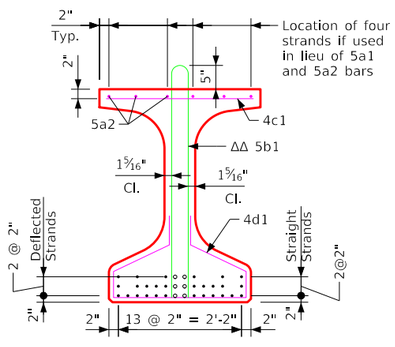
Beam Section Properties



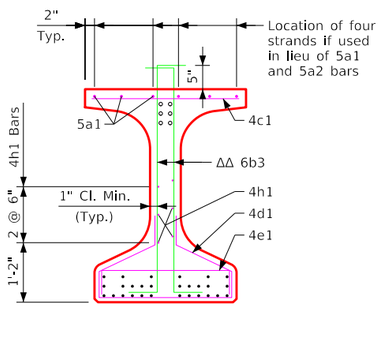
Top Flange Longitudinal Bar Layout



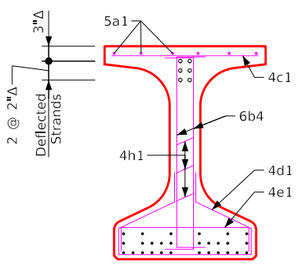
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

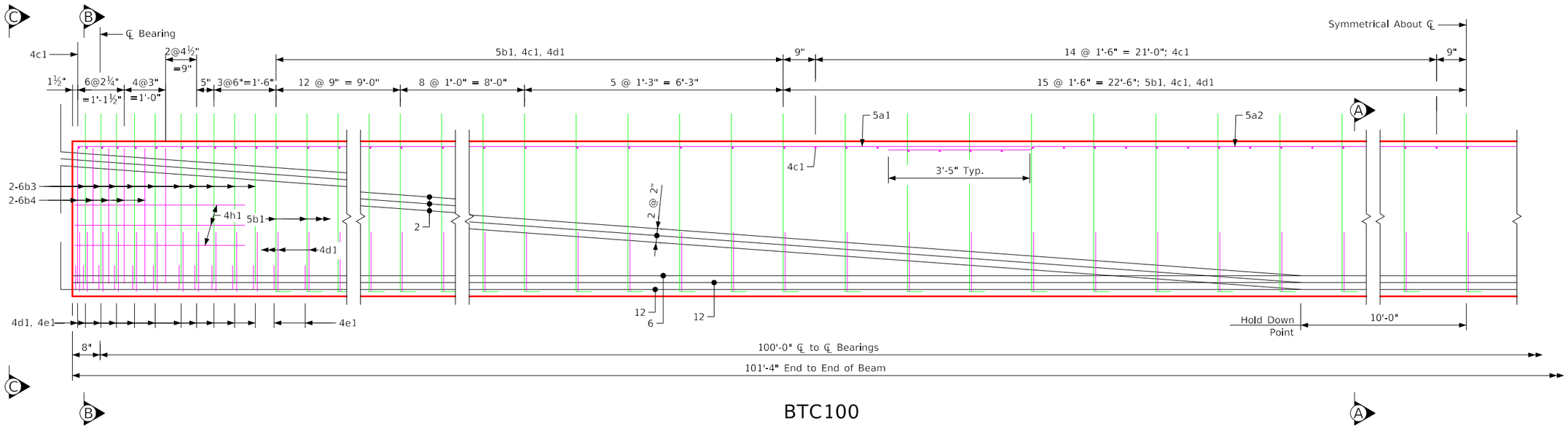
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTC95 Beam Details

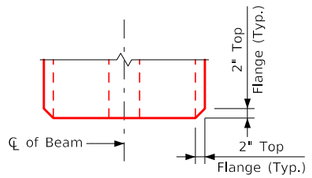
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4714 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 95'-0" Span	Standard Sheet 4714	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:30 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

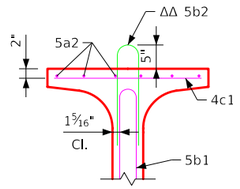


BTC100



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

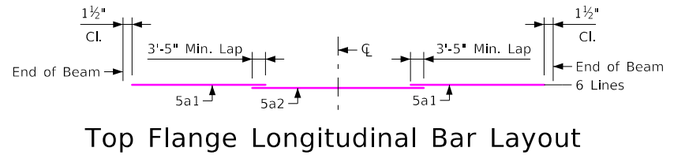


Section A-A
(Alternate)

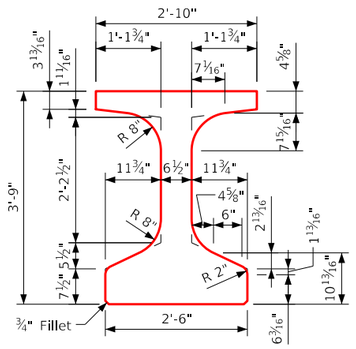
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

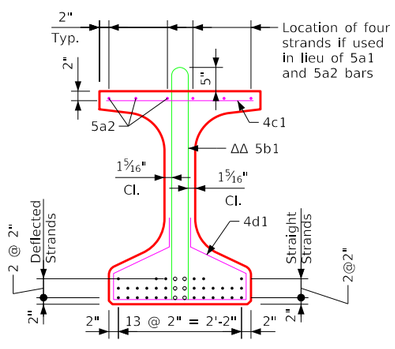
Beam Section Properties



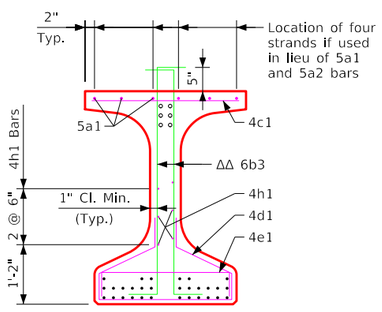
Top Flange Longitudinal Bar Layout



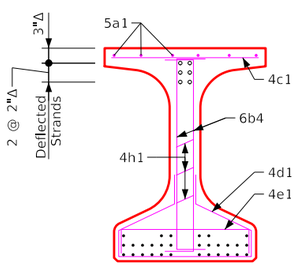
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

◦ Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTC100 Beam Details

Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4715 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 100'-0" Span	Standard Sheet 4715	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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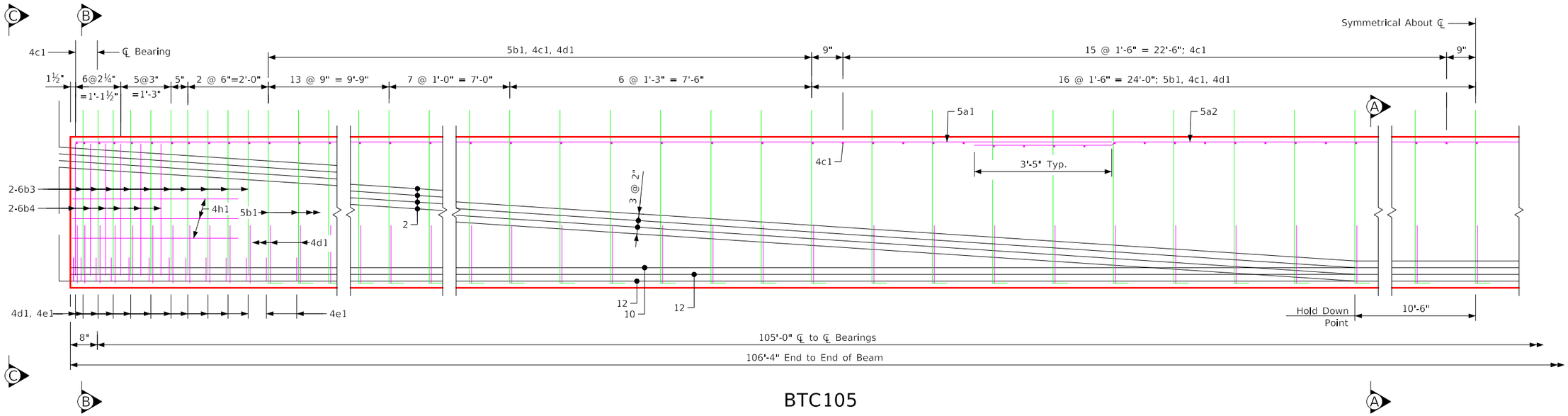
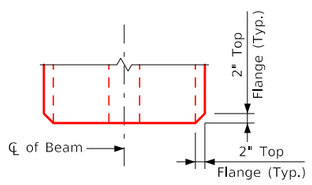
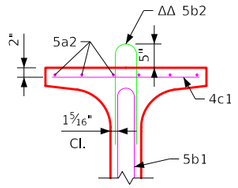


BTC105



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

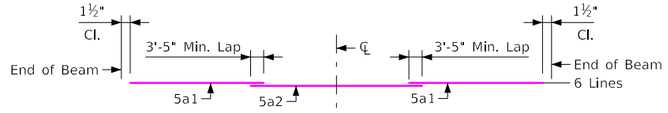


Section A-A
(Alternate)

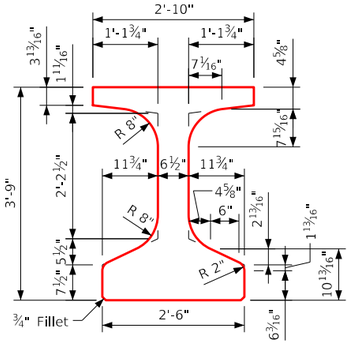
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

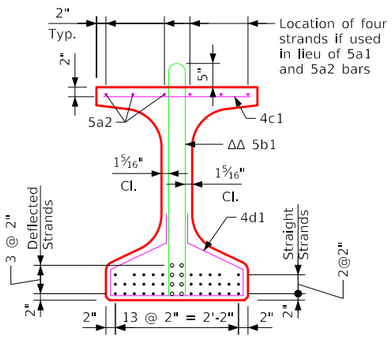
Beam Section Properties



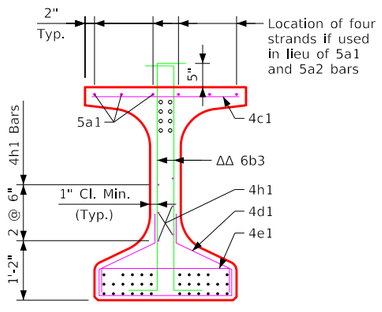
Top Flange Longitudinal Bar Layout



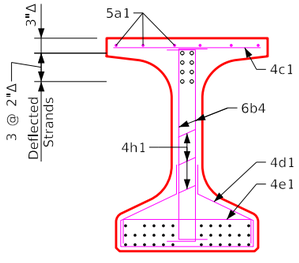
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

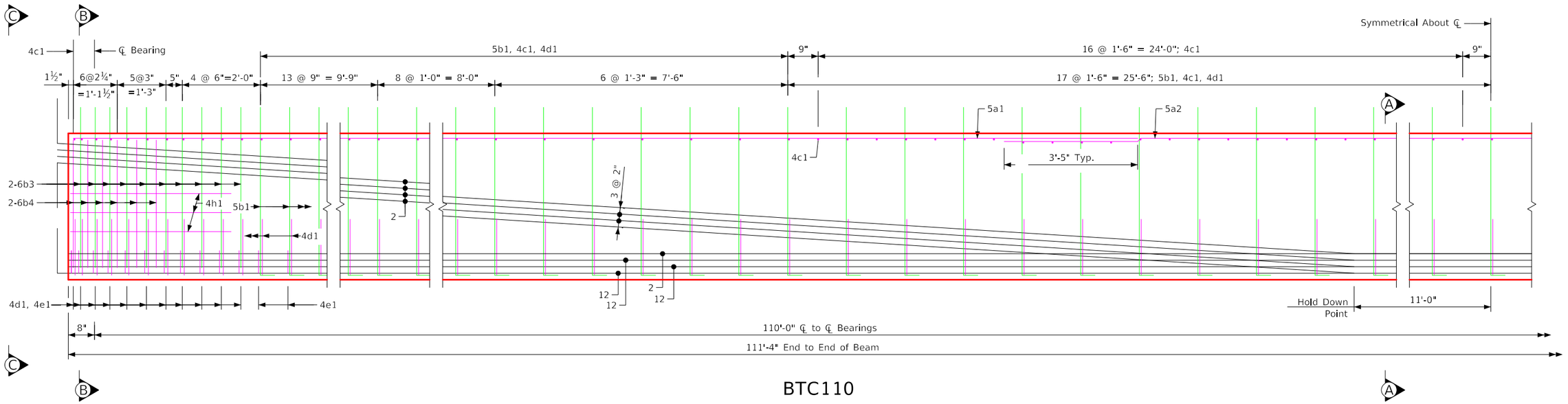
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTC105 Beam Details

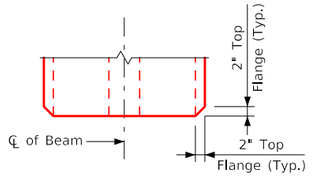
Revision 10-07: 5b2 bar deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4716 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 105'-0" Span	Standard Sheet 4716	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:31 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

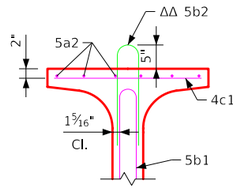


BTC110



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

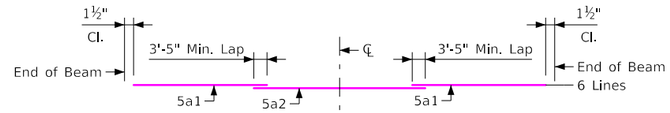


Section A-A
(Alternate)

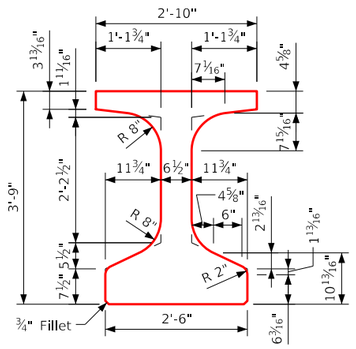
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

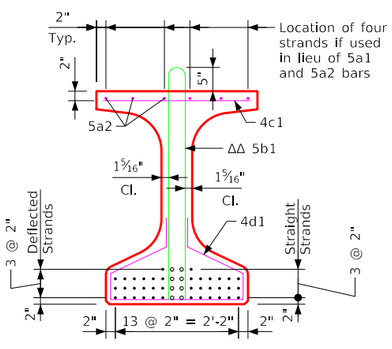
Beam Section Properties



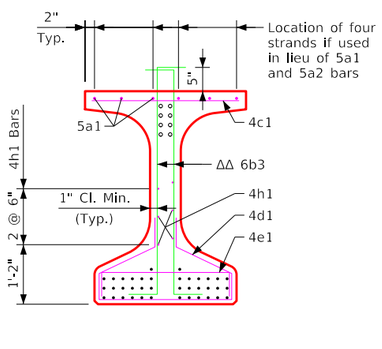
Top Flange Longitudinal Bar Layout



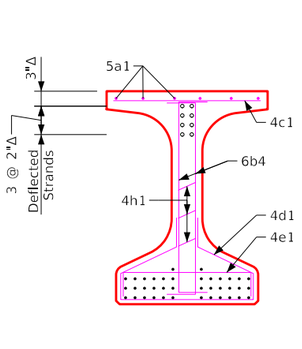
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTC110 Beam Details

Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4717 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 110'-0" Span	Standard Sheet 4717	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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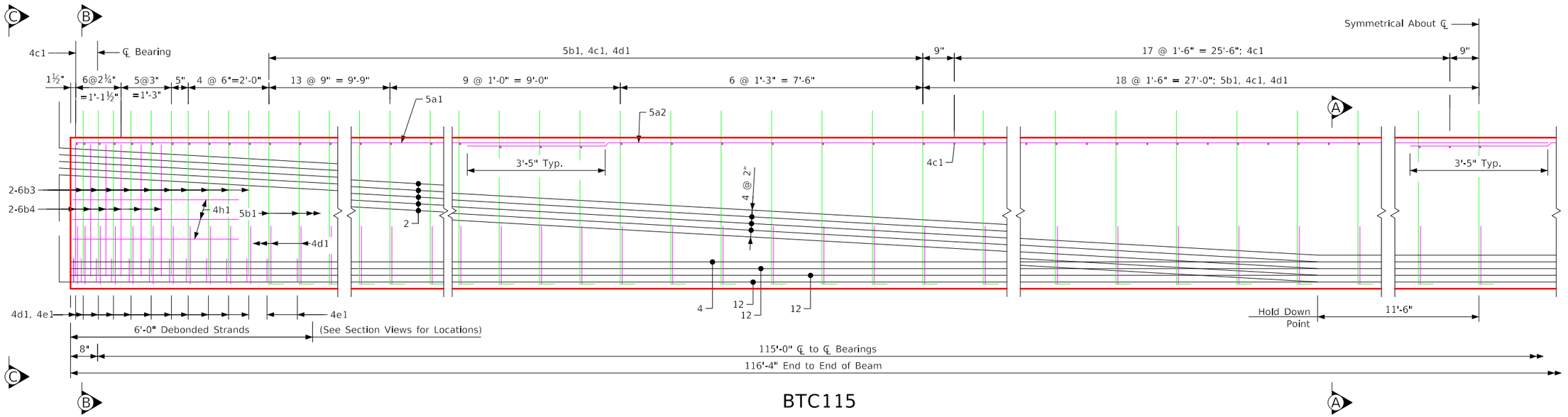
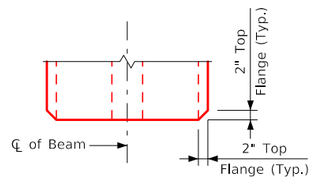
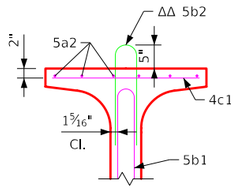


BTC115



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

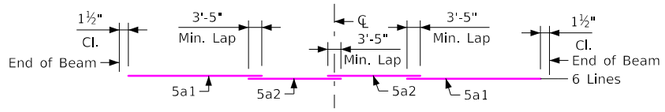


Section A-A
(Alternate)

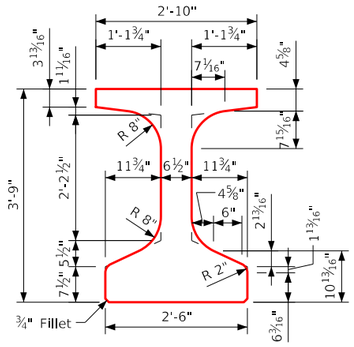
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

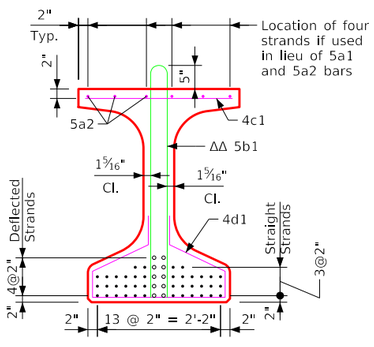
Beam Section Properties



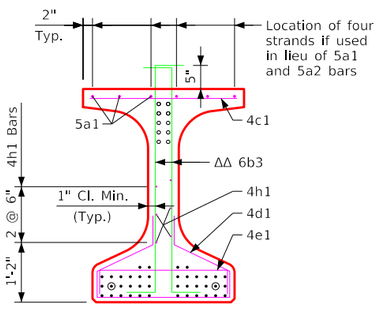
Top Flange Longitudinal Bar Layout



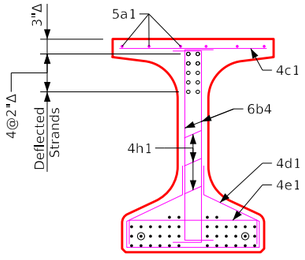
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

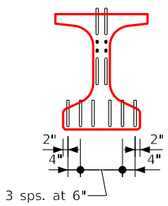
- ◦ Deflected Strands
- Δ Dimensions at End of Beam
- ΔΔ Epoxy Coated Bars
- ⊙ Strands Debonded 6'-0" from Beam Ends

BTC115 Beam Details

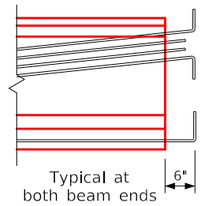
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4718 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 115'-0" Span	Standard Sheet 4718	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:33 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

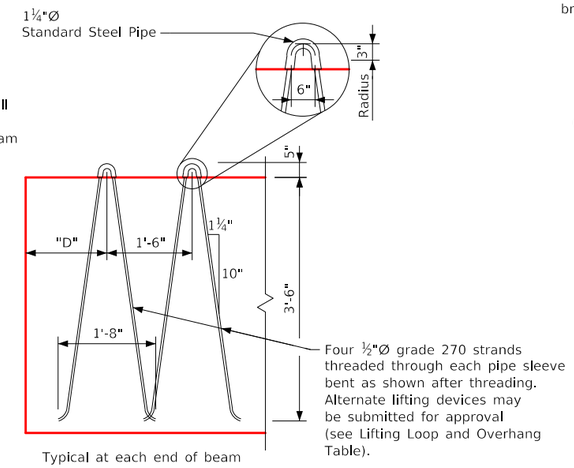


The top and bottom rows of the deflected strands are to be cut with 1'-2" projections which are to be shop bent as shown. The remaining top deflected strands are to be cut with 5" projections. Six bottom strands are to be cut with 1'-6" projections which are to be shop bent as shown. The remaining bottom strands are to be cut off reasonably flush with the concrete.



Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms

Lifting loops shall be placed on centerline of beam

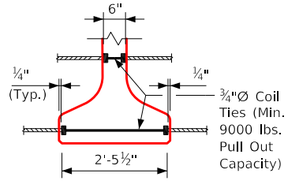


Four ½"Ø grade 270 strands threaded through each pipe sleeve bent as shown after threading. Alternate lifting devices may be submitted for approval (see Lifting Loop and Overhang Table).

Typical at each end of beam

Lifting Loop Detail

Number and exact location of coil ties to be as detailed on specific bridge design.



Coil Tie Detail

Lifting Loop and Overhang Table

Beam	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
BTC120	2	4	8'-3"	14

Lifting loops shall carry loads equally.

ΔΔ 5b1 and 6b3 bars to be epoxy coated
✱ 6b3 and 6b4 bars to be used in pairs

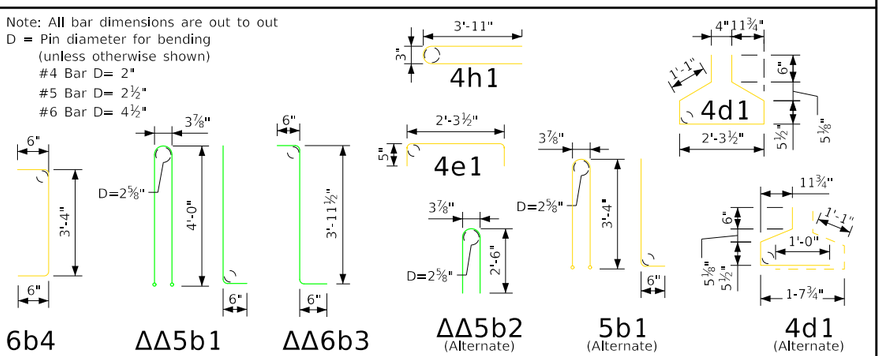
Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.

Reinforcing Bar List

	Beam		BTC120	
	Bar	Shape	No.	Length
	5a1		12	25'-8"
	5a2		12	40'-0"
ΔΔ	5b1		97	9'-2"
ΔΔ✱	6b3		40	5'-0"
✱	6b4		24	4'-4"
	4c1		157	2'-7"
	4d1		119	6'-5"
	4e1		26	3'-2"
	4h1		6	8'-0"

Bent Bar Details

Note: All bar dimensions are out to out
D = Pin diameter for bending (unless otherwise shown)
#4 Bar D= 2"
#5 Bar D= 2½"
#6 Bar D= 4½"



BTC120 Beam Data

BTC Beam	Span Length ℄-℄ Bearing	Overall Beam Length (L)	Concrete Strength f'ci (ksi.)	Concrete Strength f'c (ksi.)	Strand Size Dia. (in.)	No. of Strands Straight	No. of Strands Deflected	Total Initial Prestress ③ (kips)	Hold Down Force (kips)	Camber (in.) ⑥ At Release	Camber (in.) ⑥ After Losses	Deflection (in.) Δ_D Immediate ① (elastic) Δ_I Steel Diaphragm	Deflection (in.) Δ_D Time ② (plastic) Δ_T Steel Diaphragm	Permissible Maximum Spacing HL-93 Loading Steel Diaphragm	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight-lb.)
④ ⑤ BTC120	120'-0"	121'-4"	8.00	10.00	0.60"	44	10	2297	26.6	4.01"	6.43"	4.77"	1.19"	8'-6"	43.7	21.7	3074

① Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.5") weight of:
0.96 kips/ft. for 8'-6" beam spacing and one steel diaphragm (0.500 kips) at ℄ of span. For different deck and diapragm weights, deflections will be directly proportional.

② Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.
Total beam deflections at ℄ of span, Δ_D , due to weight of slab and diaphragms for detailing purpose:
(A) $\Delta_D=\Delta_I+\Delta_T$ for simple span.
(B) $\Delta_D=\Delta_I+\frac{3}{4}\Delta_T$ for end spans of continuous bridge.
(C) $\Delta_D=\Delta_I+\frac{1}{2}\Delta_T$ for interior spans of continous bridge.

③ Total initial prestress is based on 72.6% f's, f's= 270 ksi. and As= 0.217 in.^{2}.

④ Requires a 4500 psi., 28 day compressive strength for cast-in-place deck concrete.

⑤ Includes partial length debonded strands, see individual Beam Sheet for locations and details.

⑥ Calculated design cambers are based on multipliers developed from research in Iowa.

Design Stresses:

Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications, Series of 2017.
Reinforcing steel in accordance with Section 5, Grade 60.
Concrete in accordance with Section 5.
Prestressing steel in accordance with Section 5, Grade 270.

Specifications:

Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications.
Design: AASHTO LRFD, Series of 2017 with minor modifications.

Alternate Bar Notes:

Alternate bars shown in Bent Bar Details may be used in lieu of reinforcing bars shown in bar list. No additional payment shall be made for use of alternate bars.

Beam Notes:

These beams are designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.
All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.
Hold down points for deflected strands may be moved toward ends of beam a distance of 0.05 L maximum at producer's option.
All prestressing strands except lifting loop strands shall be 0.60 in. nominal diameter (nominal steel area = 0.217 in.^{2}) and conform to ASTM A416 Grade 270 Low Relaxation Strands. Minimum strand breaking strength shall be 58.6 kips.
Tops of beams are to be struck off level and finished as per Materials I.M.570.
Bearings shall be as detailed on other design sheets.
Beams to be used in bridges made continuous by the poured in place deck, are to be at least 28 days old before the deck is placed unless a shorter curing time is approved by the Bridge Engineer.
The portions of the prestressed beams that are to be embedded in the abutment and pier diaphragms shall be roughened for a distance of 10" from the beam end by sandblasting or other approved methods to provide suitable bond between the beam and the diaphragm in accordance with Article 2403.03, I, of the Standard Specifications.
All beams are to be increased in length to compensate for elastic shortening, creep and shrinkage.
For transporting, the allowable overhang is shown in the "Lifting Loop and Overhang Table".
The contractor shall assure the lateral stability of the BTC120 beam during handling, transporting and erection by providing temporary bracing as needed.
Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet.
If sole plate is required for bearing, sole plate is to be set in forms when beam is cast and formed out below to exclude concrete as detailed on the Bearing Sheet.
If stub abutments are used, all strands at the ends of beams at stub abutments shall be cut off reasonably flush with the concrete.
Minimum concrete f'c (at 28 days) and minimum f'ci at release are located in the BTC Beam Data Table above.
Four 0.60 in. diameter strands stressed to not more than 5000 lbs. each may be used in lieu of bars 5a1 and 5a2 in the top flange.
When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with Materials I.M.570 (Fabricator Application) and I.M.491.12 (Contractor Application).

BTC120 Beam - Data Details

Correction 12-13: Coil Tie Detail was changed to reflect the distance between Coil Tie Anchors embedded ¼ inch. Issued 05-04.
Beams.dgn - 4719s1 - This Sheet Re-Issued 04-2024, Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beams – 120'-0" Spans Data Details (Sheet 1 of 2)	Standard Sheet 4719s1	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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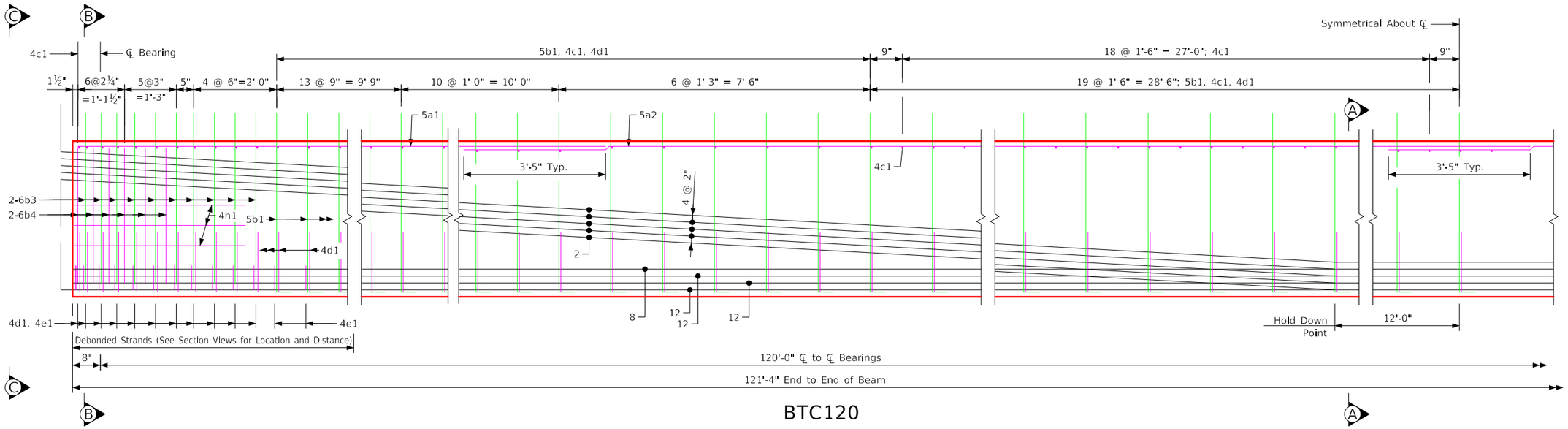
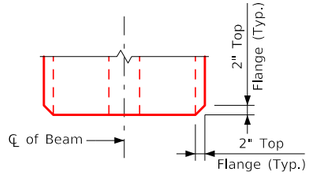
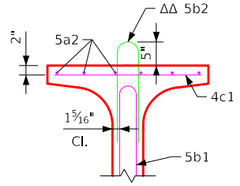


BTC120



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

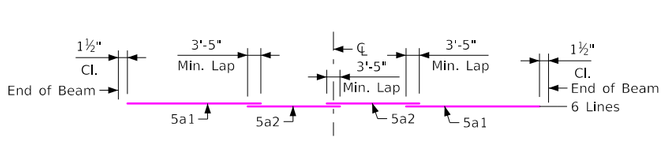


Section A-A
(Alternate)

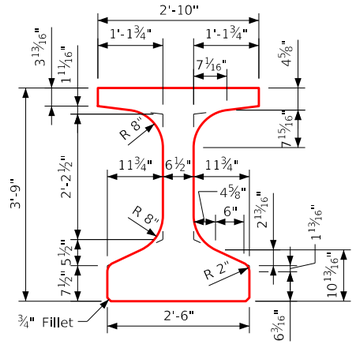
See Alternate Bar Note on Standard Sheet 4719 (sheet 1).

Area = 691.8 in.^{2}
$\bar{y}_b$ = 20.74 in.
I = 178,971 in.^{4}

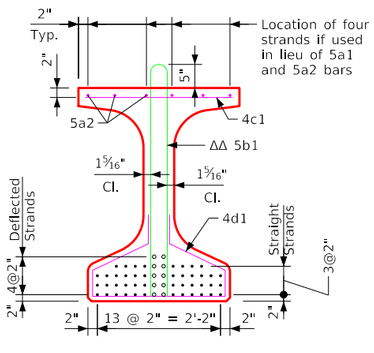
Beam Section Properties



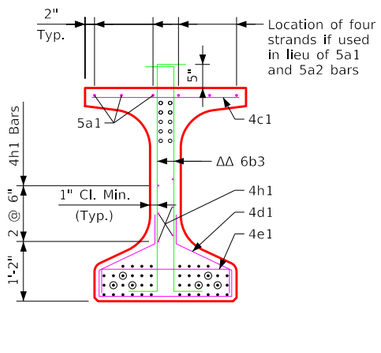
Top Flange Longitudinal Bar Layout



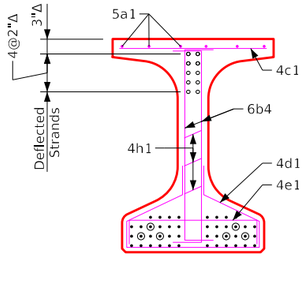
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars
⊙ Strands Debonded
3'-0" from Beam Ends - 3rd Row from Bottom
6'-0" from Beam Ends - 2nd Row from Bottom

BTC120 Beam Details

Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A added.
Issued 05-04.
Beams.dgn - 4719s2 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 120'-0" Span (Sheet 2 of 2)	Standard Sheet 4719s2	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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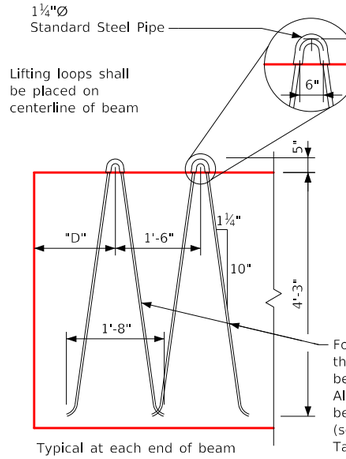
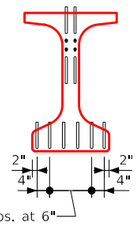
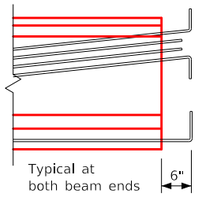


Lifting Loop Detail



The top and bottom rows of the deflected strands are to be cut with 1'-2" projections which are to be shop bent as shown. The remaining top deflected strands are to be cut with 5" projections. Six bottom strands are to be cut with 1'-6" projections which are to be shop bent as shown. The remaining bottom strands are to be cut off reasonably flush with the concrete.



Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms

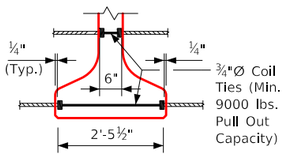
Lifting Loop And Overhang Table

Beams	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
BTD50–BTD80	1	4	2'-0"	**
BTD85–BTD90	2	4	2'-0"	**
BTD95	2	4	2'-0"	10
BTD100	2	4	3'-9"	9
BTD105	2	4	6'-3"	11
BTD110	2	4	8'-2"	11
BTD115	2	4	8'-3"	11
BTD120	2	4	9'-3"	14
BTD125	2	4	9'-3"	14
BTD130	2	4	9'-3"	14

** In accordance with Article 2407.03, K of the Standard Specifications.

Lifting loops shall carry loads equally.

Number and exact location of coil ties to be as detailed on specific bridge design.



Coil Tie Detail

Design Stresses:

Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications For, Series of 2017.
Reinforcing steel in accordance with Section 5, Grade 60.
Concrete in accordance with Section 5.
Prestressing steel in accordance with Section 5, Grade 270.

Specifications:

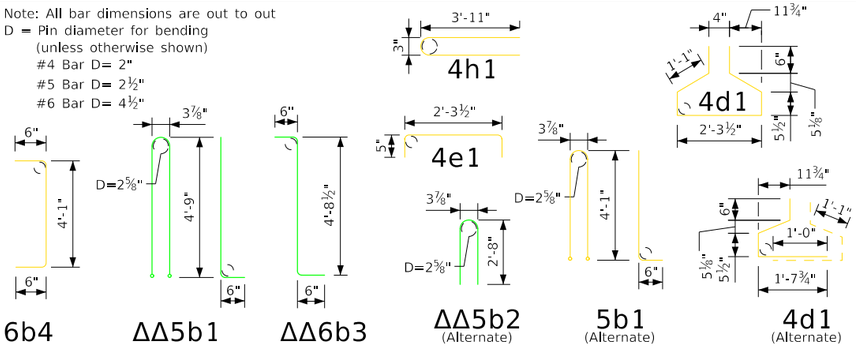
Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications.
Design: AASHTO LRFD, Series of 2017 with minor modifications.

Alternate Bar Notes:

Alternate bars shown in Bent Bar Details may be used in lieu of reinforcing bars shown in bar list. No additional payment shall be made for use of alternate bars.

Bent Bar Detail

Note: All bar dimensions are out to out
D = Pin diameter for bending
(unless otherwise shown)
#4 Bar D= 2"
#5 Bar D= 2½"
#6 Bar D= 4½"



6b4 | ΔΔ5b1 | ΔΔ6b3 | ΔΔ5b2 (Alternate) | 5b1 (Alternate) | 4d1 (Alternate)

BTD Beam Data

BTD Beam	Span Length ℄–℄ Bearing	Overal Beam Length (L)	Concrete Strength f'ci (ksi.)	Concrete Strength f'c (ksi.)	Strand Size Dia. (in.)	Number of Strands Straight	Number of Strands Deflected	Total Initial Prestress ③ (kips)	Hold Down Force (kips)	Camber (in.) ⑤ At Release	Camber (in.) ⑤ After Losses	Deflection (in.) Δ_D Immediate ① (elastic) Δ_I Steel Diaphragm	Deflection (in.) Δ_D Time ② (plastic) Δ_T Steel Diaphragm	Permissible Maximum Spacing HL-93 Loading Steel Diaphragm	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight lb.)
BTD50	50'-0"	51'-4"	4.50	5.00	0.60"	12	—	510	—	0.24"	0.45"	0.12"	0.03"	9'-3"	20.0	9.9	1585
BTD55	55'-0"	56'-4"	4.50	5.00	0.60"	14	—	596	—	0.34"	0.63"	0.18"	0.04"	9'-3"	22.0	10.8	1696
BTD60	60'-0"	61'-4"	4.50	5.00	0.60"	12	2	596	13.6	0.36"	0.67"	0.25"	0.06"	9'-3"	23.9	11.8	1803
BTD65	65'-0"	66'-4"	4.50	5.00	0.60"	14	2	681	12.6	0.47"	0.87"	0.35"	0.09"	9'-3"	25.9	12.8	1906
BTD70	70'-0"	71'-4"	4.50	5.00	0.60"	14	2	681	11.3	0.49"	0.91"	0.46"	0.12"	9'-3"	27.8	13.7	2013
BTD75	75'-0"	76'-4"	5.00	6.00	0.60"	16	2	766	10.5	0.62"	1.14"	0.58"	0.14"	9'-3"	29.8	14.7	2082
BTD80	80'-0"	81'-4"	5.00	6.00	0.60"	18	2	851	9.9	0.78"	1.44"	0.74"	0.19"	9'-3"	31.7	15.7	2207
BTD85	85'-0"	86'-4"	5.00	6.00	0.60"	18	4	936	17.9	0.90"	1.66"	0.94"	0.24"	9'-3"	33.7	16.6	2311
BTD90	90'-0"	91'-4"	5.50	6.50	0.60"	20	4	1021	17.7	1.03"	1.91"	1.15"	0.29"	9'-3"	35.6	17.6	2470
BTD95	95'-0"	96'-4"	5.50	6.50	0.60"	24	4	1191	16.8	1.38"	2.55"	1.42"	0.36"	9'-3"	37.6	18.6	2570
BTD100	100'-0"	101'-4"	6.00	7.00	0.60"	26	4	1276	16.0	1.57"	2.86"	1.70"	0.43"	9'-3"	39.5	19.5	2673
BTD105	105'-0"	106'-4"	6.00	7.00	0.60"	28	6	1446	21.9	1.89"	3.03"	2.06"	0.52"	9'-3"	41.5	20.5	2795
BTD110	110'-0"	111'-4"	6.50	7.50	0.60"	30	6	1531	20.9	2.09"	3.35"	2.43"	0.61"	9'-3"	43.4	21.4	2976
BTD115	115'-0"	116'-4"	7.00	8.00	0.60"	34	6	1701	20.3	2.46"	3.94"	2.83"	0.71"	9'-3"	45.4	22.4	3130
BTD120	120'-0"	121'-4"	7.00	8.00	0.60"	36	8	1872	24.4	2.81"	4.50"	3.25"	0.81"	9'-3"	47.3	23.4	3265
BTD125	125'-0"	126'-4"	7.50	8.50	0.60"	38	10	2042	27.9	3.09"	4.95"	3.86"	0.97"	9'-3"	49.3	24.3	3440
BTD130	130'-0"	131'-4"	7.50	9.00	0.60"	42	12	2297	30.6	3.61"	5.78"	4.43"	1.11"	9'-3"	51.2	25.3	3543

④

① Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.5") weight of:
1.04 kips/ft for 9'-3" beam spacing and one steel diaphragm (0.500 kips) at ℄ of span for BTD50 to BTD120, and two steel diaphragms (0.500 kips) placed 20'-0", on either side, of the beam ℄ for BTD125 to BTD130. For different deck and diapragm weights, deflections will be directly proportional.

② Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.
Total beam deflections at ℄ of span, Δ_D , due to weight of deck and diaphragms for detailing purpose:
(A) $\Delta_D=\Delta_I+\Delta_T$ for simple span.
(B) $\Delta_D=\Delta_I+\frac{3}{4}\Delta_T$ for end spans of continuous bridge.
(C) $\Delta_D=\Delta_I+\frac{1}{2}\Delta_T$ for interior spans of continous bridge.

③ Total initial prestress is based on 72.6% f's, f's= 270 ksi. and As= 0.217 $in.^2$.

④ Includes partial length debonded strands, see individual Beam Sheets for locations and details.

⑤ Calculated design cambers are based on multipliers developed from research in Iowa.

Beam Notes:

These beams are designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.
All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.
Hold down points for deflected strands may be moved toward ends of beam a distance of 0.05 L maximum at producer's option.
All prestressing strands except lifting loop strands shall be 0.60 in. nominal diameter (nominal steel area = 0.217 $in.^2$) and conform to ASTM A416 Grade 270 Low Relaxation Strands. Minimum strand breaking strength shall be 58.6 kips.
Tops of beams are to be struck off level and finished as per Materials I.M.570.
Bearings shall be as detailed on other design sheets.
Beams to be used in bridges made continuous by the poured in place deck, are to be at least 28 days old before the deck is placed unless a shorter curing time is approved by the Bridge Engineer.
The portions of the prestressed beams that are to be embedded in the abutment and pier diaphragms shall be roughened for a distance of 10" from the beam end by sandblasting or other approved methods to provide suitable bond between the beam and the diaphragm in accordance with Article 2403.03, I, of the Standard Specifications.
All beams are to be increased in length to compensate for elastic shortening, creep and shrinkage.
For transporting, the allowable overhang is shown in the "Lifting Loop and Overhang Table".
The contractor shall assure the lateral stability of the BTD110 to BTD130 beam during handling, transporting and erection by providing temporary bracing as needed.
Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet.
If sole plate is required for bearing, sole plate is to be set in forms when beam is cast and formed out below to exclude concrete as detailed on the Bearing Sheet.
If stub abutments are used, all strands at the ends of beams at stub abutments shall be cut off reasonably flush with the concrete.
Minimum concrete f'c (at 28 days) and minimum f'ci at release are located in the BTD Beam Data Table above.
Four 0.60 in. diameter strands stressed to not more than 5000 lbs. each may be used in lieu of bars 5a1 and 5a2 in the top flange.

Beam Notes: (continued)

When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with materials I.M.570 (Fabricator Application) and I.M.491.12 (Contractor Application).

Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.

