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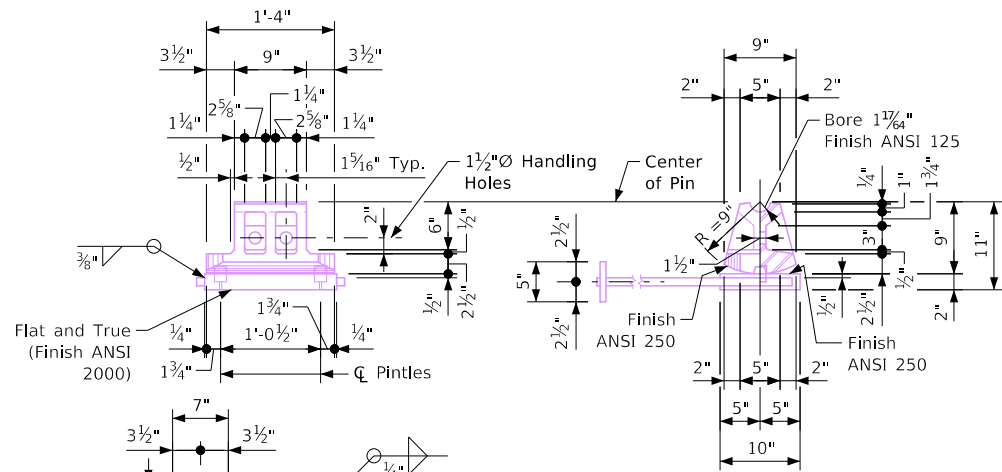
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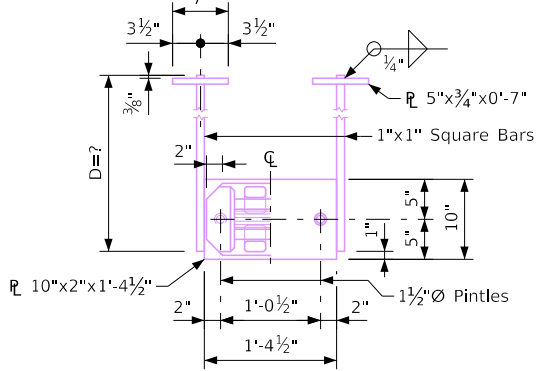
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4790s2	Bulb Tee "E" Beam - 155'-0" Spans - Sheet 2 of 2

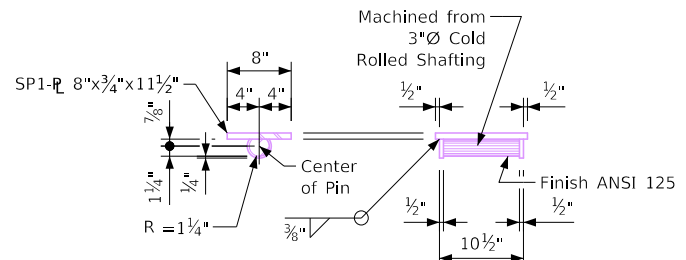
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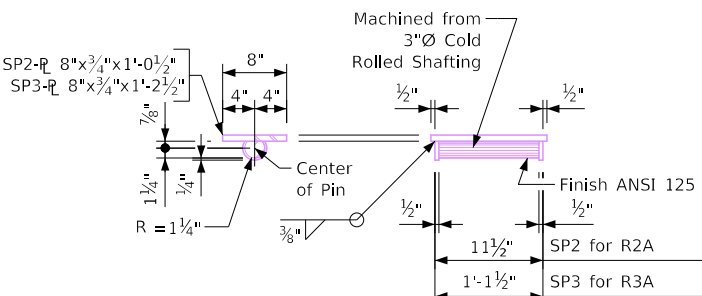
**Rocker R1A**  
Wt. = 143 lbs.



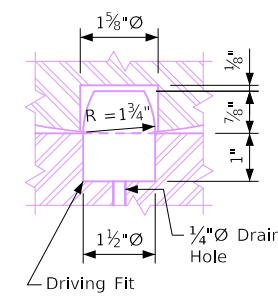
**Abutment Masonry Plate MP1A**  
Wt. = 110 lbs. (Does Not Include 1"x1" Square Bars)  
Wt. = ? lbs. for 1"x1" Square Bars



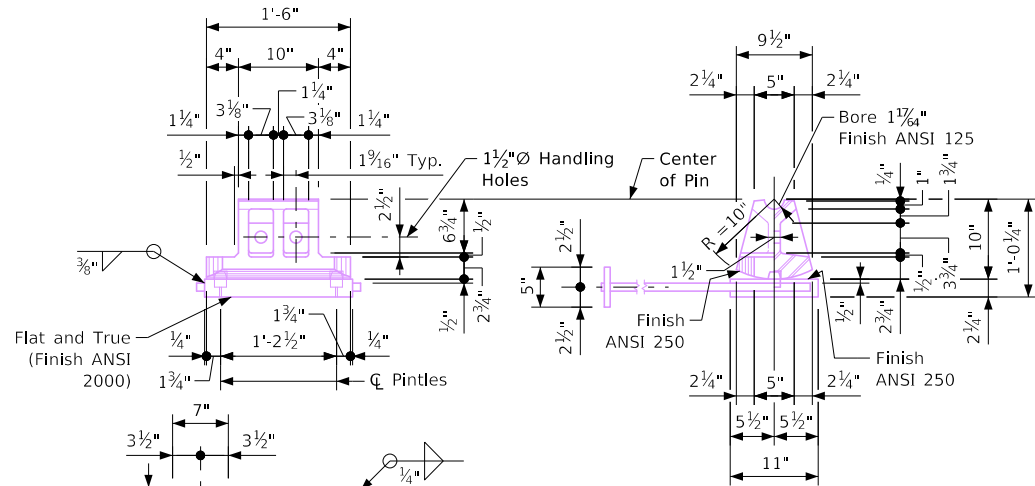
**Sole Plate SP1 for R1A**  
Wt. = SP1 = 34 lbs.



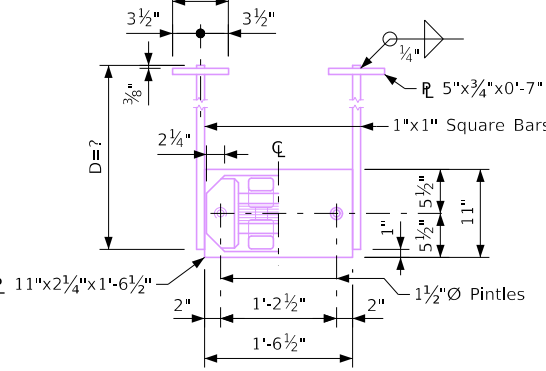
**Sole Plate SP2 & SP3**  
Wt. SP2 = 37 lbs.  
Wt. SP3 = 43 lbs.



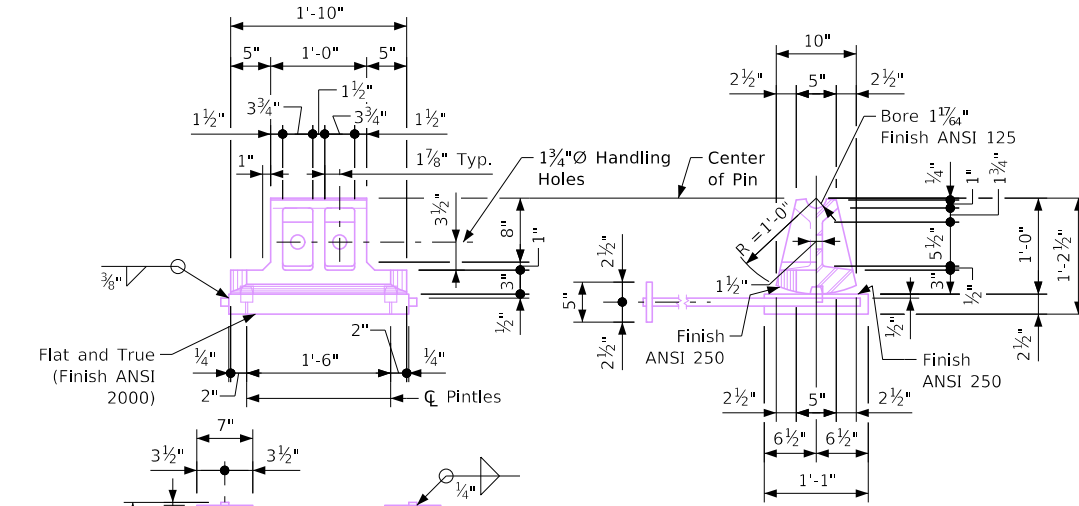
**Typical Pintle Detail**



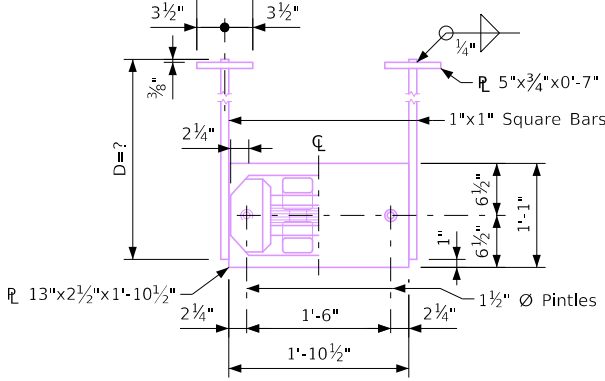
**Rocker R2A**  
Wt. = 178 lbs.



**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

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

**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.

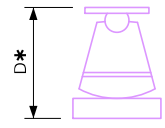
Preparation of bearing area shall be in accordance with Article 2408.03, M, of the Standard Specifications. The bedding shall be a single layer of 1/2 inch neoprene sheet.

The 1/2 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.

Distance From Top of Sole Plate to Bridge Seat	
Rockers	
R1A	1'-0 3/4"
R2A	1'-2"
R3A	1'-4 1/4"

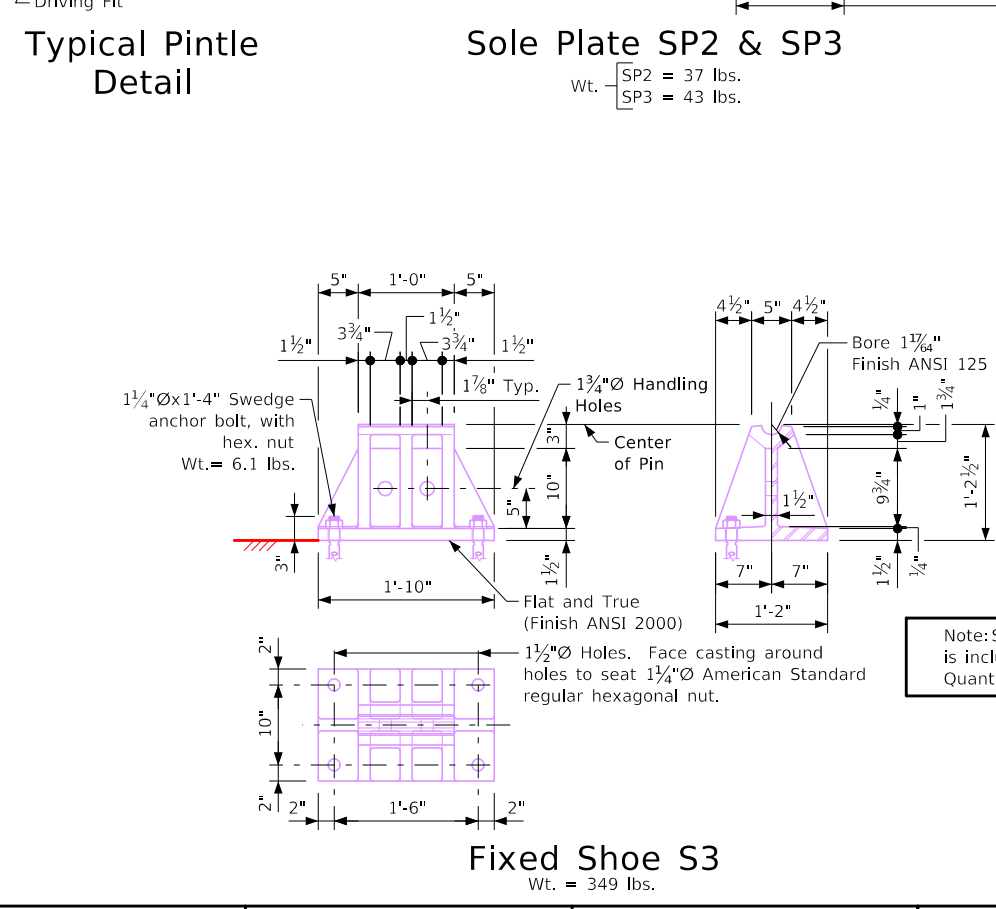
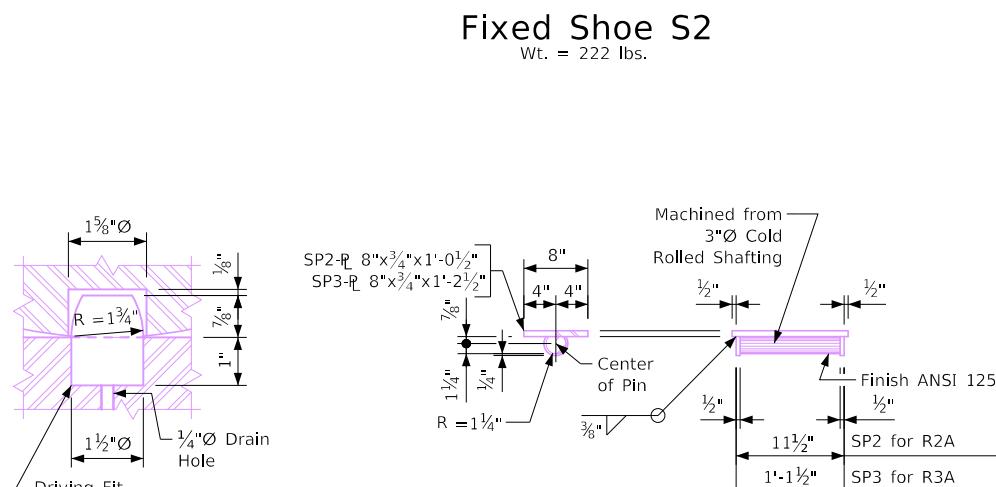
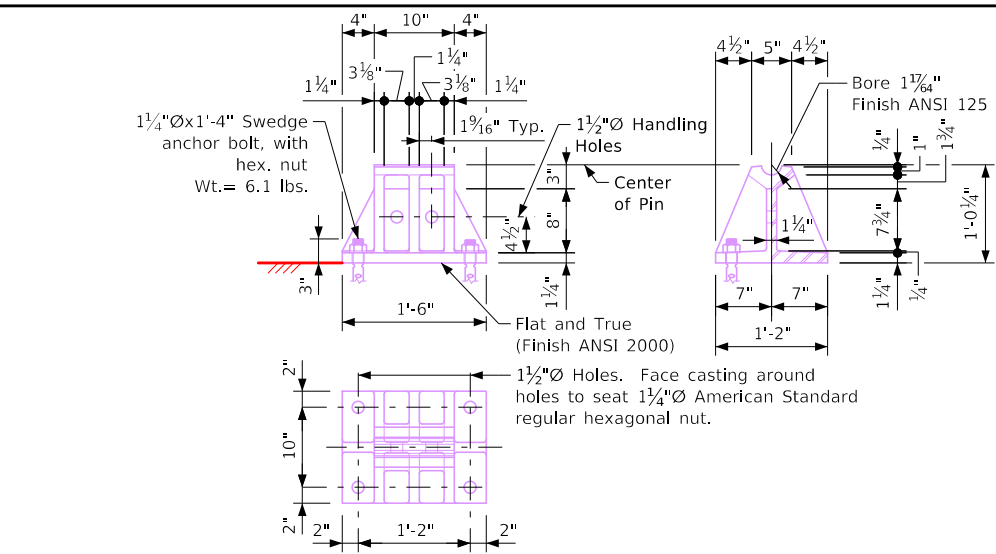
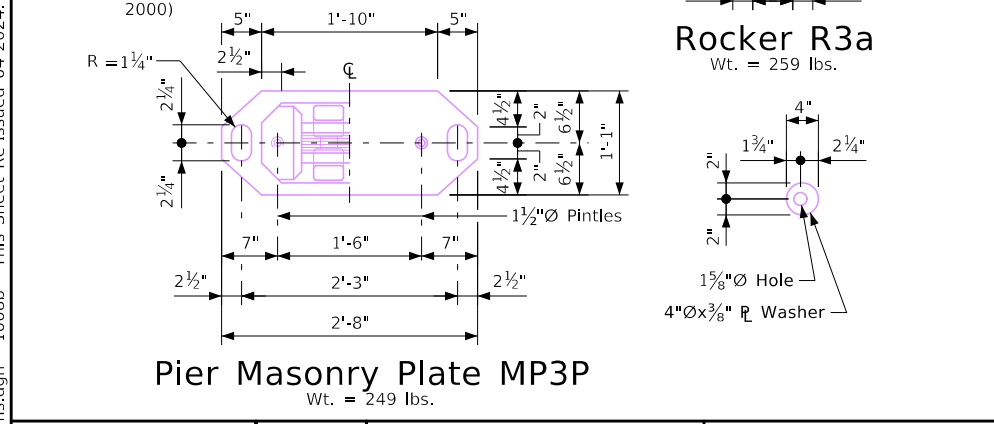
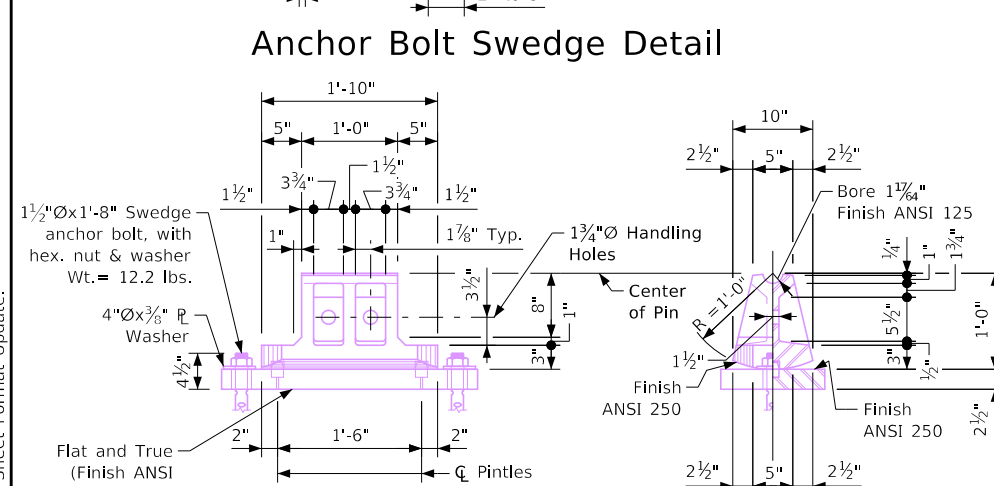
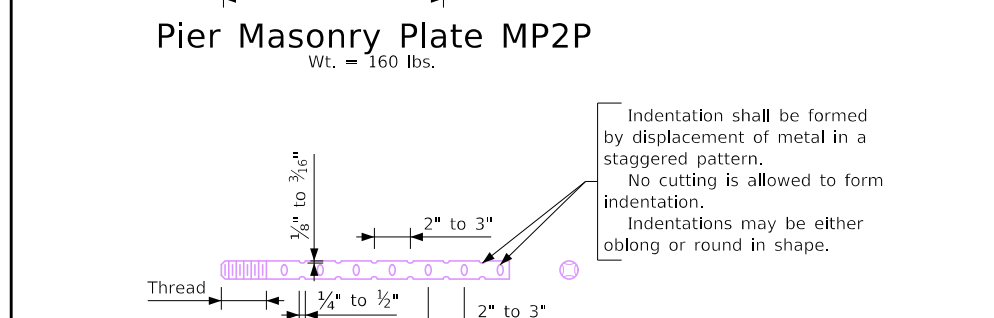
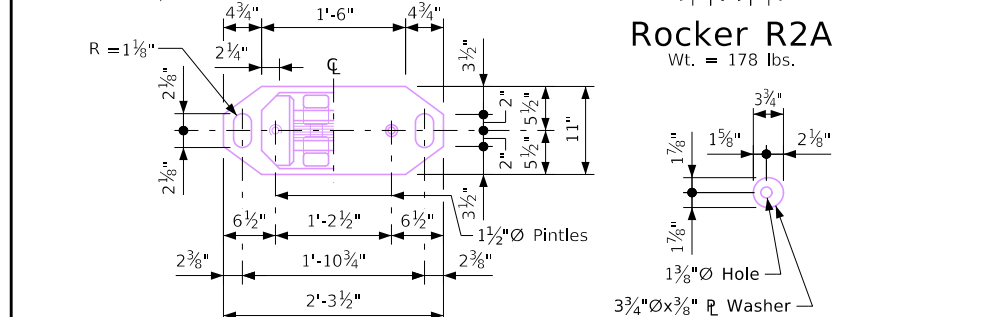
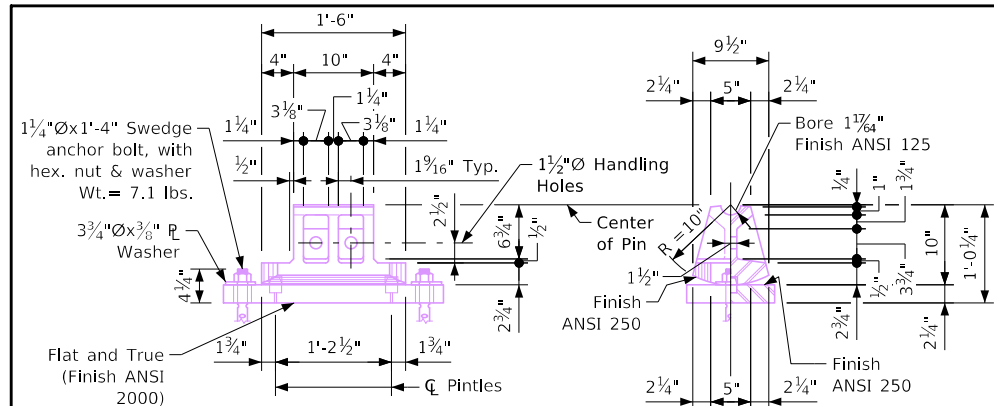
\* Including 3/4" Neoprene Sheet.