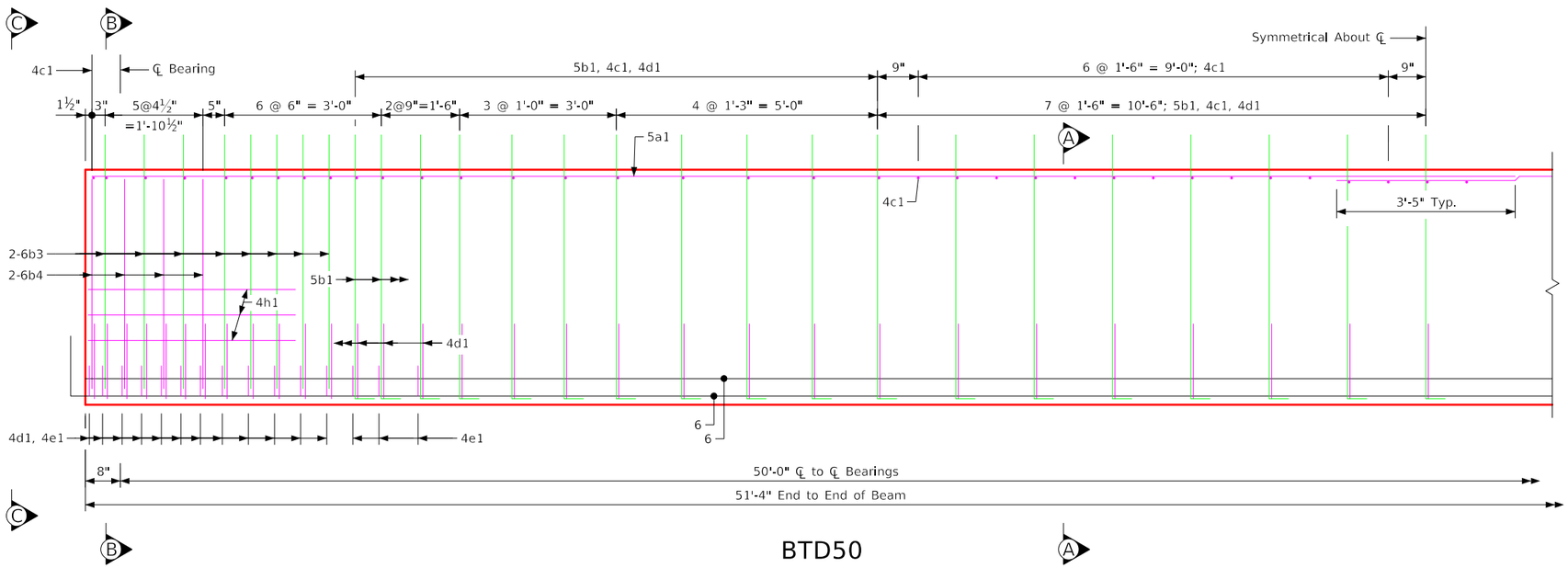
Reinforcing Bar List

	Beam		BTD50		BTD55		BTD60		BTD65		BTD70		BTD75		BTD80		BTD85		BTD90		BTD95		BTD100		BTD105		BTD110		BTD115		BTD120		BTD125		BTD130		Beam
	Bar	Shape	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	Bar
	5a1		12	27'-3"	12	29'-9"	12	32'-3"	12	34'-9"	12	37'-3"	12	39'-9"	12	24'-0"	12	26'-6"	12	29'-0"	12	31'-6"	12	34'-0"	12	36'-6"	12	39'-0"	12	23'-2"	12	25'-8"	12	28'-2"	12	30'-8"	5a1
	5a2		—	—	—	—	—	—	—	—	—	—	—	—	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	12	40'-0"	12	40'-0"	12	40'-0"	12	40'-0"	5a2
ΔΔ	5b1		35	10'-8"	39	10'-8"	43	10'-8"	47	10'-8"	51	10'-8"	53	10'-8"	57	10'-8"	61	10'-8"	67	10'-8"	71	10'-8"	75	10'-8"	81	10'-8"	85	10'-8"	91	10'-8"	97	10'-8"	103	10'-8"	107	10'-8"	5b1
ΔΔ*	6b3		32	5'-9"	32	5'-9"	32	5'-9"	32	5'-9"	32	5'-9"	32	5'-9"	32	5'-9"	32	5'-9"	36	5'-9"	36	5'-9"	36	5'-9"	36	5'-9"	40	5'-9"	40	5'-9"	40	5'-9"	40	5'-9"	40	5'-9"	6b3
*	6b4		16	5'-1"	16	5'-1"	16	5'-1"	16	5'-1"	16	5'-1"	16	5'-1"	16	5'-1"	16	5'-1"	16	5'-1"	16	5'-1"	16	5'-1"	16	5'-1"	20	5'-1"	20	5'-1"	20	5'-1"	24	5'-1"	24	5'-1"	6b4
	4c1		67	2'-7"	73	2'-7"	81	2'-7"	87	2'-7"	95	2'-7"	99	2'-7"	105	2'-7"	111	2'-7"	119	2'-7"	123	2'-7"	129	2'-7"	135	2'-7"	141	2'-7"	147	2'-7"	153	2'-7"	165	2'-7"	171	2'-7"	4c1
	4d1		59	6'-5"	63	6'-5"	67	6'-5"	71	6'-5"	75	6'-5"	77	6'-5"	81	6'-5"	85	6'-5"	89	6'-5"	93	6'-5"	97	6'-5"	103	6'-5"	107	6'-5"	113	6'-5"	119	6'-5"	125	6'-5"	129	6'-5"	4d1
	4e1		30	3'-2"	30	3'-2"	30	3'-2"	30	3'-2"	30	3'-2"	30	3'-2"	30	3'-2"	30	3'-2"	28	3'-2"	28	3'-2"	28	3'-2"	28	3'-2"	28	3'-2"	28	3'-2"	28	3'-2"	28	3'-2"	28	3'-2"	4e1
	4h1		6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	6	8'-0"	4h1

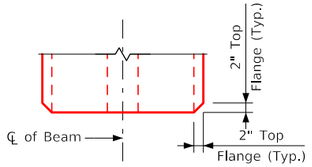
ΔΔ 5b1 and 6b3 bars to be epoxy coated
* 6b3 and 6b4 bars to be used in pairs

BTD Beam - Data Details

Correction 12-13: Coil Tie Detail was Changed to Reflect the Distance Between Coil Tie Anchors Embedded ¼ Inch.
Issued 05-04.
Beams.dgn - 4730 - This Sheet Re-Issued 04-2024, Sheet Format Update.

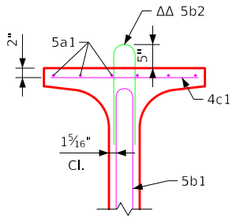


BTD50



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



Section A-A
(Alternate)

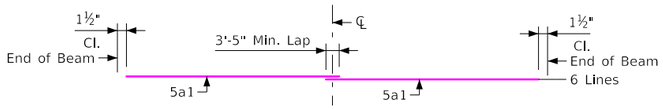
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}

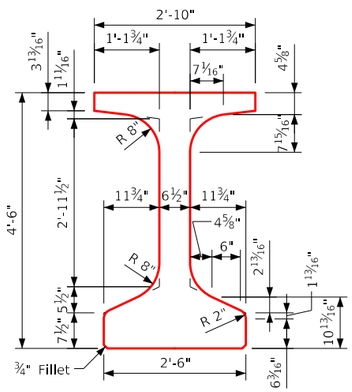
$\bar{y}_b$ = 24.64 in.

I = 285,860 in.^{4}

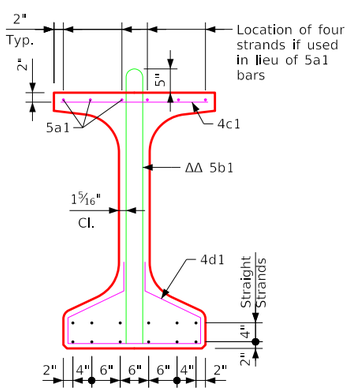
Beam Section Properties



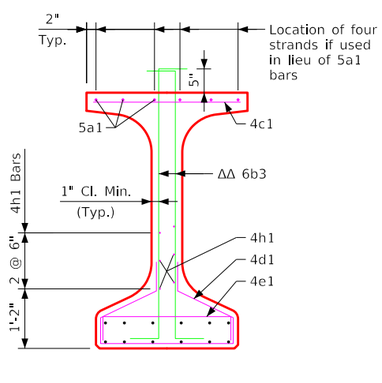
Top Flange Longitudinal Bar Layout



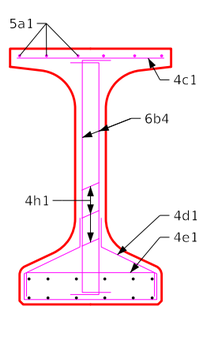
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

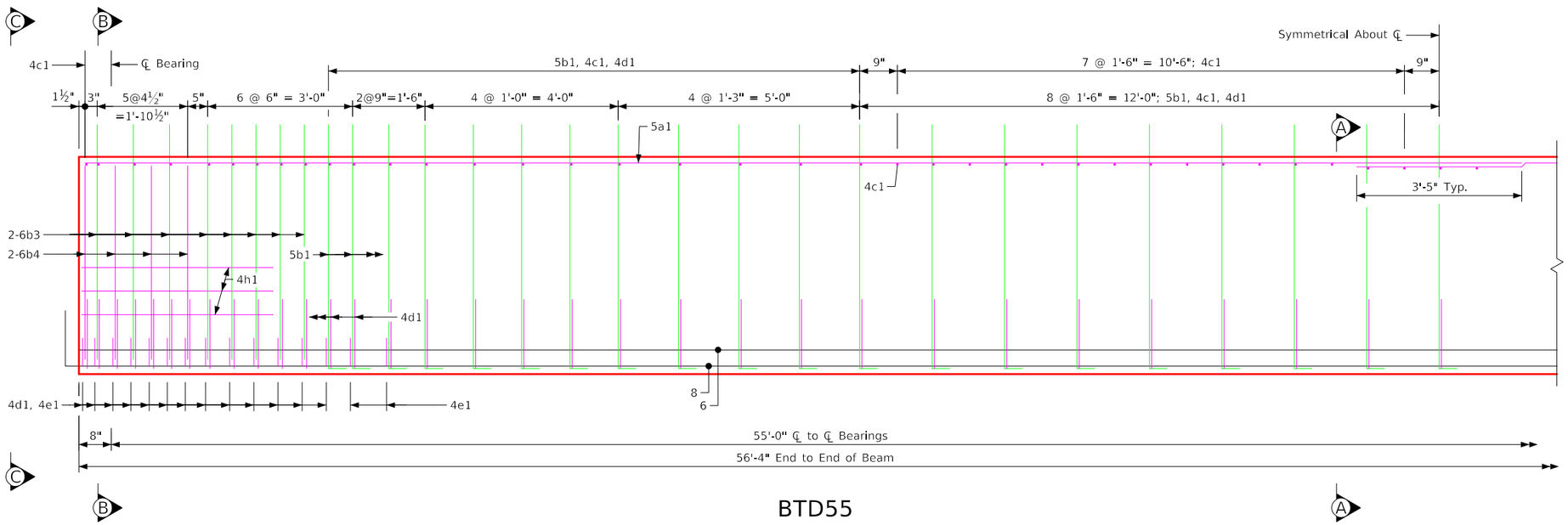
ΔΔ Epoxy Coated Bars

BTD50 Beam Details

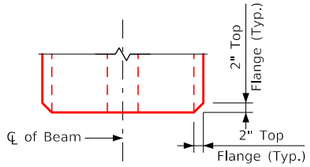
Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.
Issued 05-04
Beams.dgn - 4731 - This Sheet Re-Issued 04-2024, Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 50'-0" Span	Standard Sheet 4731	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:37 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

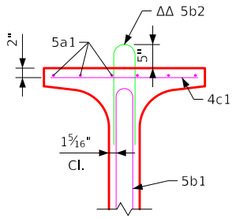


BTD55



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



Section A-A
(Alternate)

See Alternate Bar Note on Standard Sheet 4730.

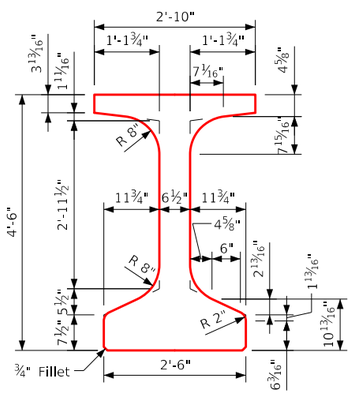
Area = 748.8 in.^{2}

$\bar{y}_b$ = 24.64 in.

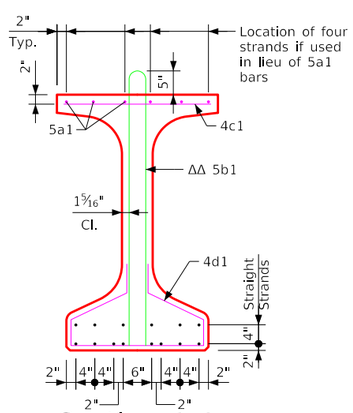
I = 285,860 in.^{4}

Beam Section Properties

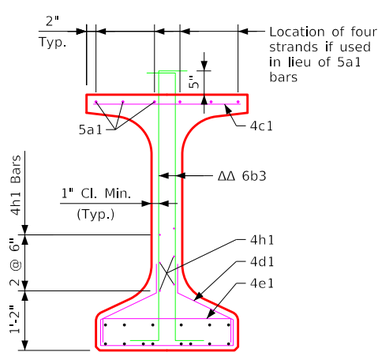
Top Flange Longitudinal Bar Layout



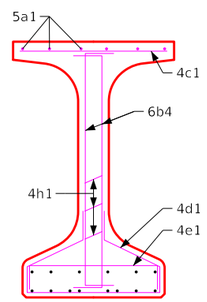
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

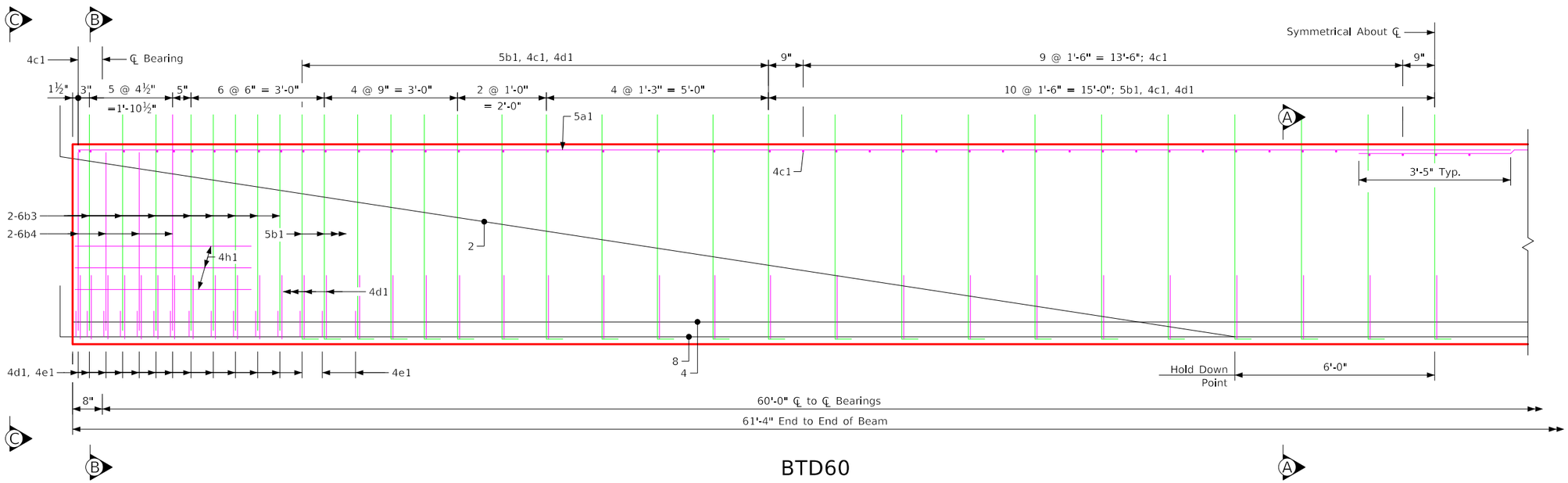
ΔΔ Epoxy Coated Bars

BTD55 Beam Details

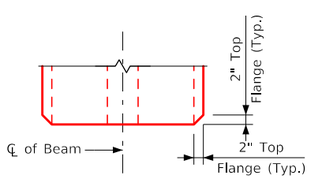
Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.
Issued 05-04
Beams.dgn - 4732 - This Sheet Re-Issued 04-2024, Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 55'-0" Span	Standard Sheet 4732	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:38 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

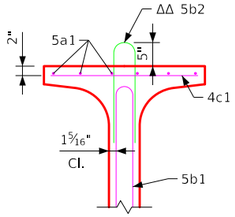


BTD60



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



Section A-A
(Alternate)

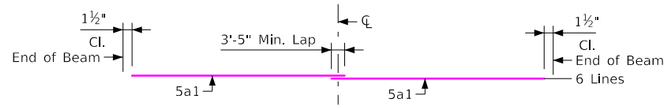
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}

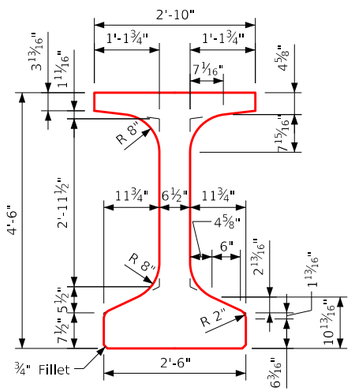
$\bar{y}_b$ = 24.64 in.

I = 285,860 in.^{4}

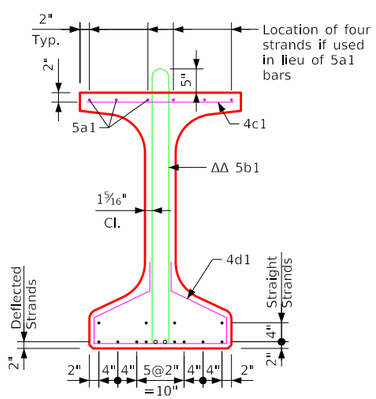
Beam Section Properties



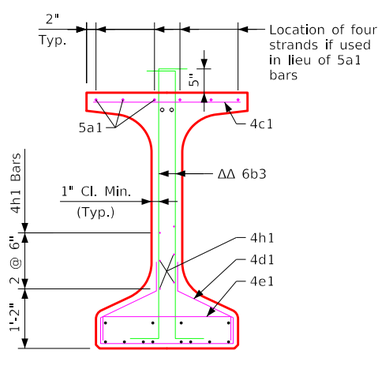
Top Flange Longitudinal Bar Layout



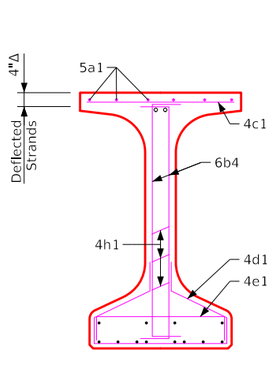
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

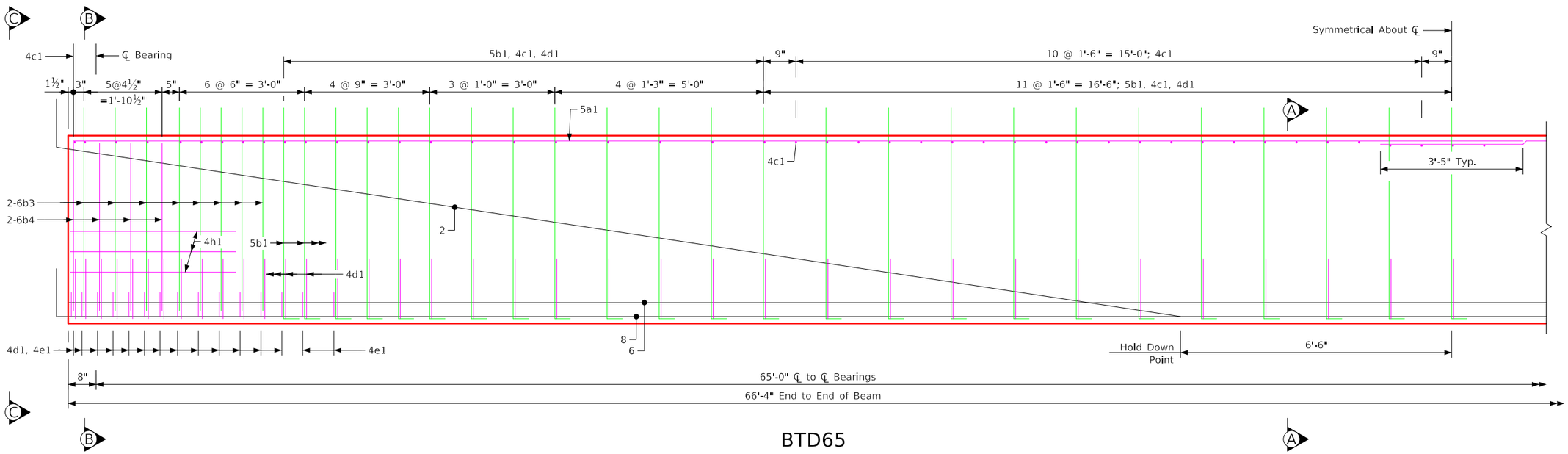
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD60 Beam Details

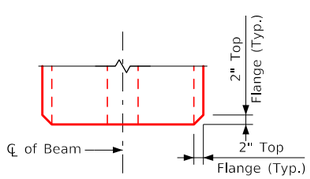
Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.
Issued 05-04
Beams.dgn - 4733 - This Sheet Re-Issued 04-2024, Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 60'-0" Span	Standard Sheet 4733	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:38 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

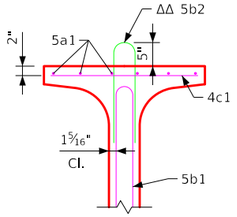


BTD65



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



Section A-A
(Alternate)

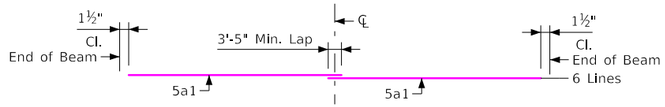
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}

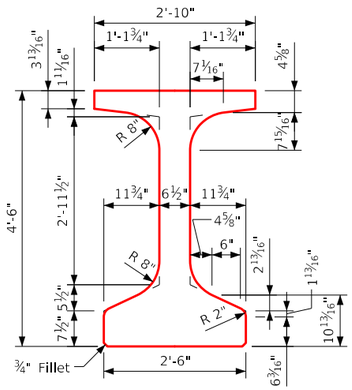
$\bar{y}_b$ = 24.64 in.

I = 285,860 in.^{4}

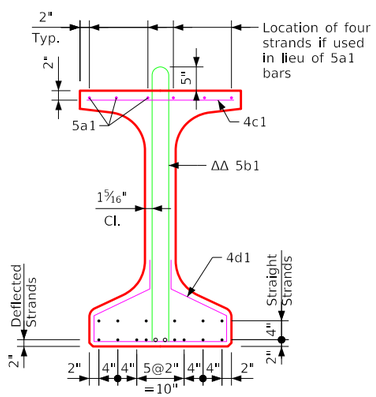
Beam Section Properties



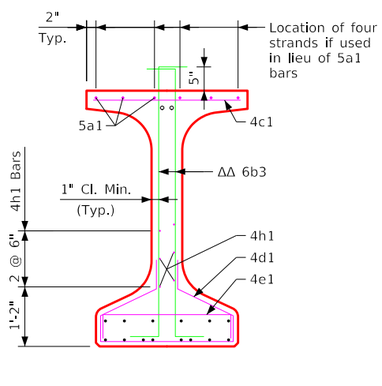
Top Flange Longitudinal Bar Layout



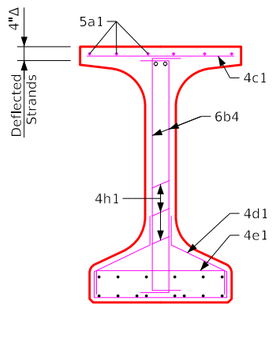
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

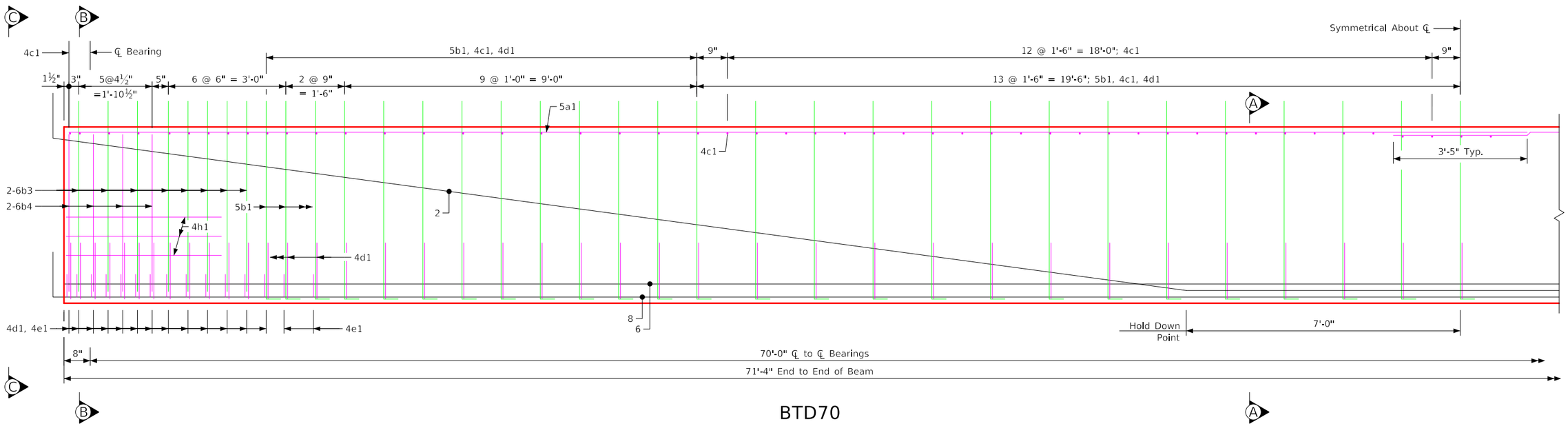
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD65 Beam Details

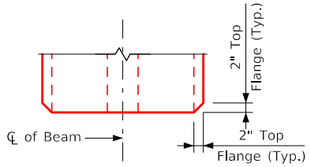
Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.
Issued 05-04
Beams.dgn - 4734 - This Sheet Re-Issued 04-2024, Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 65'-0" Span	Standard Sheet 4734	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:39 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

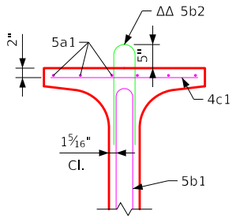


BTD70



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



Section A-A (Alternate)

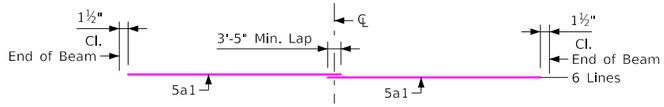
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}

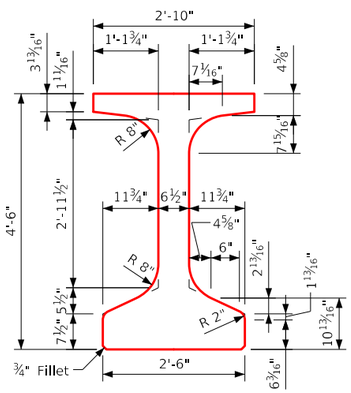
$\bar{y}_b$ = 24.64 in.

I = 285,860 in.^{4}

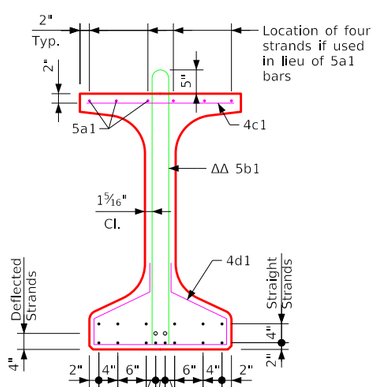
Beam Section Properties



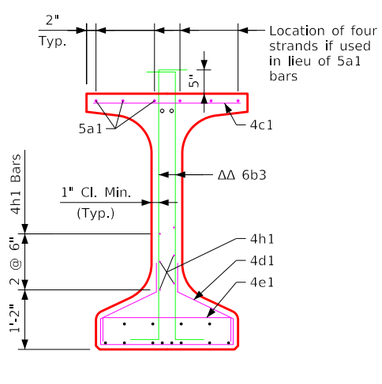
Top Flange Longitudinal Bar Layout



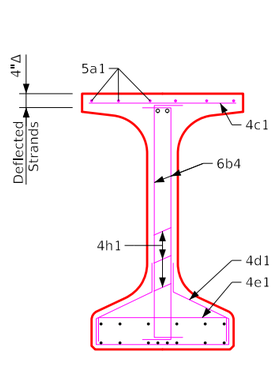
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

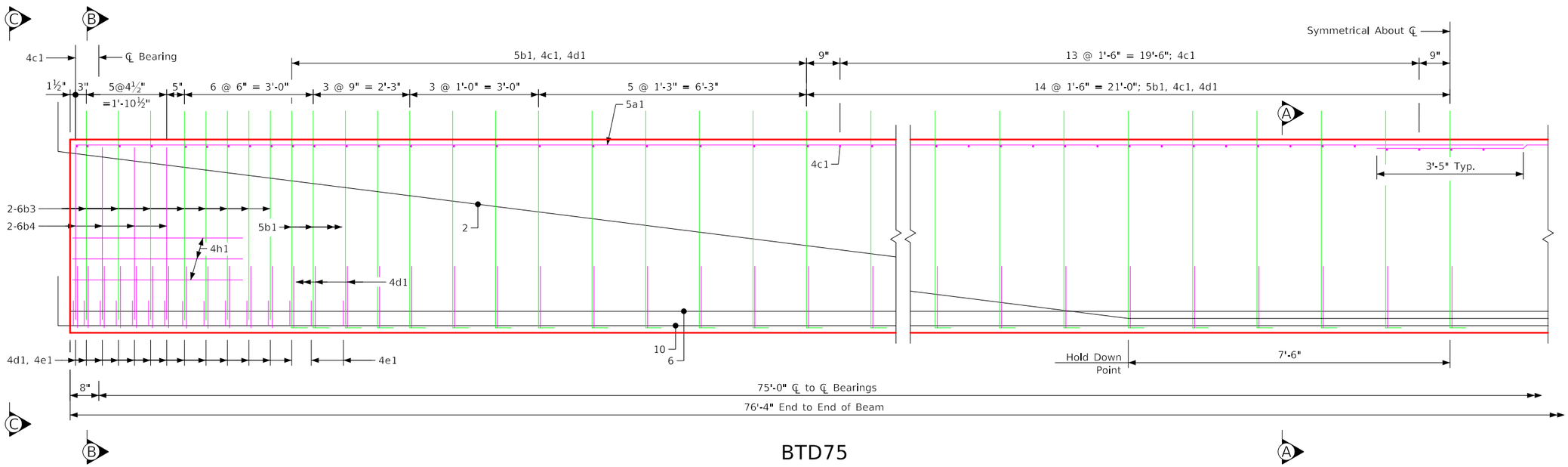
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD70 Beam Details

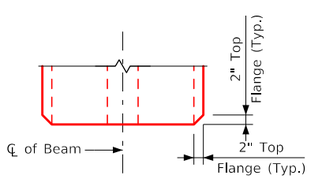
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 inches Above Beam Top. Alternate Section A-A Added.
Issued 05-04.
Beams.dgn - 4735 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 70'-0" Span	Standard Sheet 4735	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:40 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

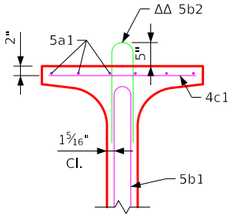


BTD75



Top View

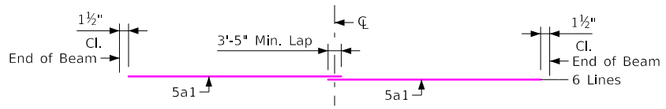
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



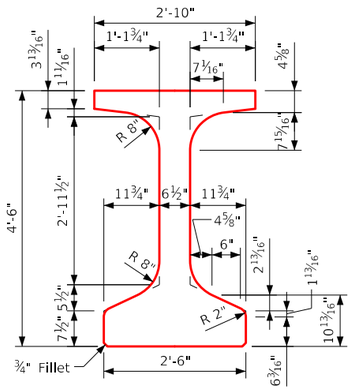
Section A-A
(Alternate)
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}
$\bar{y}_b$ = 24.64 in.
I = 285,860 in.^{4}

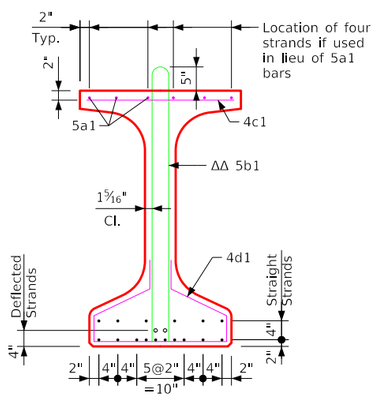
Beam Section Properties



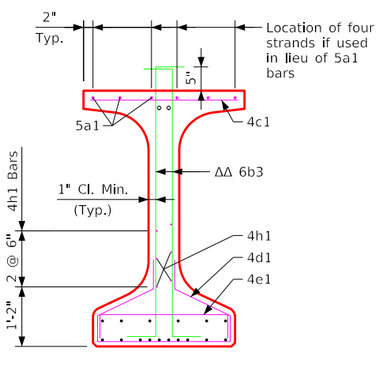
Top Flange Longitudinal Bar Layout



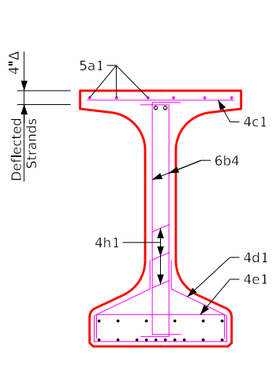
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

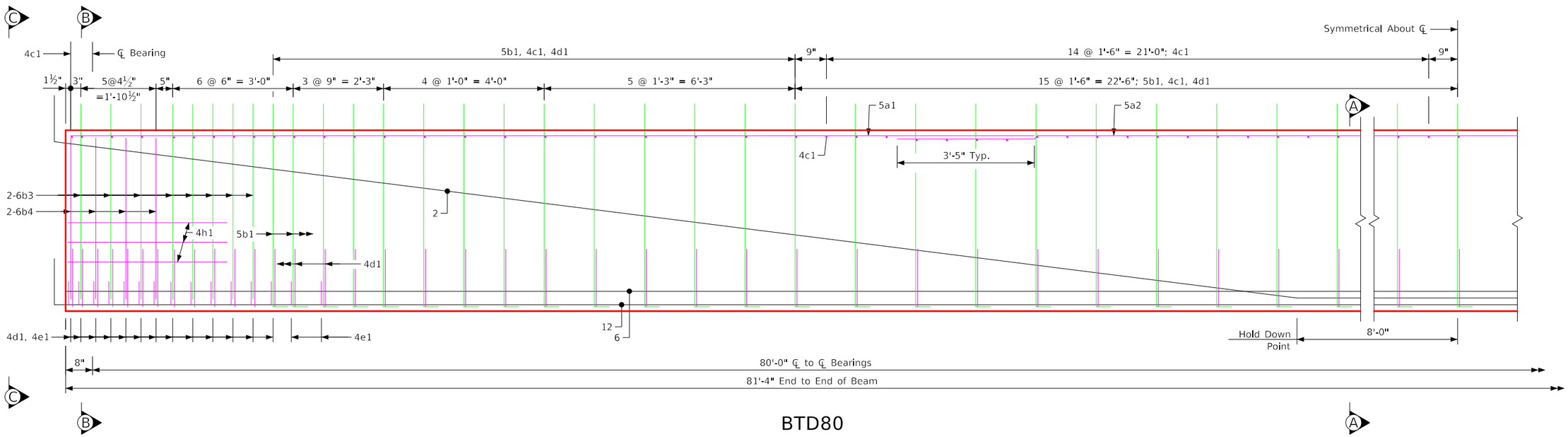
◦ Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD75 Beam Details

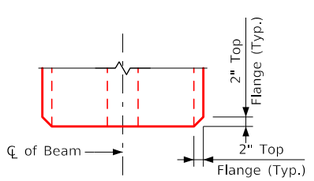
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 75'-0" Span	Standard Sheet 4736	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top.
Issued 05-04.
Beams.dgn - 4736 - This Sheet Re-Issued 04-2024. Sheet Format Update.

4:07:41 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

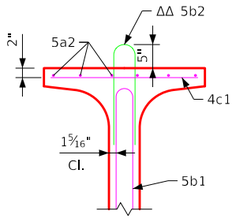


BTD80



Top View

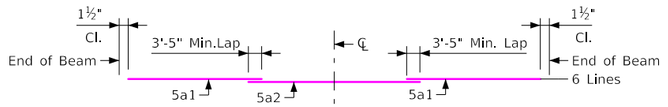
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



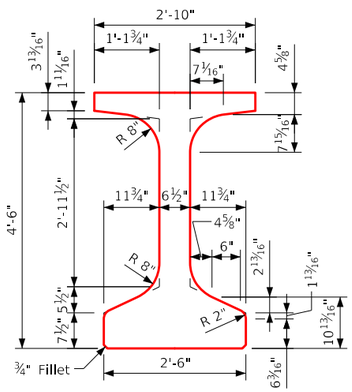
Section A-A
(Alternate)
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}
$\bar{y}_b$ = 24.64 in.
I = 285,860 in.^{4}

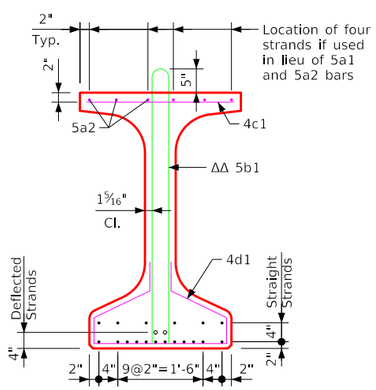
Beam Section Properties



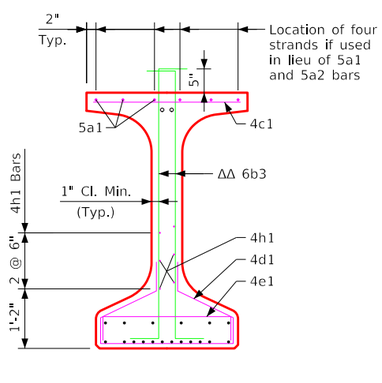
Top Flange Longitudinal Bar Layout



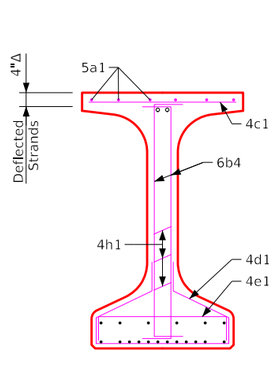
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

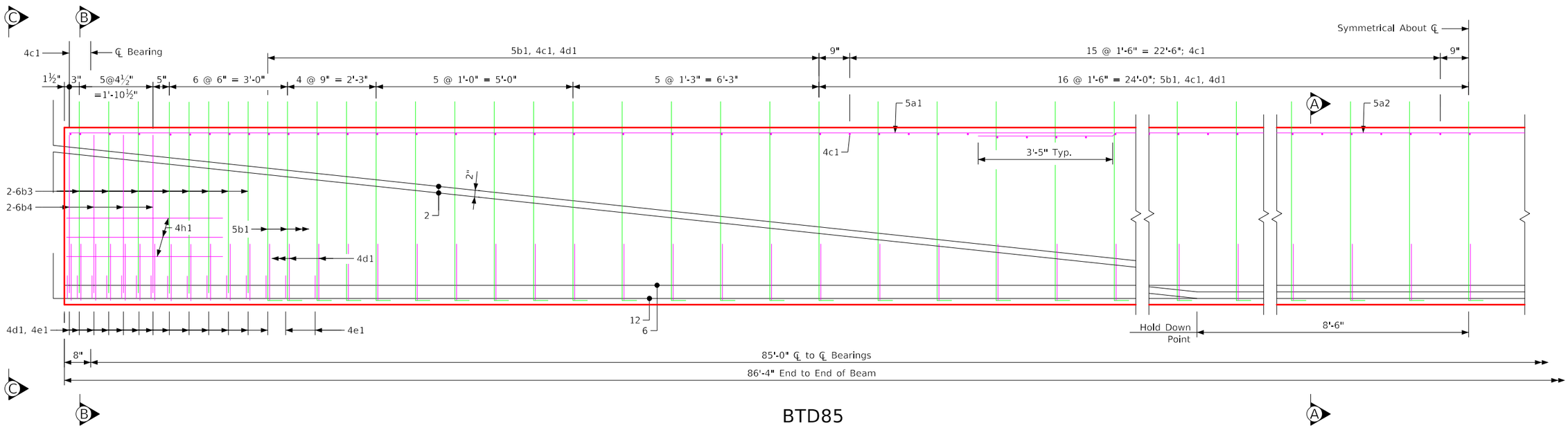
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD80 Beam Details

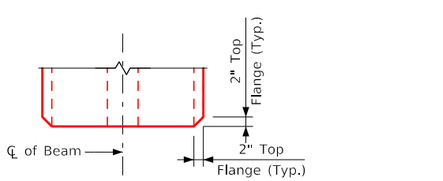
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top.
Issued 05-04.
Beams.dgn - 4737 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 80'-0" Span	Standard Sheet 4737	COUNTY	PROJECT NUMBER	SHEET NUMBER

4:07:41 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

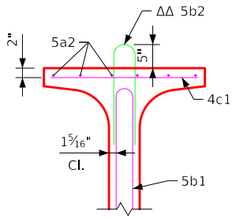


BTD85



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



Section A-A
(Alternate)

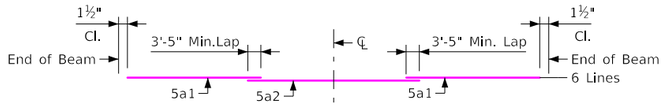
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}

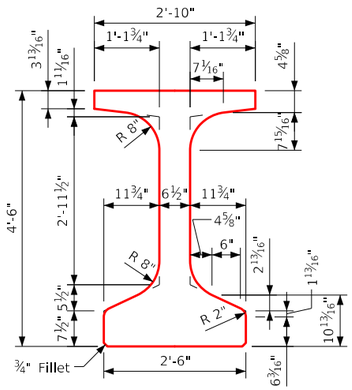
$\bar{y}_b$ = 24.64 in.

I = 285,860 in.^{4}

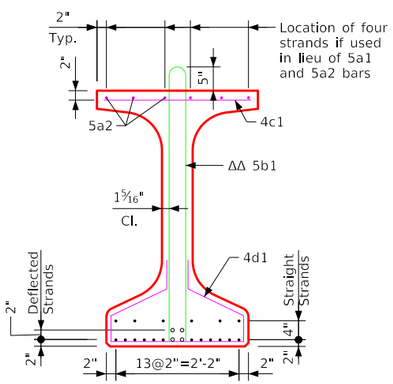
Beam Section Properties



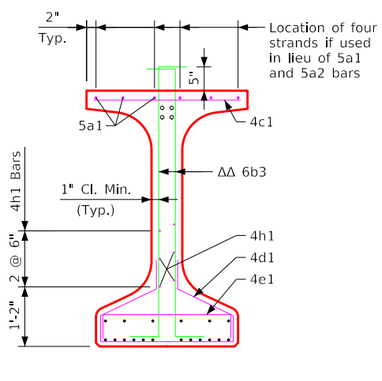
Top Flange Longitudinal Bar Layout



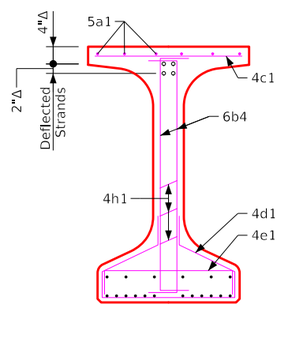
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD85 Beam Details

Revision 05-11: Added the Bend to the 2nd Deflected Strand at the Top to be Bent Down at the Beam End.
Issued 05-04.
Beams.dgn - 4738 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 85'-0" Span	Standard Sheet 4738	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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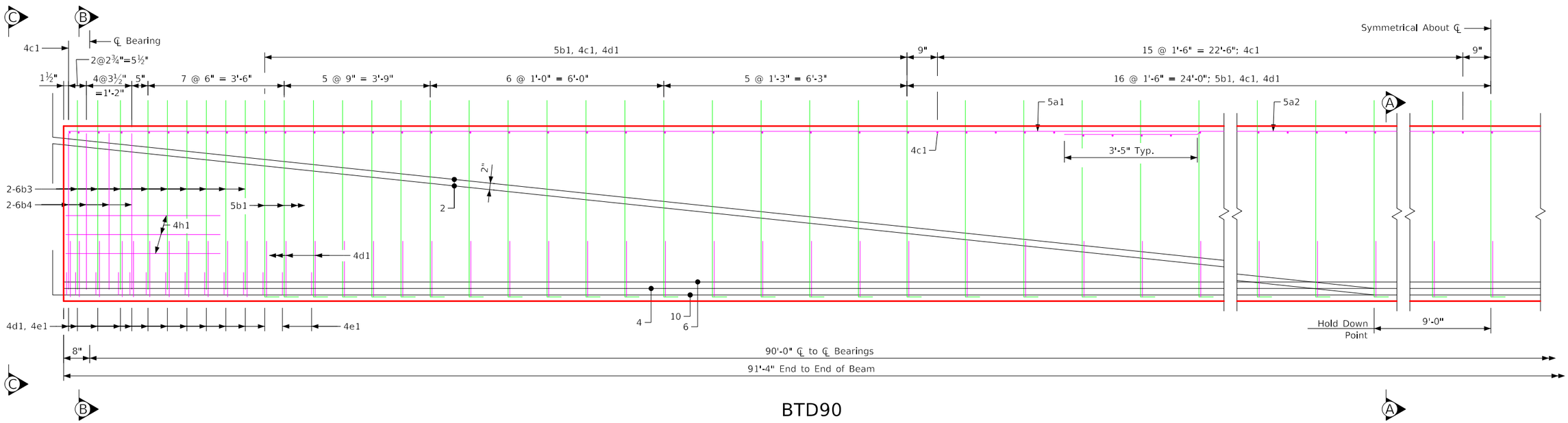
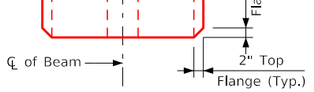
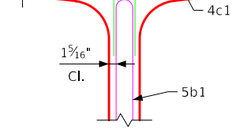


BTD90



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



Section A-A (Alternate)

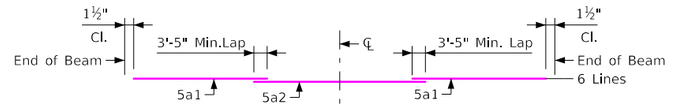
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}

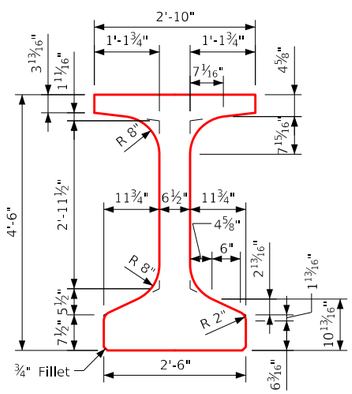
$\bar{y}_b$ = 24.64 in.