Maximum Reaction (In KIPS)		
R1A	R2A	R3A
132	171	263

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.

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.



**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 1/2 inch neoprene sheet.

The 1/2 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	D*
R2A & S2	1'-2"
R3A & S3	1'-4 1/4"

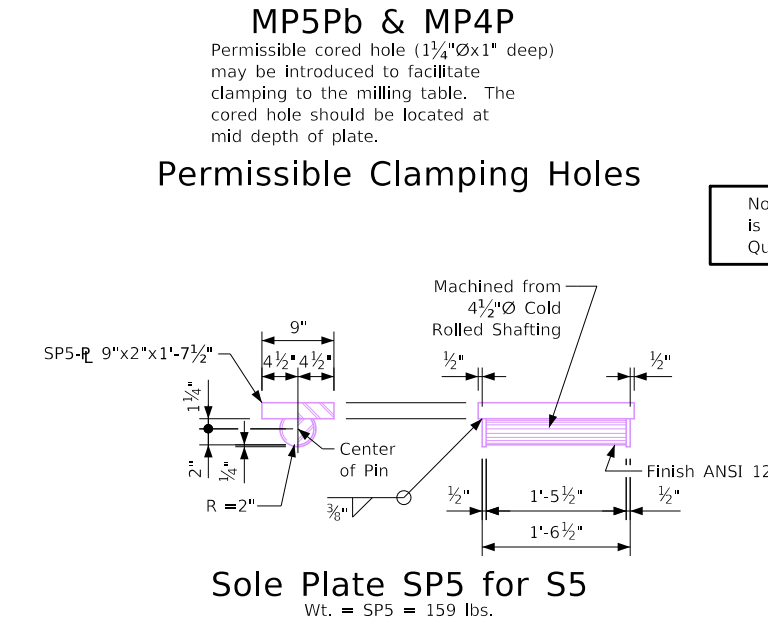
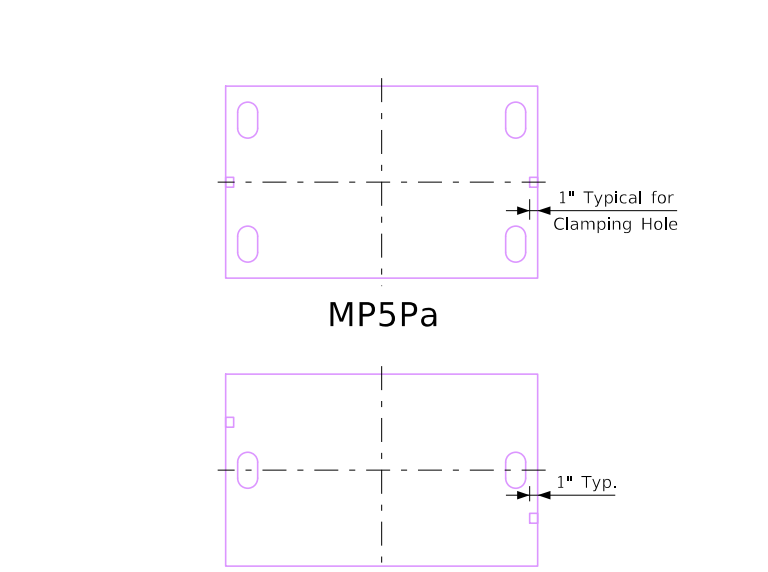
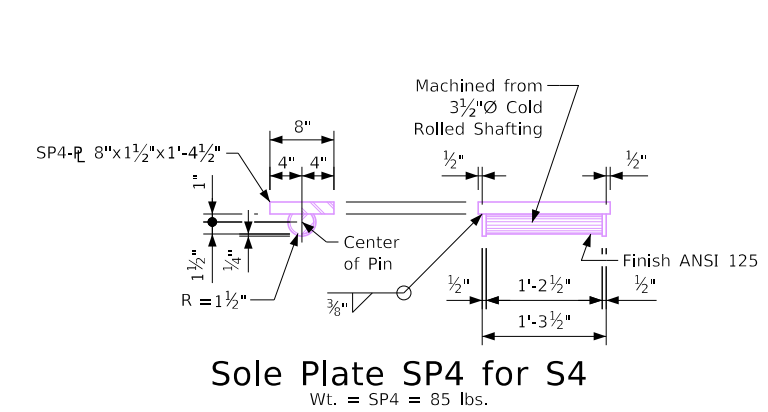
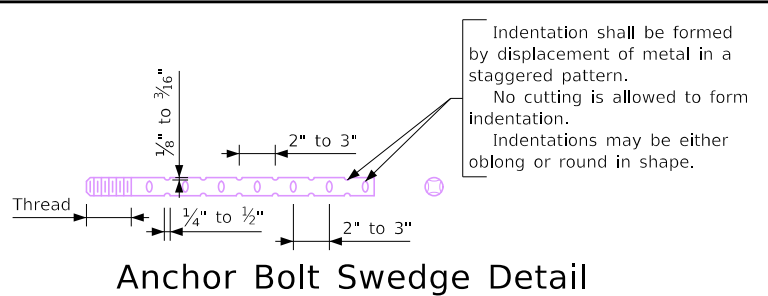
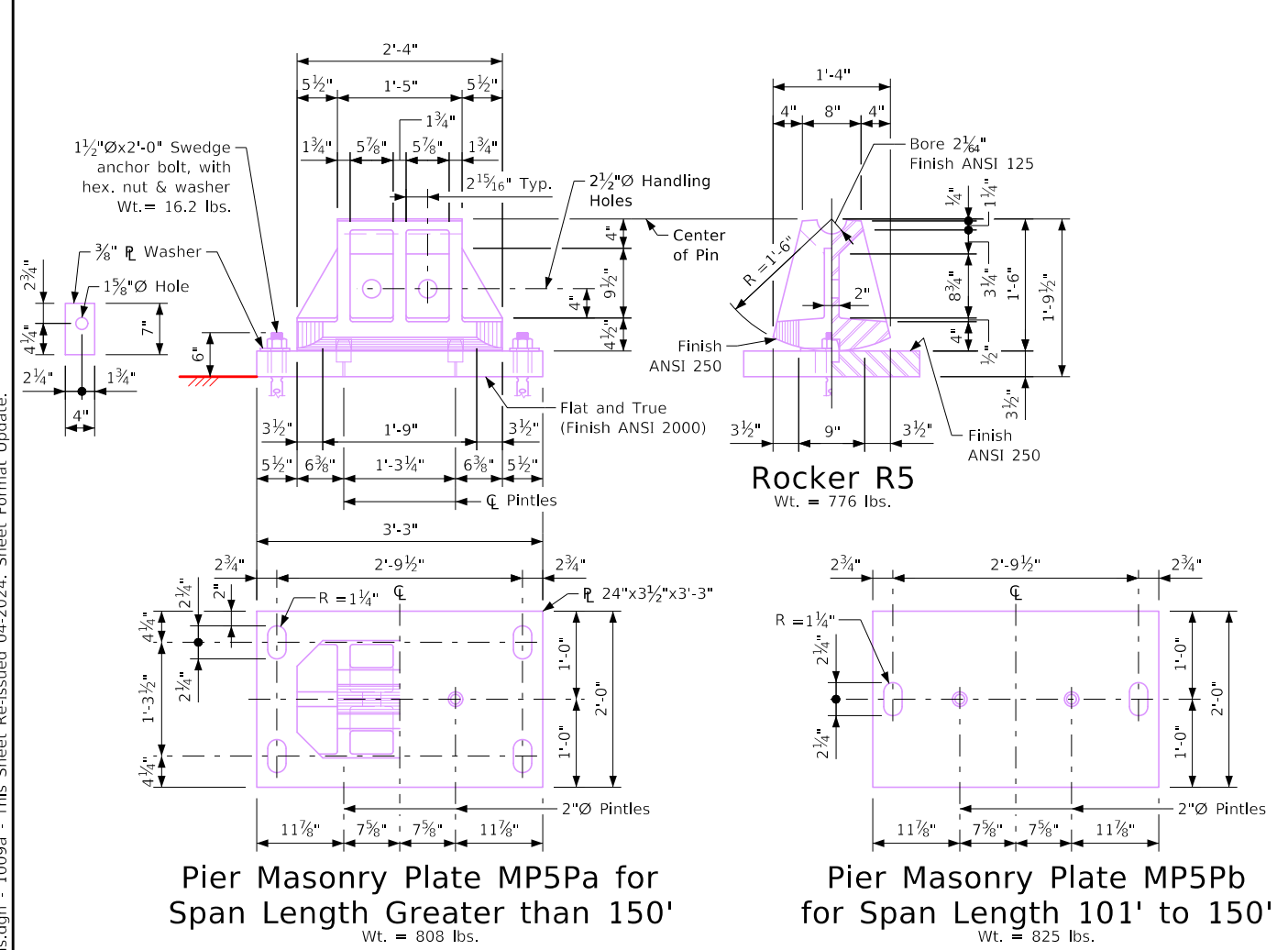
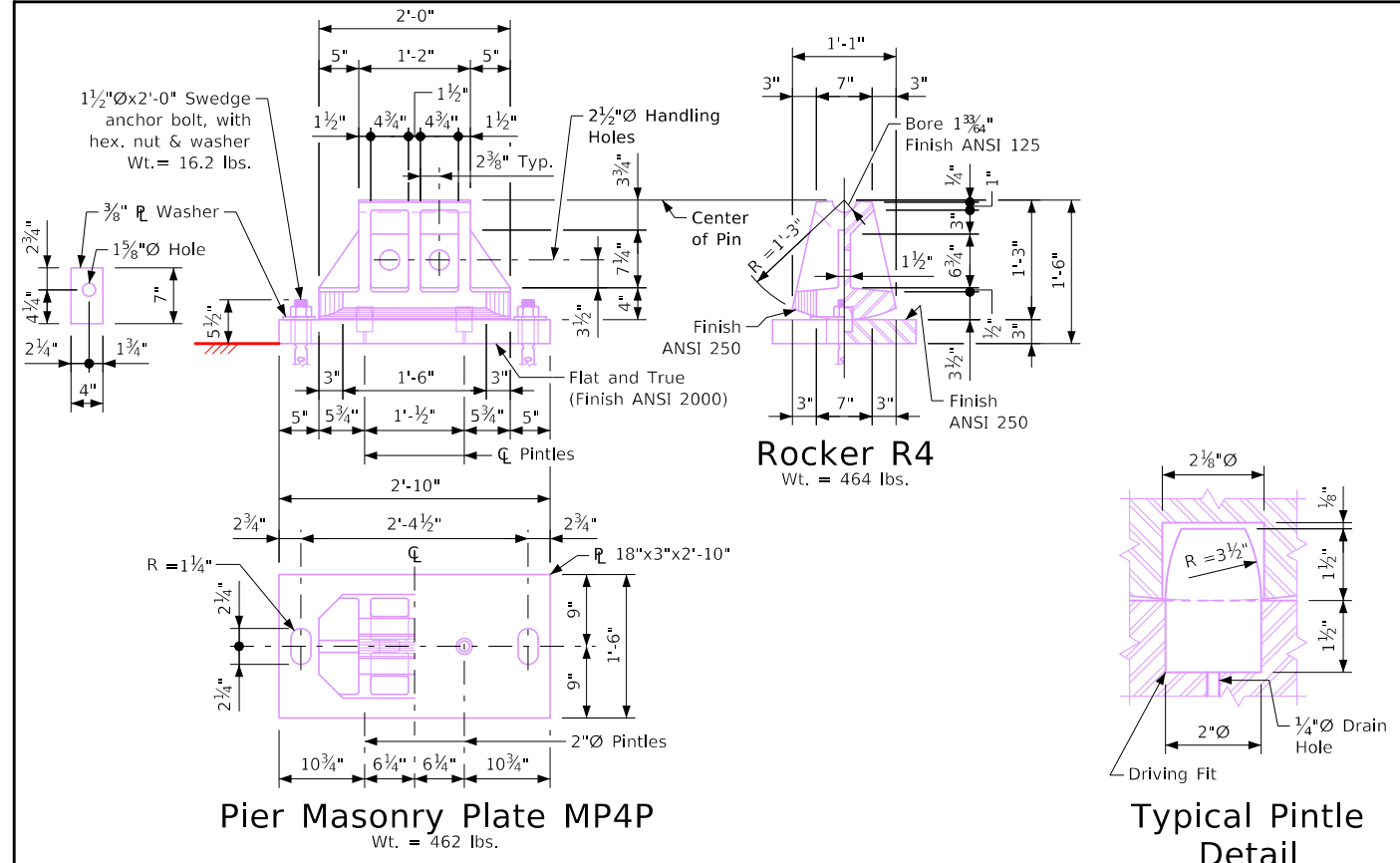
\* Including 3/4" Neoprene Sheet.

Maximum Reaction (In KIPS)	
R2A S2	R3A S3
171	263

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

**Pier Bearing**

Issued 05-10.  
 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.  
 Revised 04-2026: Corrected typo of the Clamping in the Permissible Clamping Holes Detail.  
 Beams.dgn - 1009a - This Sheet Re-issued 04-2024. Sheet Format Update.



**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 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.  
 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'-8 5/8"
R5	2'-0 7/8"

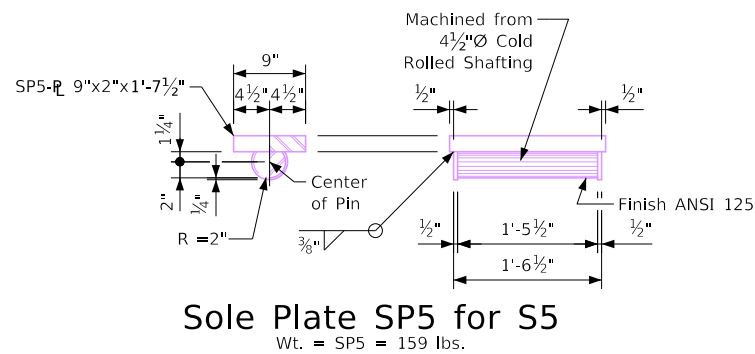
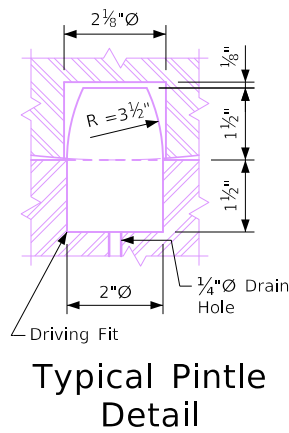
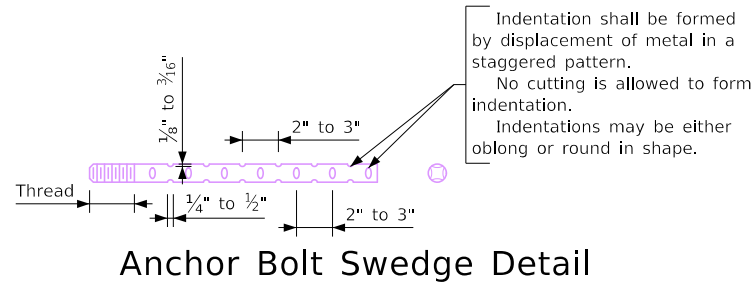
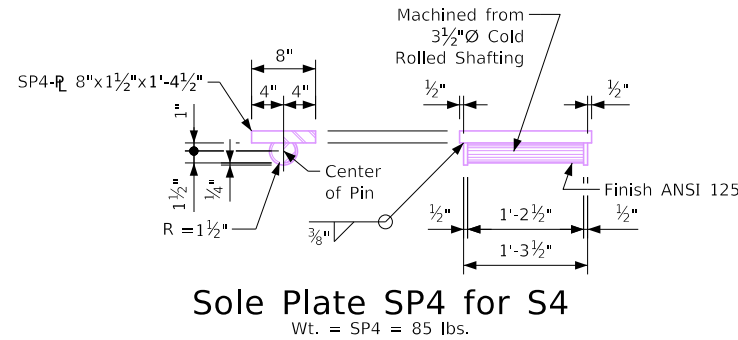
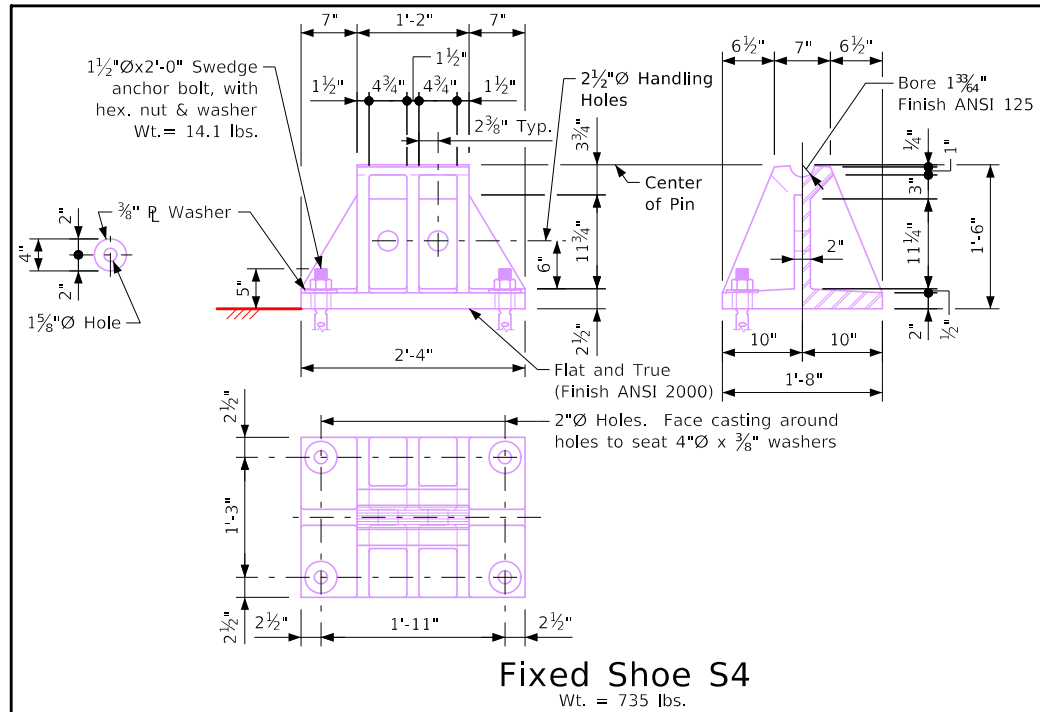
\* Including 3/4" Neoprene Sheet.