I = 285,860 in.^{4}

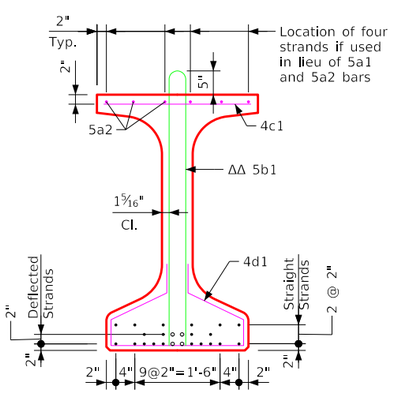
Beam Section Properties



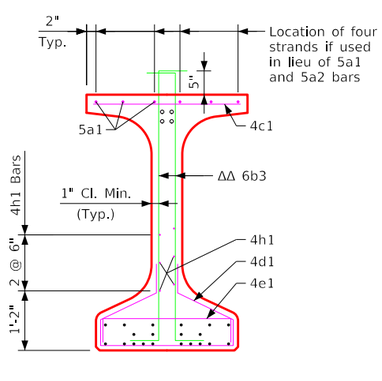
Top Flange Longitudinal Bar Layout



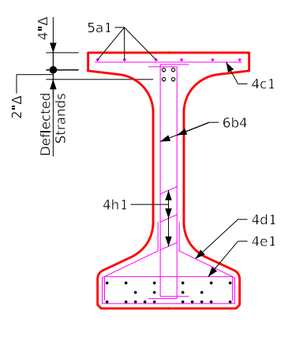
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

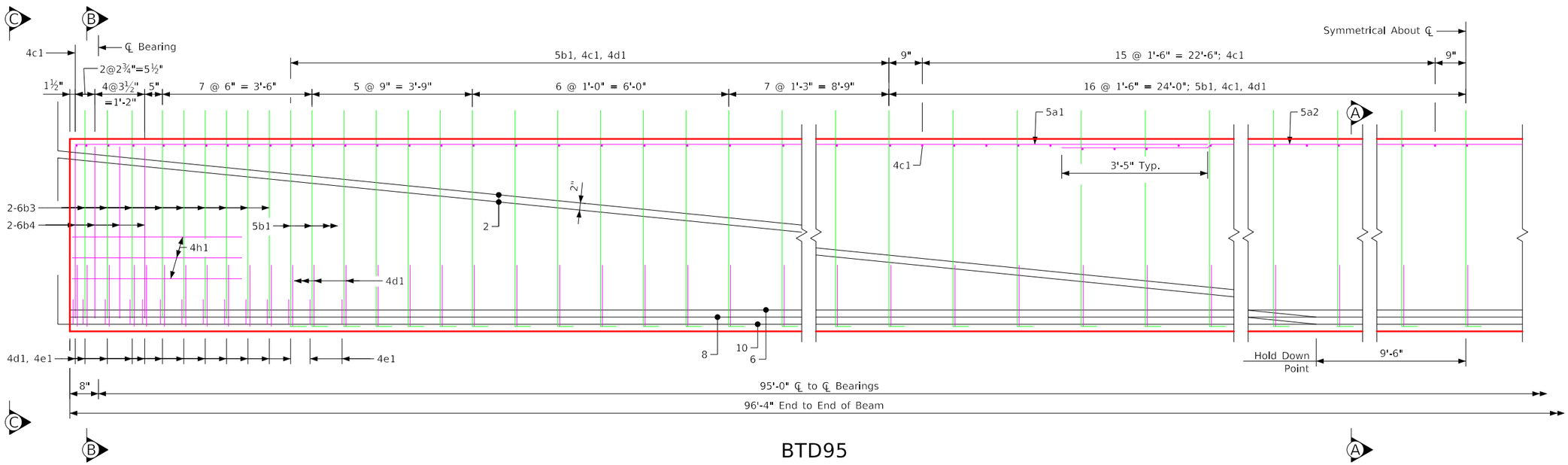
◦ Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD90 Beam Details

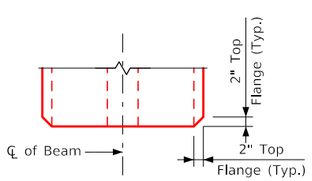
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top.
Issued 05-04.
Beams.dgn - 4739 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 90'-0" Span	Standard Sheet 4739	COUNTY	PROJECT NUMBER	SHEET NUMBER

4:07:43 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

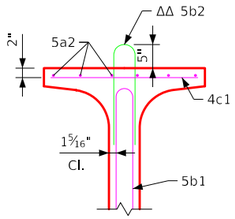


BTD95



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



Section A-A
(Alternate)

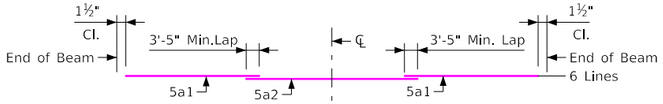
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}

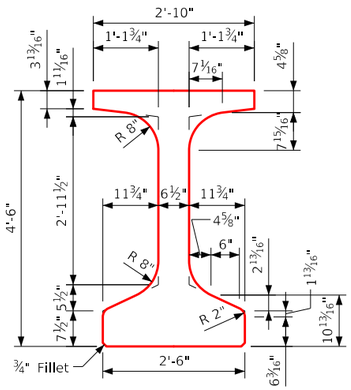
$\bar{y}_b$ = 24.64 in.

I = 285,860 in.^{4}

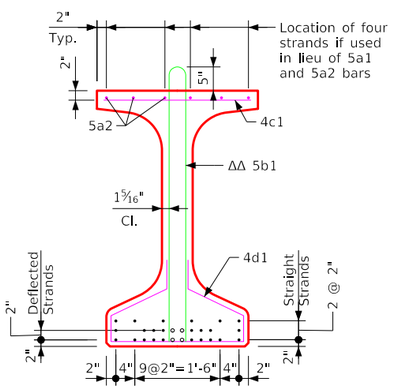
Beam Section Properties



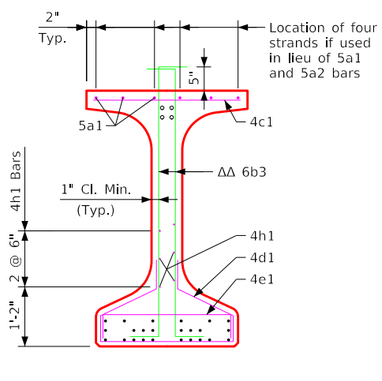
Top Flange Longitudinal Bar Layout



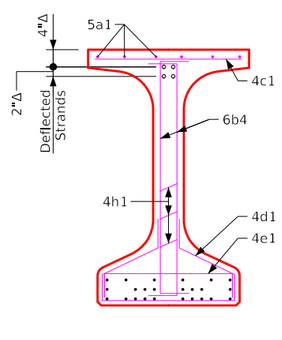
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

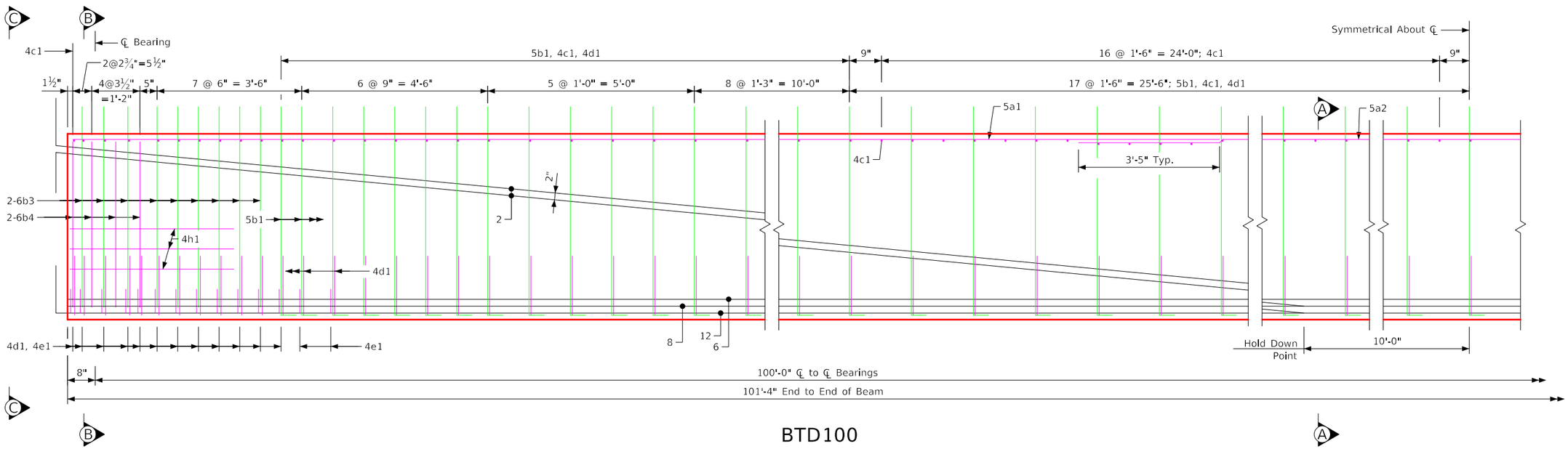
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD95 Beam Details

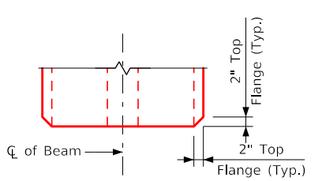
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top.
Issued 05-04.
Beams.dgn - 4740 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 95'-0" Span	Standard Sheet 4740	COUNTY	PROJECT NUMBER	SHEET NUMBER

4:07:44 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

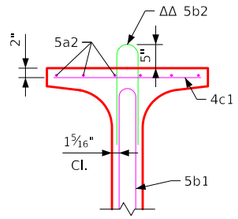


BTD100



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



Section A-A
(Alternate)

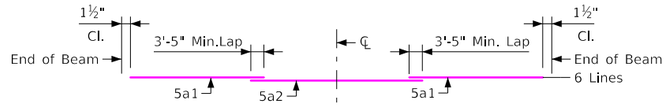
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}

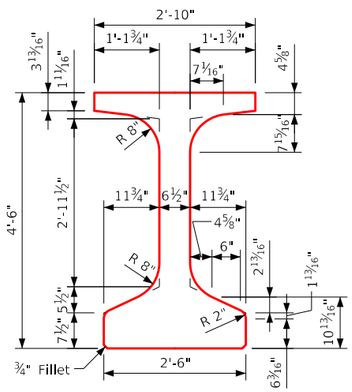
$\bar{y}_b$ = 24.64 in.

I = 285,860 in.^{4}

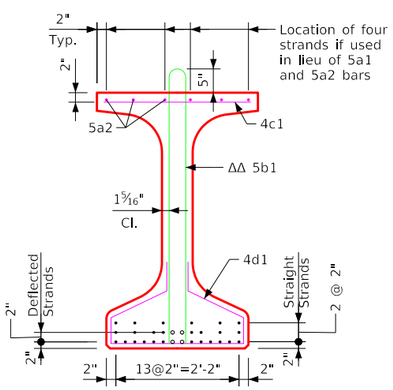
Beam Section Properties



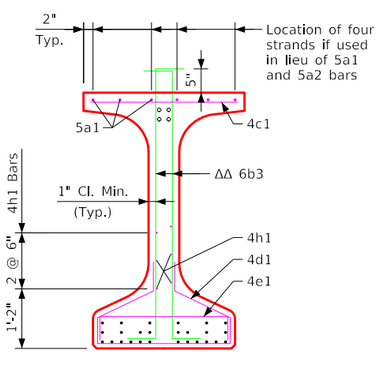
Top Flange Longitudinal Bar Layout



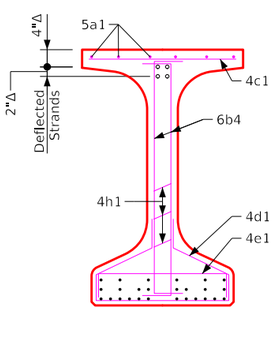
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

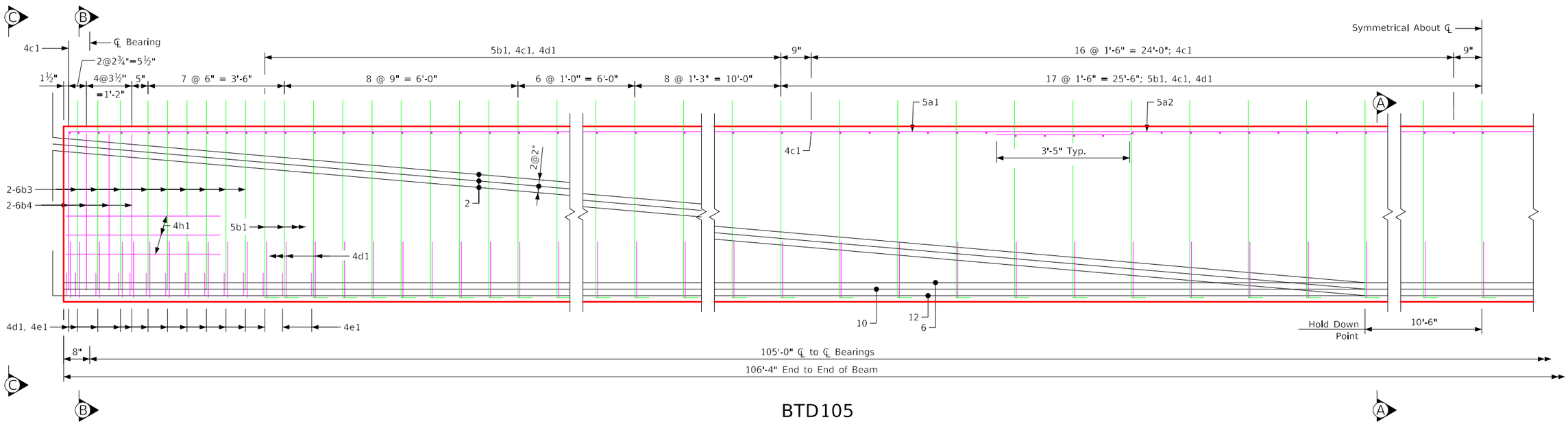
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD100 Beam Details

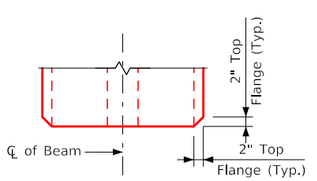
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top.
Issued 05-04.
Beams.dgn - 4741 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 100'-0" Span	Standard Sheet 4741	COUNTY	PROJECT NUMBER	SHEET NUMBER

4:07:45 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

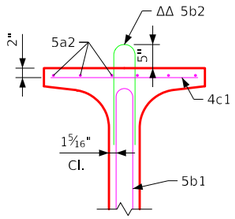


BTD105



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



Section A-A (Alternate)

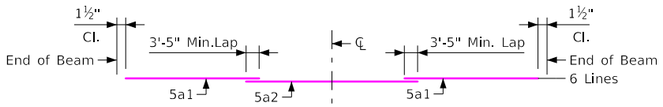
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}

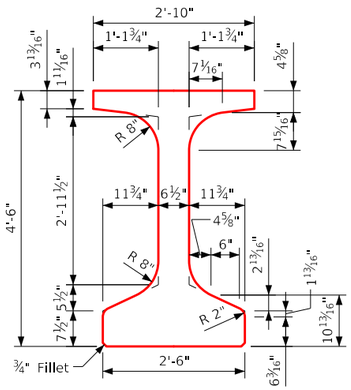
$\bar{y}_b$ = 24.64 in.

I = 285,860 in.^{4}

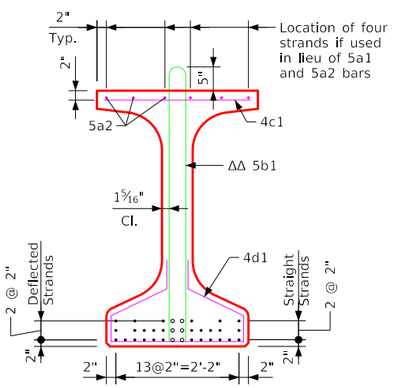
Beam Section Properties



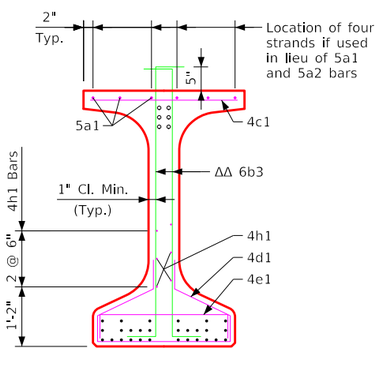
Top Flange Longitudinal Bar Layout



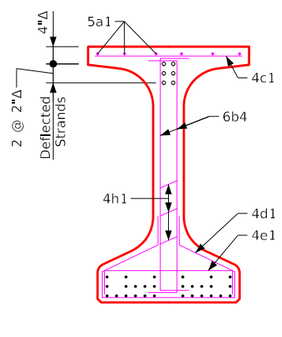
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

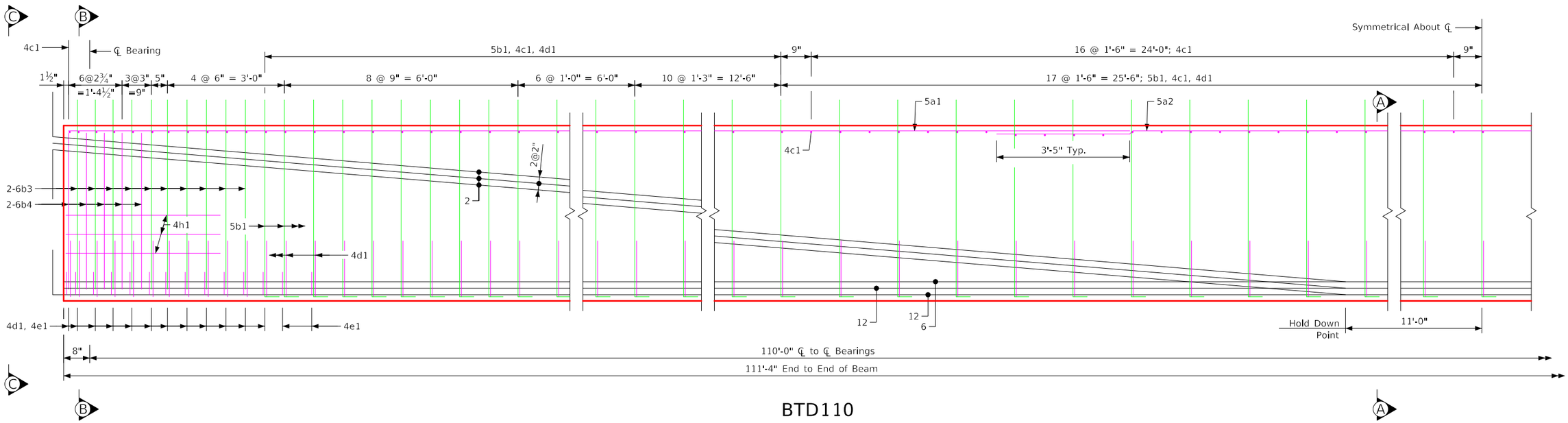
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD105 Beam Details

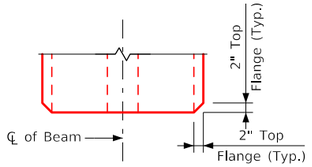
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top.
Issued 05-04.
Beams.dgn - 4742 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 105'-0" Span	Standard Sheet 4742	COUNTY	PROJECT NUMBER	SHEET NUMBER

4:07:46 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

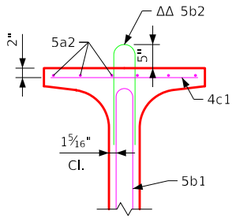


BTD110



Top View

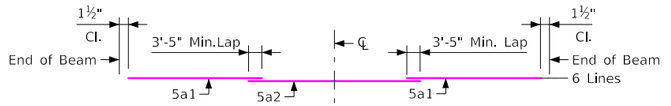
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



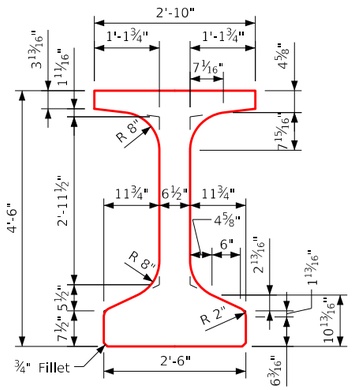
Section A-A
(Alternate)
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}
$\bar{y}_b$ = 24.64 in.
I = 285,860 in.^{4}

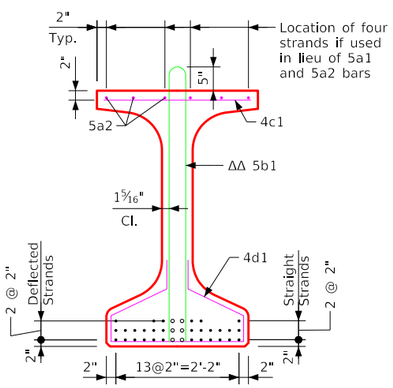
Beam Section Properties



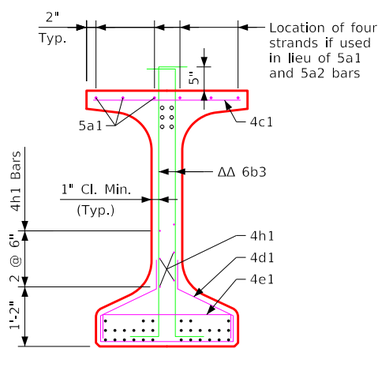
Top Flange Longitudinal Bar Layout



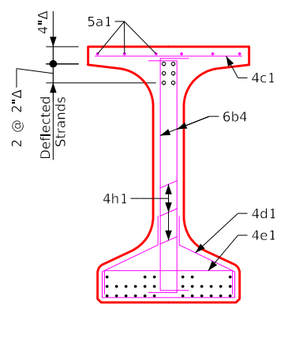
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

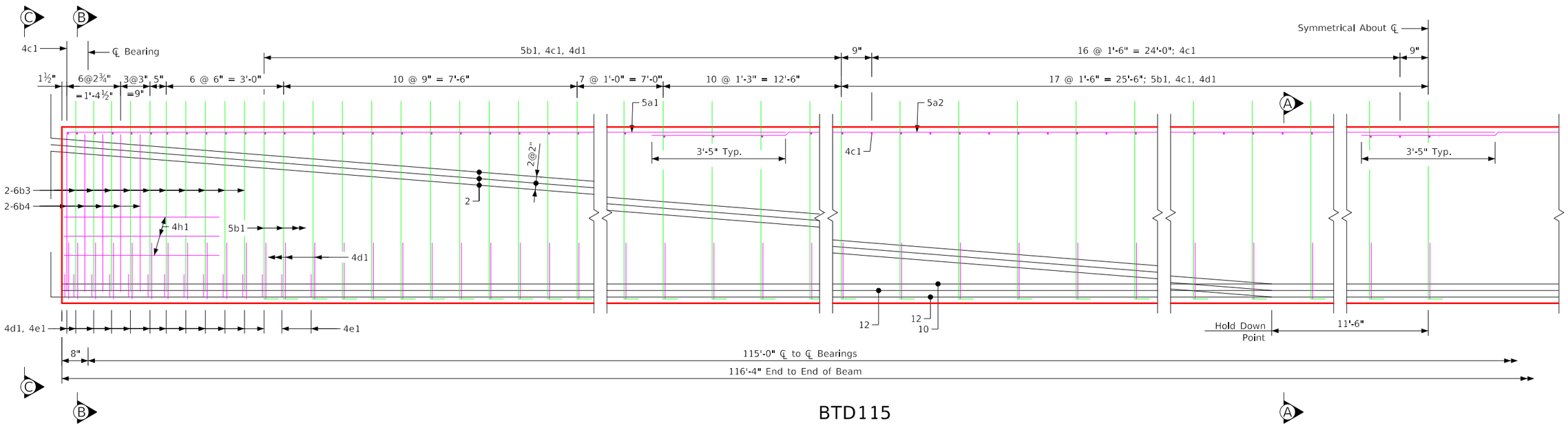
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD110 Beam Details

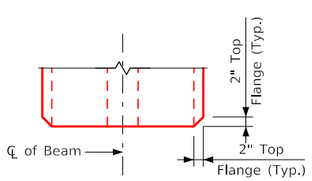
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top.
Issued 05-04.
Beams.dgn - 4743 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 110'-0" Span	Standard Sheet 4743	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:46 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

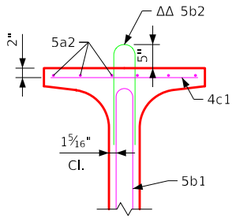


BTD115



Top View

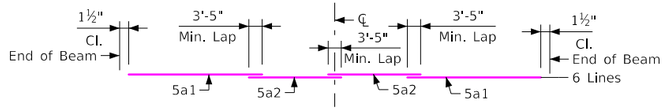
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



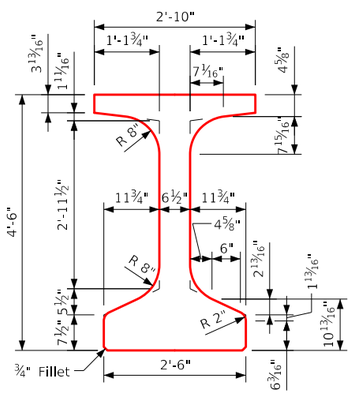
Section A-A
(Alternate)
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}
$\bar{y}_b$ = 24.64 in.
I = 285,860 in.^{4}

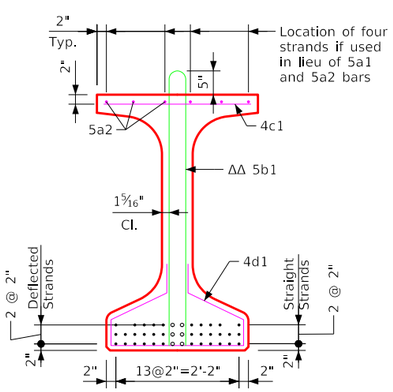
Beam Section Properties



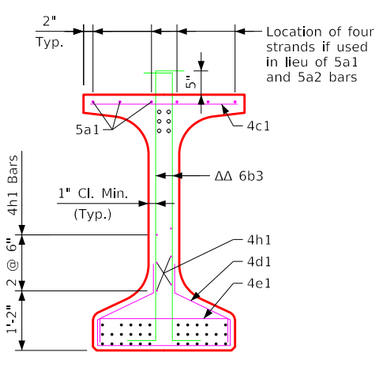
Top Flange Longitudinal Bar Layout



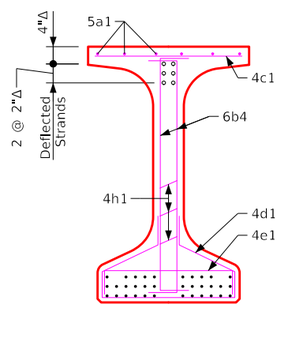
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD115 Beam Details

Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top.
Issued 05-04.
Beams.dgn - 4744 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 115'-0" Span	Standard Sheet 4744	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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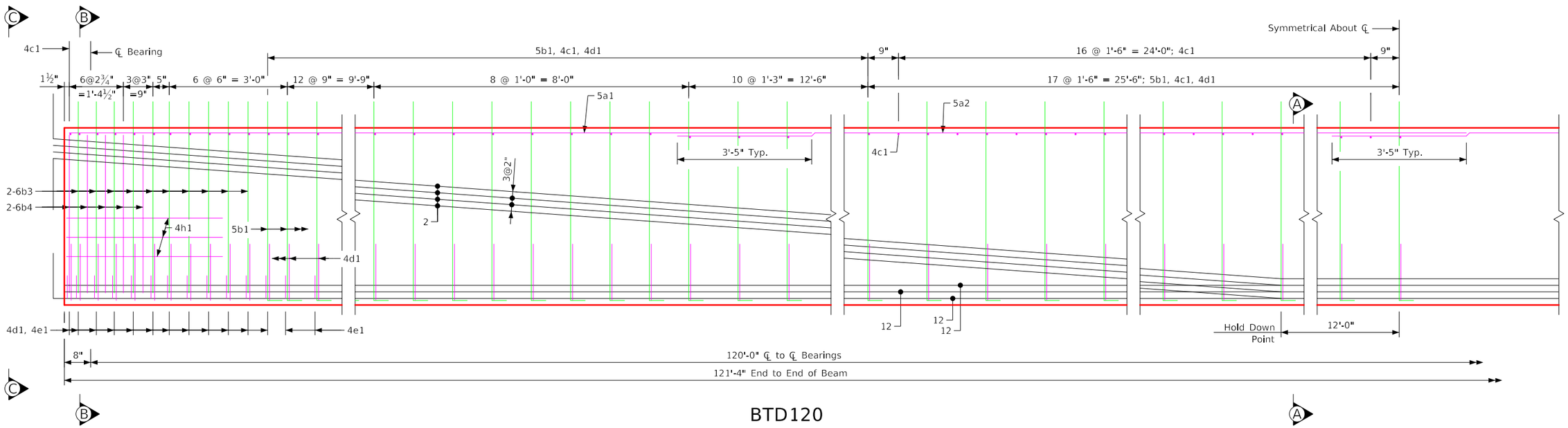
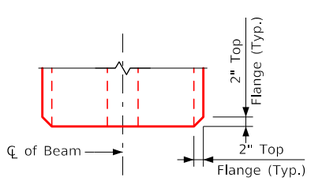
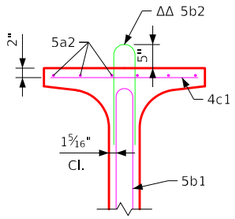


BTD120



Top View

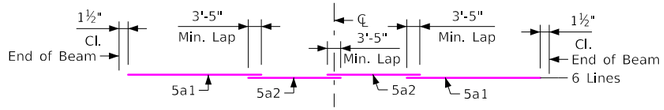
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



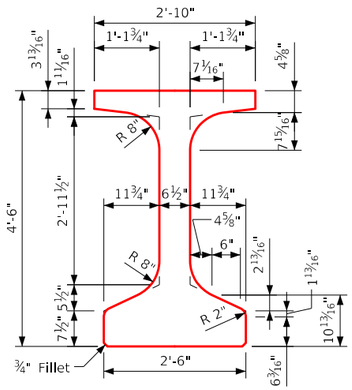
Section A-A
(Alternate)
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}
$\bar{y}_b$ = 24.64 in.
I = 285,860 in.^{4}

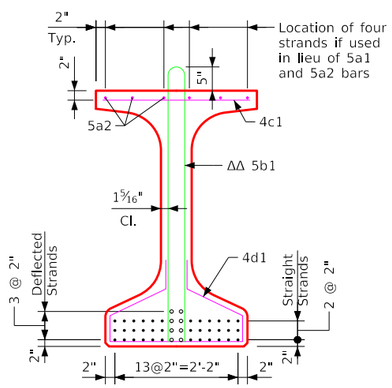
Beam Section Properties



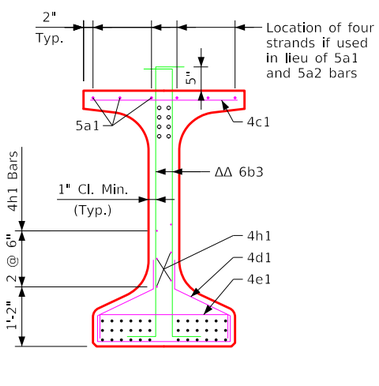
Top Flange Longitudinal Bar Layout



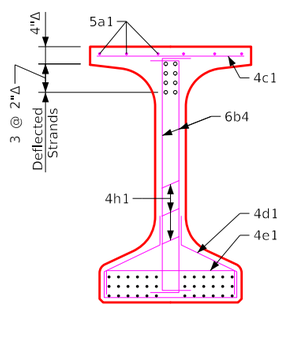
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

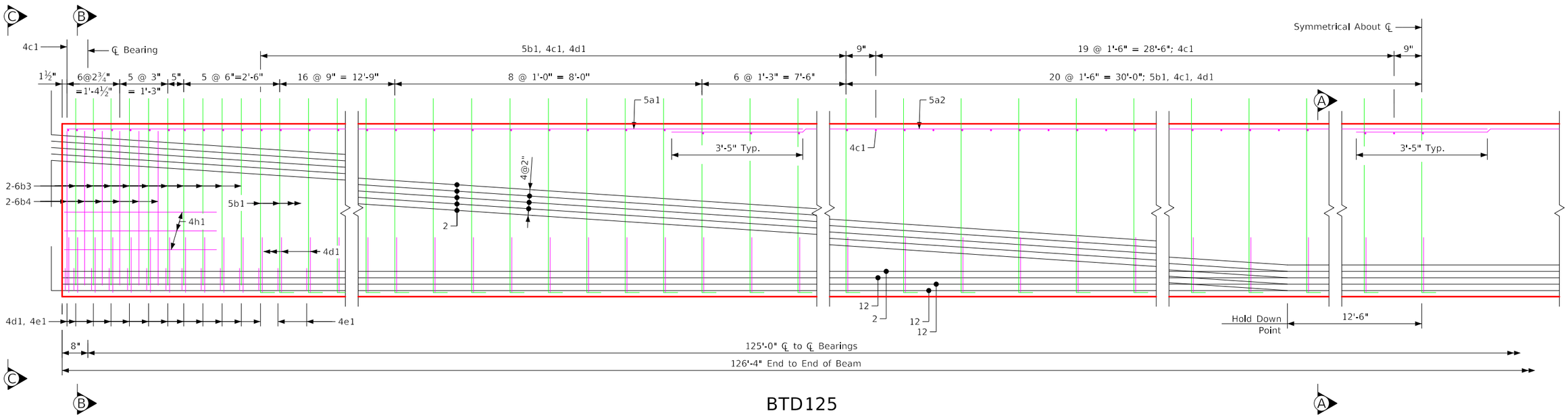
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD120 Beam Details

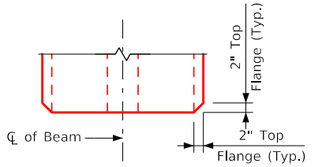
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top.
Issued 05-04.
Beams.dgn - 4745 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 120'-0" Span	Standard Sheet 4745	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:48 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

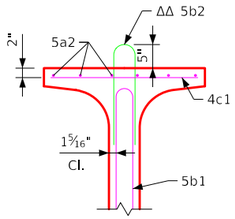


BTD125



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



Section A-A (Alternate)

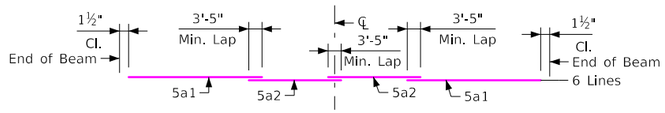
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}

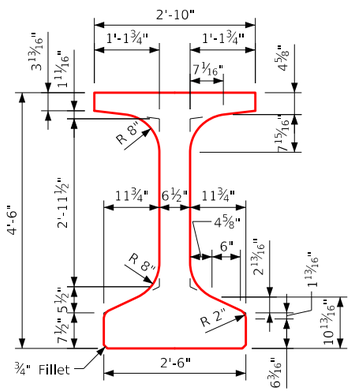
$\bar{y}_b$ = 24.64 in.

I = 285,860 in.^{4}

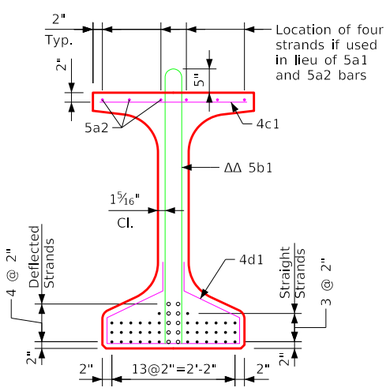
Beam Section Properties



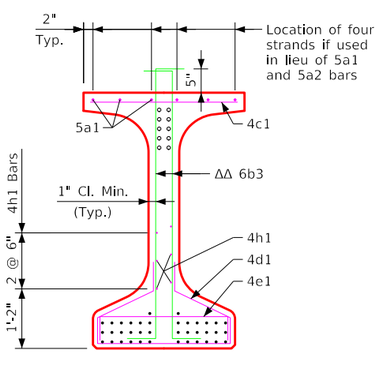
Top Flange Longitudinal Bar Layout



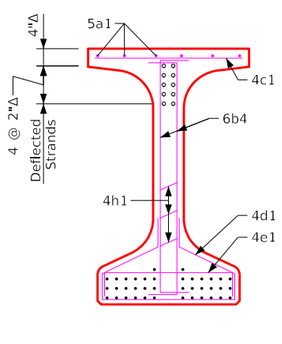
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

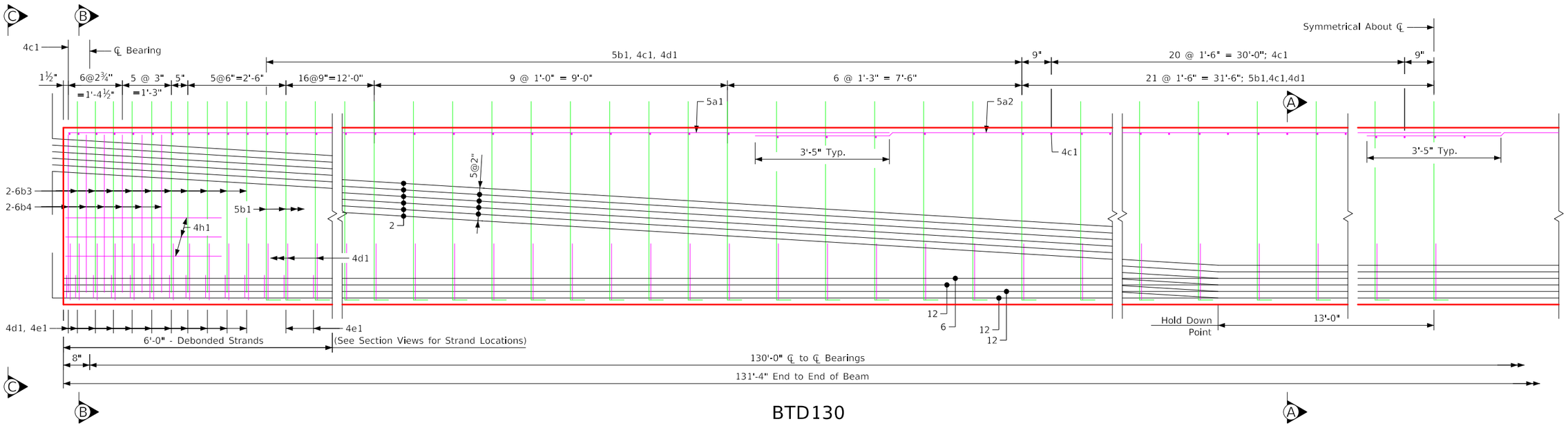
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD125 Beam Details

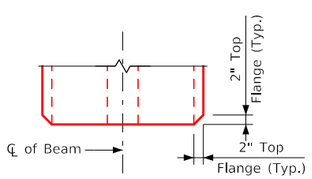
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top.
Issued 05-04.
Beams.dgn - 4746 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 125'-0" Span	Standard Sheet 4746	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:48 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

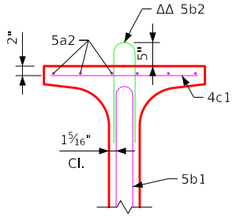


BTD130



Top View

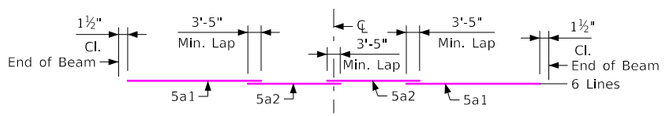
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



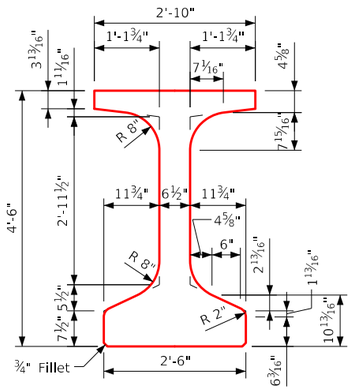
Section A-A
(Alternate)
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.^{2}
$\bar{y}_b$ = 24.64 in.
I = 285,860 in.^{4}

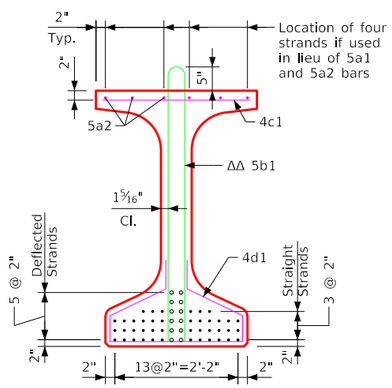
Beam Section Properties



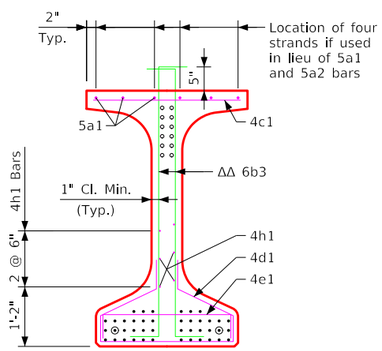
Top Flange Longitudinal Bar Layout



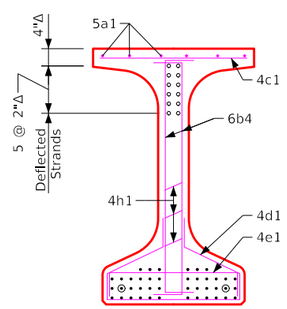
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

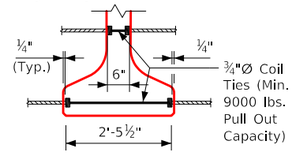
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars
⊙ Strands Debonded 6'-0" from Beam Ends

BTD130 Beam Details

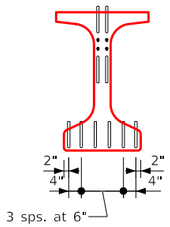
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top.
Issued 05-04.
Beams.dgn - 4747 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 130'-0" Span	Standard Sheet 4747	COUNTY	PROJECT NUMBER	SHEET NUMBER	

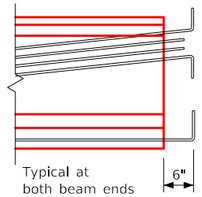
4:07:49 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



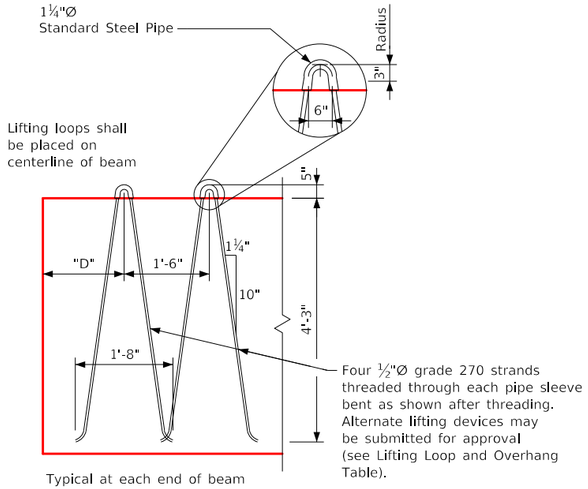
Coil Tie Detail



The top and bottom rows of the deflected strands are to be cut with 1'-2" projections which are to be shop bent as shown. The remaining top deflected strands are to be cut with 5" projections. Six bottom strands are to be cut with 1'-6" projections which are to be shop bent as shown. The remaining bottom strands are to be cut off reasonably flush with the concrete.



Strand Projection at Beam Ends When Embedded in Concrete End Diaphragm



Lifting Loop Detail

Lifting Loop and Overhang Table

Beams	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
BTD135	2	4	9'-3"	16

Lifting loops shall carry loads equally.

BTD135 Beam Data

BTD Beam	Span Length ℄-℄ Bearing	Overal Beam Length (L)	Concrete Strength f'ci (ksi.)	Concrete Strength f'c (ksi.)	Strand Size Dia. (in.)	Number of Strands Straight	Number of Strands Deflected	③ Total Initial Prestress (kips)	Hold Down Force (kips)	Camber (in.) ④ At Release	Camber (in.) ④ After Losses	Deflection (in.) Δ_D Immediate ① (elastic) Δ_I Steel Diaphragm	Deflection (in.) Δ_D Time ② (plastic) Δ_T Steel Diaphragm	Permissible Maximum Spacing HL-93 Loading Steel Diaphragm	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight lb.)
BTD135	135'-0"	136'-4"	8.00	9.50	0.60"	46	12	2467	29.5	4.02"	6.43"	5.00"	1.25"	9'-0½"	53.2	26.2	3693

① Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.5") weight of:

1.01 kips/ft. for 9'-0½" beam spacing and two steel diaphragms, (0.500 kips) placed 20'-0", on either side, of the beam ℄. For different deck and diapragm weights, deflections will be directly proportional.

② Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.

Total beam deflections at ℄ of span, Δ_D , due to weight of deck and diaphragms for detailing purpose:

(A) $\Delta_D=\Delta_I+\Delta_T$ for simple span.

(B) $\Delta_D=\Delta_I+\frac{3}{4}\Delta_T$ for end spans of continuous bridge.

(C) $\Delta_D=\Delta_I+\frac{1}{2}\Delta_T$ for interior spans of continous bridge.

③ Total initial prestress is based on 72.6% f's, f'$_s$= 270 ksi. and A$_s$= 0.217 in.^{2}.

④ Calculated design cambers are based on multipliers developed from research in Iowa.

Beam Notes:

These beams are designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.

All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.

Hold down points for deflected strands may be moved toward ends of beam a distance of 0.05 L maximum at producer's option.

All prestressing strands except lifting loop strands shall be 0.60 in. nominal diameter (nominal steel area = 0.217 in.^{2}) and conform to ASTM A416 Grade 270 Low Relaxation Strands. Minimum strand breaking strength shall be 58.6 kips.

Tops of beams are to be struck off level and finished as per Materials I.M.570.

Bearings shall be as detailed on other design sheets.

Beams to be used in bridges made continuous by the poured in place deck, are to be at least 28 days old before the deck is placed unless a shorter curing time is approved by the Bridge Engineer.

The portions of the prestressed beams that are to be embedded in the abutment and pier diaphragms shall be roughened for a distance of 10" from the beam end by sandblasting or other approved methods to provide suitable bond between the beam and the diaphragm in accordance with Article 2403.03, I, of the Standard Specifications.

All beams are to be increased in length to compensate for elastic shortening, creep and shrinkage.