Maximum Reaction (In KIPS)	
R4	R5
475	650

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

**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 - 1009b - This Sheet Re-Issued 04-2024. Sheet Format Update.



**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 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.

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'-8 3/8"
S5	2'-0 7/8"

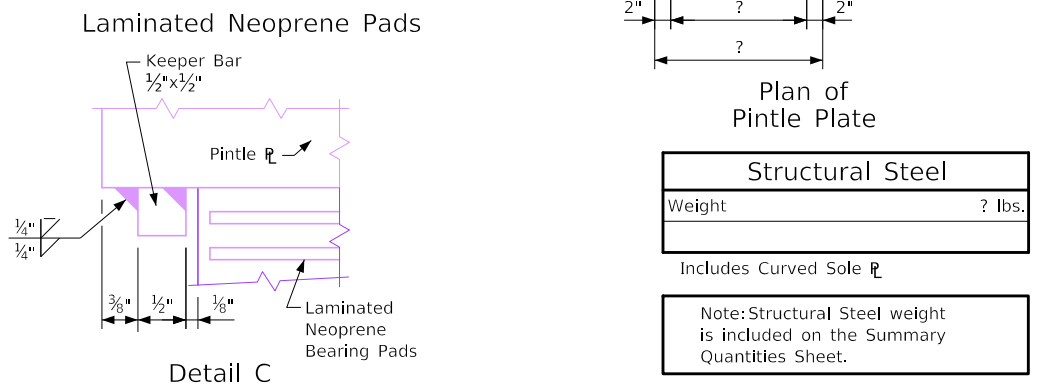
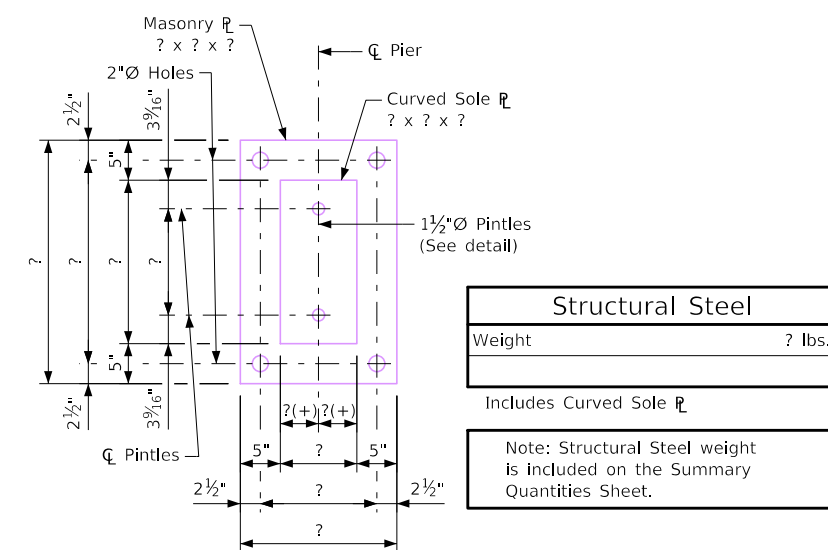
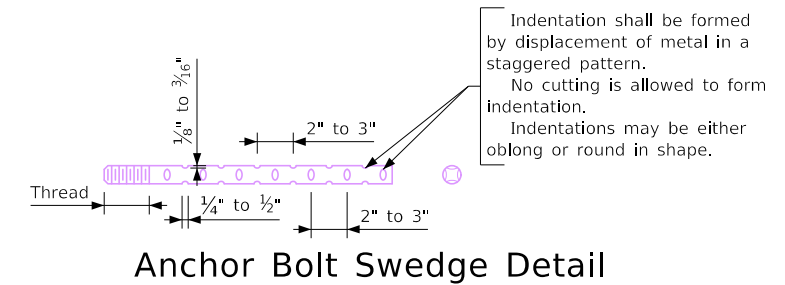
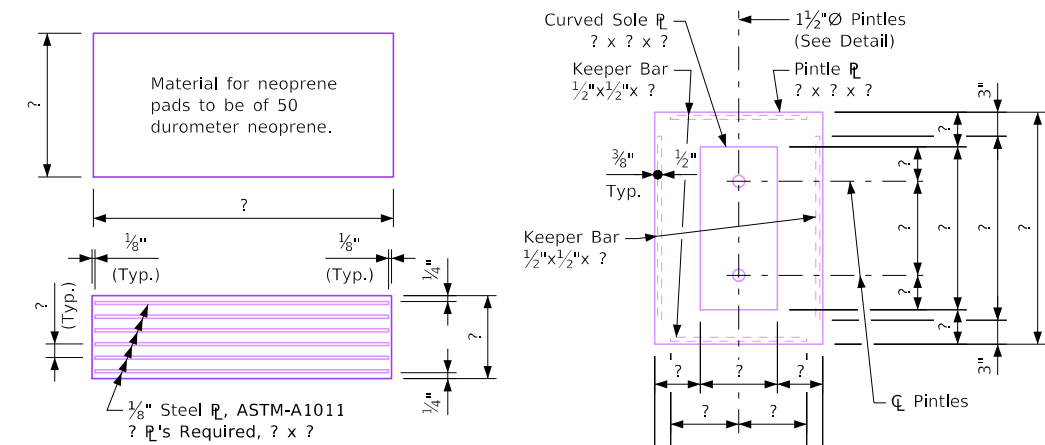
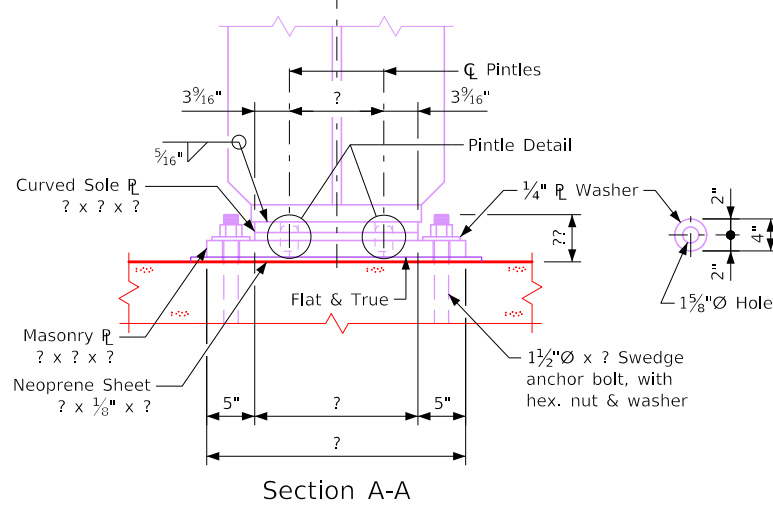
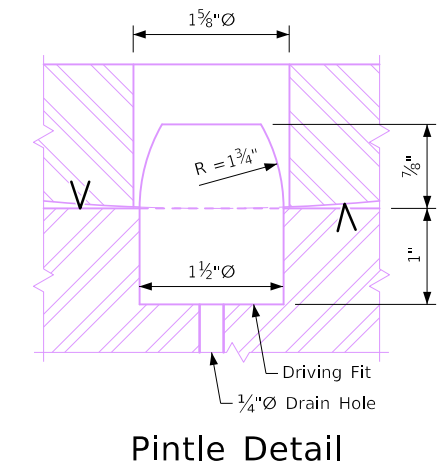
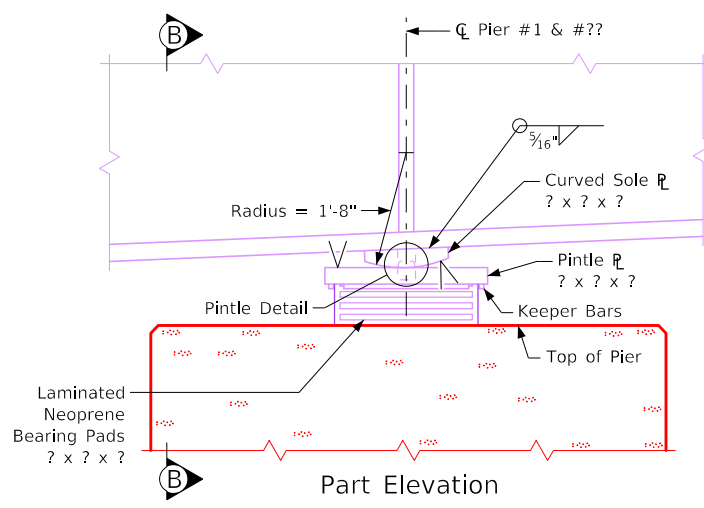
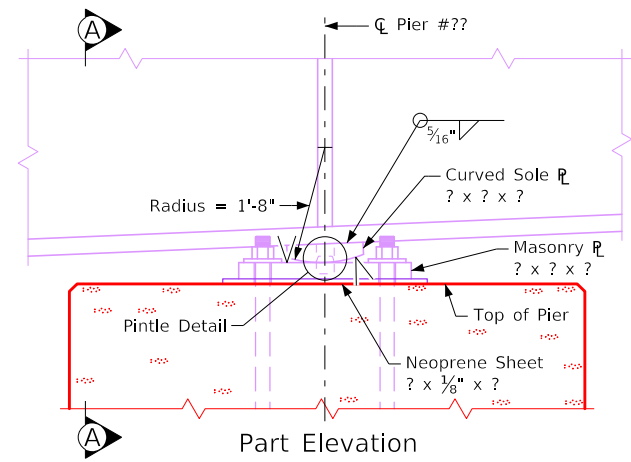
\* Including 3/4" Neoprene Sheet.

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 09-03. Beams.dgn - 1010 - This Sheet Re-Issued 04-2024. Sheet Format Update.



Structural Steel	
Weight	? lbs.
Includes Curved Sole PL	
Note: Structural Steel weight is included on the Summary Quantities Sheet.	

**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".

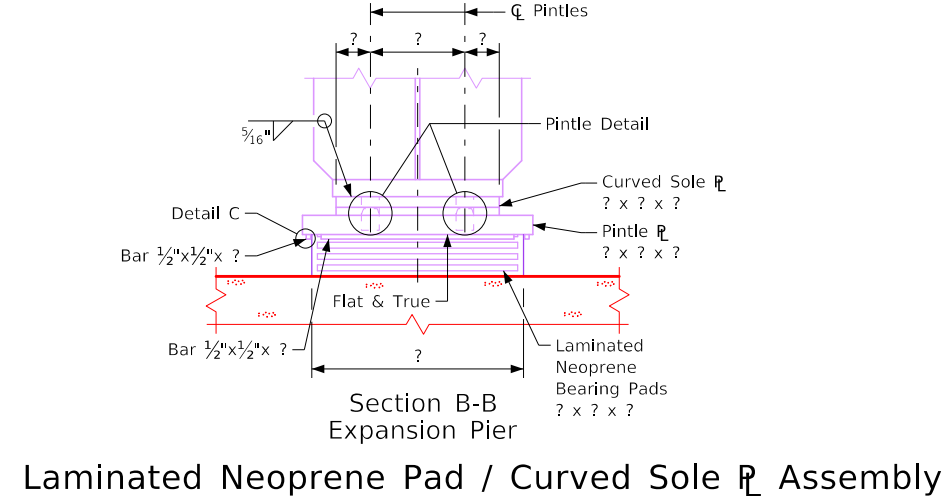
The pintles, pintle plates, keeper bars, and masonry plates shall be galvanized. Welding shall be completed prior to galvanizing. The pintles and pintle plates shall be assembled prior to galvanizing. The surfaces of the pintle plate assembly in contact with the curved sole plate and the laminated neoprene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

**Masonry PL / Curved Sole PL Assembly**



**Low Profile Bearing**

Revised: Longitudinal Stiffener Detail Changed, Arch. Type, 9, No. 9 Date  
 Revised: Miscellaneous Details Changed, Type No. 11, Dated 07-27-92  
 Revised: Longitudinal Stiffener Weld Detail Changed, Type No. 14, Dated 07-27-92  
 Revised: Intermediate Stiffener Detail Changed, Type No. 15, Dated 07-27-92  
 Revised: Flange Deflector Detail Added, Langle, Stiffener, Gussier Plate to Web and Section G-G Moved Outside of Border.  
 Correction 10-00: Flange Deflector Detail Added, Langle, Stiffener, Gussier Plate to Web and Section G-G Moved Outside of Border.  
 Revised 09-09-01: Flange Deflector Detail Changed from Grade 250 to Grade 36.  
 Revised 09-03-02: Change Section G-G Flange Deflector updated.  
 Revised 03-12-12: Revised the Description for Intermediate Diaphragm Stiffeners to eliminate Case I and II Live Load Descriptions.

Revised 04-12-12: Added a Third Caulking Company for the Lining for the Flange Deflector.  
 Issued 1-10-08.  
 Reams.dgn - 1021 - This Sheet Replaces 042024, Sheet Format Update.

**Pier Bearing Stiffener (Skewed Bridges With All Diaphragms Perpendicular to Girders)**  
**All Abutment Bearing Stiffeners Pier Bearing Stiffener (0° Skew or Bridges With Pier Diaphragms Parallel to  $\phi$  of Pier)**  
**Intermediate Stiffener Bolted Attachment to Flanges**  
**Intermediate Stiffener**  
**Types of Diaphragm Framing**  
 Diaphragms Perpendicular to Girders  
 Diaphragms Parallel to  $\phi$  of Pier  
**Flange Deflector Details** (? Required Per Bridge)  
**Section G-G**  
**Welding Details**

T - Web Thickness	X = 5T with 2X Minimum
1/2"	2 1/2"
3/4"	2 1/2"
1"	2 1/2"
1 1/4"	3 1/2"
1 1/2"	3 1/2"

**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 termini 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.

**Shear Stud Details**  
 Note: All studs to be 3/8"  $\phi$

**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 ???

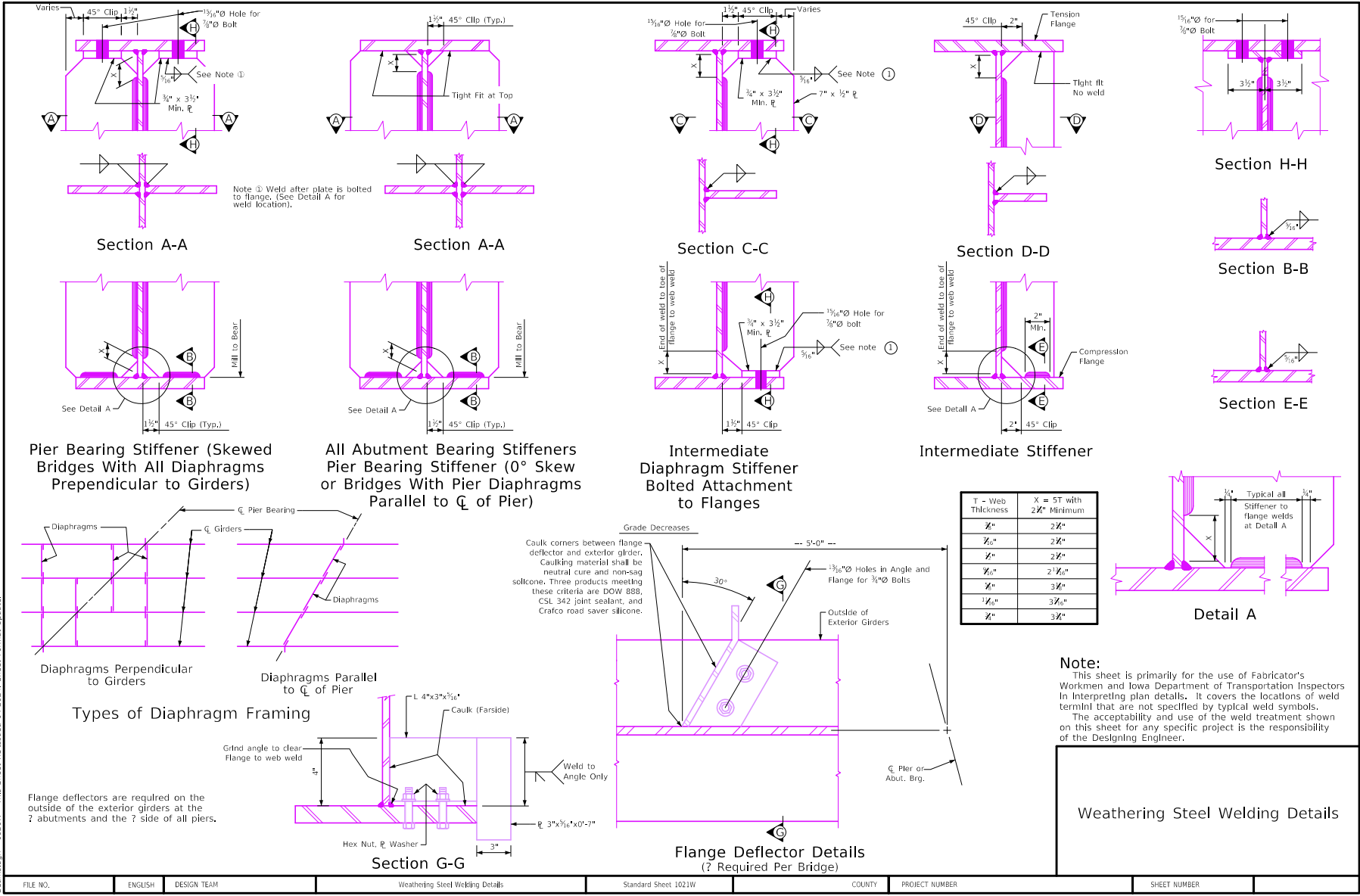
Size of Weld	Flange Thickness

**Flange to Web Weld Size**

**Longitudinal Stiffener (at Cross Frame)**  
 Groove Weld, (Inspect by Ultrasonic Testing before coping stiffener end)  
 Cut line after welding and U.T. inspection. Grind to smooth transition after welding. Perform magnetic particle inspection of surface after grinding.

**Gusset Plate to Web Detail**  
 1 1/2"  $\phi$  Holes in stiffener and tee for 1/2"  $\phi$  bolts. Provide washers for both surfaces.

**Intermediate Diaphragm Stiffener Welded Attachment to Flanges**

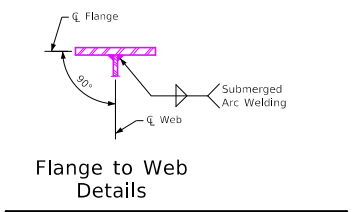
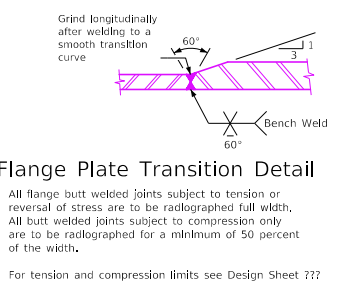
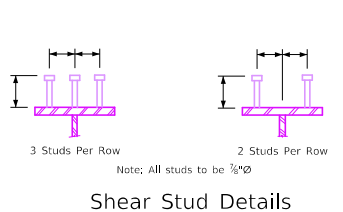


Revised 03-12: Revised the Description for Intermediate Diaphragm Stiffeners to Eliminate Case I and II Live Load Descriptions.  
 Revised 04-22: Added a Third Caulking Company for the Listing for the Flange Deflector.  
 Revised 04-22: Added missing Revision History notes in left border of sheet and Standard Sheet Title and Number in lower border.  
 Beams.dgn - 1021W - This Sheet Reissued 04-2024 - Sheet Format Update.