For transporting, the allowable overhang is shown in the "Lifting Loop and Overhang Table".

The contractor shall assure the lateral stability of the BTD135 beam during handling, transporting and erection by providing temporary bracing as needed.

Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet.

If sole plate is required for bearing, sole plate is to be set in forms when beam is cast and formed out below to exclude concrete as detailed on the Bearing Sheet.

If stub abutments are used, all strands at the ends of beams at stub abutments shall be cut off reasonably flush with the concrete.

Minimum concrete f'c (at 28 days) and minimum f'ci at release are located in the BTD Beam Data Table above.

Four 0.60 in. diameter strands stressed to not more than 5000 lbs. each may be used in lieu of bars 5a1 and 5a2 in the top flange.

When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with materials I.M.570 (Fabricator Application) and I.M.491.12 (Contractor Application).

ΔΔ 5b1 and 6b3 bars to be epoxy coated

✱ 6b3 and 6b4 bars to be used in pairs

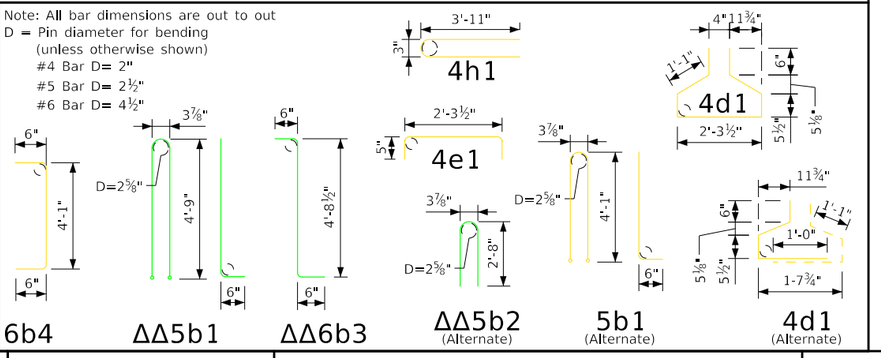
Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.

Reinforcing Bar List

	Beam Bar	Beam Shape	BTD135 No.	BTD135 Length
	5a1		12	33'-2"
	5a2		12	40'-0"
ΔΔ	5b1		111	10'-8"
ΔΔ✱	6b3		40	5'-9"
✱	6b4		28	5'-1"
	4c1		179	2'-7"
	4d1		135	6'-5"
	4e1		30	3'-2"
	4h1		6	8'-0"

Bent Bar Details

Note: All bar dimensions are out to out
D = Pin diameter for bending (unless otherwise shown)
#4 Bar D= 2"
#5 Bar D= 2½"
#6 Bar D= 4½"



Design Stresses:

Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications, Series of 2017.
Reinforcing steel in accordance with Section 5, Grade 60.
Concrete in accordance with Section 5.
Prestressing steel in accordance with Section 5, Grade 270.

Specifications:

Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications.
Design: AASHTO LRFD, Series of 2017 with minor modifications.

Alternate Bar Notes:

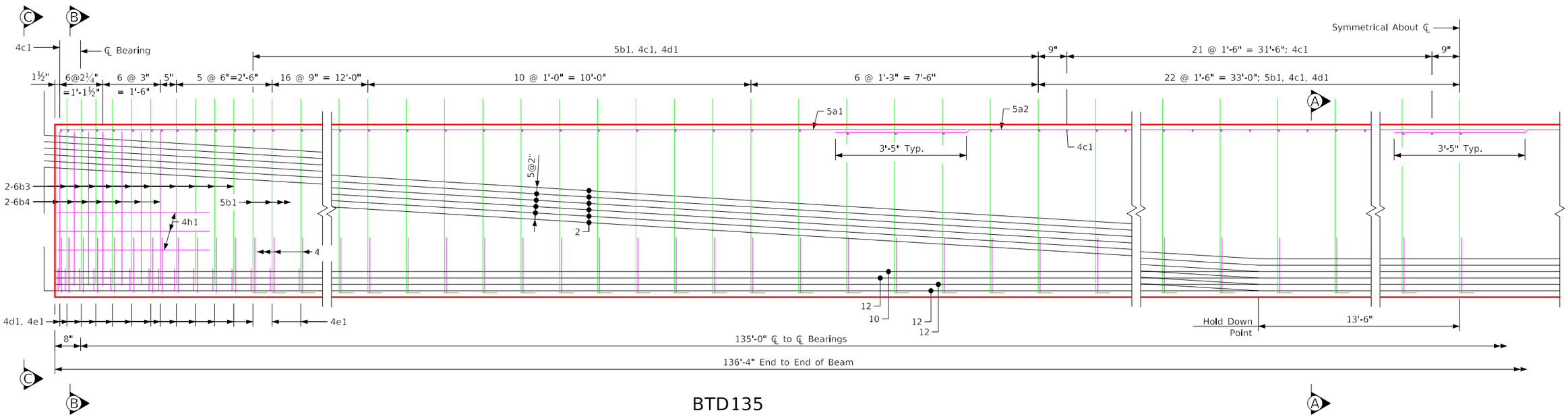
Alternate bars shown in Bent Bar Details may be used in lieu of reinforcing bars shown in bar list. No additional payment shall be made for use of alternate bars.

BTD135 Beam - Data Details

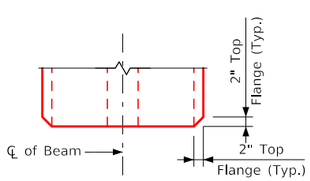
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 135'-0" Span Data Details - (Sheet 1 of 2)	Standard Sheet 4748s1	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:50 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Correction 12-13: Coil Tie Detail was Changed to Reflect the Distance Between Coil Tie Anchors Embedded ¼ inch.
Issued 05-04.
Beams.dgn - 4748s1 - This Sheet Re-Issued 04-2024. Sheet Format Update.

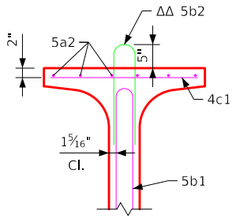


BTD135



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



Section A-A
(Alternate)

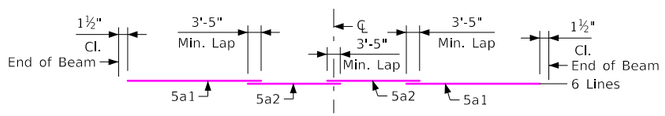
See Alternate Bar Note on Standard Sheet 4748s1.

Area = 748.8 in.^{2}

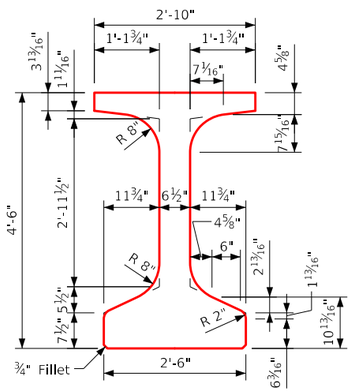
$\bar{y}_b$ = 24.64 in.

I = 285,860 in.^{4}

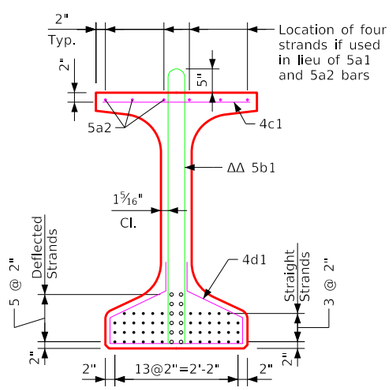
Beam Section Properties



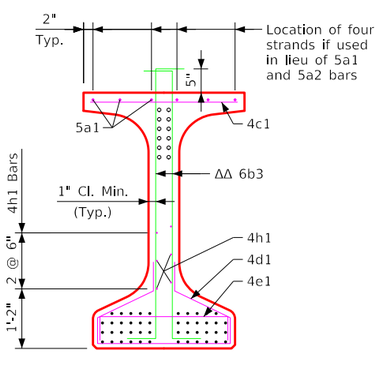
Top Flange Longitudinal Bar Layout



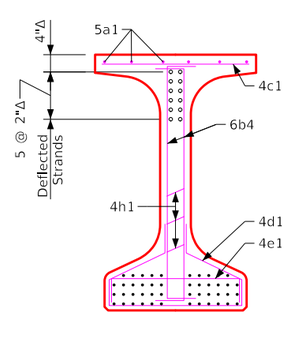
BTD Beam Cross Section



Section A-A



Section B-B



View C-C

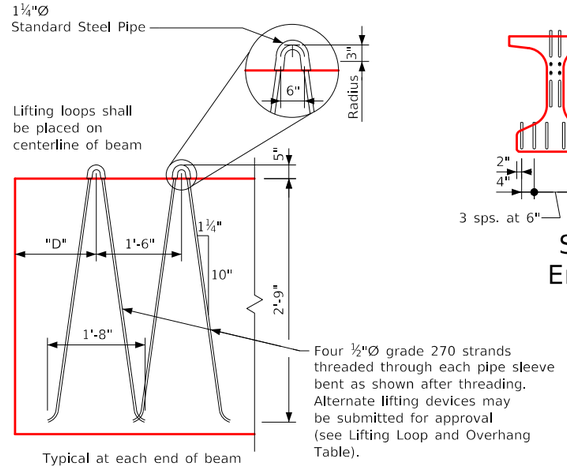
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTD135 Beam Details

Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top.
Issued 05-04.
Beams.dgn - 4748s2 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 135'-0" Span - (Sheet 2 of 2)	Standard Sheet 4748s2	COUNTY	PROJECT NUMBER	SHEET NUMBER

4:07:51 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



Lifting Loop Detail

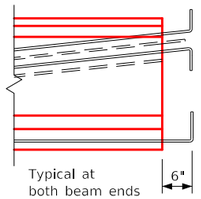
Lifting Loop and Overhang Table

Beams	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
BTB30–BTB75	1	4	2'-0"	**
BTB80–BTB85	2	4	2'-0"	7
BTB90	2	4	2'-6"	8.5
BTB95	2	4	2'-6"	11

** In accordance with Article 2407.03, K of the Standard Specifications.

Lifting loops shall carry loads equally.

The top and bottom for 2 rows or the top and 3rd rows of deflected strands are to be cut with 1'-2" projections which are to be shop bent as shown. The second row is to be cut with a 5" projection and the remaining top deflected strands in rows 4 and below are to be cut flush with beam face. Six bottom strands are to be cut with 1'-6" projections which are to be shop bent as shown. The remaining bottom strands are to be cut off reasonably flush with the concrete.



Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms

Design Stresses:

Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications, Series of 2017.
Reinforcing steel in accordance with Section 5, Grade 60.
Concrete in accordance with Section 5.
Prestressing steel in accordance with Section 5, Grade 270.

Specifications:

Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications.
Design: AASHTO LRFD, Series of 2017 with minor modifications.

Alternate Bar Notes:

Alternate bars shown in Bent Bar Details may be used in lieu of reinforcing bars shown in bar list. No additional payment shall be made for use of alternate bars.

BTB Beam Data

BTB Beam	Span Length ℄–℄ Bearing	Overal Beam Length (L)	Concrete Strength f'ci (ksi.)	Concrete Strength f'c (ksi.)	Strand Size Dia. (in.)	Number of Strands Straight	Number of Strands Deflected	③ Total Initial Prestress (kips)	Hold Down Force (kips)	Camber (in.) ⑤ At Release	Camber (in.) ⑤ After Losses	Deflection (in.) Δ_D Immediate ① (elastic) Δ_I Steel Diaphragm	Deflection (in.) Δ_D Time ② (plastic) Δ_T Steel Diaphragm	Permissible Maximum Spacing HL-93 Loading Steel Diaphragm	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight lb.)
BTB30	30'-0"	31'-4"	4.50	5.00	0.60"	8	—	340	—	0.12"	0.22"	0.04"	0.01"	9'-3"	10.3	5.1	890
BTB35	35'-0"	36'-4"	4.50	5.00	0.60"	10	—	425	—	0.20"	0.37"	0.08"	0.02"	9'-3"	12.0	5.9	984
BTB40	40'-0"	41'-4"	4.50	5.00	0.60"	12	—	510	—	0.31"	0.58"	0.15"	0.04"	9'-3"	13.6	6.7	1072
BTB45	45'-0"	46'-4"	4.50	5.00	0.60"	12	—	510	—	0.37"	0.68"	0.22"	0.06"	9'-3"	15.2	7.5	1184
BTB50	50'-0"	51'-4"	4.50	5.00	0.60"	14	—	596	—	0.51"	0.94"	0.34"	0.09"	9'-3"	16.9	8.3	1324
BTB55	55'-0"	56'-4"	4.50	5.00	0.60"	16	—	681	—	0.66"	1.22"	0.49"	0.12"	9'-3"	18.5	9.2	1436
BTB60	60'-0"	61'-4"	4.50	5.00	0.60"	16	2	765	8.6	0.81"	1.51"	0.67"	0.17"	9'-3"	20.2	10.0	1523
BTB65	65'-0"	66'-4"	4.50	5.00	0.60"	18	2	851	8.0	1.05"	1.94"	0.95"	0.24"	9'-3"	21.8	10.8	1659
BTB70	70'-0"	71'-4"	5.00	5.50	0.60"	20	4	1021	14.0	1.35"	2.50"	1.18"	0.30"	9'-3"	23.5	11.6	1746
BTB75	75'-0"	76'-4"	5.50	6.50	0.60"	22	6	1191	20.6	1.67"	2.67"	1.54"	0.38"	9'-3"	25.1	12.4	1837
BTB80	80'-0"	81'-4"	6.00	7.00	0.60"	24	8	1361	20.8	1.97"	3.14"	1.94"	0.49"	9'-3"	26.8	13.2	2002
BTB85	85'-0"	86'-4"	6.50	7.50	0.60"	28	8	1531	19.7	2.47"	3.95"	2.41"	0.60"	9'-3"	28.4	14.0	2100
BTB90	90'-0"	91'-4"	7.50	8.50	0.60"	30	8	1616	18.6	2.75"	4.40"	2.90"	0.73"	9'-3"	30.0	14.8	2187
④ BTB95	95'-0"	96'-4"	8.00	9.50	0.60"	34	10	1871	20.1	3.29"	5.26"	3.47"	0.87"	9'-3"	31.7	15.7	2327

① Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.5") weight of:
1.04 kips/ft. for 9'-3" beam spacing and one steel diaphragm (0.500 kips) at ℄ of span. For different deck and diapragm weights, deflections will be directly proportional.

② Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.
Total beam deflections at ℄ of span, Δ_D , due to weight of deck and diaphragms for detailing purpose:
(A) $\Delta_D=\Delta_I+\Delta_T$ for simple span.
(B) $\Delta_D=\Delta_I+\frac{3}{4}\Delta_T$ for end spans of continuous bridge.
(C) $\Delta_D=\Delta_I+\frac{1}{2}\Delta_T$ for interior spans of continous bridge.

③ Total initial prestress is based on 72.6% f's, f'ss= 270 ksi. and As= 0.217 in.^{2}.

④ Includes partial length debonded strands, see individual Beam Sheets for location and details.

⑤ Calculated design cambers are based on multipliers developed from research in Iowa.

Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.

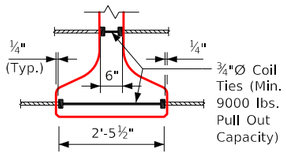
ΔΔ 5b1 and 6b3 bars to be epoxy coated

✱ 6b3 and 6b4 bars to be used in pairs

Beam Notes:

These beams are designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.
All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.
Hold down points for deflected strands may be moved toward ends of beam a distance of 0.05 L maximum at producer's option.
All prestressing strands except lifting loop strands shall be 0.60 in. nominal diameter (nominal steel area = 0.217 in.^{2}) and conform to ASTM A416 Grade 270 Low Relaxation Strands. Minimum strand breaking strength shall be 58.6 kips.
Tops of beams are to be struck off level and finished as per Materials I.M.570.
Bearings shall be as detailed on other design sheets.
Beams to be used in bridges made continuous by the poured in place deck, are to be at least 28 days old before the deck is placed unless a shorter curing time is approved by the Bridge Engineer.
The portions of the prestressed beams that are to be embedded in the abutment and pier diaphragms shall be roughened for a distance of 10" from the beam end by sandblasting or other approved methods to provide suitable bond between the beam and the diaphragm in accordance with Article 2403.03, I, of the Standard Specifications.
All beams are to be increased in length to compensate for elastic shortening, creep and shrinkage.
For transporting, the allowable overhang is shown in the Lifting Loop and Overhang Table.
Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet.
If sole plate is required for bearing, sole plate is to be set in forms when beam is cast and formed out below to exclude concrete as detailed on the Bearing Sheet.
If stub abutments are used, all strands at the ends of beams at stub abutments shall be cut off reasonably flush with the concrete.
Minimum concrete f'c (at 28 days) and minimum f'ci at release are located in the BTB Beam Data Table above.
Four 0.60 in. diameter strands stressed to not more than 5000 lbs. each may be used in lieu of bars 5a1 and 5a2 in the top flange.
When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with materials I.M.570 (Fabricator Application) and I.M.491.12 (Contractor Application).

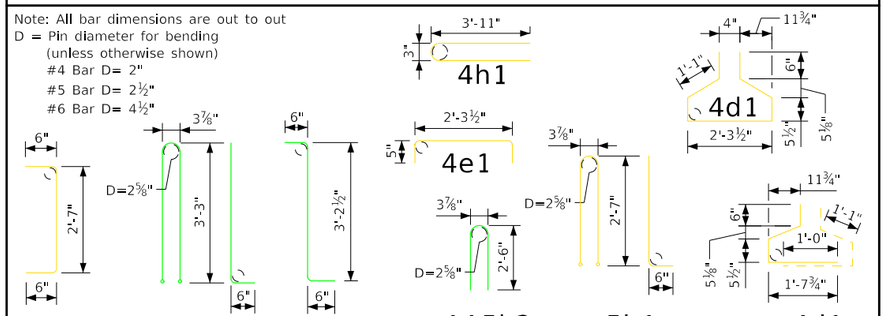
Number and exact location of coil ties to be as detailed on specific bridge design.



Coil Tie Detail

Bent Bar Details

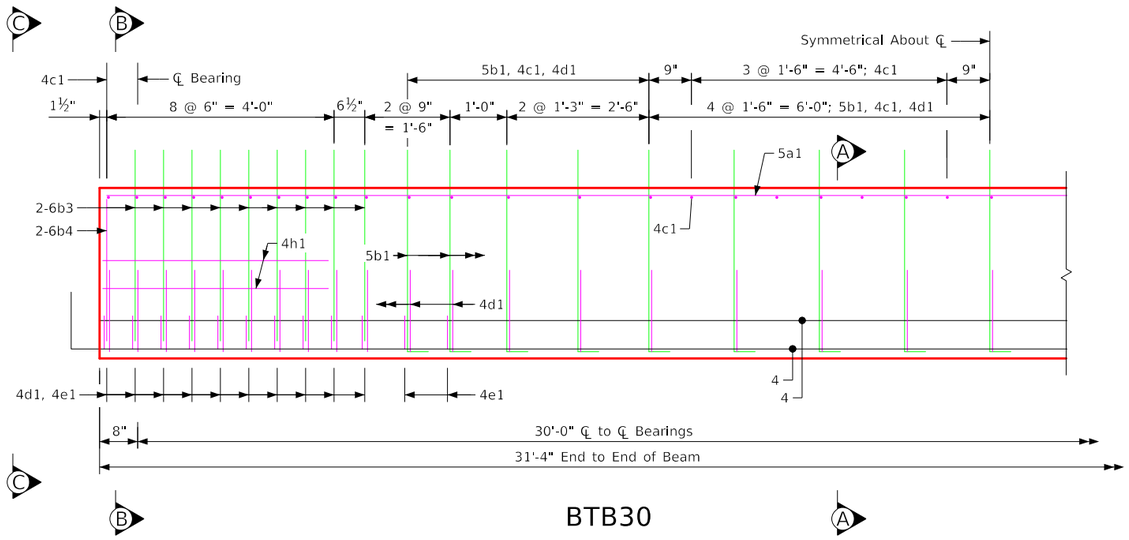
Note: All bar dimensions are out to out
D = Pin diameter for bending (unless otherwise shown)
#4 Bar D= 2"
#5 Bar D= 2½"
#6 Bar D= 4½"



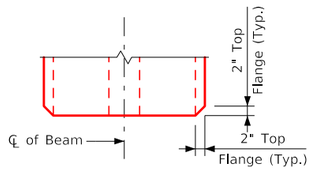
Reinforcing Bar List

Beam Bar	Beam Shape	BTB30 No.	BTB30 Length	BTB35 No.	BTB35 Length	BTB40 No.	BTB40 Length	BTB45 No.	BTB45 Length	BTB50 No.	BTB50 Length	BTB55 No.	BTB55 Length	BTB60 No.	BTB60 Length	BTB65 No.	BTB65 Length	BTB70 No.	BTB70 Length	BTB75 No.	BTB75 Length	BTB80 No.	BTB80 Length	BTB85 No.	BTB85 Length	BTB90 No.	BTB90 Length	BTB95 No.	BTB95 Length	Beam Bar
5a1		6	31'-1"	6	36'-1"	6	41'-1"	12	24'-9"	12	27'-3"	12	29'-9"	12	32'-3"	12	34'-9"	12	37'-3"	12	39'-9"	12	24'-0"	12	26'-6"	12	29'-0"	12	31'-6"	5a1
5a2		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	5a2
ΔΔ 5b1		17	7'-8"	21	7'-8"	25	7'-8"	29	7'-8"	37	7'-8"	43	7'-8"	47	7'-8"	55	7'-8"	59	7'-8"	63	7'-8"	67	7'-8"	71	7'-8"	75	7'-8"	83	7'-8"	5b1 ΔΔ
ΔΔ✱ 6b3		36	4'-3"	36	4'-3"	36	4'-3"	36	4'-3"	36	4'-3"	36	4'-3"	36	4'-3"	36	4'-3"	32	4'-3"	32	4'-3"	32	4'-3"	32	4'-3"	32	4'-3"	32	4'-3"	6b3 ΔΔ✱
✱ 6b4		4	3'-7"	4	3'-7"	4	3'-7"	4	3'-7"	4	3'-7"	4	3'-7"	4	3'-7"	4	3'-7"	8	3'-7"	8	3'-7"	16	3'-7"	16	3'-7"	16	3'-7"	16	3'-7"	6b4 ✱
4c1		45	2'-7"	53	2'-7"	57	2'-7"	63	2'-7"	69	2'-7"	73	2'-7"	77	2'-7"	81	2'-7"	87	2'-7"	93	2'-7"	97	2'-7"	107	2'-7"	111	2'-7"	117	2'-7"	4c1
4d1		37	6'-5"	41	6'-5"	45	6'-5"	49	6'-5"	57	6'-5"	63	6'-5"	67	6'-5"	75	6'-5"	79	6'-5"	83	6'-5"	89	6'-5"	93	6'-5"	97	6'-5"	105	6'-5"	4d1
4e1		24	3'-2"	24	3'-2"	24	3'-2"	24	3'-2"	24	3'-2"	24	3'-2"	24	3'-2"	24	3'-2"	24	3'-2"	24	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	26	3'-2"	4e1
4h1		4	8'-0"	4	8'-0"	4	8'-0"	4	8'-0"	4	8'-0"	4	8'-0"	4	8'-0"	4	8'-0"	4	8'-0"	4	8'-0"	4	8'-0"	4	8'-0"	4	8'-0"	4	8'-0"	4h1

BTB Beam - Data Details

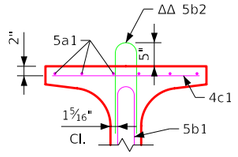


BTB30



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

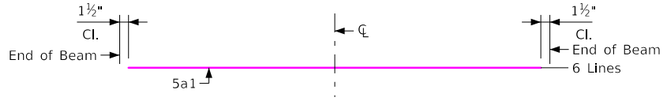


Section A-A
(Alternate)

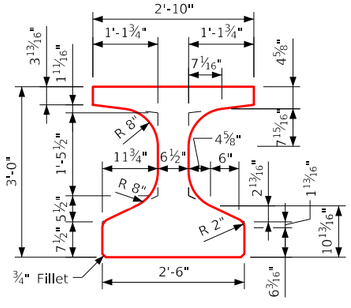
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

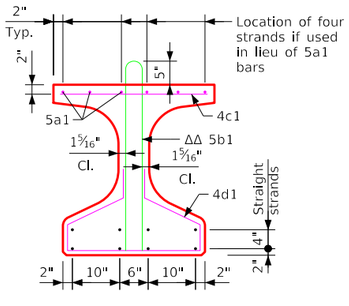
Beam Section Properties



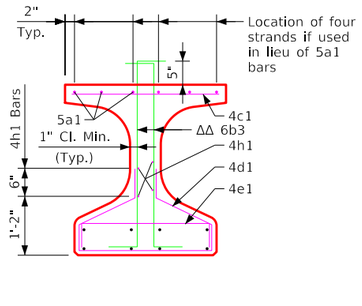
Top Flange Longitudinal Bar Layout



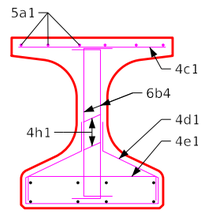
BTB Beam Cross Section



Section A-A



Section B-B



View C-C

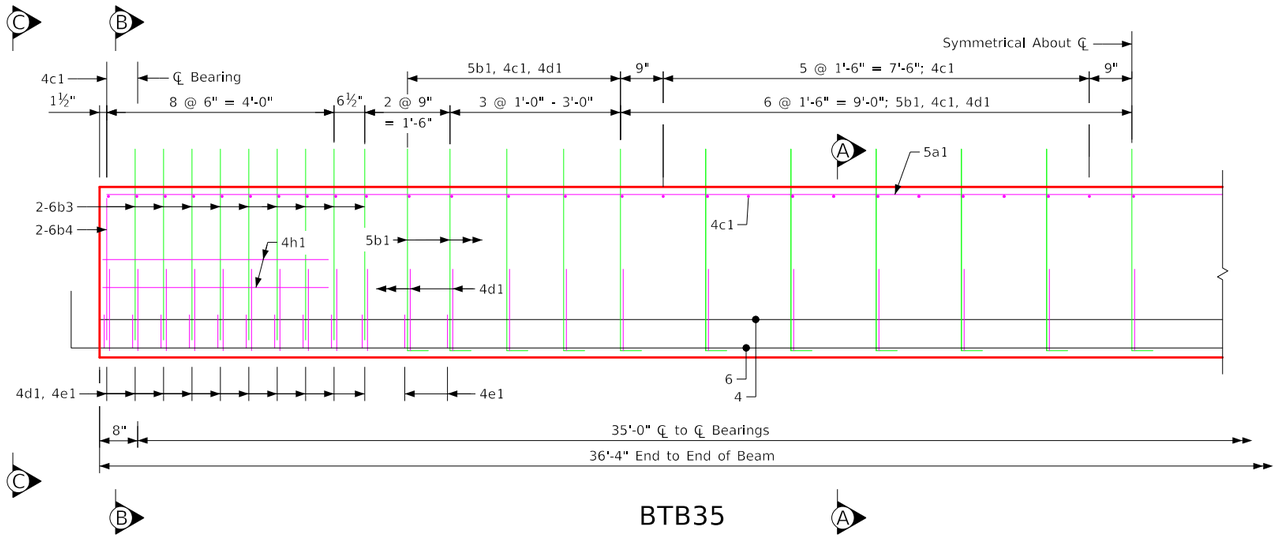
ΔΔ Epoxy Coated Bars

BTB30 Beam Details

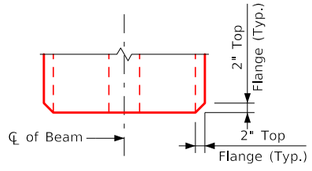
Issued 02-08.
Beams.dgn - 4751 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 30'-0" Span	Standard Sheet 4751	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:53 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

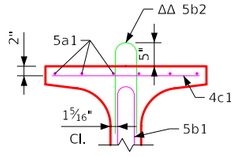


BTB35



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

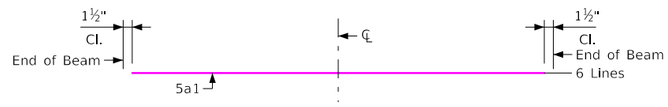


Section A-A
(Alternate)

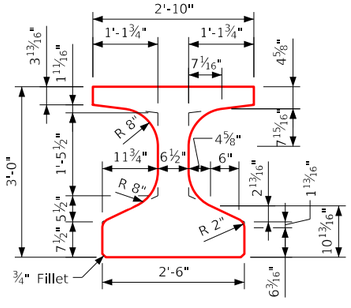
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

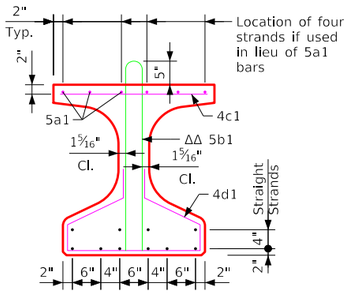
Beam Section Properties



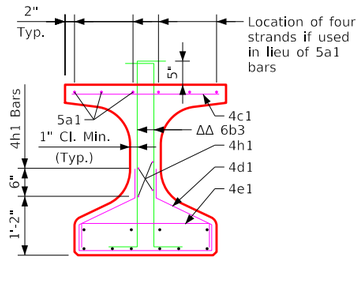
Top Flange Longitudinal Bar Layout



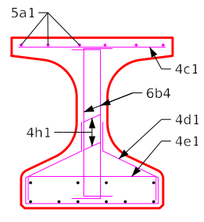
BTB Beam Cross Section



Section A-A



Section B-B



View C-C

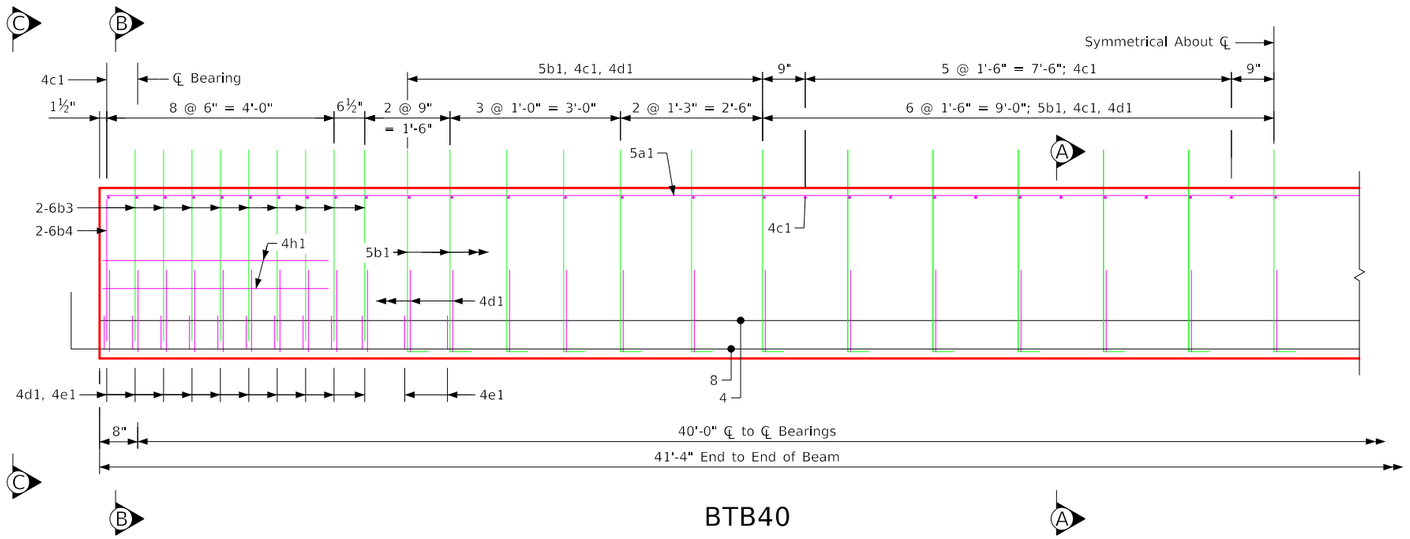
ΔΔ Epoxy Coated Bars

BTB35 Beam Details

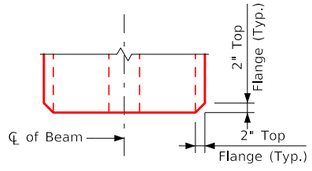
Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.
Issued 02-08.
Beams.dgn - 4752 - This Sheet Re-Issued 04-2024, Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 35'-0" Span	Standard Sheet 4752	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:53 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

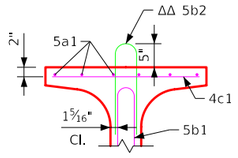


BTB40



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

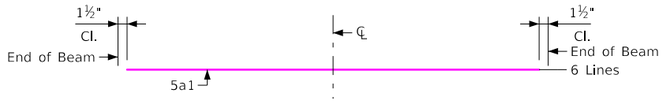


Section A-A
(Alternate)

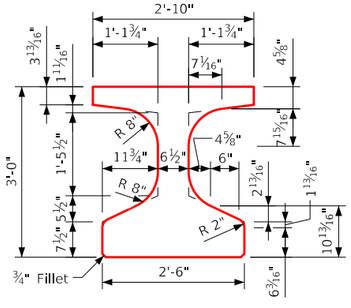
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

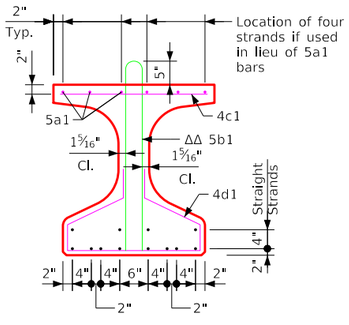
Beam Section Properties



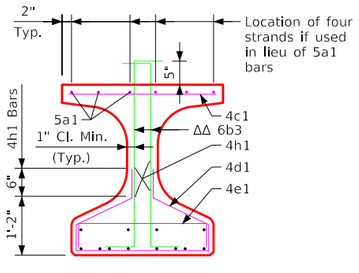
Top Flange Longitudinal Bar Layout



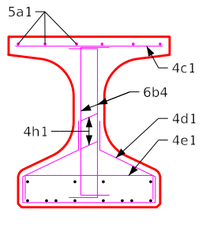
BTB Beam Cross Section



Section A-A



Section B-B



View C-C

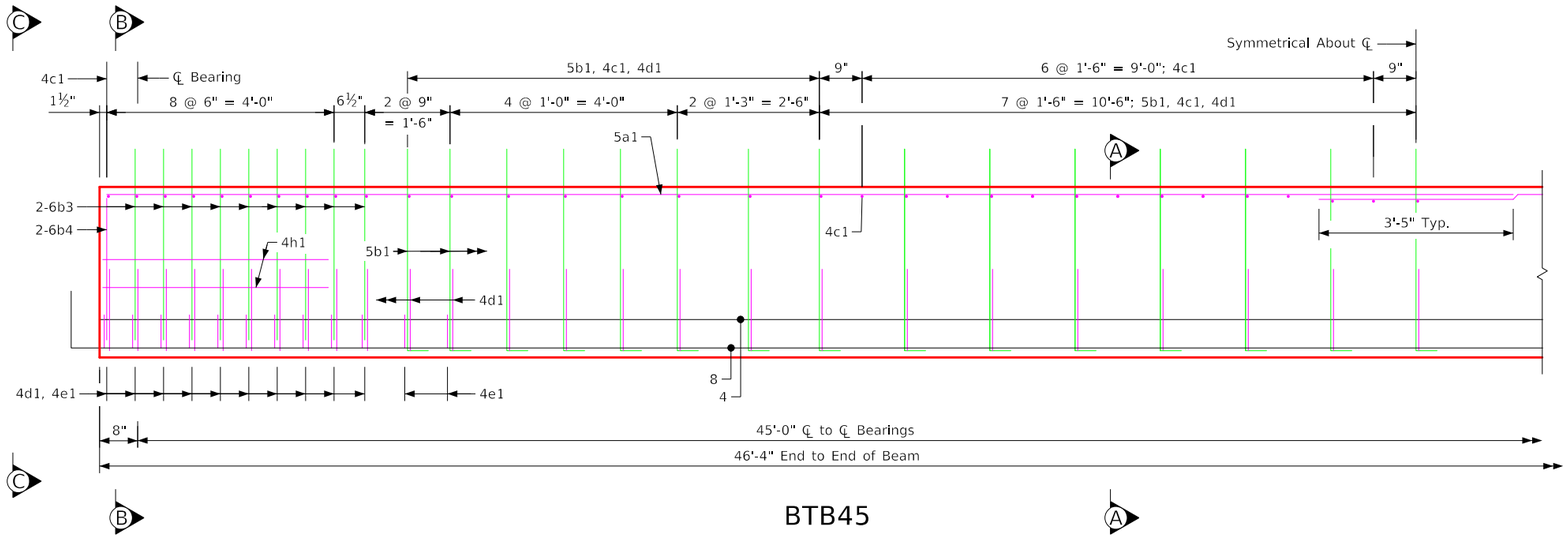
ΔΔ Epoxy Coated Bars

BTB40 Beam Details

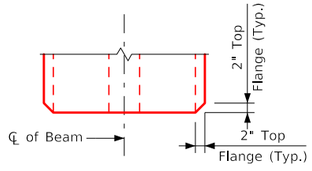
Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.
Issued 02-08.
Beams.dgn - 4753 - This Sheet Re-Issued 04-2024, Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 40'-0" Span	Standard Sheet 4753	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:54 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

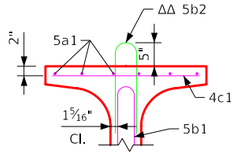


BTB45



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

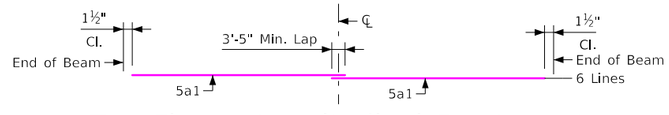


Section A-A (Alternate)

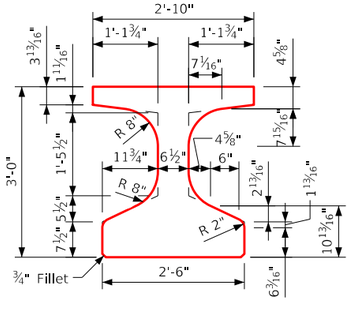
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

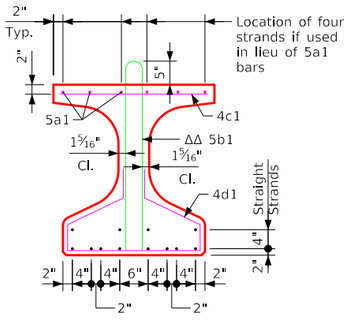
Beam Section Properties



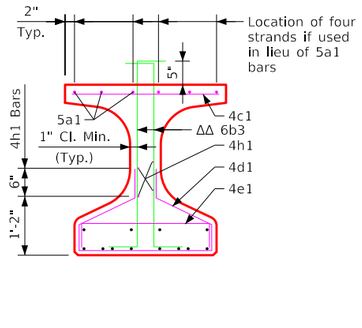
Top Flange Longitudinal Bar Layout



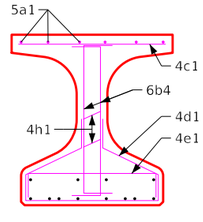
BTB Beam Cross Section



Section A-A



Section B-B



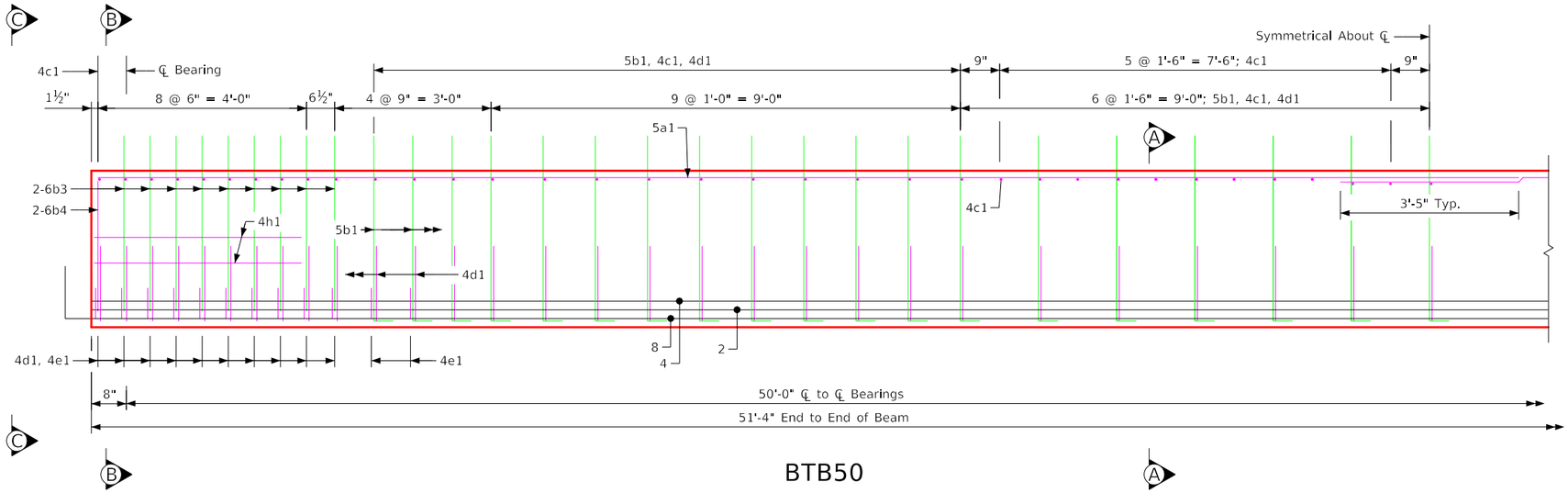
View C-C

ΔΔ Epoxy Coated Bars

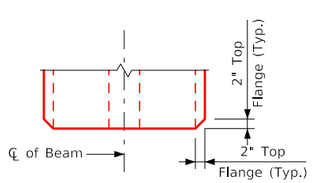
BTB45 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 45'-0" Span	Standard Sheet 4754	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:55 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

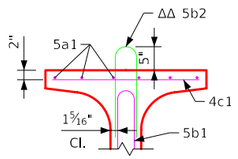


BTB50



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

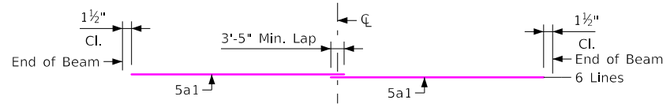


Section A-A
(Alternate)

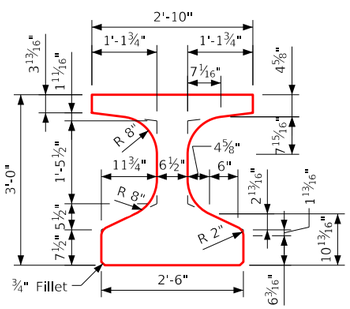
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

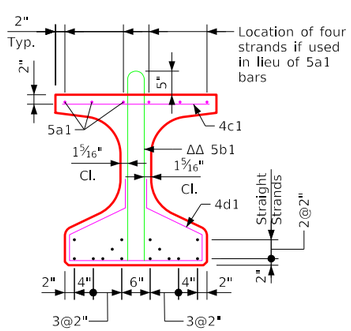
Beam Section Properties



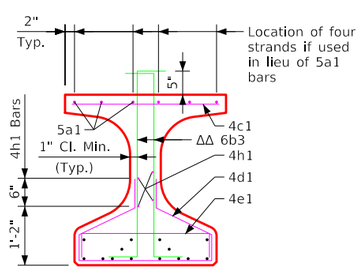
Top Flange Longitudinal Bar Layout



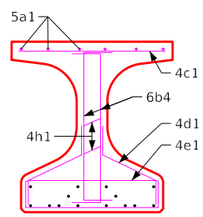
BTB Beam Cross Section



Section A-A



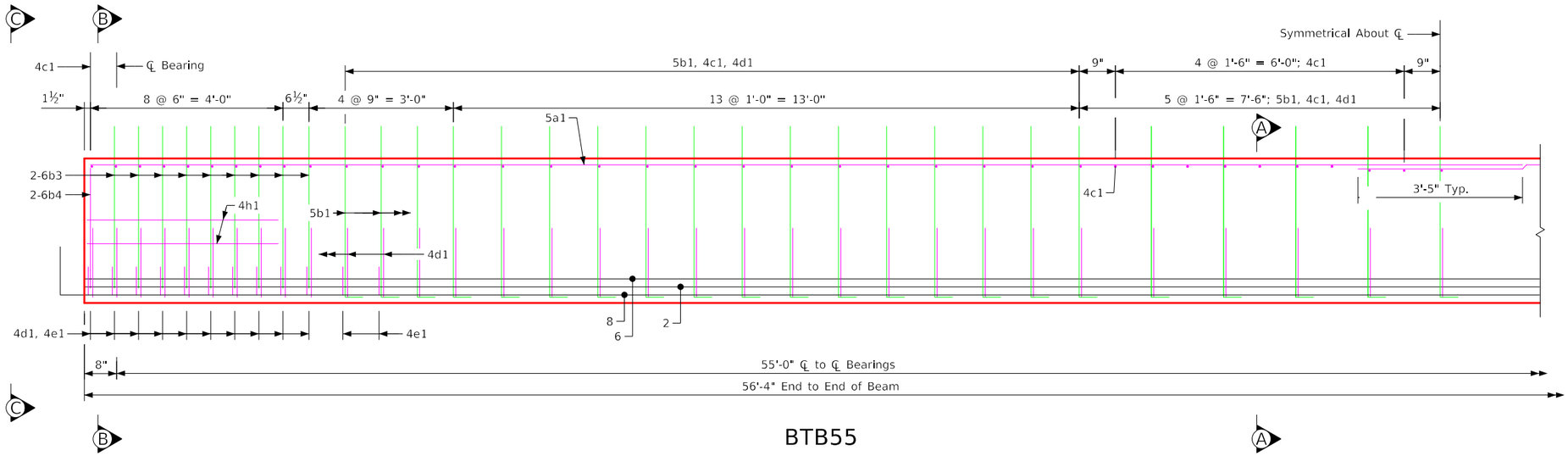
Section B-B



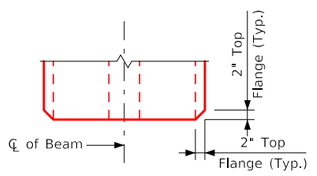
View C-C

ΔΔ Epoxy Coated Bars

BTB50 Beam Details

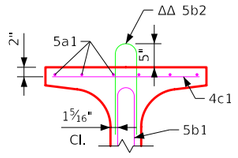


BTB55



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

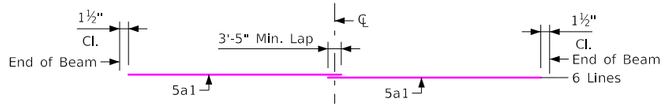


Section A-A
(Alternate)