**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 termini 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.

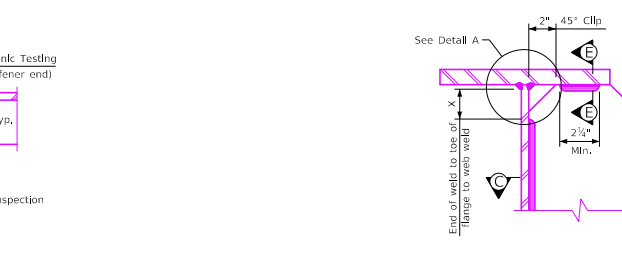
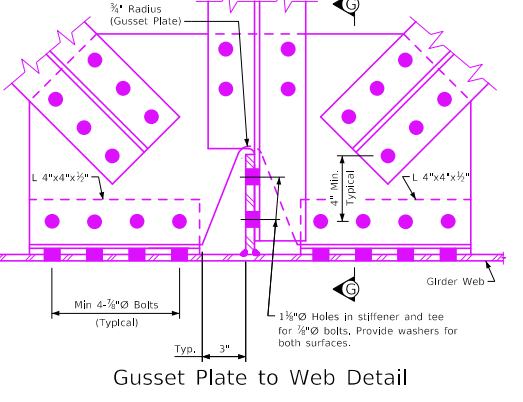
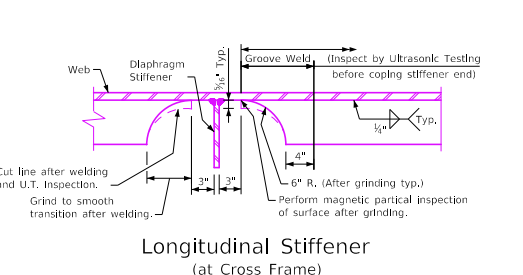
**Weathering Steel Welding Details**

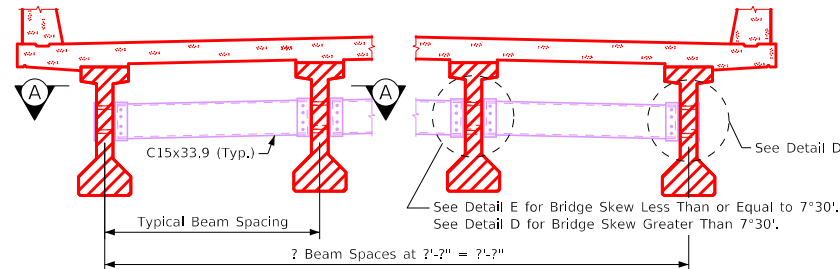
FILE NO.	ENGLISH	DESIGN TEAM	Weathering Steel Welding Details	Standard Sheet 1021W	COUNTY	PROJECT NUMBER	SHEET NUMBER
3/48/13 PM	4/5/2026	oklass	p:\w\p\w\w\1\dot\nt\lan\p\w\Main\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				



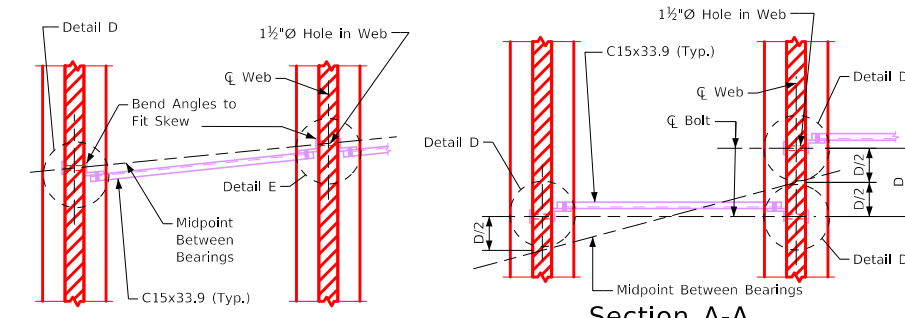
**Flange to Web Weld Size**

Size of Weld	Flange Thickness





Section Showing Intermediate Diaphragms



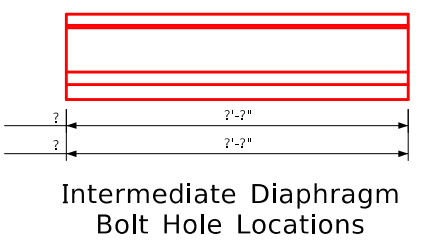
Section A-A

Section A-A

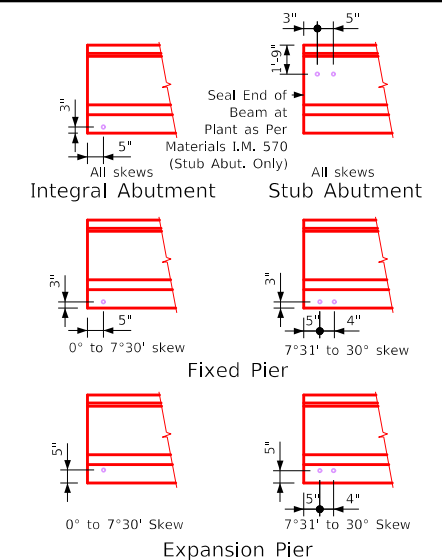
For Bridges Skewed Less Than or Equal to 7°30'

For Bridges Skewed Greater Than 7°30'

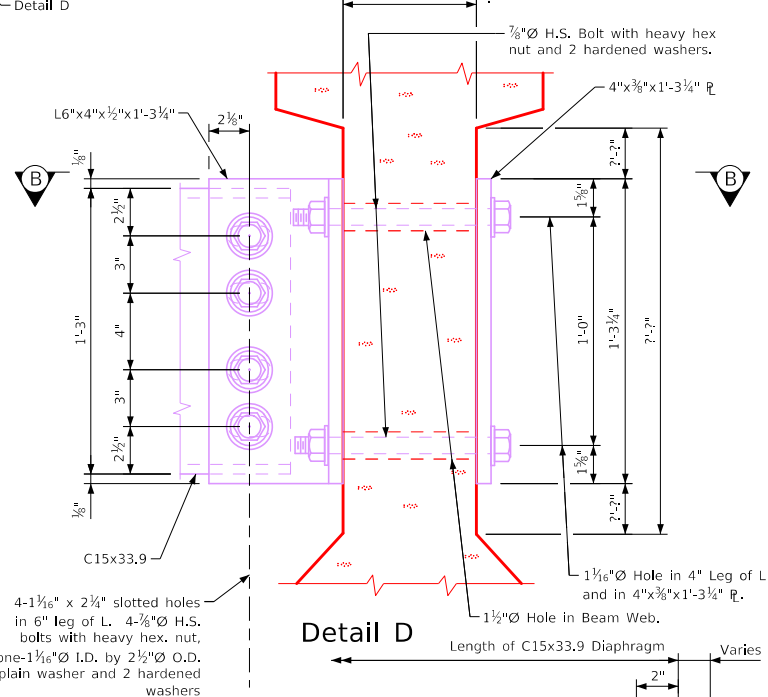
Intermediate Diaphragm Structural Steel									
One Connection Detail "E"									Weight
Two - 7/8"Ø X Length H.S. Bolts with Nuts and Washers									
Web Thickness	Length of H.S. Bolts		Weight per Detail "E"		Number of Detail "E"				
6"	9"		4.30 lbs		?		?		
7"	10"		4.66 lbs		?		?		
9"	12"		5.34 lbs		?		?		
Two - L 6" x 4" x 1/2" x 1'-3 3/4" = 41.2 lbs									?
One Connection Detail "D"									Weight
Two - 7/8"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 PL 4"x3/8"x1'-3 3/4" = 6.5 lbs									?
One - L 6" x 4" x 1/2" x 1'-3 3/4" = 20.6 lbs									?
One C15 x 33.9 Diaphragm									
Web Thickness	Beam Spacing	6'-9"		6'-10"		7'-3"		7'-4 1/2"	
		* Length	Unit Weight (lbs)	* Length	Unit Weight (lbs)	* Length	Unit Weight (lbs)	* Length	Unit Weight (lbs)
6"		5'-11 3/4"	202.3	6'-0 3/8"	205.2	5'-9 3/8"	197.2	6'-5 3/8"	219.3
7"		5'-10 3/4"	199.5	5'-11 3/8"	202.3	5'-8 3/8"	194.4	6'-4 3/8"	216.5
9"		5'-8 3/4"	193.9	5'-9 3/8"	196.7	5'-6 3/8"	188.7	6'-2 3/8"	210.8
*The Length of The C15 X 33.9 Shown in the Table is Based on a Variable Clearance of 1 1/2" To 2 1/2" Between The Face of Beam Web and End of C15 X 33.9.									
Diaphragm Weights									
Unit Weight					Number of Diaphragms				
?					?				
?					?				
Diaphragm Connection Bolts									
Eight - 7/8"Ø x 0'-2 3/4" H.S. Bolts with Nuts and Washers, per Unit Diaphragm					Number of Diaphragms				
10.3 lbs					?				
Intermediate Diaphragm Structural Steel - Total (lbs)									



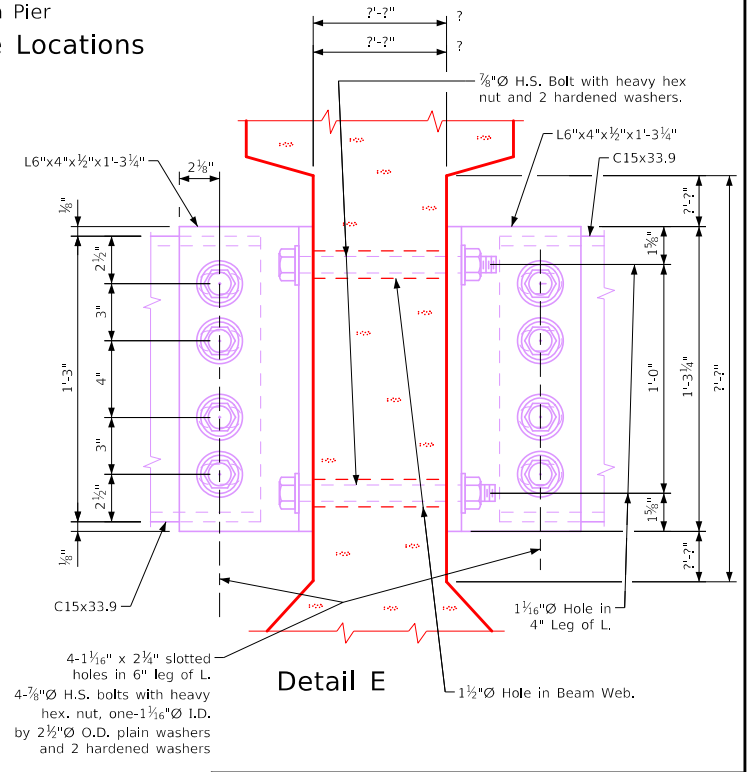
Intermediate Diaphragm Bolt Hole Locations