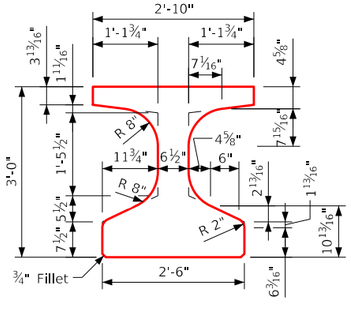
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

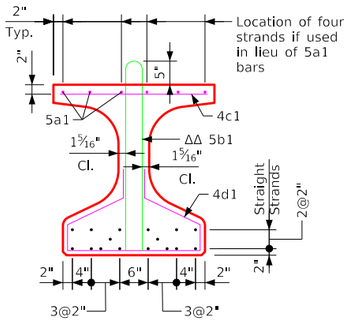
Beam Section Properties



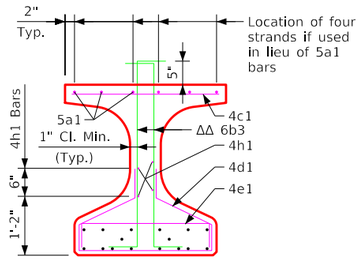
Top Flange Longitudinal Bar Layout



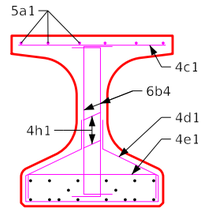
BTB Beam Cross Section



Section A-A



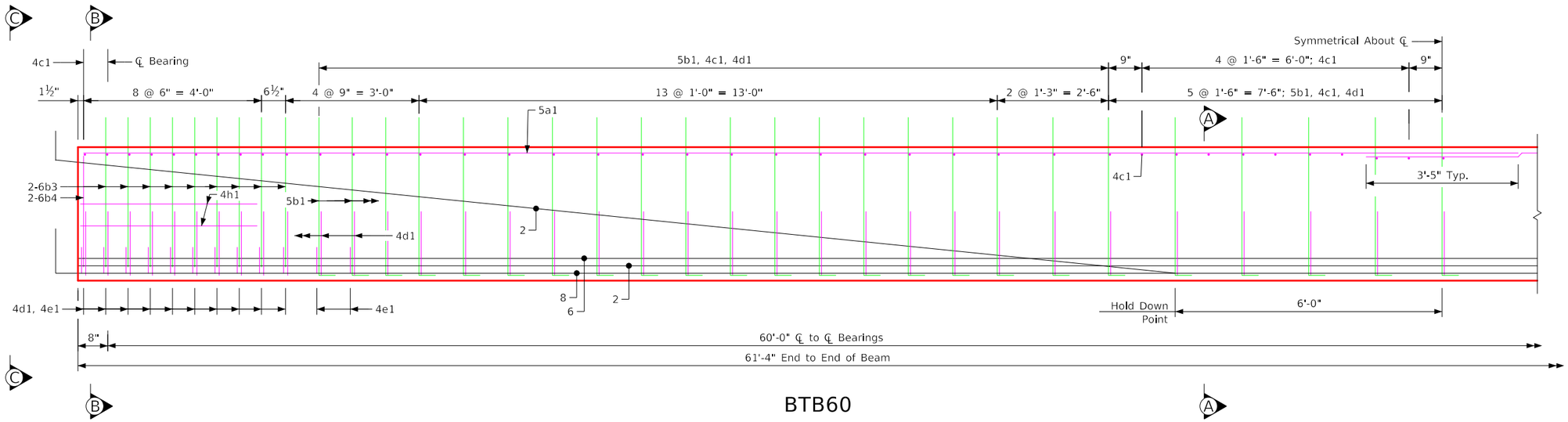
Section B-B



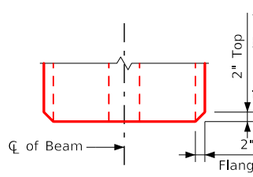
View C-C

ΔΔ Epoxy Coated Bars

BTB55 Beam Details

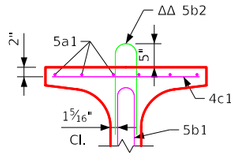


BTB60



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

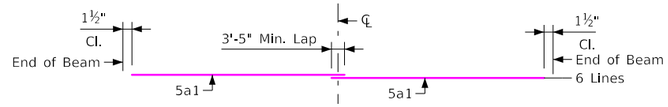


Section A-A
(Alternate)

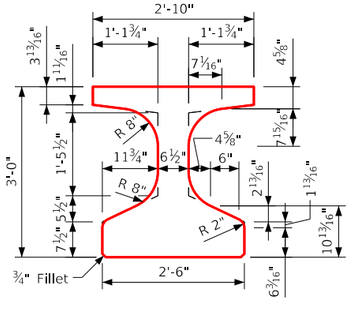
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

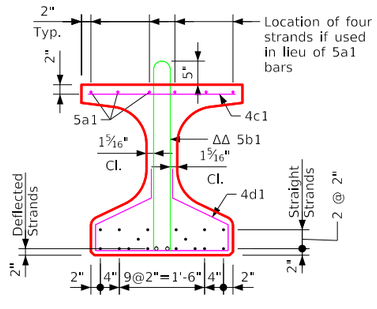
Beam Section Properties



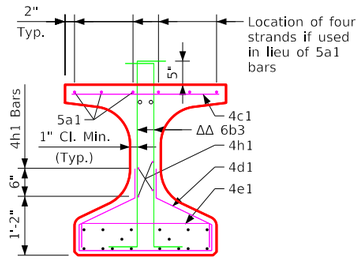
Top Flange Longitudinal Bar Layout



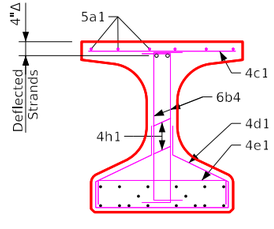
BTB Beam Cross Section



Section A-A



Section B-B



View C-C

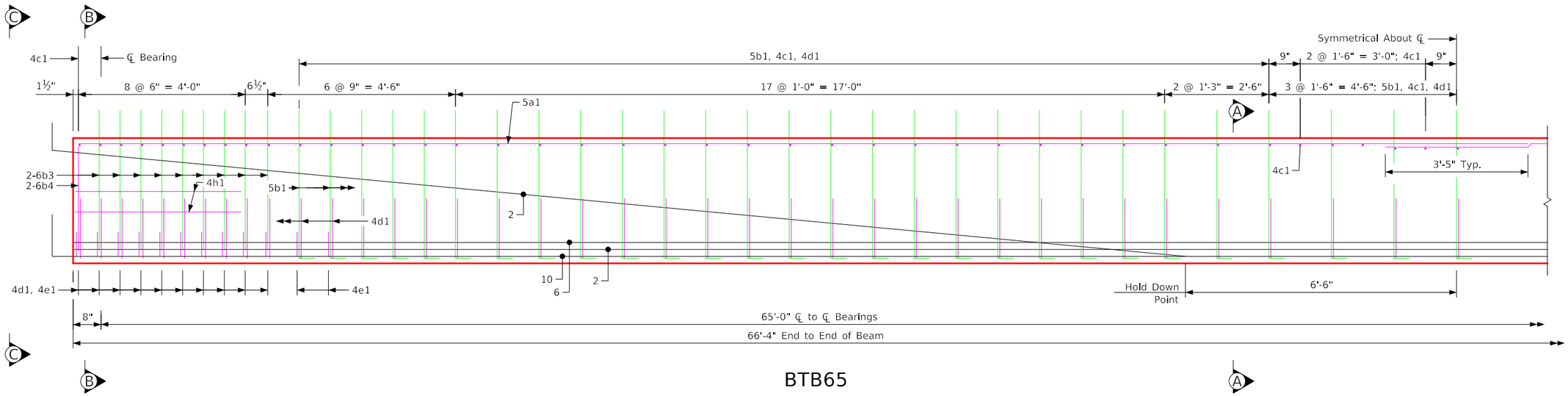
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTB60 Beam Details

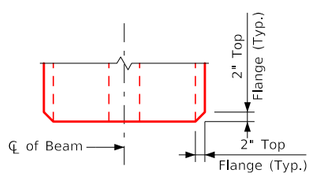
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 60'-0" Span	Standard Sheet 4757	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Issued 02-08.
Beams.dgn - 4757 - This Sheet Re-Issued 04-2024. Sheet Format Update.

4:07:57 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

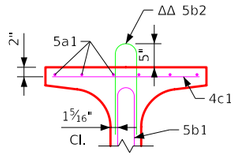


BTB65



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

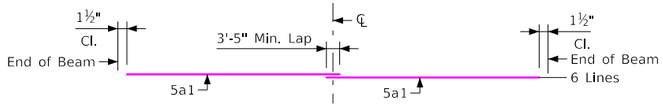


Section A-A
(Alternate)

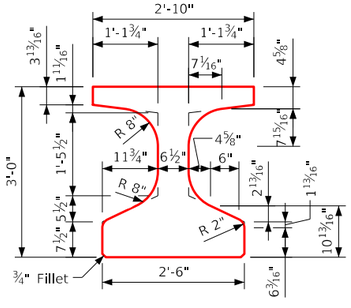
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

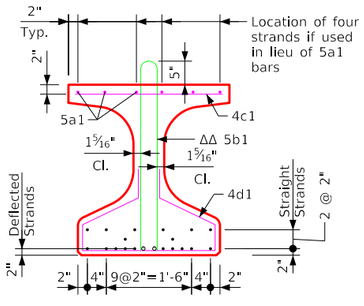
Beam Section Properties



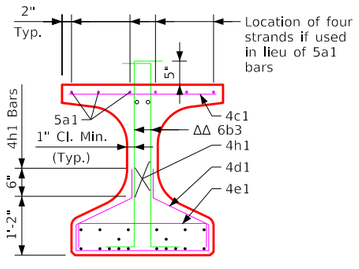
Top Flange Longitudinal Bar Layout



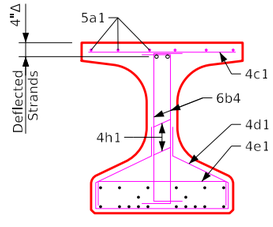
BTB Beam Cross Section



Section A-A



Section B-B



View C-C

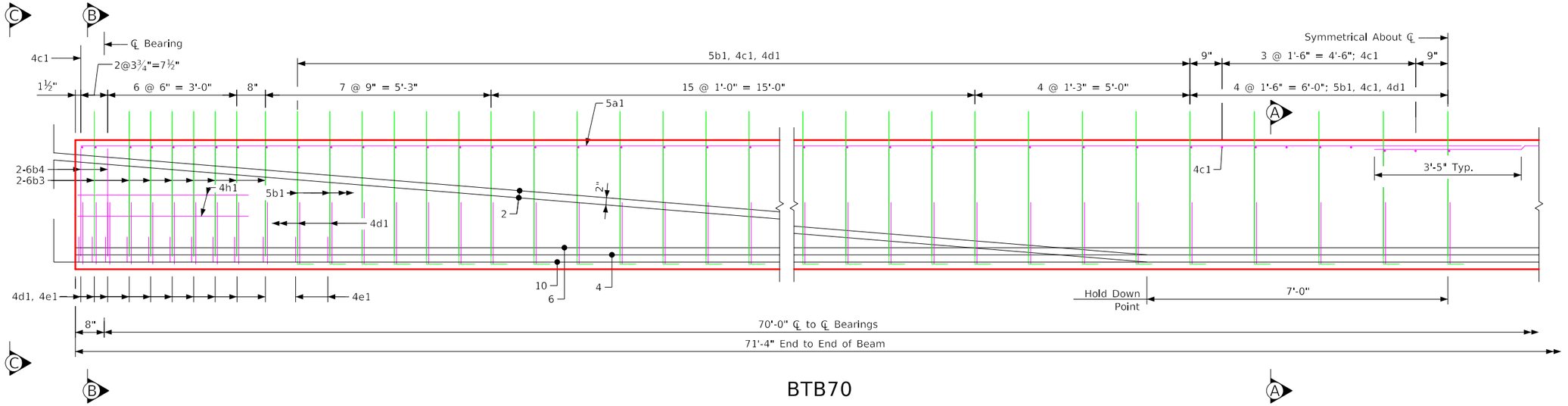
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTB65 Beam Details

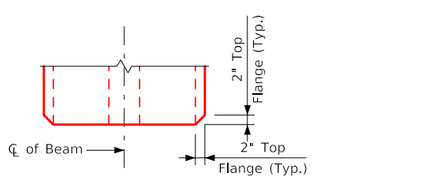
Issued 02-08.
Beams.dgn - 4758 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 65'-0" Span	Standard Sheet 4758	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:07:58 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

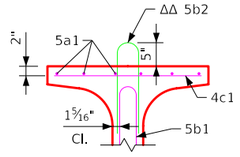


BTB70



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

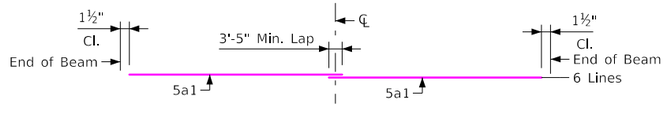


Section A-A
(Alternate)

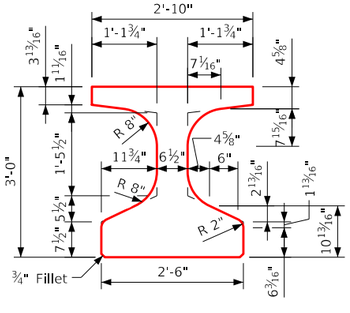
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

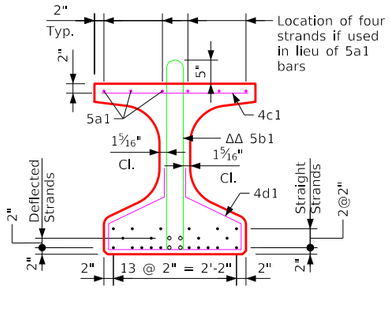
Beam Section Properties



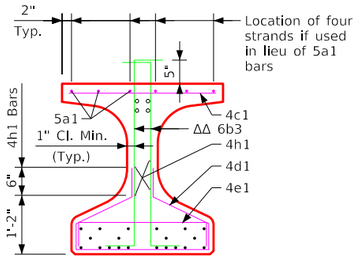
Top Flange Longitudinal Bar Layout



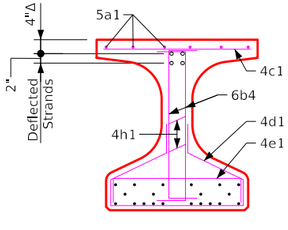
BTB Beam Cross Section



Section A-A



Section B-B



View C-C

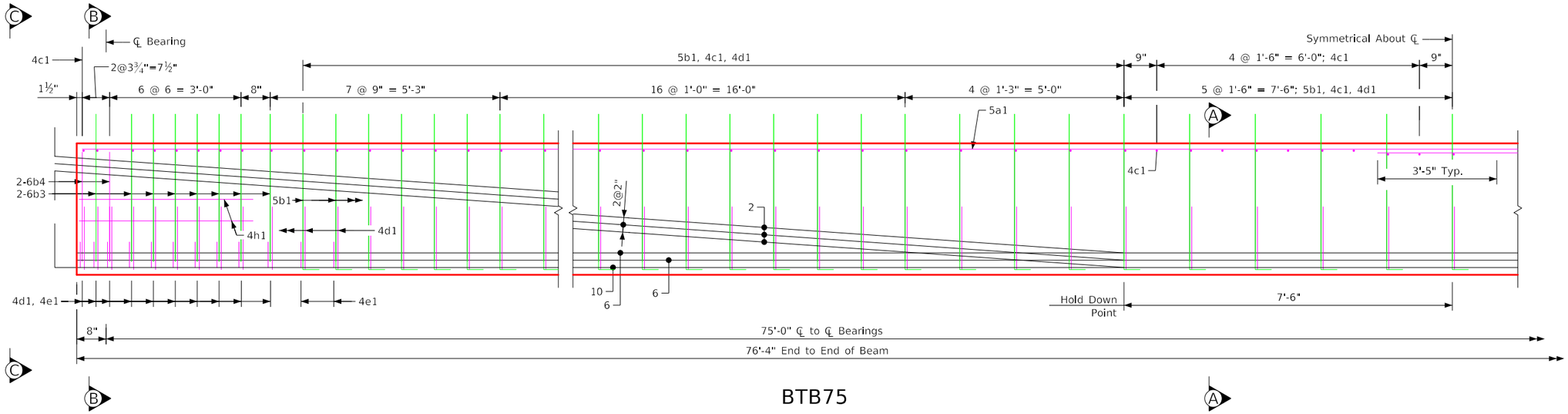
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTB70 Beam Details

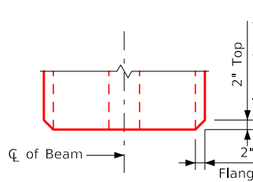
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 70'-0" Span	Standard Sheet 4759	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Issued 02-08.
Beams.dgn - 4759 - This Sheet Re-Issued 04-2024. Sheet Format Update.

4:07:59 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

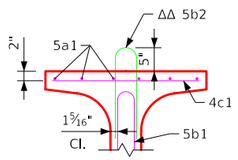


BTB75



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

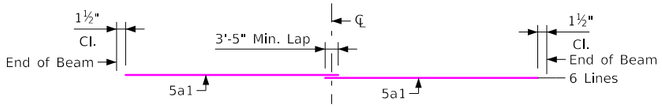


Section A-A
(Alternate)

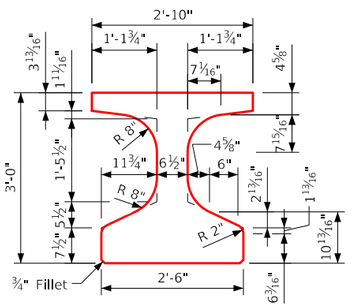
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

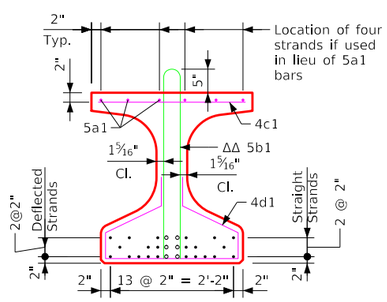
Beam Section Properties



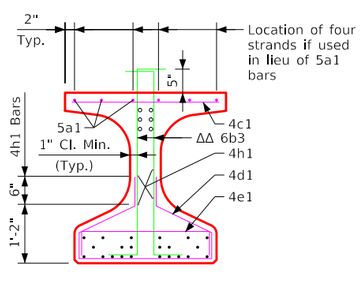
Top Flange Longitudinal Bar Layout



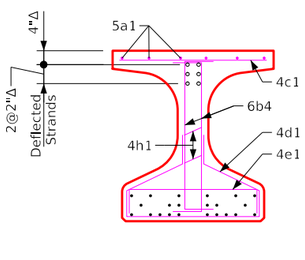
BTB Beam Cross Section



Section A-A



Section B-B



View C-C

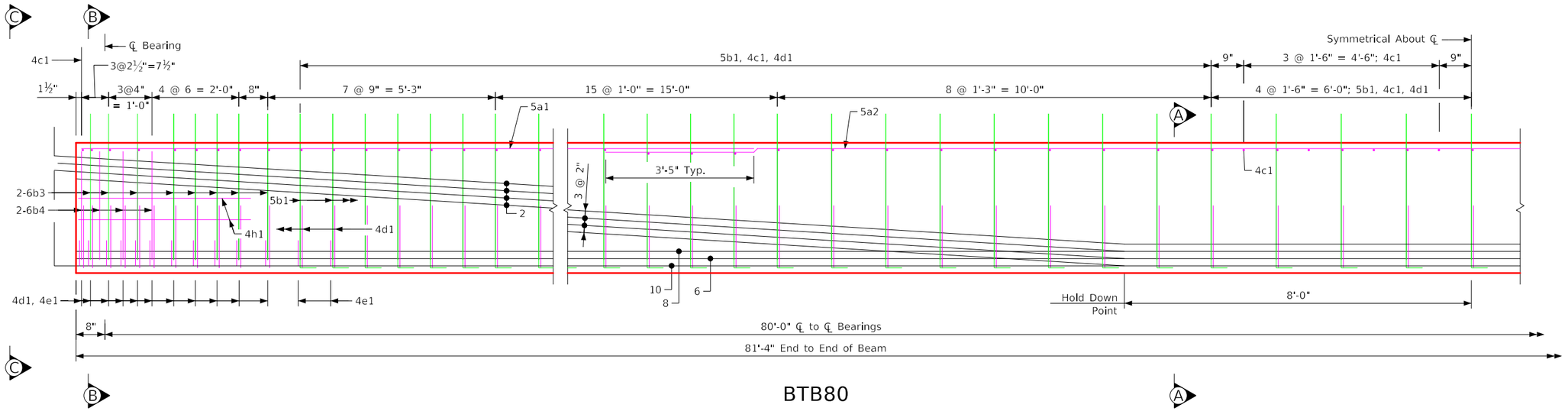
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTB75 Beam Details

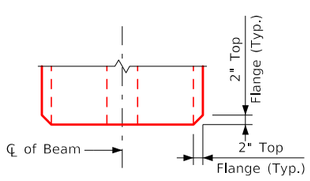
Issued 02-08.
Beams.dgn - 4760 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 75'-0" Span	Standard Sheet 4760	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:08:00 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

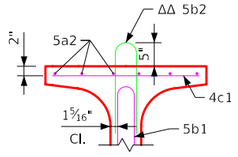


BTB80



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

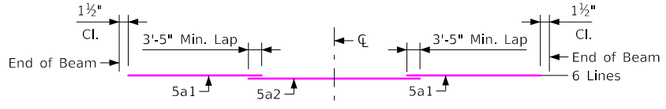


Section A-A
(Alternate)

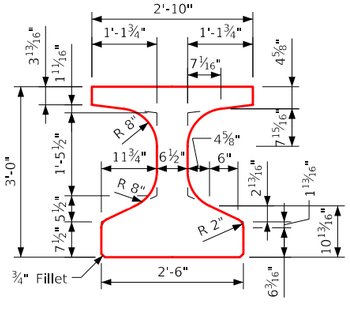
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

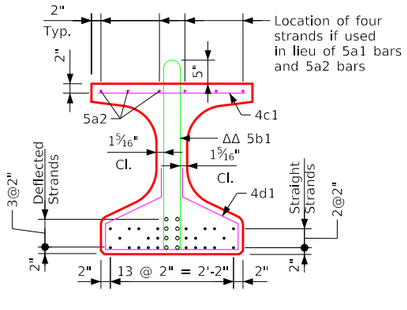
Beam Section Properties



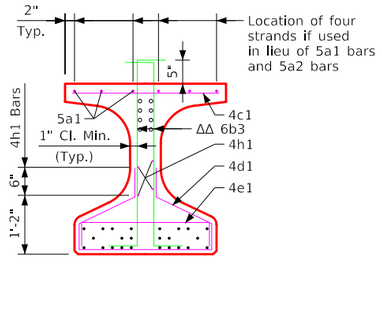
Top Flange Longitudinal Bar Layout



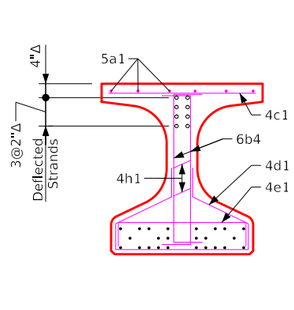
BTB Beam Cross Section



Section A-A



Section B-B



View C-C

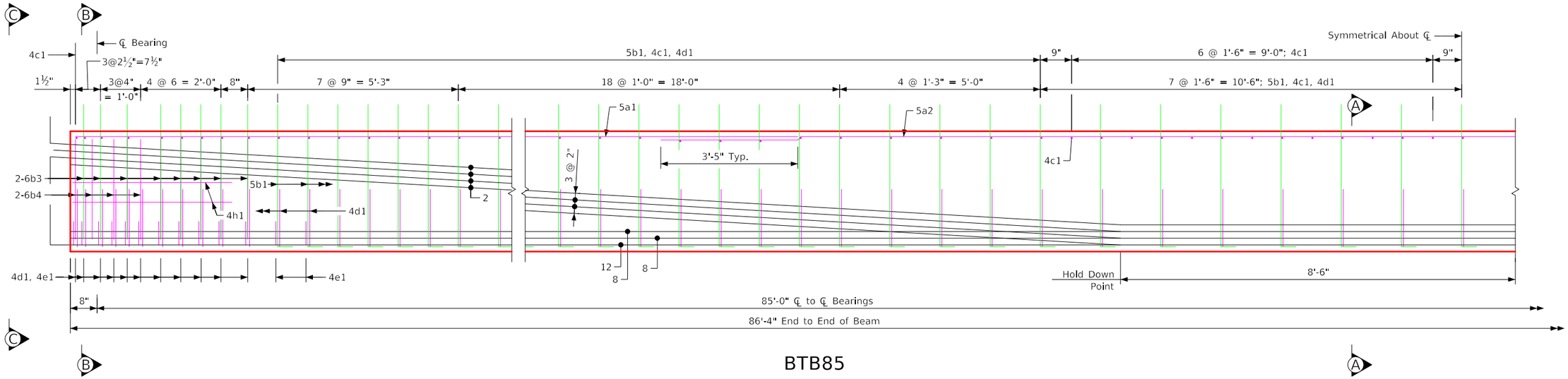
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTB80 Beam Details

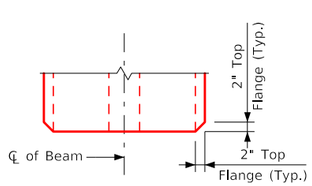
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 80'-0" Span	Standard Sheet 4761	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Issued 02-08.
Beams.dgn - 4761 - This Sheet Re-Issued 04-2024. Sheet Format Update.

4:08:01 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

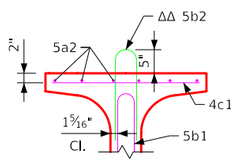


BTB85



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

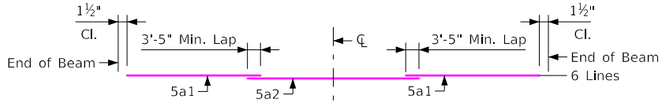


Section A-A
(Alternate)

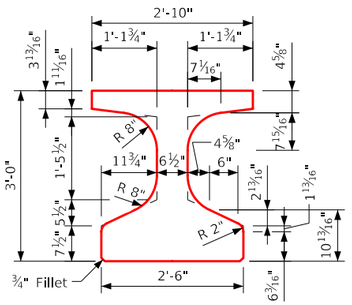
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

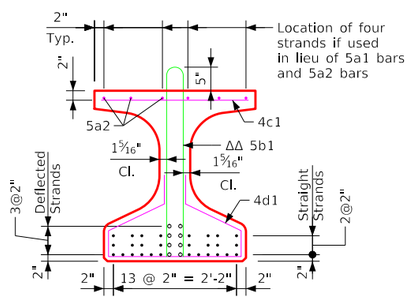
Beam Section Properties



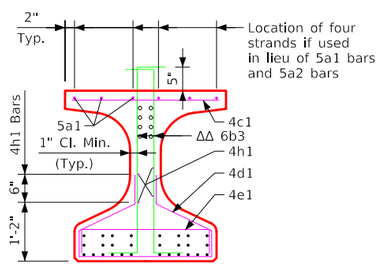
Top Flange Longitudinal Bar Layout



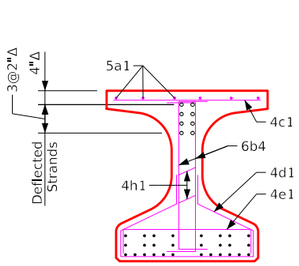
BTB Beam Cross Section



Section A-A



Section B-B



View C-C

° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTB85 Beam Details

Issued 02-08.
Beams.dgn - 4762 - This Sheet Re-Issued 04-2024, Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 85'-0" Span	Standard Sheet 4762	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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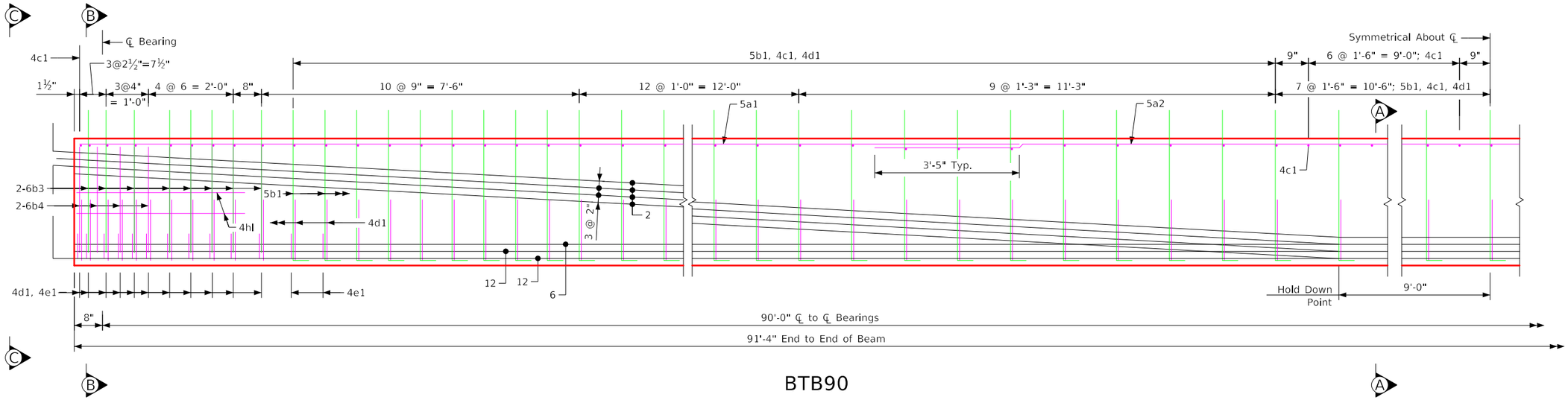
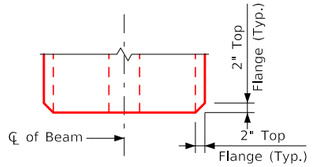
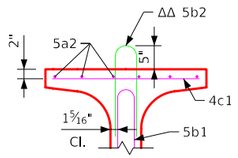


BTB90



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

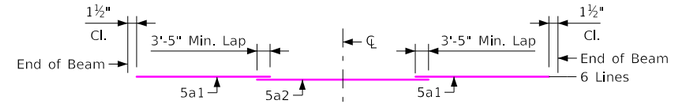


Section A-A
(Alternate)

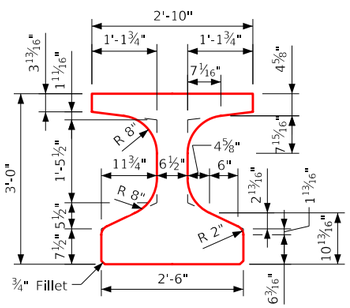
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

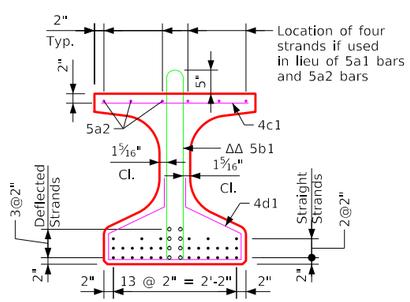
Beam Section Properties



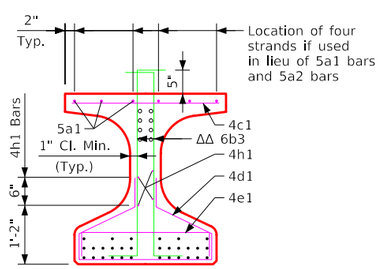
Top Flange Longitudinal Bar Layout



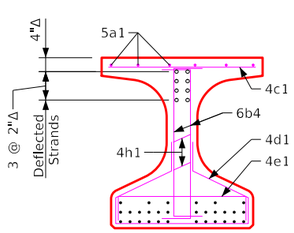
BTB Beam Cross Section



Section A-A



Section B-B



View C-C

° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTB90 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 90'-0" Span	Standard Sheet 4763	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.
Issued 02-08.
Beams.dgn - 4763 - This Sheet Re-Issued 04-2024. Sheet Format Update.

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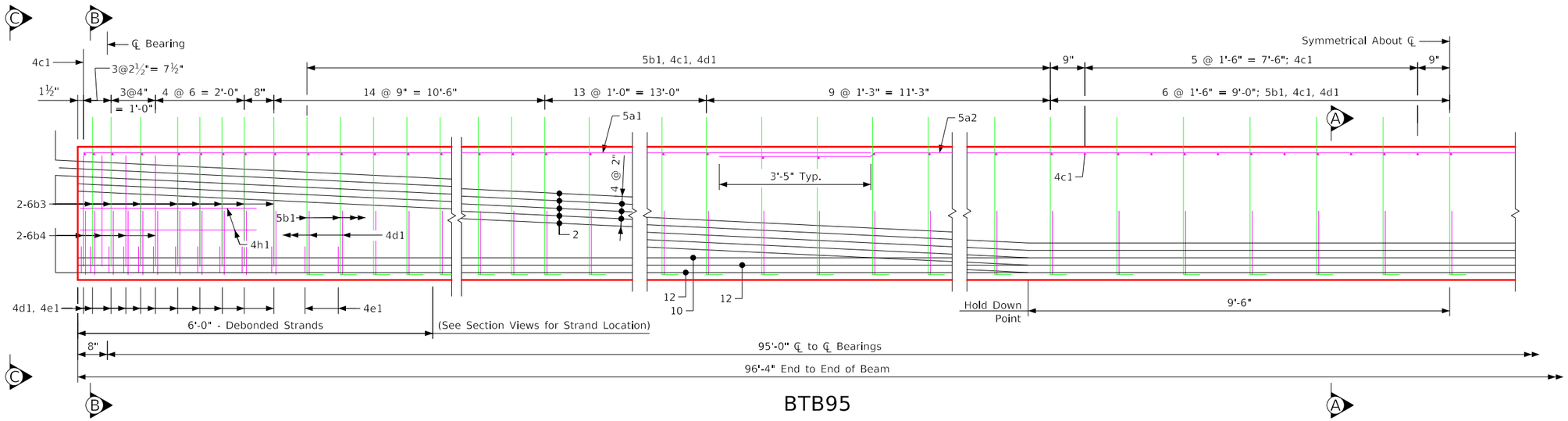
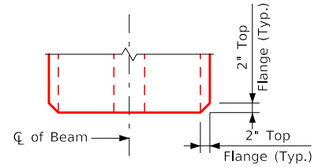
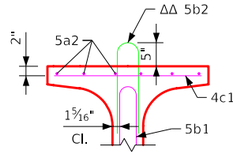


BTB95



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

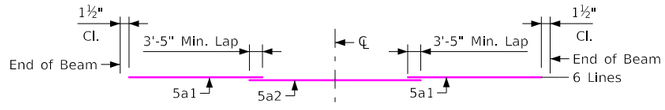


Section A-A (Alternate)

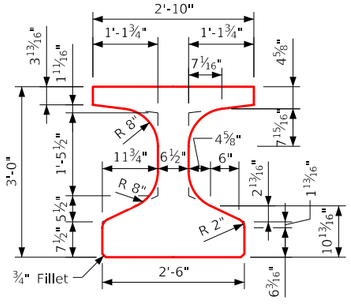
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

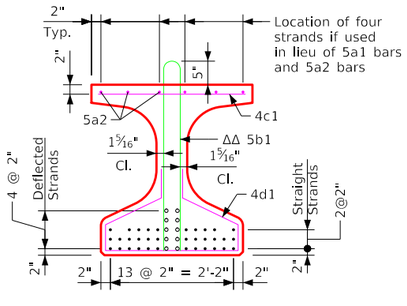
Beam Section Properties



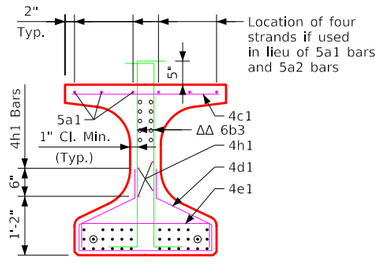
Top Flange Longitudinal Bar Layout



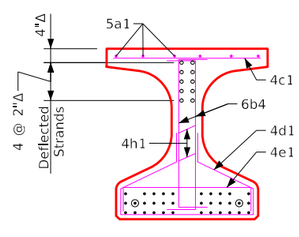
BTB Beam Cross Section



Section A-A



Section B-B



View C-C

- ° Deflected Strands
- Δ Dimensions at End of Beam
- ΔΔ Epoxy Coated Bars
- ⊙ Strands Debonded 6'-0" from Beam Ends

BTB95 Beam Details

Revision 05-11: Added the Bend to the 3rd Deflected Strand at the Top to be Bent Down at the Beam End.
Issued 02-08.
Beams.dgn - 4764 - This Sheet Re-Issued 04-2024, Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 95'-0" Span	Standard Sheet 4764	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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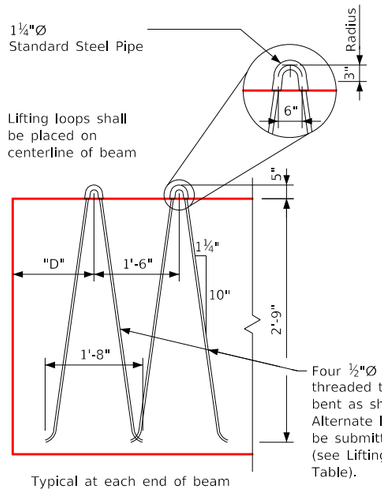
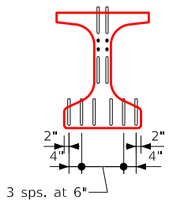


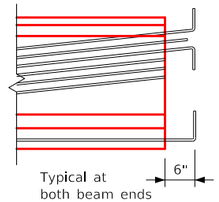
Four ½"Ø grade 270 strands threaded through each pipe sleeve bent as shown after threading. Alternate lifting devices may be submitted for approval (see Lifting Loop and Overhang Table).

Typical at each end of beam

Lifting Loop Detail



The top and 3rd rows of the deflected strands are to be cut with 1'-2" projections which are to be shop bent as shown. The second row is to be cut with a 5" projection and the remaining top deflected strands in rows 4 and below are to be cut flush with beam face. Six bottom strands are to be cut with 1'-6" projections which are to be shop bent as shown. The remaining bottom strands are to be cut off reasonably flush with the concrete.



Typical at both beam ends

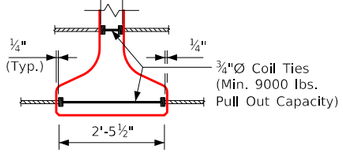
Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms

Lifting Loop and Overhang Table

Beams	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
BTB100–BTB105	2	4	6'-3"	11.5

Lifting loops shall carry loads equally.

Number and exact location of coil ties to be as detailed on specific bridge design.



Coil Tie Detail

Design Stresses:

Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications, Series of 2017.
Reinforcing steel in accordance with Section 5, Grade 60.
Concrete in accordance with Section 5.
Prestressing steel in accordance with Section 5, Grade 270.

Specifications:

Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications.
Design: AASHTO LRFD, Series of 2017 with minor modifications.

Alternate Bar Notes:

Alternate bars shown in Bent Bar Details may be used in lieu of reinforcing bars shown in Bar List. No additional payment shall be made for use of alternate bars.

BTB Beam Data

	BTB Beam	Span Length ℄–℄ Bearing	Overall Beam Length (L)	Concrete Strength f'ci (ksi.)	Concrete Strength f'c (ksi.)	Strand Size Dia. (in.)	Number of Strands Straight	Number of Strands Deflected	Total Initial Prestress ③ (kips)	Hold Down Force (kips)	Camber (in.) ⑤ At Release	Camber (in.) ⑤ After Losses	Deflection (in.) Δ_D Immediate ① (elastic) Δ_I Steel Diaphragm	Deflection (in.) Δ_D Time ② (plastic) Δ_T Steel Diaphragm	Permissible Maximum Spacing HL-93 Loading Steel Diaphragm	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight lb.)
④	BTB100	100'-0"	101'-4"	8.00	10.00	0.60"	38	8	1956	19.2	3.73"	5.97"	3.94"	0.98"	8'-0⅜"	33.3	16.5	2410
④	BTB105	105'-0"	106'-4"	8.50	10.00	0.60"	38	12	2127	22.8	3.94"	6.31"	4.51"	1.13"	7'-4"	35.0	17.3	2428

① Deflections at mid-span due to weight of slab and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.5") weight of:
0.91 kip/ft. for 8'-0⅜" beam spacing
0.832 kip/ft. for 7'-4" beam spacing
and one steel diaphragm (0.500 kips) at ℄ of span. For different deck and diaphragm weights, deflections will be directly proportional.

② Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.
Total beam deflections at ℄ of span, Δ_D , due to weight of deck and diaphragms for detailing purpose:
(A) $\Delta_D=\Delta_I+\Delta_T$ for simple span.
(B) $\Delta_D=\Delta_I+\frac{3}{4}\Delta_T$ for end spans of continuous bridge.
(C) $\Delta_D=\Delta_I+\frac{1}{2}\Delta_T$ for interior spans of continous bridge.

③ Total initial prestress is based on 72.6% f's, f's= 270 ksi. and As= 0.217 in.^{2}.

④ Includes partial length debonded strands, see individual Beam Sheets for location and details.

⑤ Calculated design cambers are based on multipliers developed from research in Iowa.

Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.

Beam Notes:

These beams are designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.
All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.
Hold down points for deflected strands may be moved toward ends of beam a distance of 0.05 L maximum at producer's option.
All prestressing strands except lifting loop strands shall be 0.60 in. nominal diameter (nominal steel area = 0.217 in.^{2}) and conform to ASTM A416 Grade 270 Low Relaxation Strands. Minimum strand breaking strength shall be 58.6 kips.
Tops of beams are to be struck off level and finished as per Materials I.M.570.
Bearings shall be as detailed on other design sheets.
Beams to be used in bridges made continuous by the poured in place deck, are to be at least 28 days old before the deck is placed unless a shorter curing time is approved by the Bridge Engineer.
The portions of the prestressed beams that are to be embedded in the abutment and pier diaphragms shall be roughened for a distance of 10" from the beam end by sandblasting or other approved methods to provide suitable bond between the beam and the diaphragm in accordance with Article 2403.03, I, of the Standard Specifications.
All beams are to be increased in length to compensate for elastic shortening, creep and shrinkage.
For transporting, the allowable overhang is shown in the "Lifting Loop and Overhang Table".
The contractor shall assure the lateral stability of the beam during handling, transporting and erection by providing temporary bracing as needed.
Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet.
If sole plate is required for bearing, sole plate is to be set in forms when beam is cast and formed out below to exclude concrete as detailed on the Bearing Sheet.
If stub abutments are used, all strands at the ends of beams at stub abutments shall be cut off reasonably flush with the concrete.
Minimum concrete f'c (at 28 days) and minimum f'ci at release are located in the BTB Beam Data Table above.
Four 0.60 in. diameter strands stressed to not more than 5000 lbs. each may be used in lieu of bars 5a1 and 5a2 in the top flange.
When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with Materials I.M.570 (Fabricator Application) and I.M.491.12 (Contractor Application).

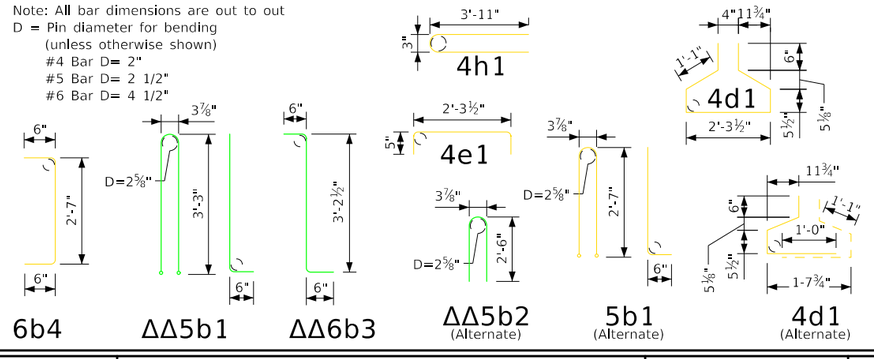
ΔΔ 5b1 and 6b3 bars to be epoxy coated
✱ 6b3 and 6b4 bars to be used in pairs

Reinforcing Bar List

Beam Bar	Shape	BTB100 No.	BTB100 Length	BTB105 No.	BTB105 Length	Beam Bar
5a1		12	34'-0"	12	36'-6"	5a1
5a2		6	40'-0"	6	40'-0"	5a2
ΔΔ 5b1		87	7'-8"	85	7'-8"	5b1
ΔΔ✱ 6b3		32	4'-3"	32	4'-3"	6b3
✱ 6b4		16	3'-7"	16	3'-7"	6b4
4c1		119	2'-7"	125	2'-7"	4c1
4d1		109	6'-5"	107	6'-5"	4d1
4e1		26	3'-2"	26	3'-2"	4e1
4h1		4	8'-0"	4	8'-0"	4h1

Bent Bar Detail

Note: All bar dimensions are out to out
D = Pin diameter for bending (unless otherwise shown)
#4 Bar D= 2"
#5 Bar D= 2 1/2"
#6 Bar D= 4 1/2"

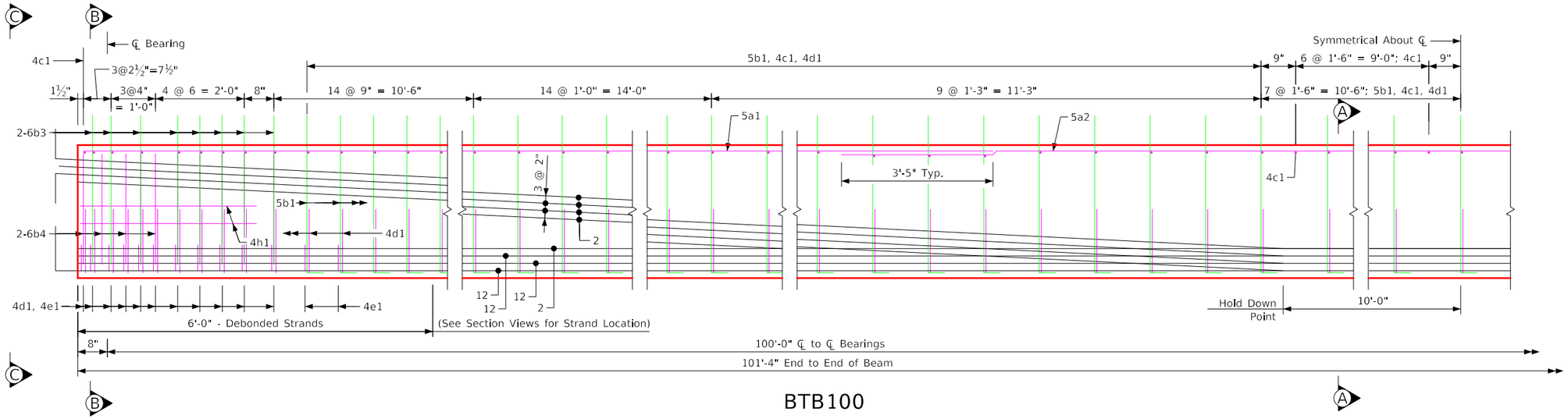


BTB100 & BTB105 Beam-Data Dtls.

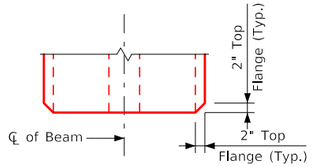
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beams - 100'-0" and 105'-0" Spans Data Details	Standard Sheet 4765	COUNTY	PROJECT NUMBER	SHEET NUMBER

4:08:03 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

Correction 12-13: Coil Tie Detail was Changed to Reflect the Distance Between Coil Tie Anchors Embedded ¼ inch. Removed Article 2407.13 Spec. Note Under Lifting Loop Table.
Issued 02-08.
Beams.dgn - 4765 - This Sheet Re-Issued 04-2024, Sheet Format Update.

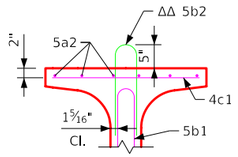


BTB100



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

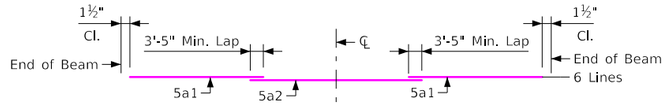


Section A-A
(Alternate)

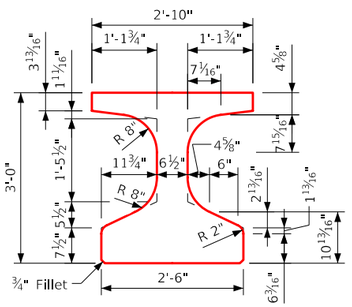
See Alternate Bar Note on Standard Sheet 4765.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

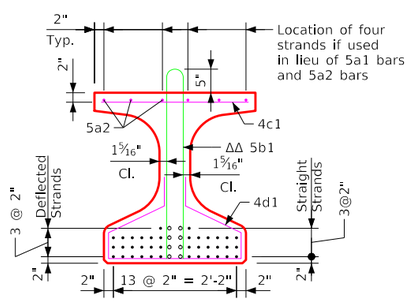
Beam Section Properties



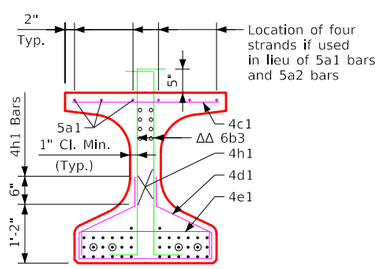
Top Flange Longitudinal Bar Layout



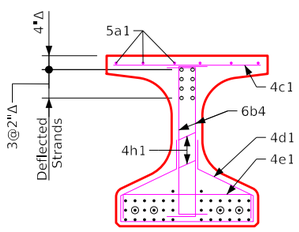
BTB Beam Cross Section



Section A-A



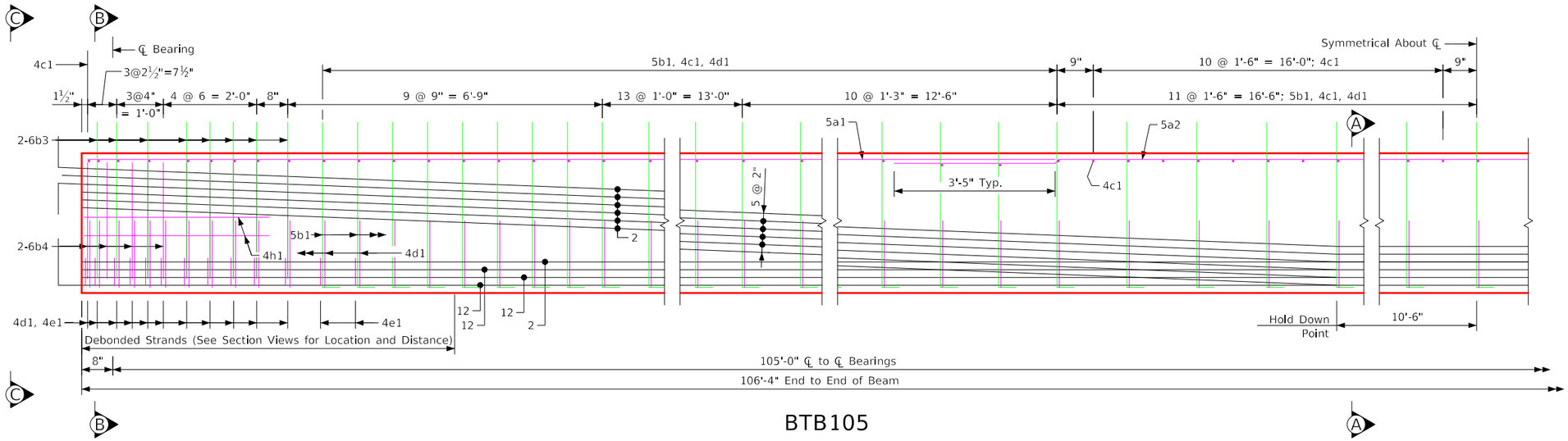
Section B-B



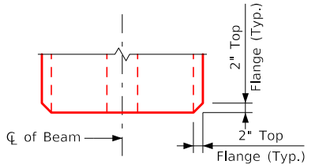
View C-C

- ◦ Deflected Strands
- Δ Dimensions at End of Beam
- ΔΔ Epoxy Coated Bars
- ⊙ Strands Debonded 6'-0" from Beam Ends

BTB100 Beam Details

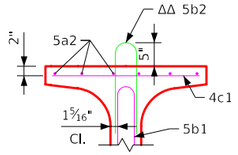


BTB105



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

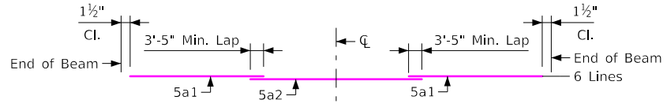


Section A-A
(Alternate)

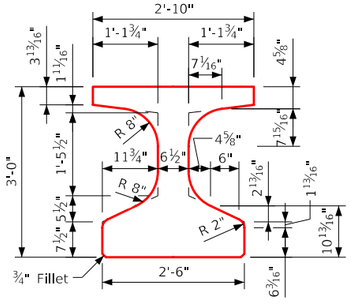
See Alternate Bar Note on Standard Sheet 4765.

Area = 631.7 in.^{2}
$\bar{y}_b$ = 17.14 in.
I = 99,980 in.^{4}

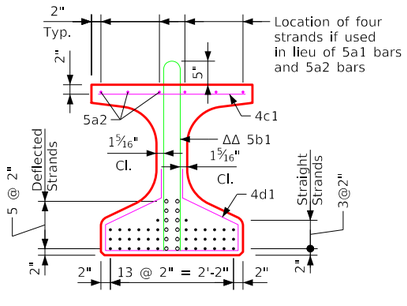
Beam Section Properties



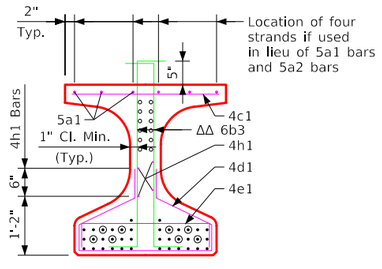
Top Flange Longitudinal Bar Layout



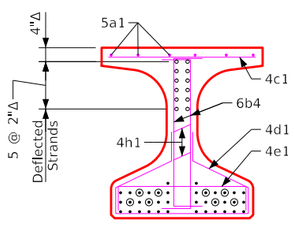
BTB Beam Cross Section



Section A-A



Section B-B



View C-C

- ° Deflected Strands
- Δ Dimensions at End of Beam
- ΔΔ Epoxy Coated Bars
- ⊙ Strands Debonded:
  - 3'-0" from Beam Ends - 3rd Row from Bottom
  - 6'-0" from Beam Ends - 2nd Row from Bottom

BTB105 Beam Details

Beam Notes:

These beams are designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.

All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.

Hold down points for deflected strands may be moved toward ends of beam a distance of 0.05 L maximum at producer's option.

All prestressing strands except lifting loop strands shall be 0.60 in. nominal diameter (nominal steel area = 0.217 $in.^2$) and conform to ASTM A416 Grade 270 Low Relaxation Strands. Minimum strand breaking strength shall be 58.6 kips.

Tops of beams are to be struck off level and finished as per Materials I.M.570.

Bearings shall be as detailed on other design sheets.

Beams to be used in bridges made continuous by the poured in place deck, are to be at least 28 days old before the deck is placed unless a shorter curing time is approved by the bridge engineer.

The portions of the prestressed beams that are to be embedded in the abutment and pier diaphragms shall be roughened for a distance of 10" from the beam end by sandblasting or other approved methods to provide suitable bond between the beam and the diaphragm in accordance with Article 2403.03, I, of the Standard Specifications.

All beams are to be increased in length to compensate for elastic shortening, creep and shrinkage.

For transporting, the allowable overhang is shown in the Lifting Loop and Overhang Table.

The Contractor shall assure the lateral stability of the beam during handling, transporting and erection by providing temporary bracing as needed.

Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet.

If sole plate is required for bearing, sole plate is to be set in forms when beam is cast and formed out below to exclude concrete as detailed on the Bearing Sheet.

If stub abutments are used, all strands at the ends of beams at stub abutments shall be cut off reasonably flush with the concrete.

When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with Materials I.M.570 (Fabricator Application) and I.M.491.12 (Contractor Application).

Minimum concrete f'c (at 28 days) and minimum f'ci at release are located in the BTE Beam Data Table above.

Four 0.60 in. diameter strands stressed to not more than 5000 lbs. each may be used in lieu of bars 5a1 and 5a2 in the top flange.

Design Stresses:

Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications, Series of 2017.
Reinforcing steel in accordance with Section 5, Grade 60.
Concrete in accordance with Section 5.
Prestressing steel in accordance with Section 5, Grade 270.

Specifications:

Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications.
Design: AASHTO LRFD, Series of 2017 with minor modifications.

BTE Beam Data

	BTE Beam	Span Length ℄–℄ Bearing	Overal Beam Length (L)	Concrete Strength f'ci (ksi.)	Concrete Strength f'c (ksi.)	Strand Size Dia (in.)	Number of Strands Straight	Number of Strands Deflected	Total Initial Prestress ③ (kips)	Hold Down Force (kips)	Camber (in.) ⑥ At Release	Camber (in.) ⑥ After Losses	Deflection (in.) Δ_D Immediate ① (elastic) Δ_I Steel Diaphragm	Deflection (in.) Δ_D Time ② (plastic) Δ_T Steel Diaphragm	Permissible Maximum Spacing HL-93 Loading Steel Diaphragm	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight lb.)
	BTE60	60'-0"	61'-4"	4.50	5.00	0.60"	14	—	596	—	0.33"	0.61"	0.17"	0.04"	9'-3"	25.8	12.8	2003
	BTE65	65'-0"	66'-4"	4.50	5.00	0.60"	14	—	596	—	0.36"	0.67"	0.23"	0.06"	9'-3"	27.9	13.8	2112
	BTE70	70'-0"	71'-4"	4.50	5.00	0.60"	16	—	681	—	0.46"	0.85"	0.32"	0.08"	9'-3"	30.0	14.8	2218
	BTE75	75'-0"	76'-4"	4.50	5.00	0.60"	16	—	681	—	0.49"	0.91"	0.40"	0.10"	9'-3"	32.1	15.9	2324
	BTE80	80'-0"	81'-4"	5.00	6.00	0.60"	18	—	766	—	0.61"	1.12"	0.49"	0.12"	9'-3"	34.2	16.9	2456
	BTE85	85'-0"	86'-4"	5.00	6.00	0.60"	18	2	851	11.8	0.71"	1.31"	0.65"	0.16"	9'-3"	36.3	18.0	2566
	BTE90	90'-0"	91'-4"	5.00	6.00	0.60"	18	2	851	11.2	0.73"	1.36"	0.81"	0.20"	9'-3"	38.4	19.0	2672
	BTE95	95'-0"	96'-4"	5.00	6.00	0.60"	20	4	1021	20.4	0.96"	1.77"	1.06"	0.27"	9'-3"	40.5	20.0	2782
	BTE100	100'-0"	101'-4"	5.00	6.00	0.60"	22	4	1106	19.5	1.11"	2.06"	1.23"	0.31"	9'-3"	42.6	21.1	2891
	BTE105	105'-0"	106'-4"	5.00	6.00	0.60"	24	4	1191	18.6	1.31"	2.42"	1.48"	0.37"	9'-3"	44.7	22.1	3035
	BTE110	110'-0"	111'-4"	5.00	6.00	0.60"	26	6	1361	25.6	1.61"	2.58"	1.78"	0.45"	9'-3"	46.8	23.1	3192
	BTE115	115'-0"	116'-4"	5.50	6.00	0.60"	28	6	1446	24.6	1.78"	2.85"	2.12"	0.53"	9'-3"	48.9	24.2	3409
	BTE120	120'-0"	121'-4"	5.50	6.00	0.60"	30	8	1617	30.0	2.07"	3.31"	2.50"	0.63"	9'-3"	51.0	25.2	3451
	BTE125	125'-0"	126'-4"	6.50	7.50	0.60"	32	8	1702	29.0	2.22"	3.56"	2.75"	0.69"	9'-3"	53.1	26.2	3561
	BTE130	130'-0"	131'-4"	6.50	7.50	0.60"	36	8	1872	28.0	2.64"	4.02"	3.21"	0.80"	9'-3"	55.2	27.3	3670
	BTE135	135'-0"	136'-4"	7.00	8.00	0.60"	40	8	2042	27.0	2.99"	4.79"	3.65"	0.91"	9'-3"	57.3	28.3	3776
	BTE140	140'-0"	141'-4"	7.50	8.50	0.60"	42	10	2213	31.2	3.27"	5.23"	4.14"	1.03"	9'-3"	59.4	29.3	3920
	BTE145	145'-0"	146'-4"	7.50	9.00	0.60"	44	12	2383	34.7	3.59"	5.75"	4.66"	1.17"	9'-3"	61.5	30.4	4107
④ ⑤	BTE150	150'-0"	151'-4"	7.50	9.50	0.60"	48	12	2553	33.7	4.03"	6.45"	5.17"	1.29"	9'-0½"	63.6	31.4	4239

① Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.5") weight of:
1.04 kips/ft. for 9'-3" beam spacing
1.01 kips/ft. for 9'-0½" beam spacing
And one steel diaphragm (0.500 kips) at ℄ of span for BTE60 to BTE120, and two steel diaphragms (0.500 kips) placed 20'-0", on either side of the beam ℄ for BTE125 to BTE150. For different deck and diapragm weights, deflections will be directly proportional.

② Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.
Total beam deflections at ℄ of span, Δ_D , due to weight of deck and diaphragms for detailing purpose:
(A) $\Delta_D=\Delta_I+\Delta_T$ for simple span.
(B) $\Delta_D=\Delta_I+\frac{3}{4}\Delta_T$ for end spans of continuous bridge.
(C) $\Delta_D=\Delta_I+\frac{1}{2}\Delta_T$ for interior spans of continous bridge.

③ Total initial prestress is based on 72.6% f's, f's= 270 ksi. and As= 0.217 $in.^2$.

④ Requires a 4500 psi., 28 day compressive strength for cast-in-place slab concrete.

⑤ Includes partial length debonded strands, see individual Beam Sheet for locations and details.

⑥ Calculated design cambers are based on multipliers developed from research in Iowa.

BTE Beam - Data Details

Revision 08-12 - I.M. Reference Note for Sealing Beam Ends Distinguishes Between the Fabricator and Contractor. Deck Panel Option Note was Deleted.
Issued 02-08.
Beams.dgn - 4770s1 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beams – 60'-0" – 150'-0" Spans Data Details – (Sheet 1 of 2)	Standard Sheet 4770s1	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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Reinforcing Bar List

	Beam Bar	Shape	BTE60 No.	BTE60 Length	BTE65 No.	BTE65 Length	BTE70 No.	BTE70 Length	BTE75 No.	BTE75 Length	BTE80 No.	BTE80 Length	BTE85 No.	BTE85 Length	BTE90 No.	BTE90 Length	BTE95 No.	BTE95 Length	BTE100 No.	BTE100 Length	BTE105 No.	BTE105 Length	BTE110 No.	BTE110 Length	BTE115 No.	BTE115 Length	BTE120 No.	BTE120 Length	BTE125 No.	BTE125 Length	BTE130 No.	BTE130 Length	BTE135 No.	BTE135 Length	BTE140 No.	BTE140 Length	BTE145 No.	BTE145 Length	BTE150 No.	BTE150 Length	Beam Bar	
	5a1		12	32'-3"	12	34'-9"	12	37'-3"	12	39'-9"	12	24'-0"	12	26'-6"	12	29'-0"	12	31'-6"	12	34'-0"	12	36'-6"	12	39'-0"	12	23'-2"	12	25'-8"	12	28'-2"	12	30'-8"	12	33'-2"	12	35'-8"	12	38'-2"	12	22'-5"	5a1	
	5a2		—	—	—	—	—	—	—	—	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	12	40'-0"	12	40'-0"	12	40'-0"	12	40'-0"	12	40'-0"	12	40'-0"	12	40'-0"	18	40'-0"	5a2	
ΔΔ	5b1		37	12'-2"	41	12'-2"	45	12'-2"	49	12'-2"	53	12'-2"	57	12'-2"	61	12'-2"	65	12'-2"	69	12'-2"	75	12'-2"	79	12'-2"	87	12'-2"	87	12'-2"	91	12'-2"	95	12'-2"	99	12'-2"	105	12'-2"	111	12'-2"	115	12'-2"	5b1	ΔΔ
ΔΔ*	6b3		52	6'-6"	52	6'-6"	52	6'-6"	52	6'-6"	52	6'-6"	52	6'-6"	52	6'-6"	52	6'-6"	52	6'-6"	52	6'-6"	52	6'-6"	56	6'-6"	56	6'-6"	56	6'-6"	56	6'-6"	56	6'-6"	56	6'-6"	52	6'-6"	52	6'-6"	6b3	ΔΔ*
*	6b4		8	5'-10"	8	5'-10"	8	5'-10"	8	5'-10"	8	5'-10"	8	5'-10"	8	5'-10"	8	5'-10"	8	5'-10"	8	5'-10"	12	5'-10"	12	5'-10"	12	5'-10"	12	5'-10"	12	5'-10"	12	5'-10"	12	5'-10"	20	5'-10"	20	5'-10"	6b4	*
	4c1		87	2'-7"	93	2'-7"	97	2'-7"	101	2'-7"	107	2'-7"	113	2'-7"	117	2'-7"	123	2'-7"	129	2'-7"	135	2'-7"	141	2'-7"	143	2'-7"	149	2'-7"	155	2'-7"	161	2'-7"	165	2'-7"	171	2'-7"	177	2'-7"	183	2'-7"	4c1	
	4d1		67	6'-5"	71	6'-5"	75	6'-5"	79	6'-5"	83	6'-5"	87	6'-5"	91	6'-5"	95	6'-5"	99	6'-5"	105	6'-5"	111	6'-5"	117	6'-5"	117	6'-5"	121	6'-5"	125	6'-5"	129	6'-5"	135	6'-5"	143	6'-5"	147	6'-5"	4d1	
	4e1		34	3'-2"	34	3'-2"	34	3'-2"	34	3'-2"	34	3'-2"	34	3'-2"	34	3'-2"	34	3'-2"	34	3'-2"	34	3'-2"	36	3'-2"	34	3'-2"	34	3'-2"	34	3'-2"	34	3'-2"	34	3'-2"	34	3'-2"	36	3'-2"	36	3'-2"	4e1	
	4h1		8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	8	8'-0"	4h1	

ΔΔ 5b1 and 6b3 bars to be epoxy coated
* 6b3 and 6b4 bars to be used in pairs

Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.

Lifting Loop and Overhang Table

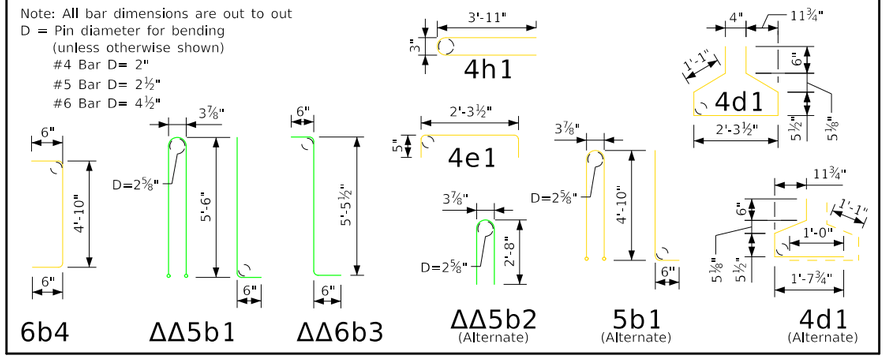
Beams	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
BTE60–BTE75	1	4	2'-0"	**
BTE80–BTE90	2	4	2'-0"	**
BTE95	2	4	2'-0"	10
BTE100	2	4	3'-9"	10
BTE105	2	4	6'-3"	10
BTE110–BTE120	2	4	8'-3"	10
BTE125-BTE135	2	4	9'-3"	14
BTE140	2	4	9'-3"	16
BTE145	2	4	10'-0"	16
BTE150	2	4	12'-3"	16

** In accordance with Article 2407.03, K of the Standard Specifications.

Lifting loops shall carry loads equally.

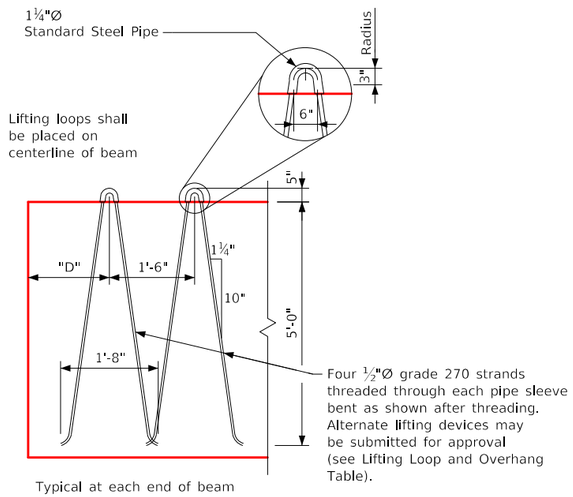
Bent Bar Details

Note: All bar dimensions are out to out
D = Pin diameter for bending
(unless otherwise shown)
#4 Bar D= 2"
#5 Bar D= 2½"
#6 Bar D= 4½"

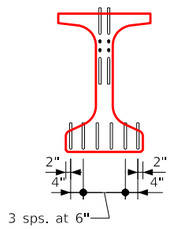


Alternate Bar Notes:

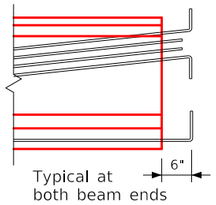
Alternate bars shown in Bent Bar Details may be used in lieu of reinforcing bars shown in bar list. No additional payment shall be made for use of alternate bars.



Lifting Loop Detail

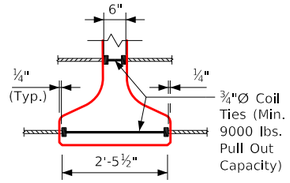


The top and bottom rows of the deflected strands are to be cut with 1'-2" projections which are to be shop bent as shown. The remaining top deflected strands are to be cut with 5" projections. Six bottom strands are to be cut with 1'-6" projections which are to be shop bent as shown. The remaining bottom strands are to be cut off reasonably flush with the concrete.



Strand Projection At Beam Ends When Embedded In Concrete End Diaphragms

Number and exact location of coil ties to be as detailed on specific bridge design.



Coil Tie Detail

BTE Beam - Data Details

Correction 12-13: Coil Tie Detail was Changed to Reflect the Distance Between Coil Tie Anchors Embedded ¼ inch.
Issued 02-08.
Beams.dgn - 4770s2 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beams – 60'-0" – 150'-0" Spans Data Details – (Sheet 2 of 2)	Standard Sheet 4770s2	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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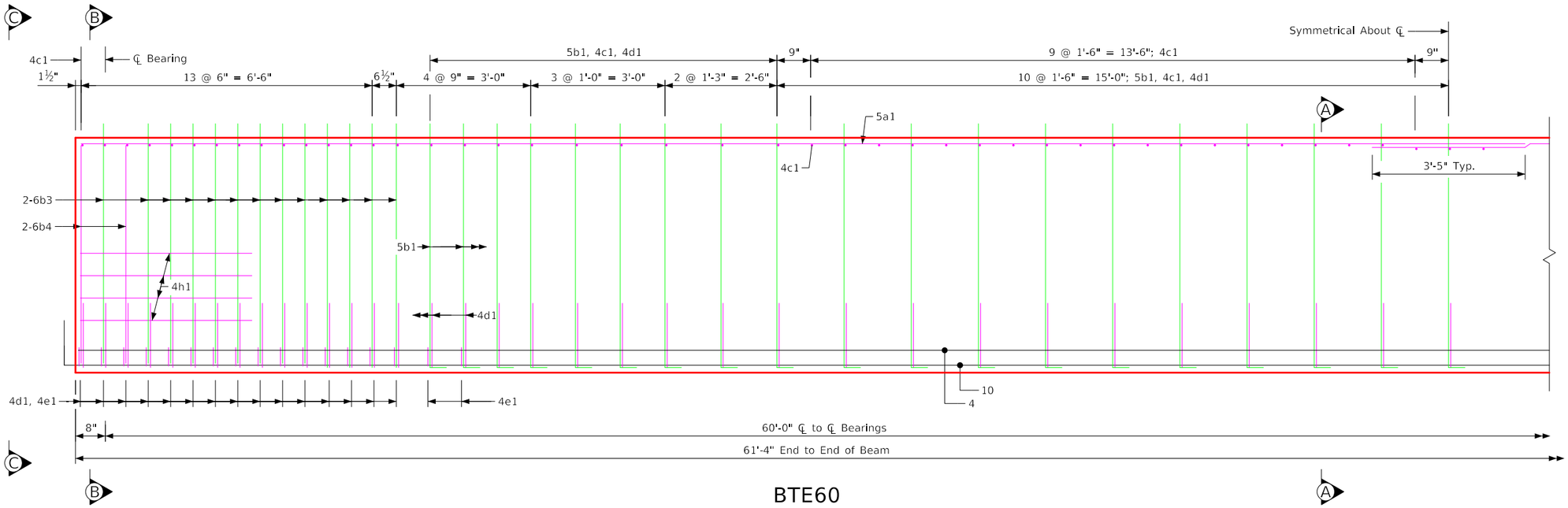
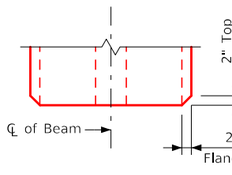
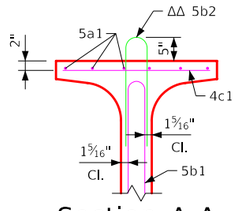


BTE60



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

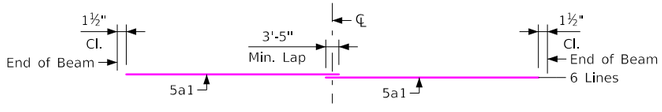


Section A-A (Alternate)

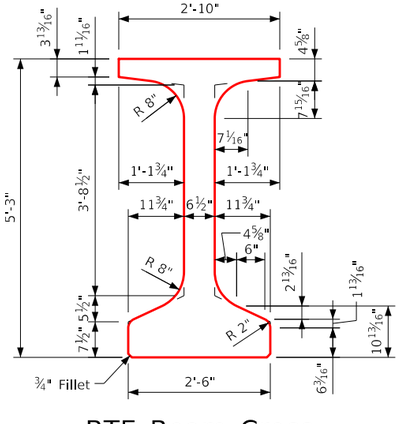
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

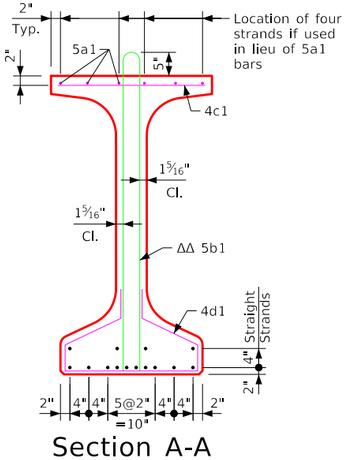
Beam Section Properties



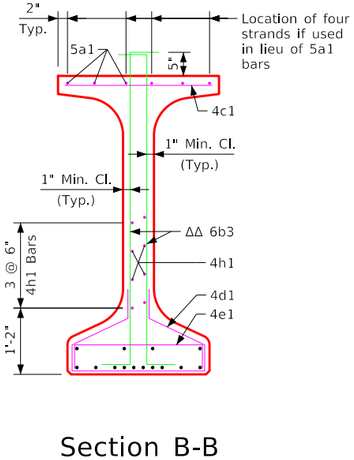
Top Flange Longitudinal Bar Layout



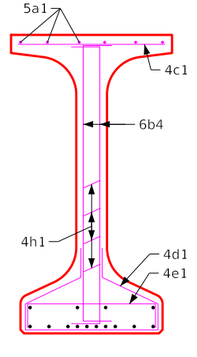
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

ΔΔ Epoxy Coated Bars

BTE60 Beam Details

Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.
Issued 02-08.
Beams.dgn - 4771 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 60'-0" Span	Standard Sheet 4771	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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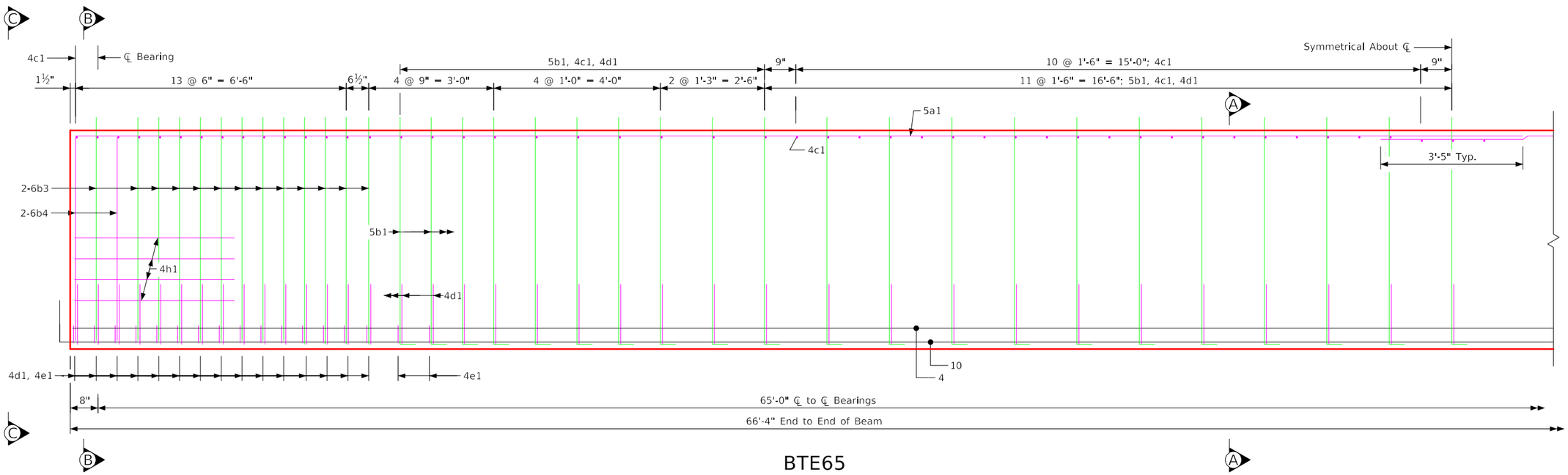
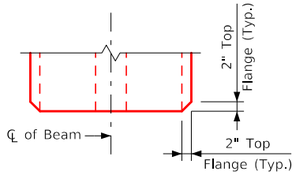
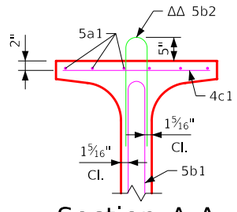


BTE65



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

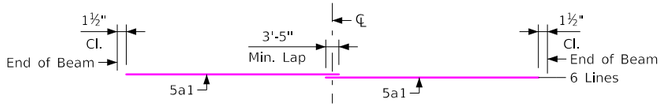


Section A-A (Alternate)

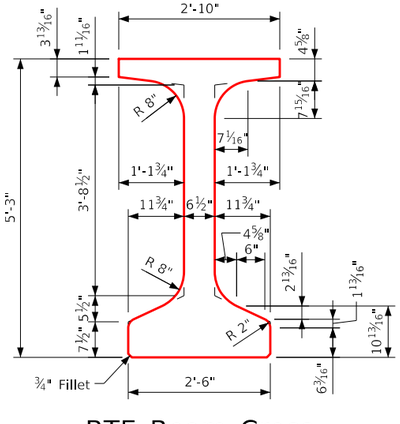
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

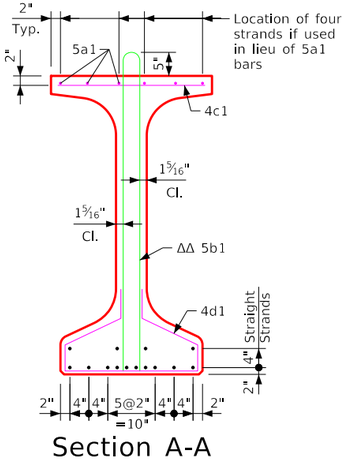
Beam Section Properties



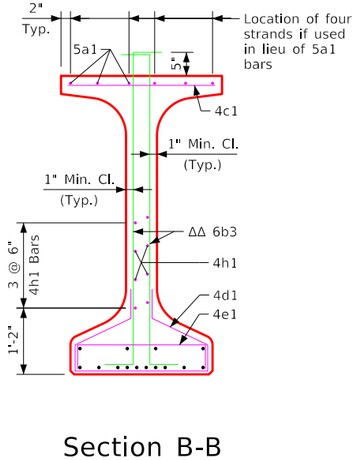
Top Flange Longitudinal Bar Layout



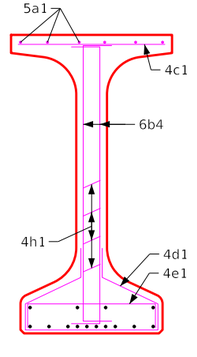
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

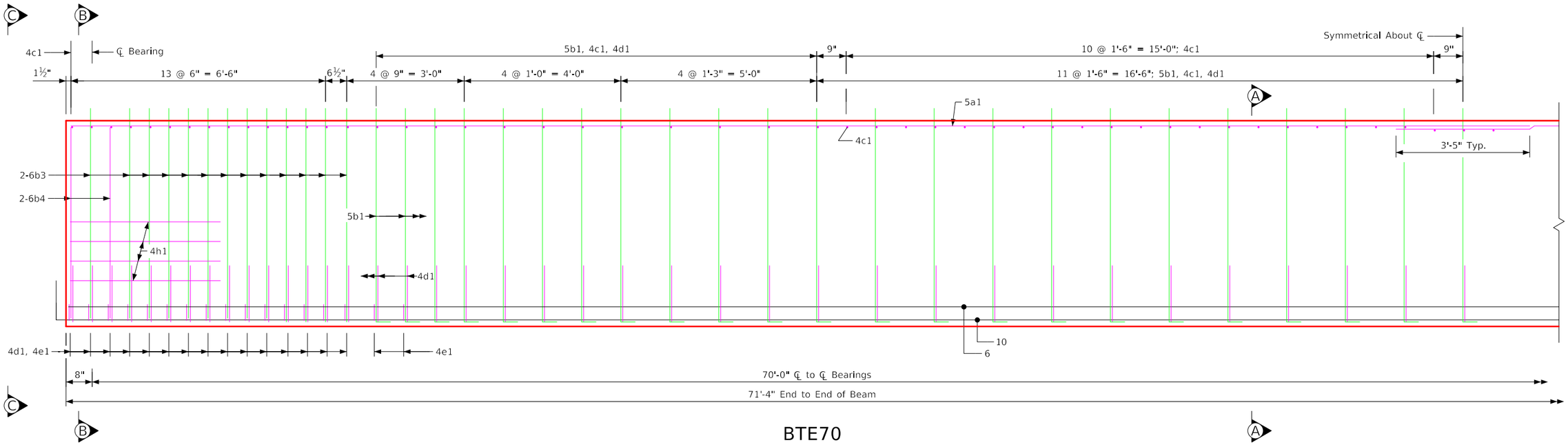
ΔΔ Epoxy Coated Bars

BTE65 Beam Details

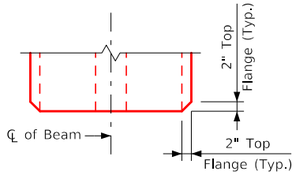
Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.
Issued 02-08.
Beams.dgn - 4772 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 65'-0" Span	Standard Sheet 4772	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:08:09 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

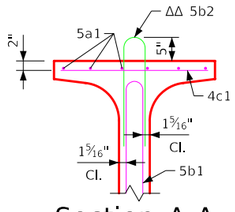


BTE70



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

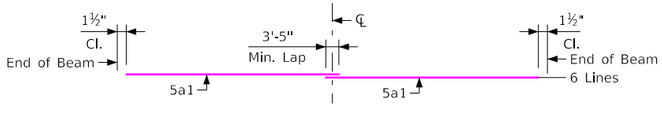


Section A-A
(Alternate)

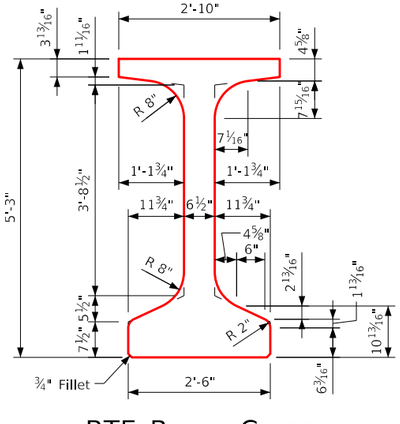
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

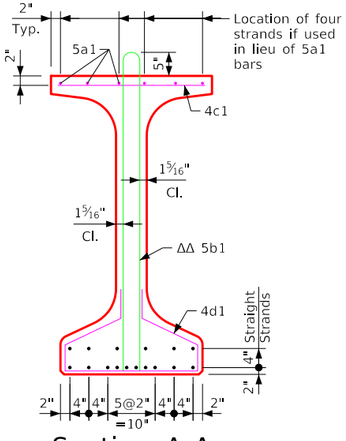
Beam Section Properties



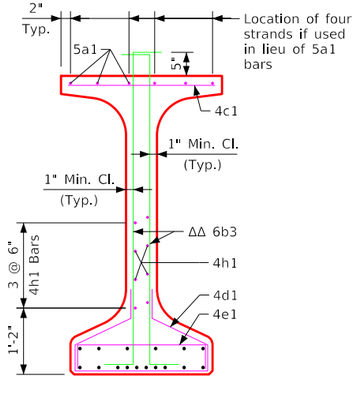
Top Flange Longitudinal Bar Layout



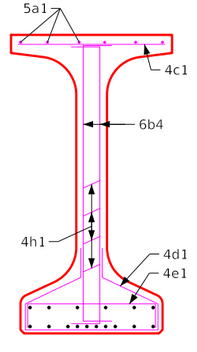
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

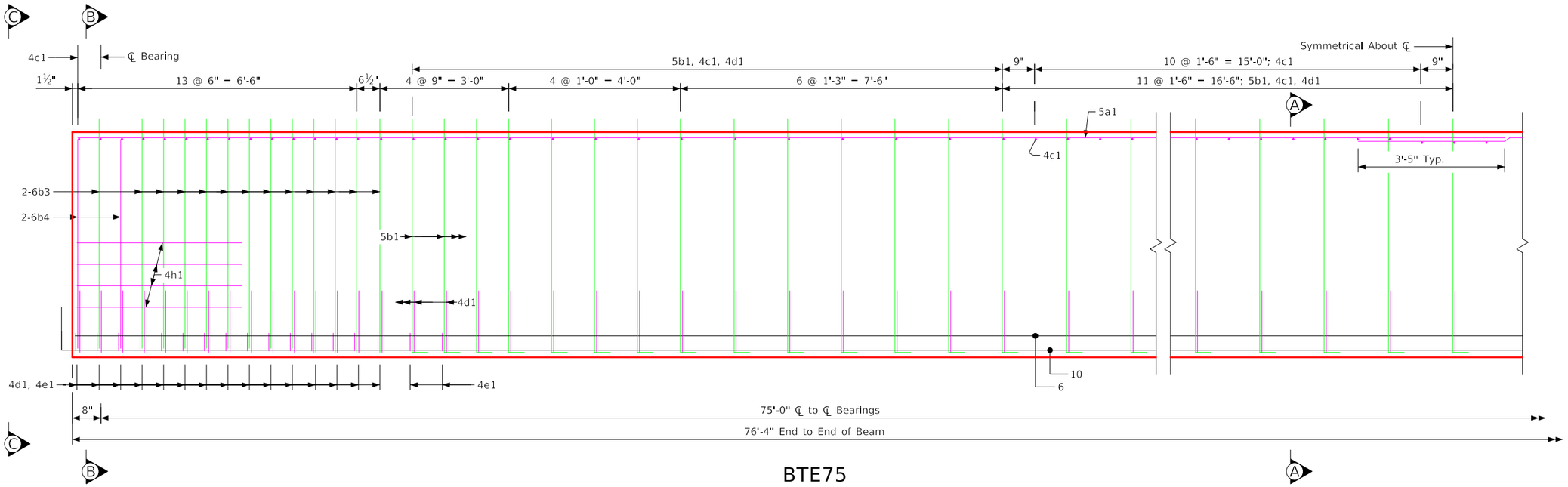
ΔΔ Epoxy Coated Bars

BTE70 Beam Details

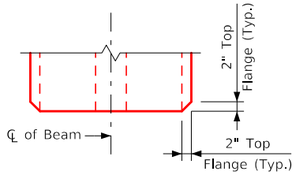
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 70'-0" Span	Standard Sheet 4773	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.
Issued 02-08.
Beams.dgn - 4773 - This Sheet Re-Issued 04-2024. Sheet Format Update.

4:08:09 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

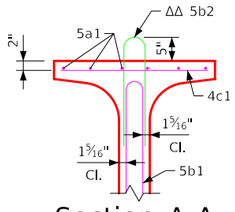


BTE75



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

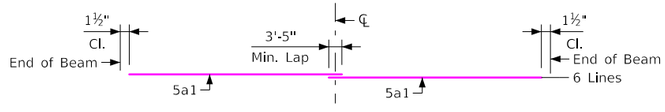


Section A-A
(Alternate)

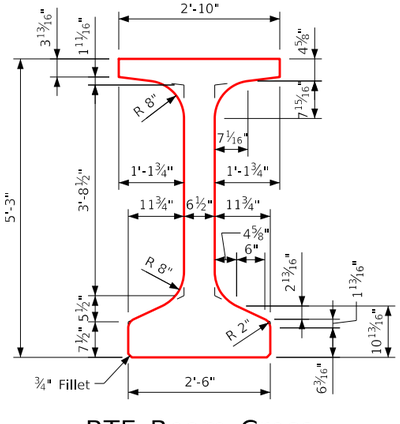
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

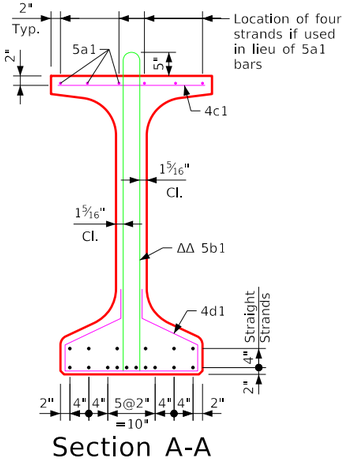
Beam Section Properties



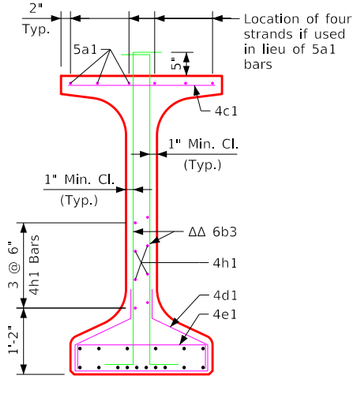
Top Flange Longitudinal Bar Layout



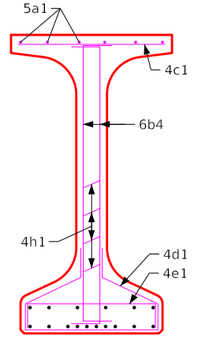
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

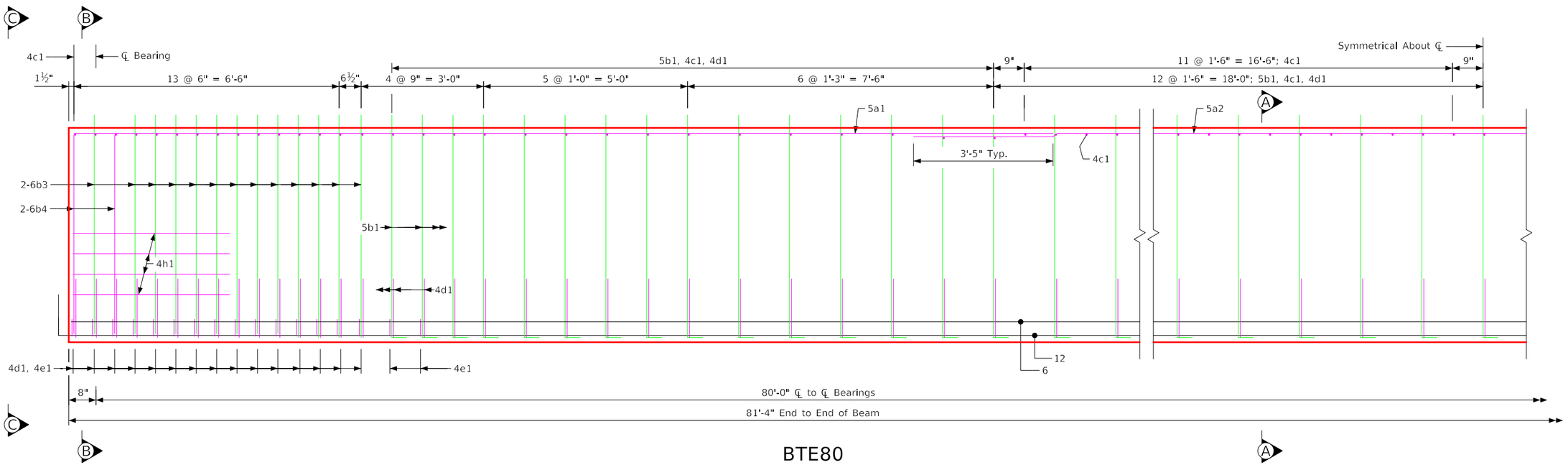
ΔΔ Epoxy Coated Bars

BTE75 Beam Details

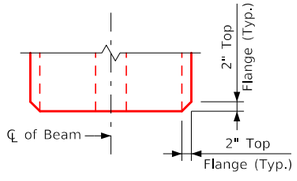
Issued 02-08.
Beams.dgn - 4774 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 75'-0" Span	Standard Sheet 4774	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:08:11 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

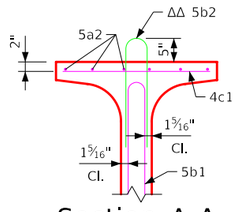


BTE80



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

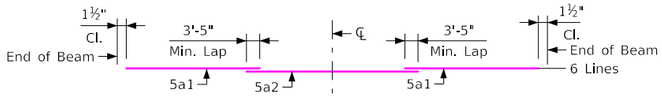


Section A-A
(Alternate)

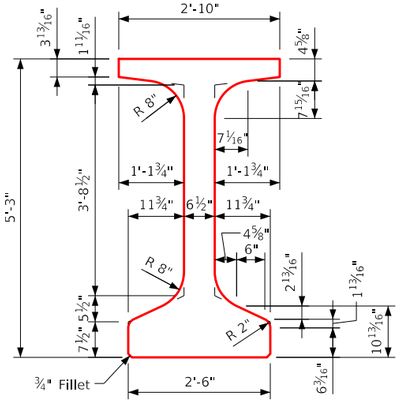
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

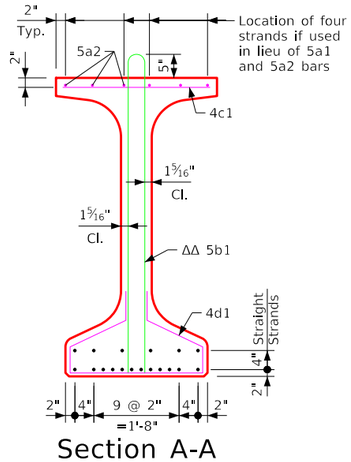
Beam Section Properties



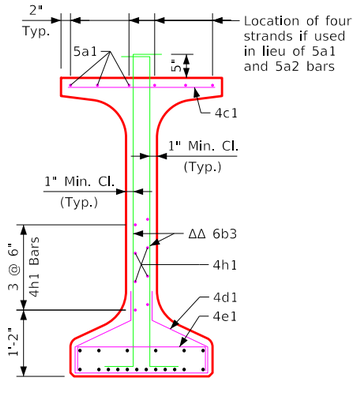
Top Flange Longitudinal Bar Layout



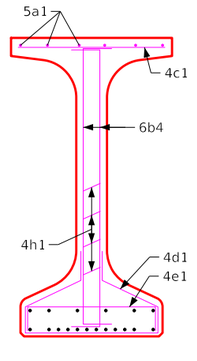
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

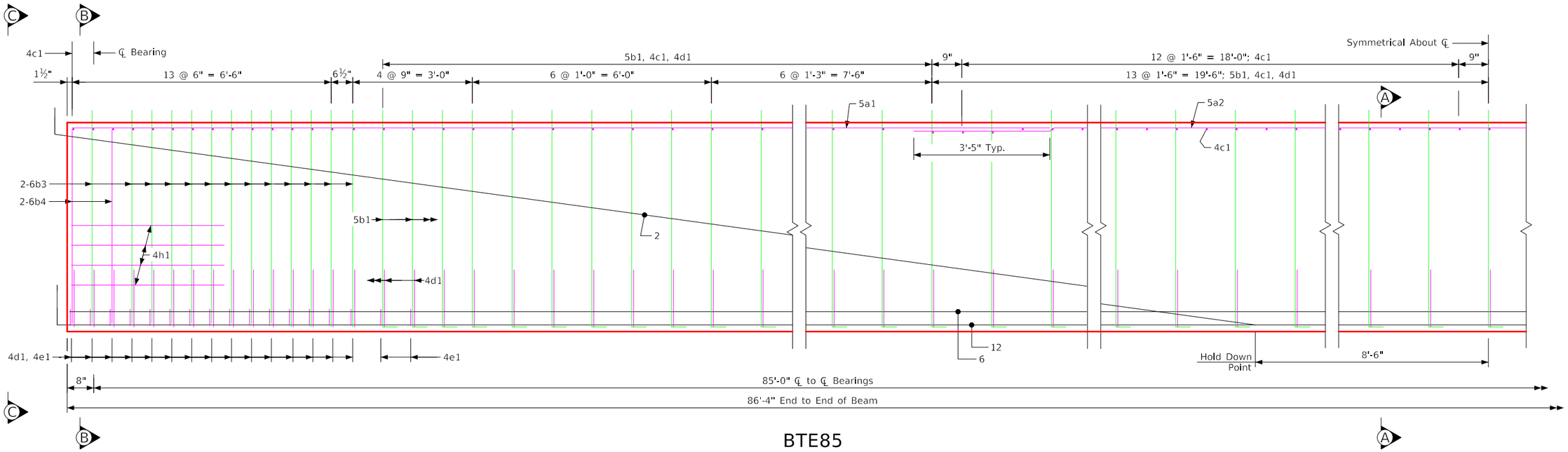
ΔΔ Epoxy Coated Bars

BTE80 Beam Details

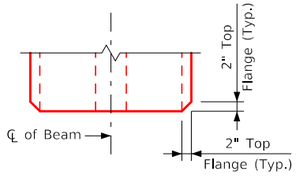
Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4775 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 80'-0" Span	Standard Sheet 4775	COUNTY	PROJECT NUMBER	SHEET NUMBER	

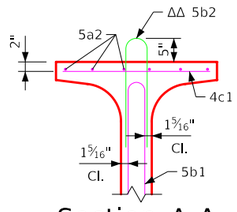
4:08:12 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



BTE85



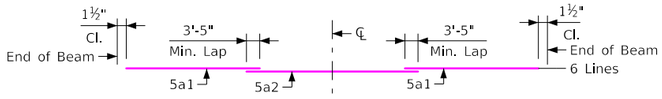
Top View The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



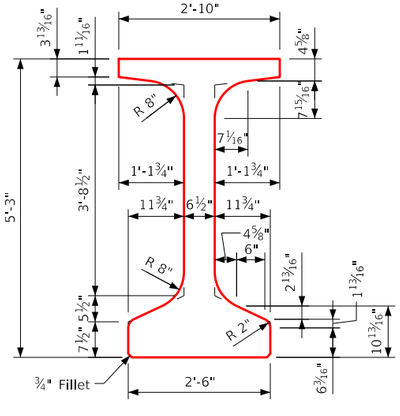
Section A-A
(Alternate)
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

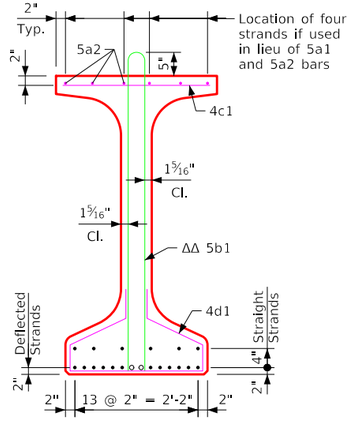
Beam Section Properties



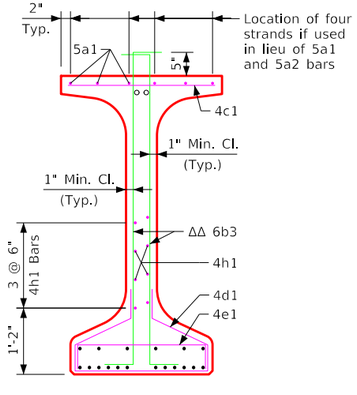
Top Flange Longitudinal Bar Layout



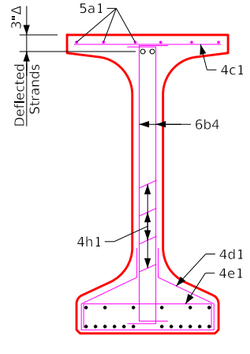
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

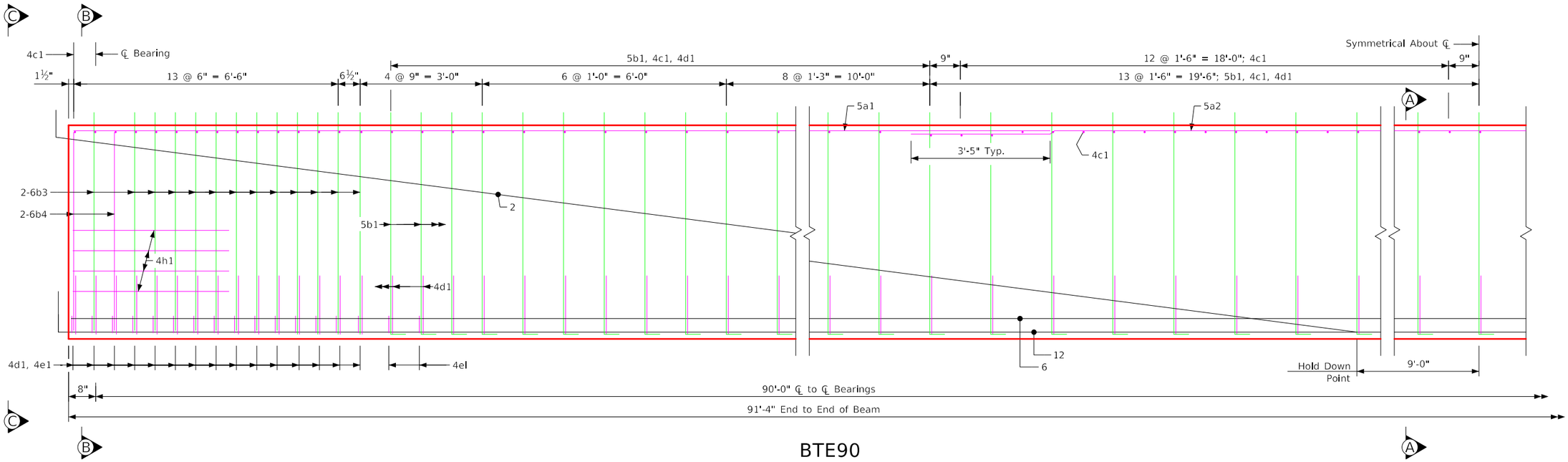
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE85 Beam Details

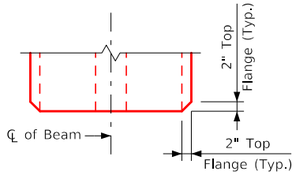
Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4776 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 85'-0" Span	Standard Sheet 4776	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:08:13 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

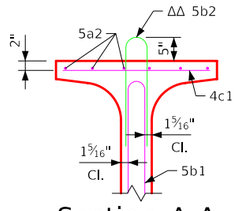


BTE90



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

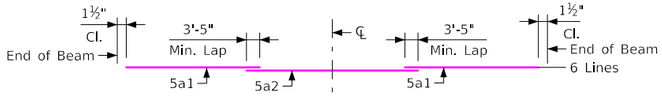


Section A-A
(Alternate)

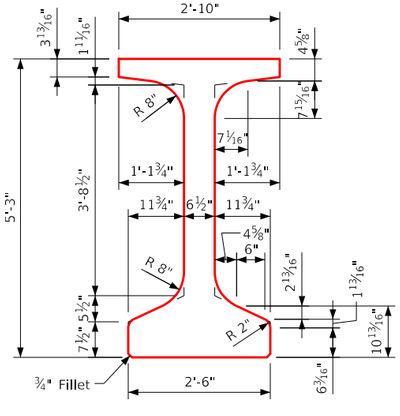
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

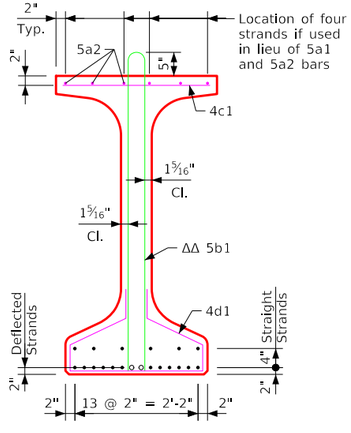
Beam Section Properties



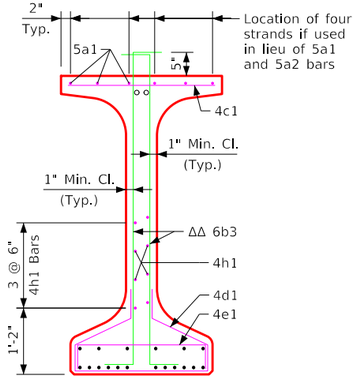
Top Flange Longitudinal Bar Layout



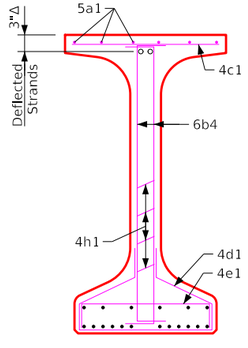
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

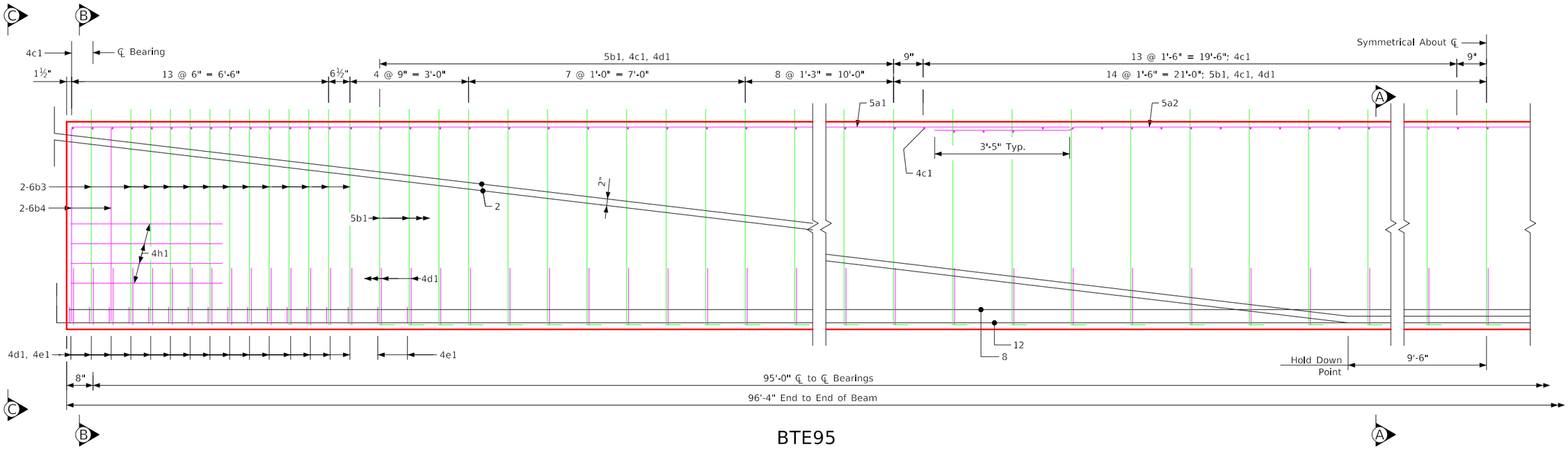
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE90 Beam Details

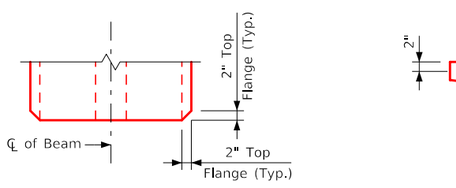
Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4777 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 90'-0" Span	Standard Sheet 4777	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:08:13 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

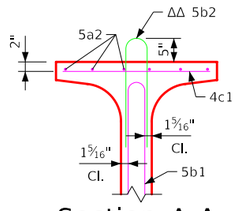


BTE95



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

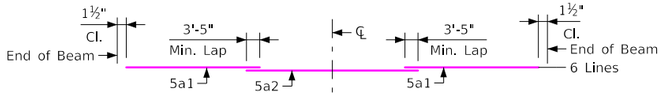


Section A-A
(Alternate)

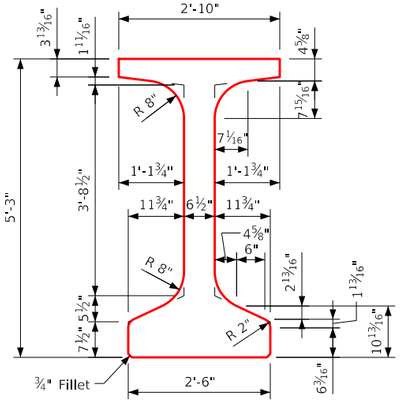
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

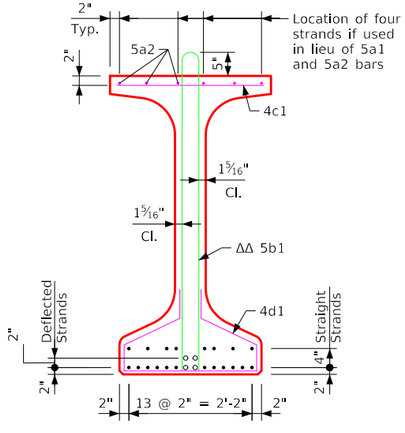
Beam Section Properties



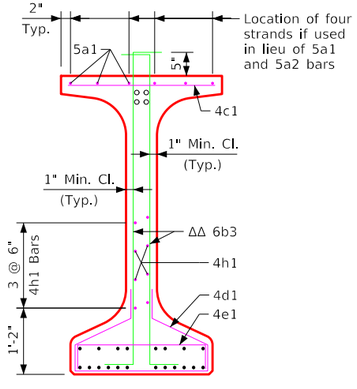
Top Flange Longitudinal Bar Layout



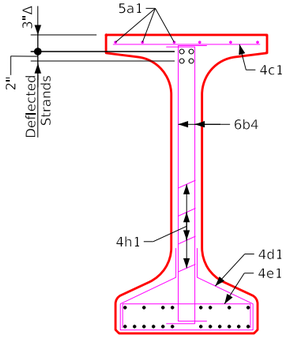
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

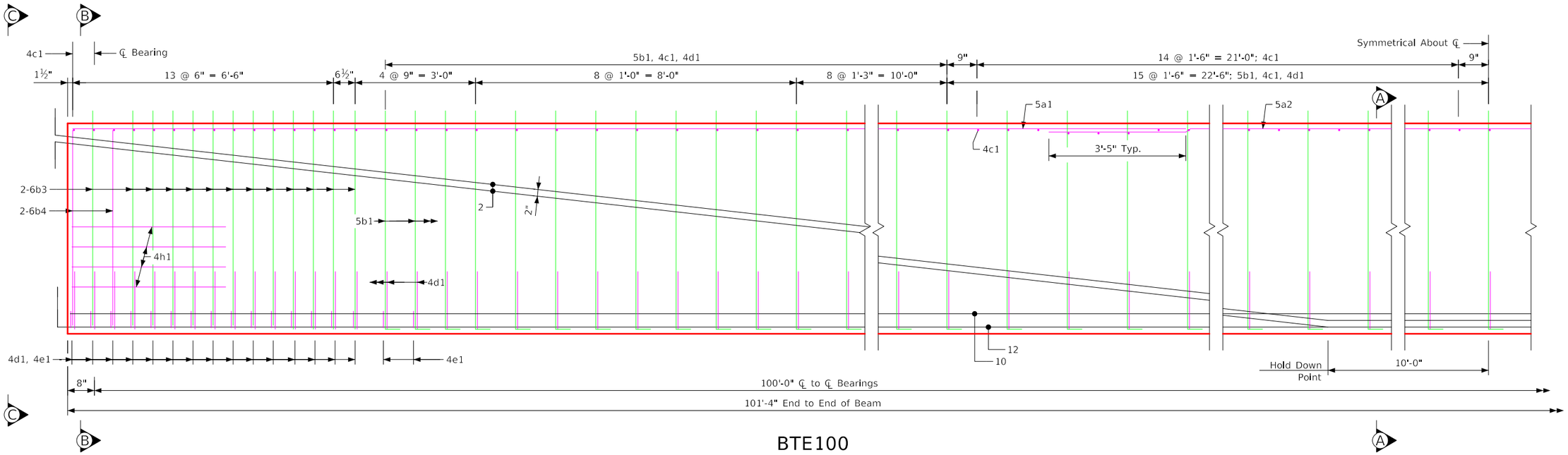
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE95 Beam Details

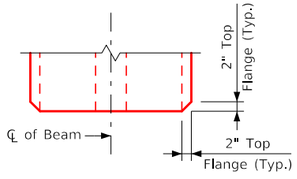
Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4778 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 95'-0" Span	Standard Sheet 4778	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:08:14 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

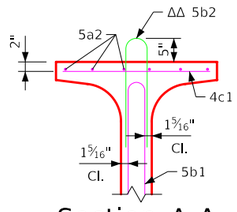


BTE100



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

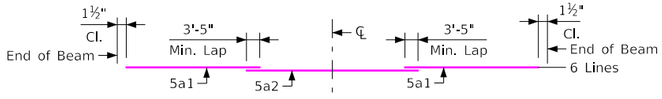


Section A-A (Alternate)

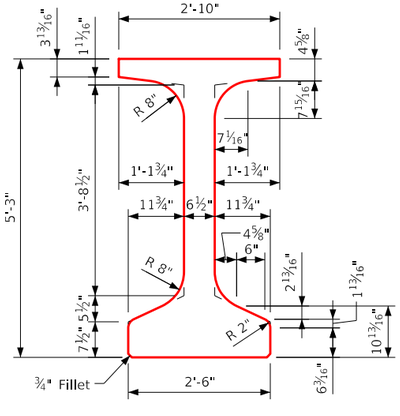
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

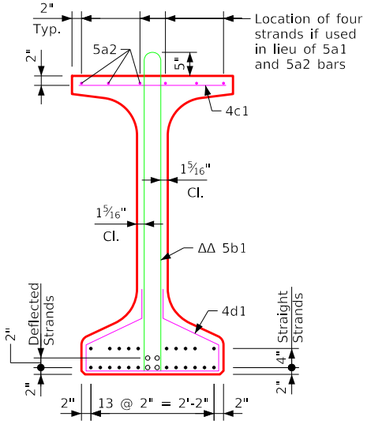
Beam Section Properties



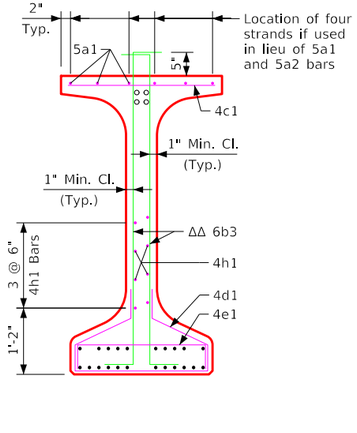
Top Flange Longitudinal Bar Layout



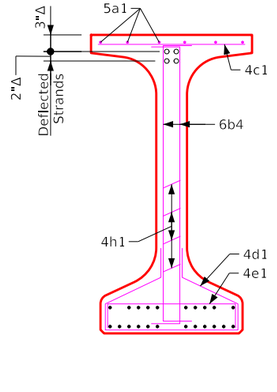
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

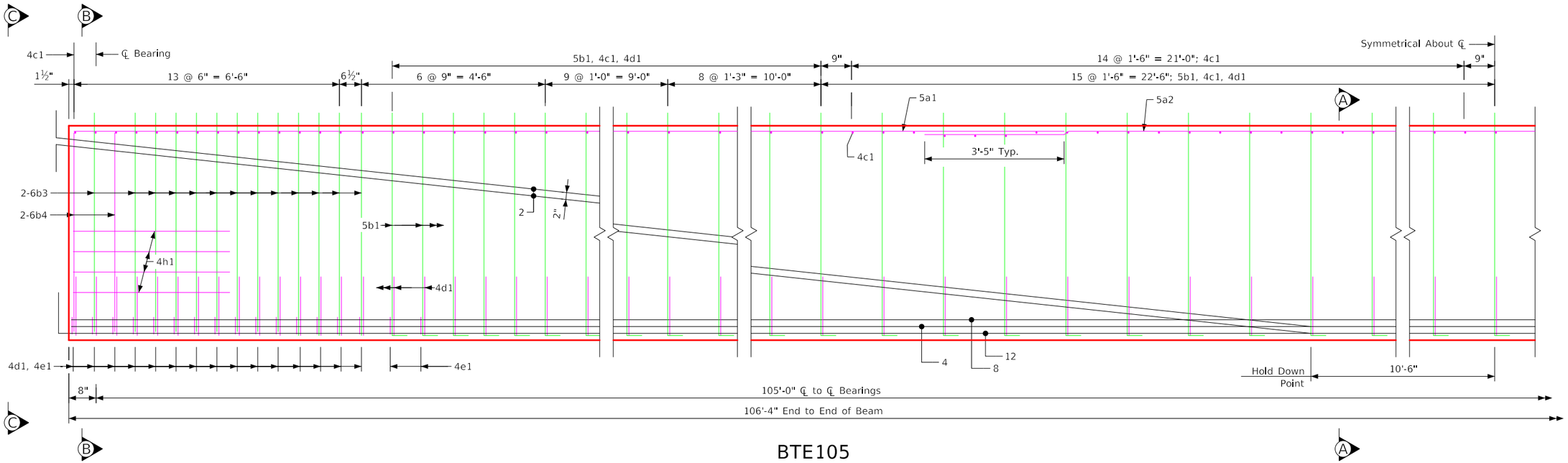
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE100 Beam Details

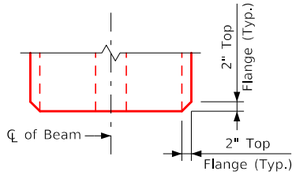
Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4779 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 100'-0" Span	Standard Sheet 4779	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:08:15 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

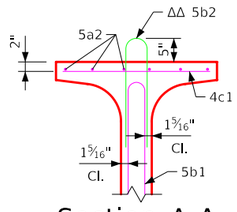


BTE105



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

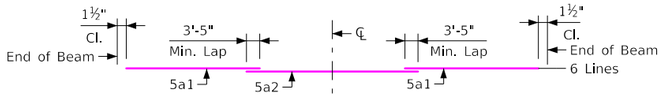


Section A-A (Alternate)

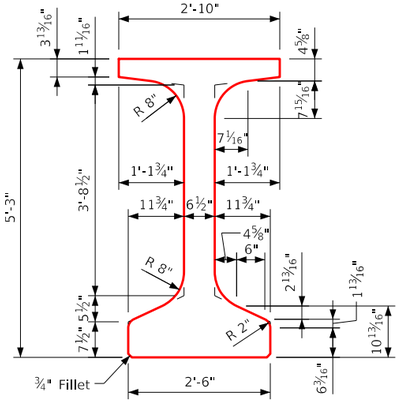
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

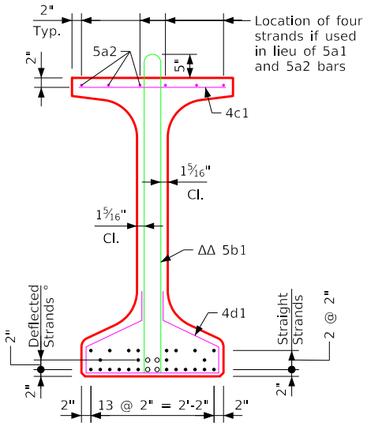
Beam Section Properties



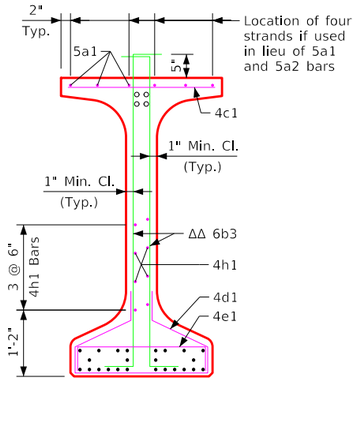
Top Flange Longitudinal Bar Layout



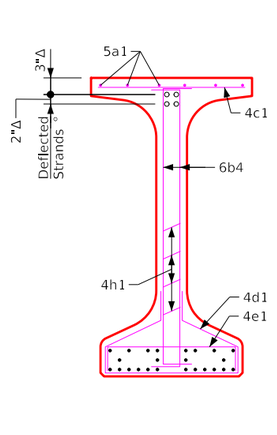
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

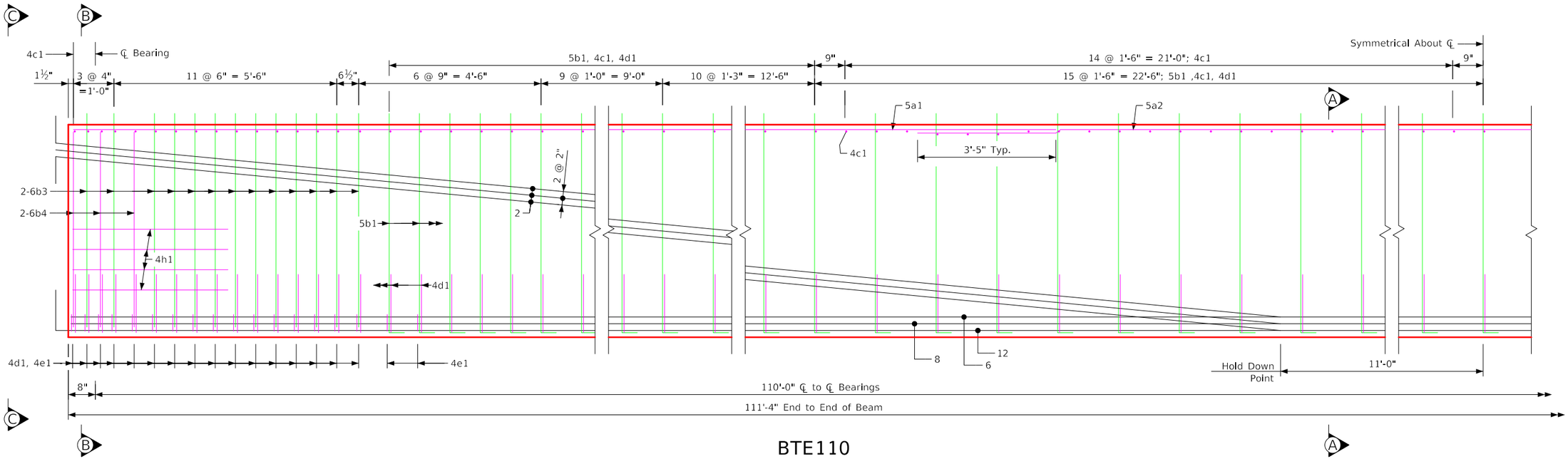
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE105 Beam Details

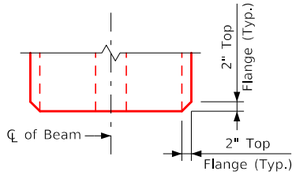
Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4780 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 105'-0" Span	Standard Sheet 4780	COUNTY	PROJECT NUMBER	SHEET NUMBER	

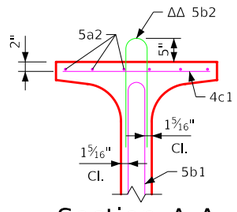
4:08:16 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



BTE110



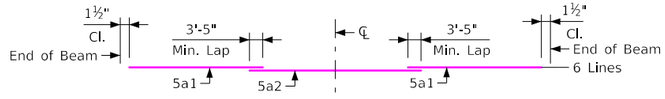
Top View The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



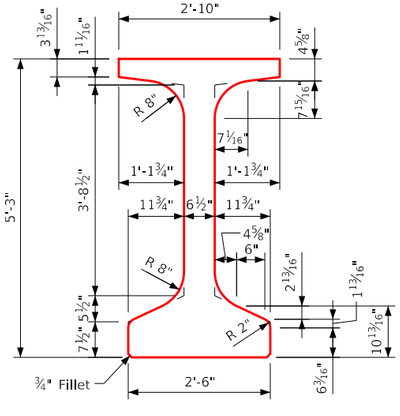
Section A-A
(Alternate)
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

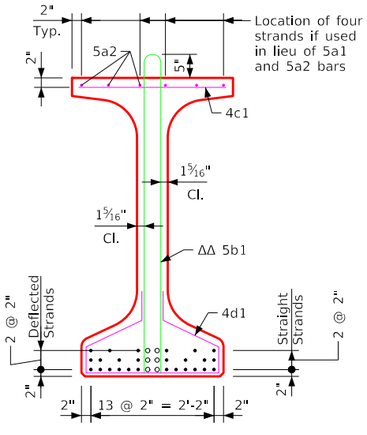
Beam Section Properties



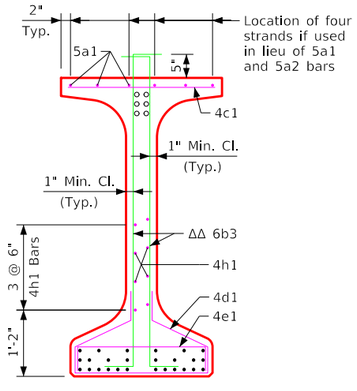
Top Flange Longitudinal Bar Layout



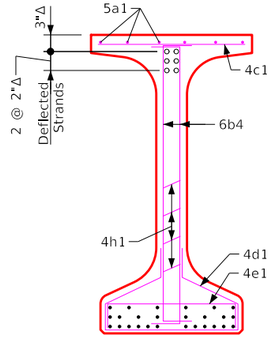
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

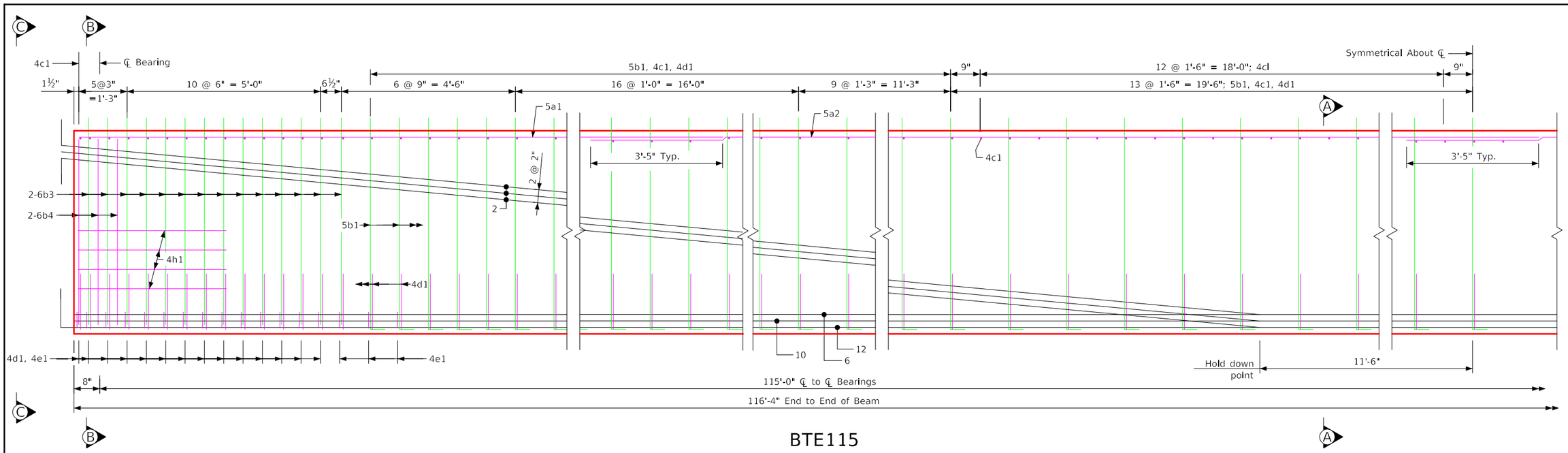
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE110 Beam Details

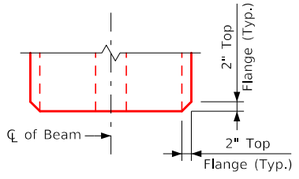
Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4781 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 110'-0" Span	Standard Sheet 4781	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:08:16 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

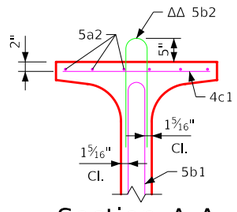


BTE115



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

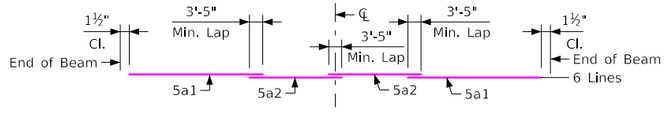


Section A-A (Alternate)

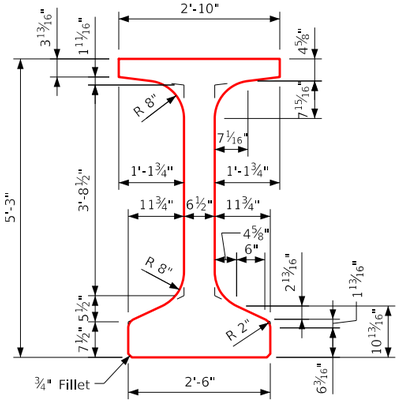
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

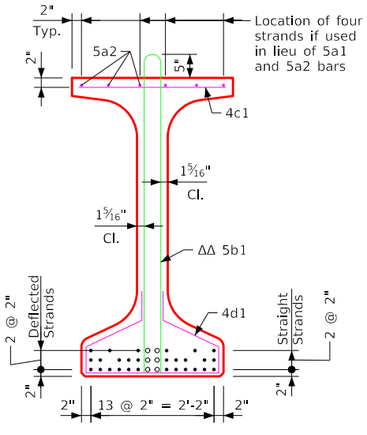
Beam Section Properties



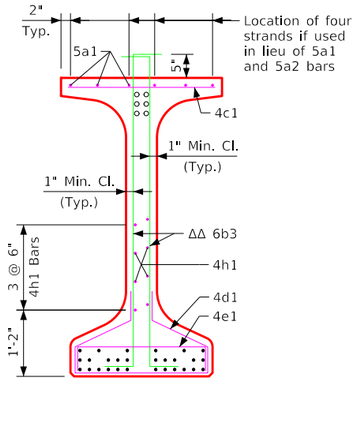
Top Flange Longitudinal Bar Layout



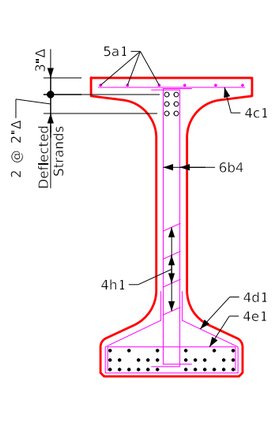
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

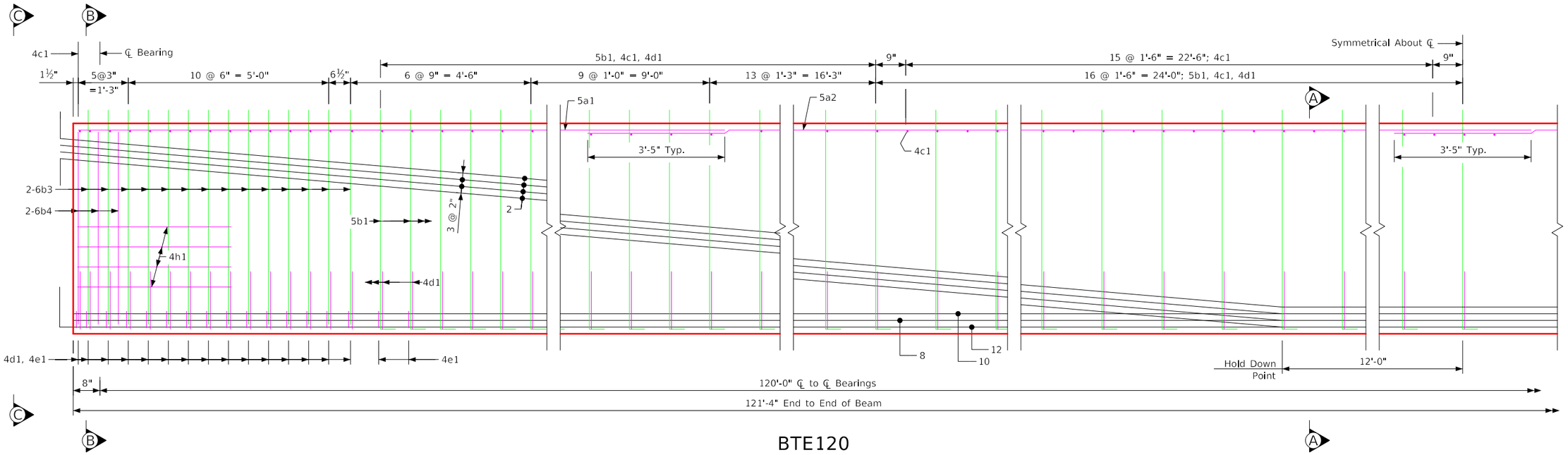
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE115 Beam Details

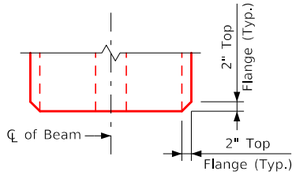
Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4782 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 115'-0" Span	Standard Sheet 4782	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:08:17 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

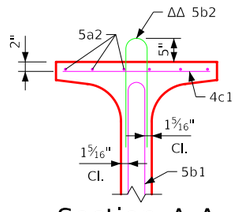


BTE120



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

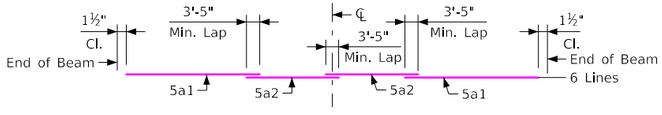


Section A-A (Alternate)

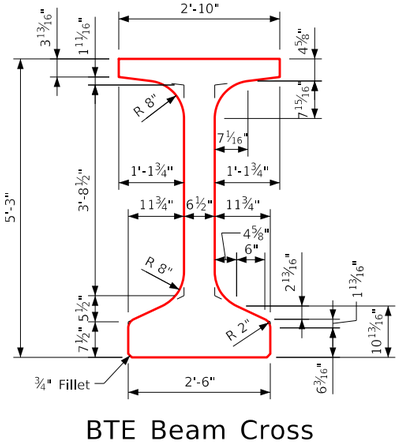
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

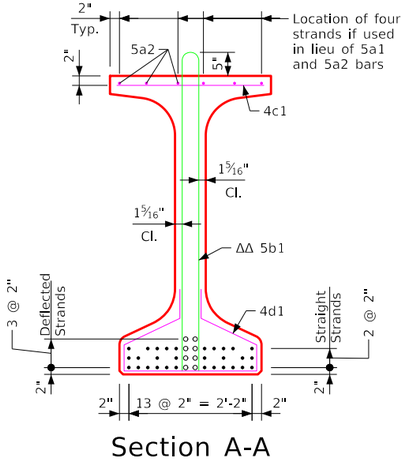
Beam Section Properties



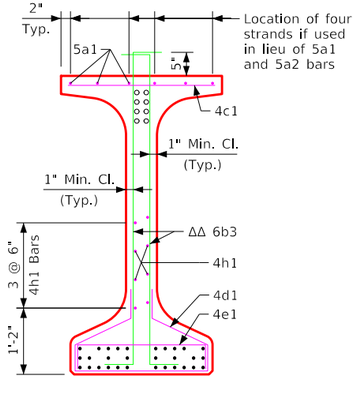
Top Flange Longitudinal Bar Layout



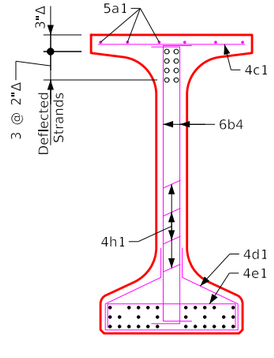
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

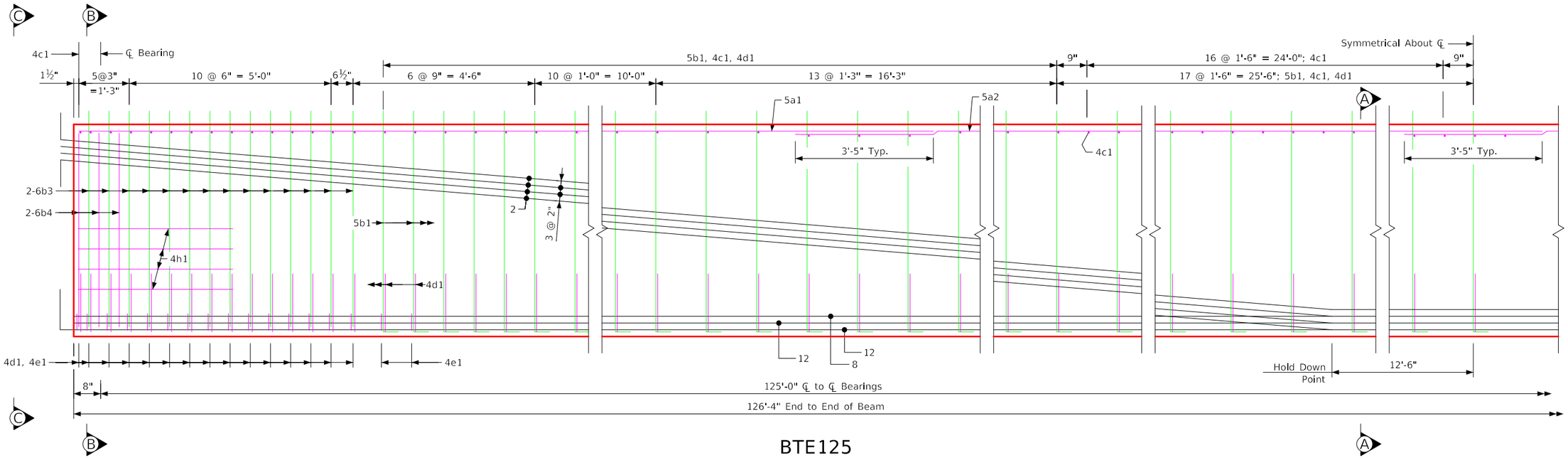
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE120 Beam Details

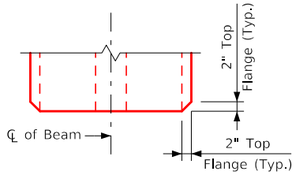
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 120'-0" Span	Standard Sheet 4783	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4783 - This Sheet Re-Issued 04-2024. Sheet Format Update.

4:08:18 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

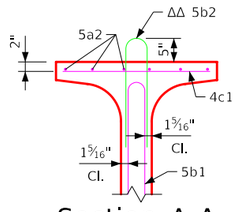


BTE125



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

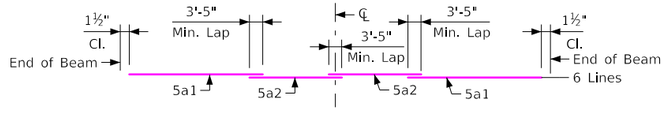


Section A-A (Alternate)

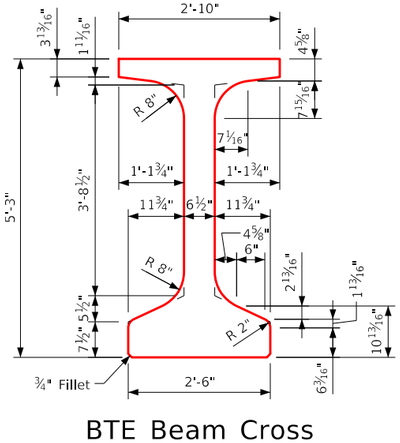
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

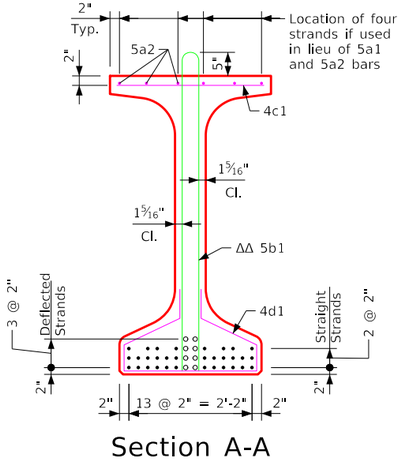
Beam Section Properties



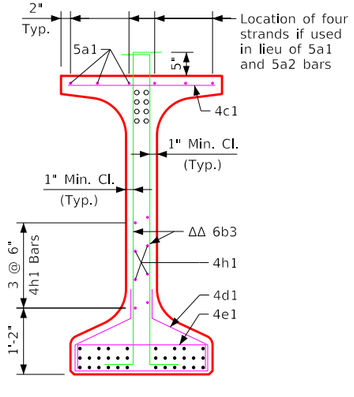
Top Flange Longitudinal Bar Layout



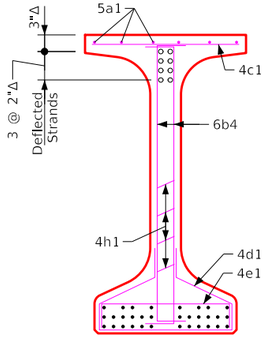
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

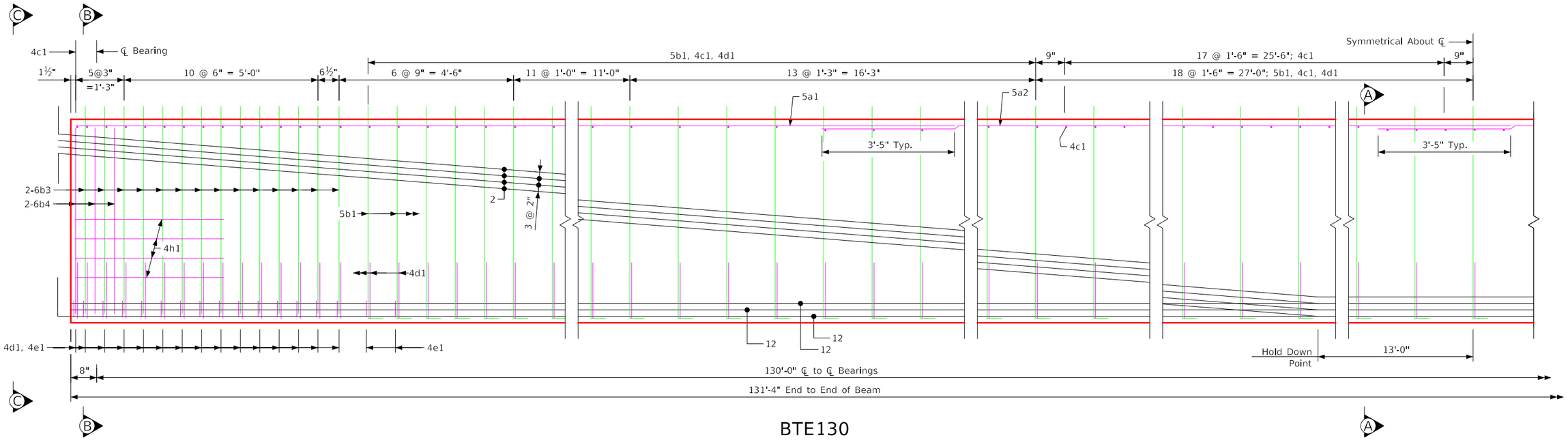
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE125 Beam Details

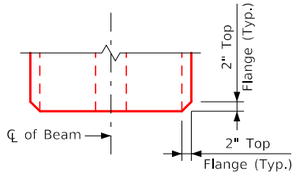
Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4784 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 125'-0" Span	Standard Sheet 4784	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:08:19 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

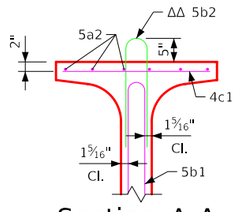


BTE130



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

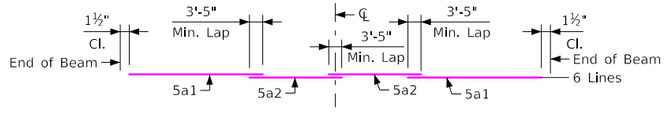


Section A-A
(Alternate)

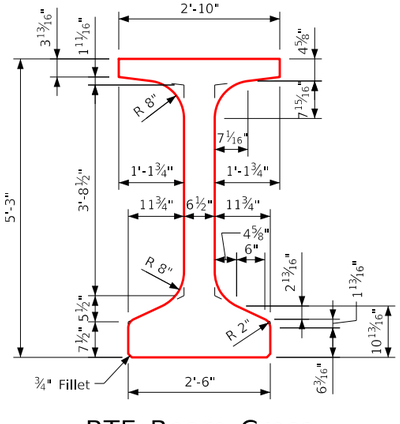
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

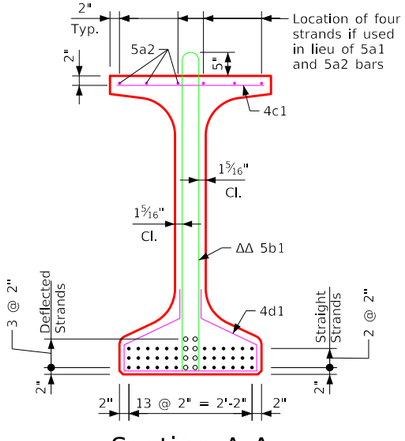
Beam Section Properties



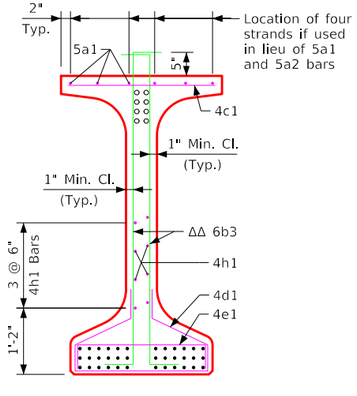
Top Flange Longitudinal Bar Layout



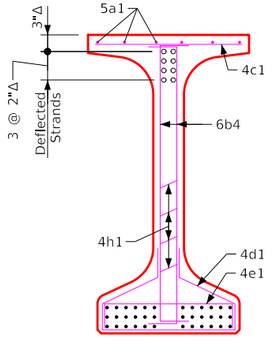
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

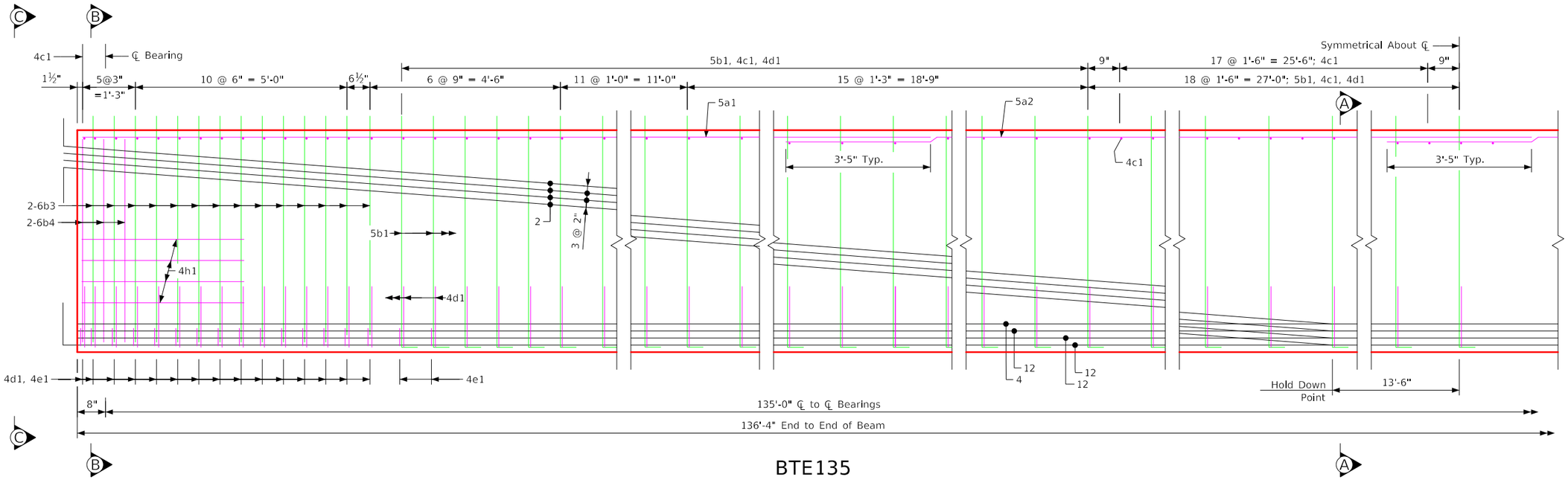
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE130 Beam Details

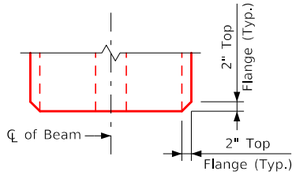
Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4785 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 130'-0" Span	Standard Sheet 4785	COUNTY	PROJECT NUMBER	SHEET NUMBER	

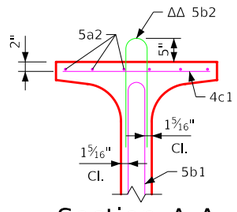
4:08:19 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



BTE135



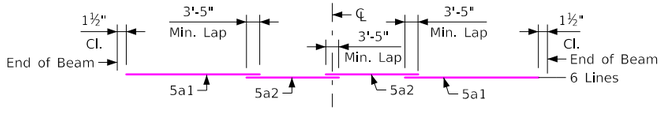
Top View The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



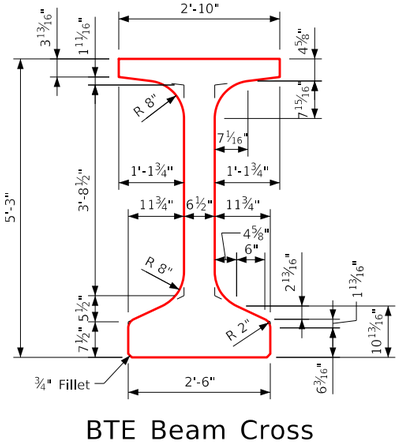
Section A-A (Alternate)
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

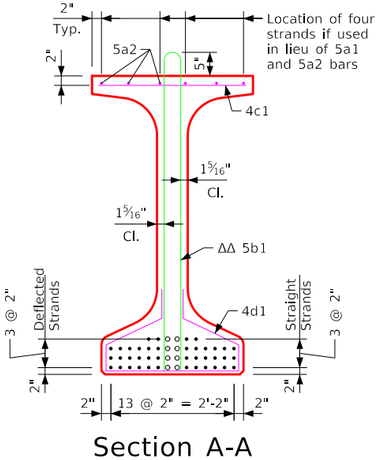
Beam Section Properties



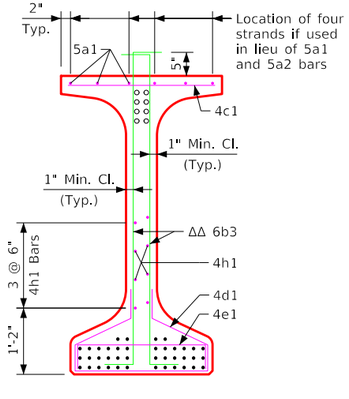
Top Flange Longitudinal Bar Layout



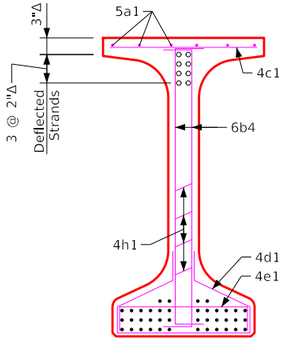
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

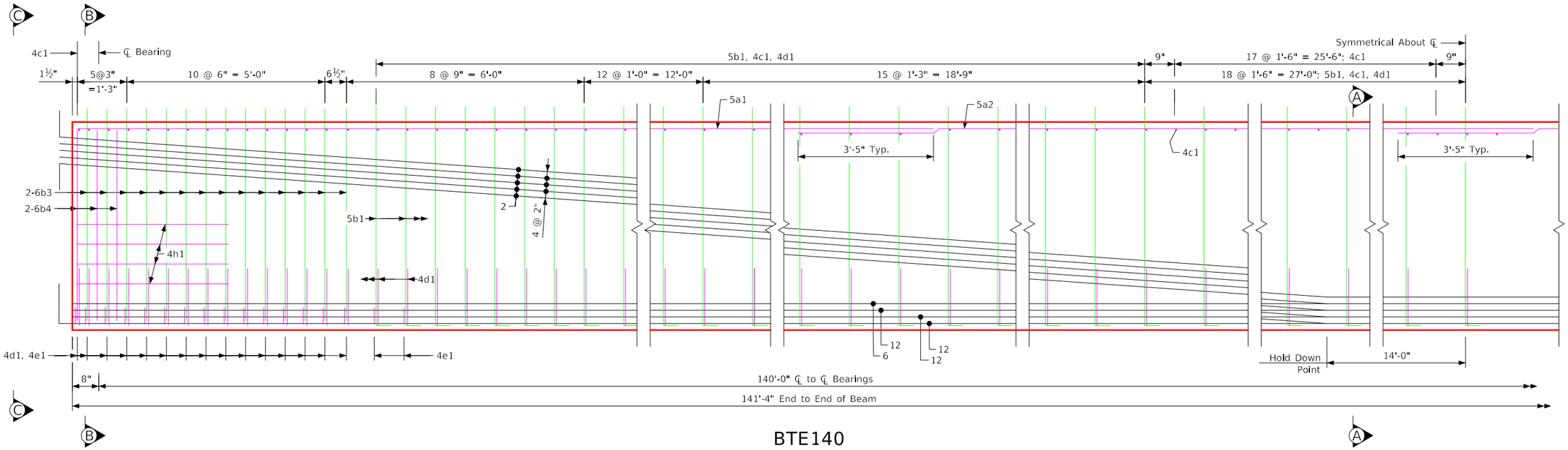
◦ Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE135 Beam Details

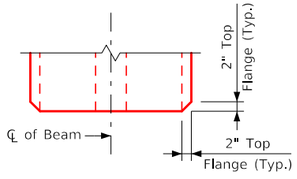
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 135'-0" Span	Standard Sheet 4786	COUNTY	PROJECT NUMBER	SHEET NUMBER	

Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4786 - This Sheet Re-Issued 04-2024. Sheet Format Update.

4:08:20 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

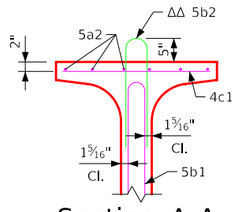


BTE140



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

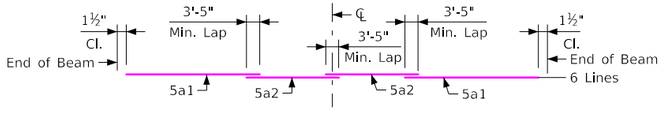


Section A-A (Alternate)

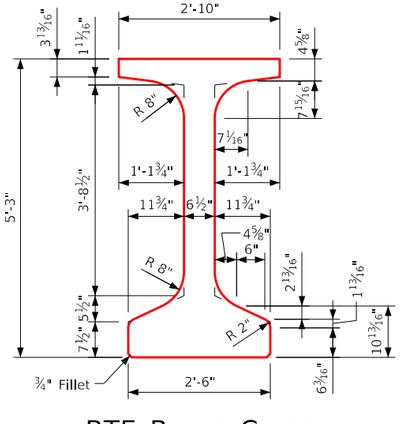
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

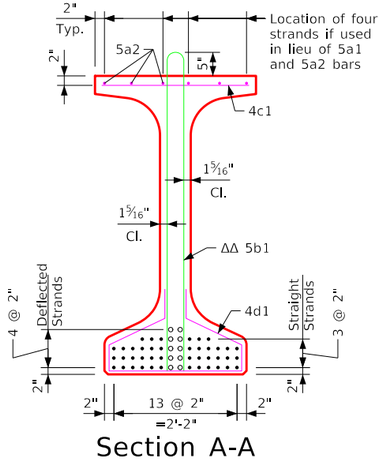
Beam Section Properties



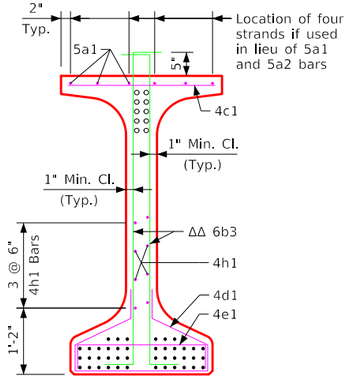
Top Flange Longitudinal Bar Layout



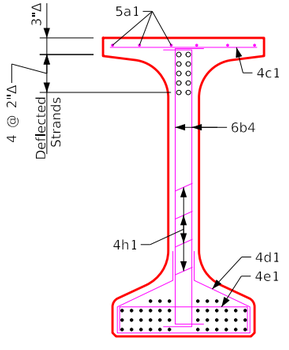
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

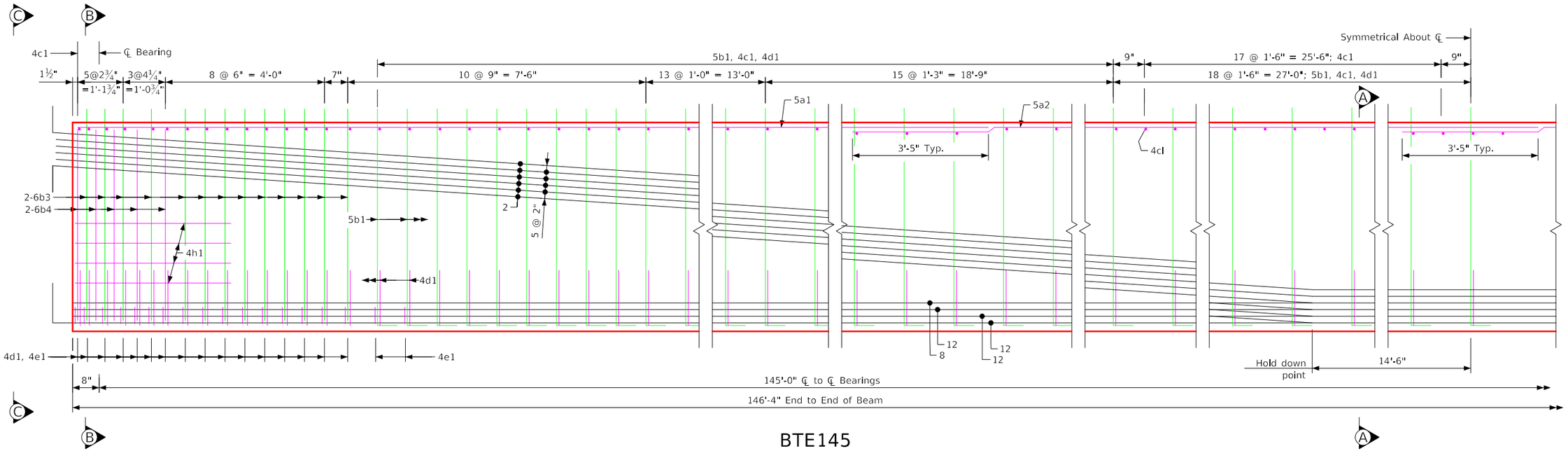
◦ Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE140 Beam Details

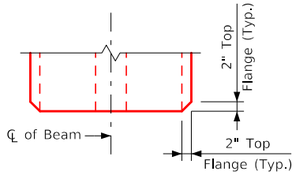
Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4787 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 140'-0" Span	Standard Sheet 4787	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:08:21 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

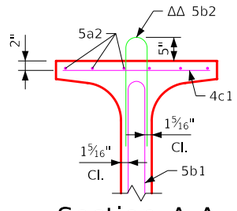


BTE145



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

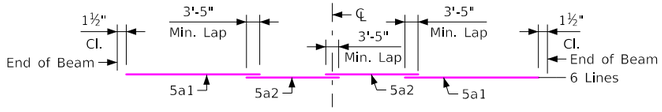


Section A-A
(Alternate)

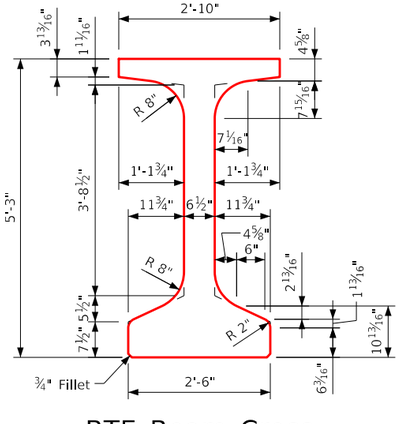
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

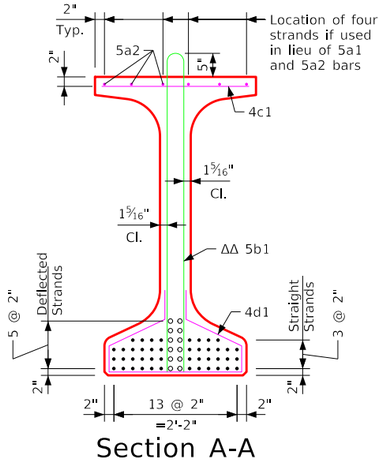
Beam Section Properties



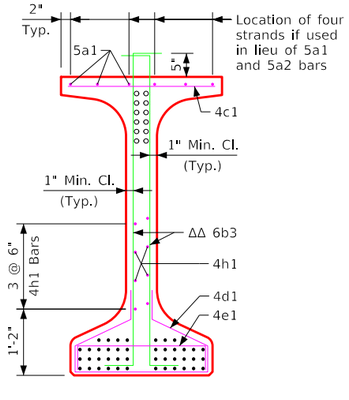
Top Flange Longitudinal Bar Layout



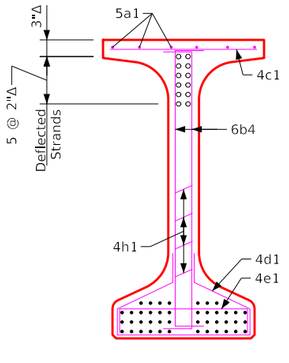
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

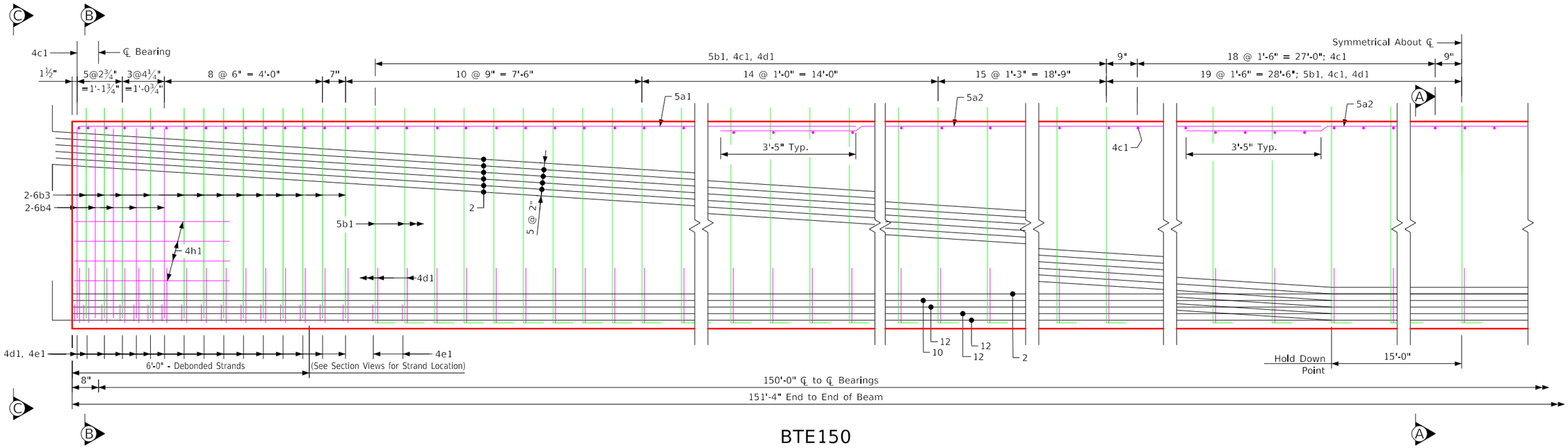
° Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE145 Beam Details

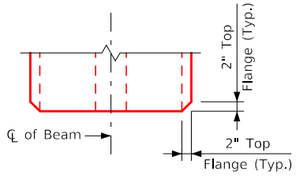
Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2. Changed the 5b4 Bar to 6b4.
Issued 02-08.
Beams.dgn - 4788 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 145'-0" Span	Standard Sheet 4788	COUNTY	PROJECT NUMBER	SHEET NUMBER	

4:08:22 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn

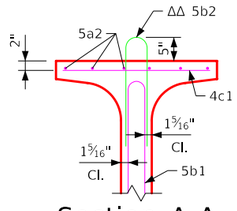


BTE150



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

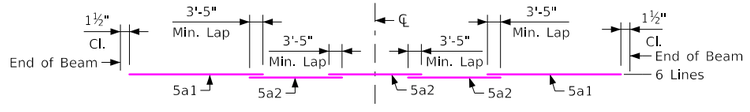


Section A-A
(Alternate)

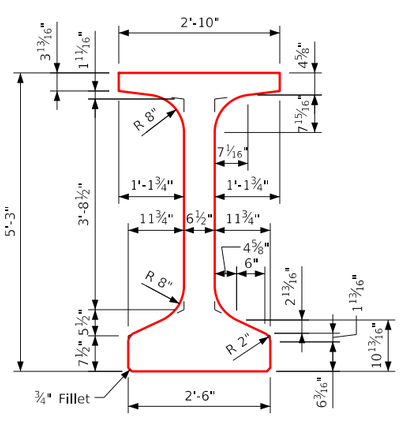
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

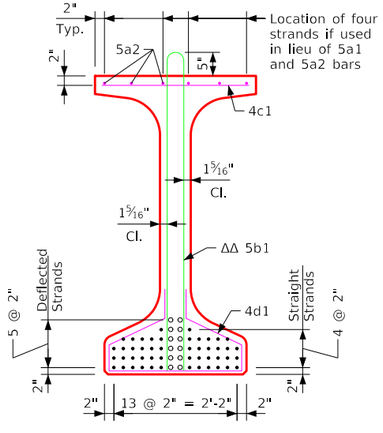
Beam Section Properties



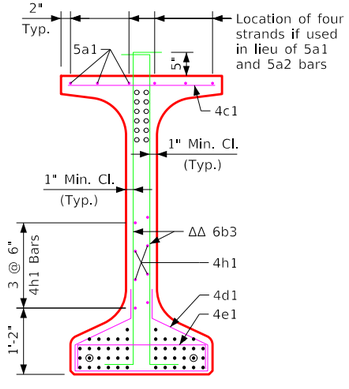
Top Flange Longitudinal Bar Layout



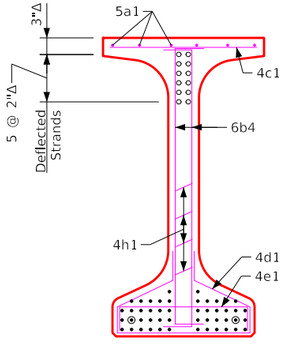
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

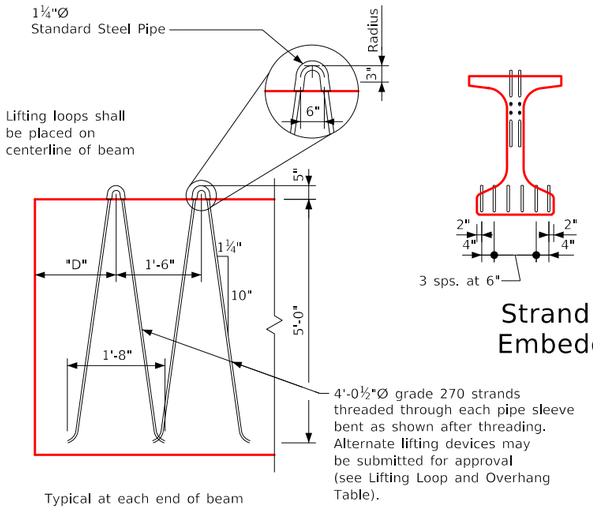
- ° Deflected Strands
- Δ Dimensions at End of Beam
- ΔΔ Epoxy Coated Bars
- ⊙ Strands Debonded 6'-0" from Beam Ends

BTE150 Beam Details

Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4789 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 150'-0" Span	Standard Sheet 4789	COUNTY	PROJECT NUMBER	SHEET NUMBER	

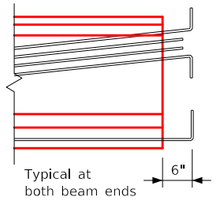
4:08:22 PM 4/9/2024 bkloss pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn



Typical at each end of beam

Lifting Loop Detail

The top and bottom rows of the deflected strands are to be cut with 1'-2" projections which are to be shop bent as shown. The remaining top deflected strands are to be cut with 5" projections. Six bottom strands are to be cut with 1'-6" projections which are to be shop bent as shown. The remaining bottom strands are to be cut off reasonably flush with the concrete.



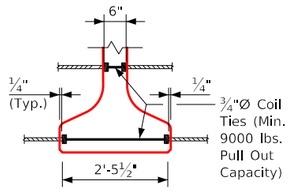
Strand Projection at Beam Ends When Embedded in Concrete End Diaphragm

Lifting Loop and Overhang Table

Beams	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
BTE155	2	4	13'-6"	16

Lifting loops shall carry loads equally.

Number and exact location of coil ties to be as detailed on specific bridge design.



Coil Tie Detail

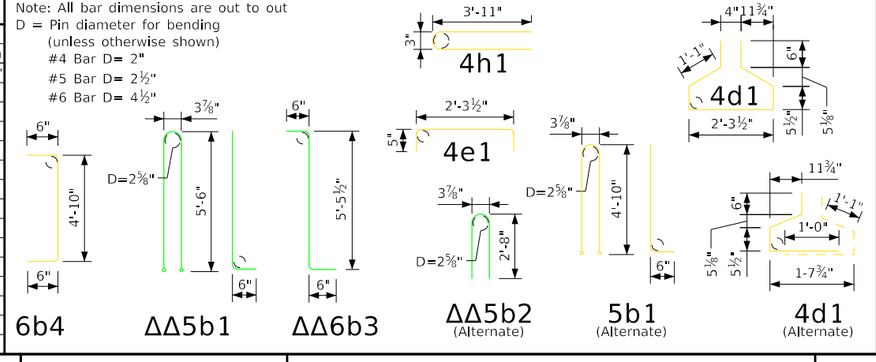
ΔΔ 5b1 and 6b3 bars to be epoxy coated
✱ 6b3 and 6b4 bars to be used in pairs

Reinforcing Bar List

	Beam		BTE155	
	Bar	Shape	No.	Length
	5a1		12	24'-11"
	5a2		18	40'-0"
ΔΔ	5b1		119	12'-2"
ΔΔ✱	6b3		52	6'-6"
✱	6b4		20	5'-10"
	4c1		189	2'-7"
	4d1		151	6'-5"
	4e1		36	3'-2"
	4h1		8	8'-0"

Bent Bar Detail

Note: All bar dimensions are out to out
D = Pin diameter for bending
(unless otherwise shown)
#4 Bar D= 2"
#5 Bar D= 2½"
#6 Bar D= 4½"



BTE Beam Data

	BTE Beam	Span Length ℄–℄ Bearing	Overal Beam Length (L)	Concrete Strength f'ci (ksi.)	Concrete Strength f'c (ksi.)	Strand Size Dia (in.)	Number of Strands Straight	Number of Strands Deflected	Total Initial Prestress ③ (kips)	Hold Down Force (kips)	Camber (in.) ⑤ At Release	Camber (in.) ⑤ After Losses	Deflection (in.) Δ_D Immediate ① (elastic) Δ_I Steel Diaphragm	Deflection (in.) Δ_D Time ② (plastic) Δ_T Steel Diaphragm	Permissible Maximum Spacing HL-93 Loading Steel Diaphragm	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight lb.)
④	BTE155	155'-0"	156'-4"	8.00	10.50	0.60"	50	12	2637	32.6	4.19"	6.70"	5.45"	1.36"	8'-0½"	65.8	32.5	4348

① Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.5") weight of:

0.91 kips/ft. for 8'-0½" beam spacing and two steel diaphragms, (0.500 kips) placed 20'-0", on either side, of the beam centerline. For different deck and diaphragm weight, deflections will be directly proportional.

② Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.

Total beam deflections at ℄ of span, Δ_D, due to weight of deck and diaphragms for detailing purpose:

(A) $\Delta_D=\Delta_I+\Delta_T$ for simple span.

(B) $\Delta_D=\Delta_I+\frac{3}{4}\Delta_T$ for end spans of continuous bridge.

(C) $\Delta_D=\Delta_I+\frac{1}{2}\Delta_T$ for interior spans of continous bridge.

③ Total initial prestress is based on 72.6% f's, f's= 270 ksi. and As= 0.217 $in.^2$.

④ Requires a 4500 psi., 28 day compressive strength for cast-in-place deck concrete.

⑤ Calculated design cambers are based on multipliers developed from research in Iowa.

Design Stresses:

Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications, Series of 2017.
Reinforcing steel in accordance with Section 5, Grade 60.
Concrete in accordance with Section 5.
Prestressing steel in accordance with Section 5, Grade 270.

Specifications:

Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications.
Design: AASHTO LRFD, Series of 2017 with minor modifications.

Alternate Bar Notes:

Alternate bars shown in bent bar details may be used in lieu of reinforcing bars shown in bar list. No additional payment shall be made for use of alternate bars.

Beam Notes:

This beam is designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.

All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.

Hold down points for deflected strands may be moved toward ends of beam a distance of 0.05 L maximum at producer's option.

All prestressing strands except lifting loop strands shall be 0.60 in. nominal diameter (nominal steel area = 0.217 $in.^2$) and conform to ASTM A416 Grade 270 Low Relaxation Strands. Minimum strand breaking strength shall be 58.6 kips.

Tops of beams are to be struck off level and finished as per Materials I.M.570.

Bearings shall be as detailed on other design sheets.

Beams to be used in bridges made continuous by the poured in place deck, are to be at least 28 days old before the deck is placed unless a shorter curing time is approved by the Bridge Engineer.

The portions of the prestressed beams that are to be embedded in the abutment and pier diaphragms shall be roughened for a distance of 10" from the beam end by sandblasting or other approved methods to provide suitable bond between the beam and the diaphragm in accordance with Article 2403.03, I, of the Standard Specifications.

All beams are to be increased in length to compensate for elastic shortening, creep and shrinkage.

For transporting, the allowable overhang is shown in the Lifting Loop and Overhang Table.

The contractor shall assure the lateral stability of the beam during handling, transporting and erection by providing temporary bracing as needed.

Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet.

If sole plate is required for bearing, sole plate is to be set in forms when beam is cast and formed out below to exclude concrete as detailed on the Bearing Sheet.

If stub abutments are used, all strands at the ends of beams at stub abutments shall be cut off reasonably flush with the concrete.

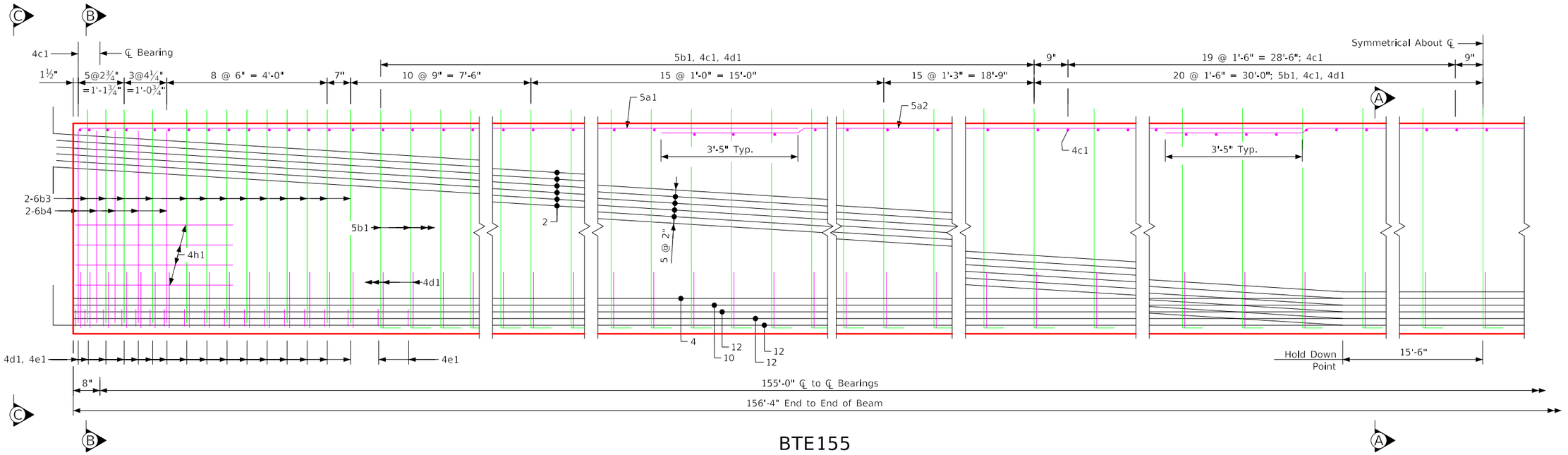
When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with Materials I.M.570 (Fabricator Application) and I.M.491.12 (Contractor Application).

Minimum concrete f'c (at 28 days) and minimum f'ci at release are located in the BTE Beam Data Table above.

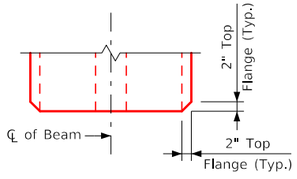
Four 0.60 in. diameter strands stressed to not more than 5000 lbs. Each may be used in lieu of bars 5a1 and 5a2 in the top flange.

BTE155 Beam - Data Details

Correction 12-13: Coil Tie Detail was Changed to Reflect the Distance Between Coil Tie Anchors Embedded ¼ Inch.
Issued 02-08.
Beams.dgn - 4790s1 - This Sheet Re-Issued 04-2024, Sheet Format Update.

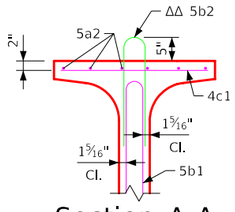


BTE155



Top View

The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

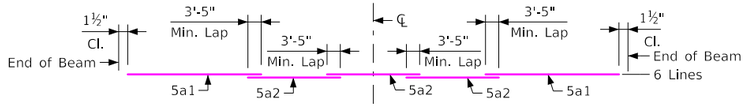


Section A-A
(Alternate)

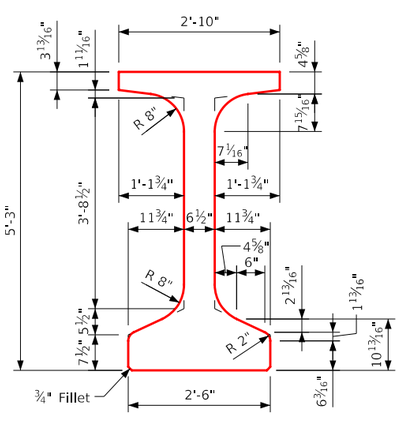
See Alternate Bar Note on Design Sheet No. 4790s1.

Area = 807.4 in.^{2}
$\bar{y}_b$ = 28.75 in.
I = 422.790 in.^{4}

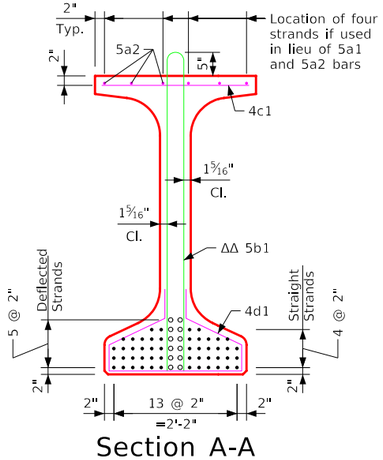
Beam Section Properties



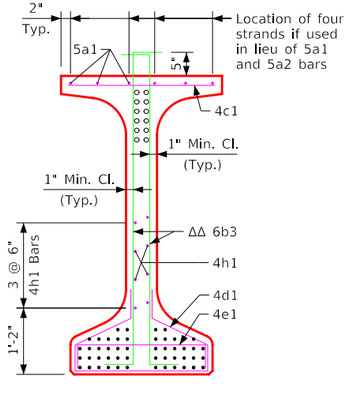
Top Flange Longitudinal Bar Layout



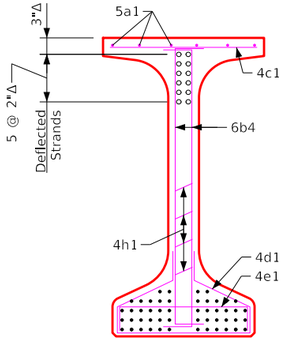
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

◦ Deflected Strands
Δ Dimensions at End of Beam
ΔΔ Epoxy Coated Bars

BTE155 Beam Details

Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.
Issued 02-08.
Beams.dgn - 4790s2 - This Sheet Re-issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 155'-0" Spans - (Sheet 2 of 2)	Standard Sheet 4790s2	COUNTY	PROJECT NUMBER	SHEET NUMBER	

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