Beam Coil Tie Locations

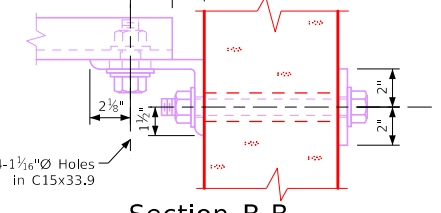


Detail D



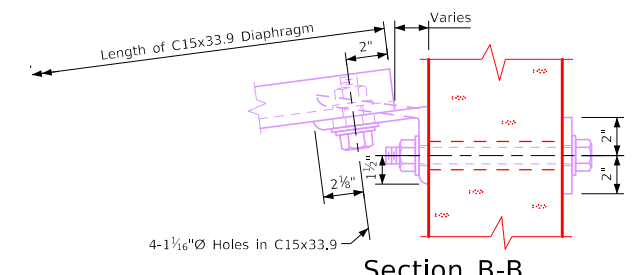
Detail E

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



Section B-B

Steel Intern. Diaphragm - PC Beam



Section B-B

**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 1 1/2"Ø holes for the 7/8"Ø H.S. bolts shall be cast into the web. Drilling is not allowed.  
 The 7/8"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.

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
3:48:14 PM	4/5/2026	bkloss	pw:\NTP\wnt1.dot.Int.Jan:P\W\Mah\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				

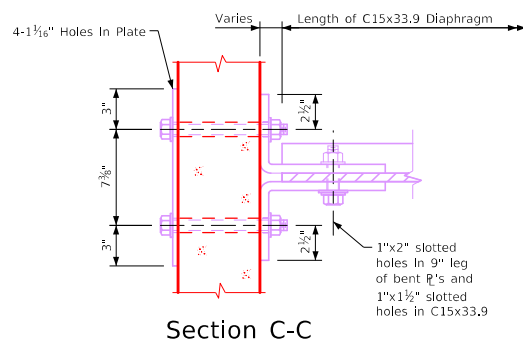
Bulb Tee "B" Beam Intermediate Diaphragm Structural Steel		
One Beam Connection Information		
Beam Spacing	Diaphragm Length	C15x33.9 Weight (Lbs.)
6'-6 1/2"	5'-4 1/4"	182
7'-2 13/16"	6'-0 3/8"	205
8'-0 1/8"	6'-10 1/16"	232
8'-8 3/8"	7'-6 3/8"	255
9'-0 1/2"	7'-10 1/4"	266

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 11-13: Added Detail F Outside of the Sheet to be Used when Skew is Greater than 7°30'.  
 ENGLISHBEAMS.DGN - 1036-BTBR - This Sheet Issued 02-08

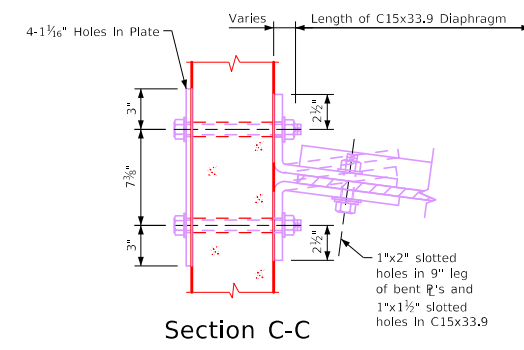
This Sheet Issued 06-14, Sheet 1 of 2.  
 Beams.dgn - 1036-1-BTB - This Sheet Re-Issued 04-2024, Sheet Format Update.

Bulb Tee "B" Beam Intermediate Diaphragm Structural Steel			
One Beam Connection (Detail "F" and/or Detail "G")		No. of Beam Connections	Weight
Four - 7/8"Ø X 9 1/4" H.S. Bolts with Nuts & Washers = 9.6 Lbs.		?	?
One Detail "G"	Four - Bent 9" x 6" x 1/2" x 0'-11" = 93.6 Lbs.	?	?
One Detail "F"	One - Backing 9" x 3/8" x 1'-1 3/8" = 7.1 Lbs. Two - Bent 9" x 6" x 1/2" 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.		?	?
One - C15 x 33.9 = 33.9 Lbs./Ft.	Length of Member	?	?
Intermediate Diaphragm Structural Steel - Total (Lbs.)		?	?

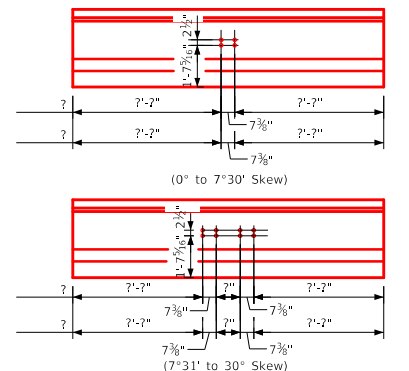
Note to Designer: Chart outside of border contains diaphragm lengths



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



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



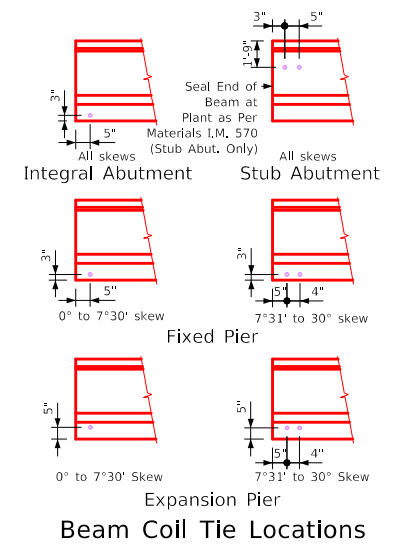
Intermediate Diaphragm Bolt Hole Locations

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 1 1/2"Ø holes for the 7/8"Ø H.S. bolts shall be cast into the web. Drilling is not allowed.  
 The 7/8"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.

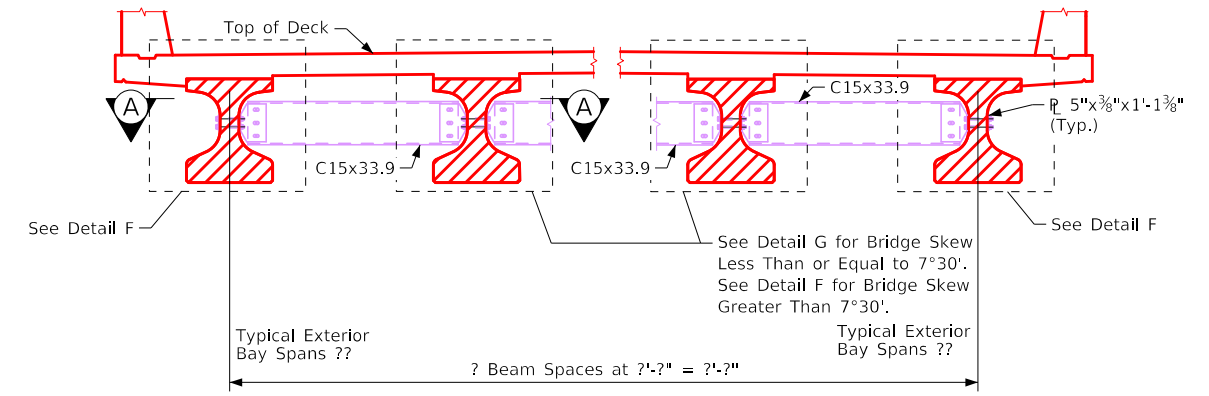
NOTE: Structural Steel weight is included on the Summary Quantities Sheet.



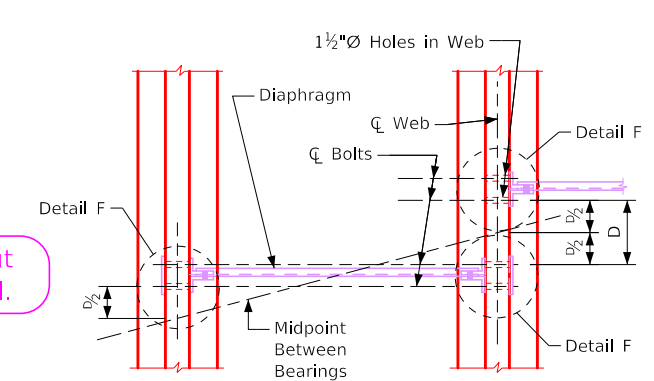
Beam Coil Tie Locations

Steel Intern. Diaphragm - BTB Beam

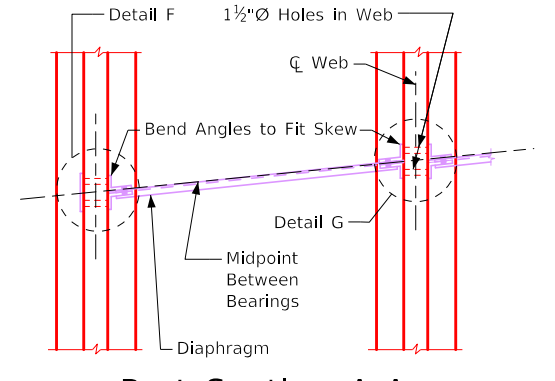
FILE NO.	ENGLISH	DESIGN TEAM	Steel Intermediate Diaphragms for "BTB" Beam Bridges - Sheet 1 of 2	Standard Sheet 1036-1-BTB	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:15 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot\int.lan:PWM\main\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				



Section Showing Intermediate Diaphragms

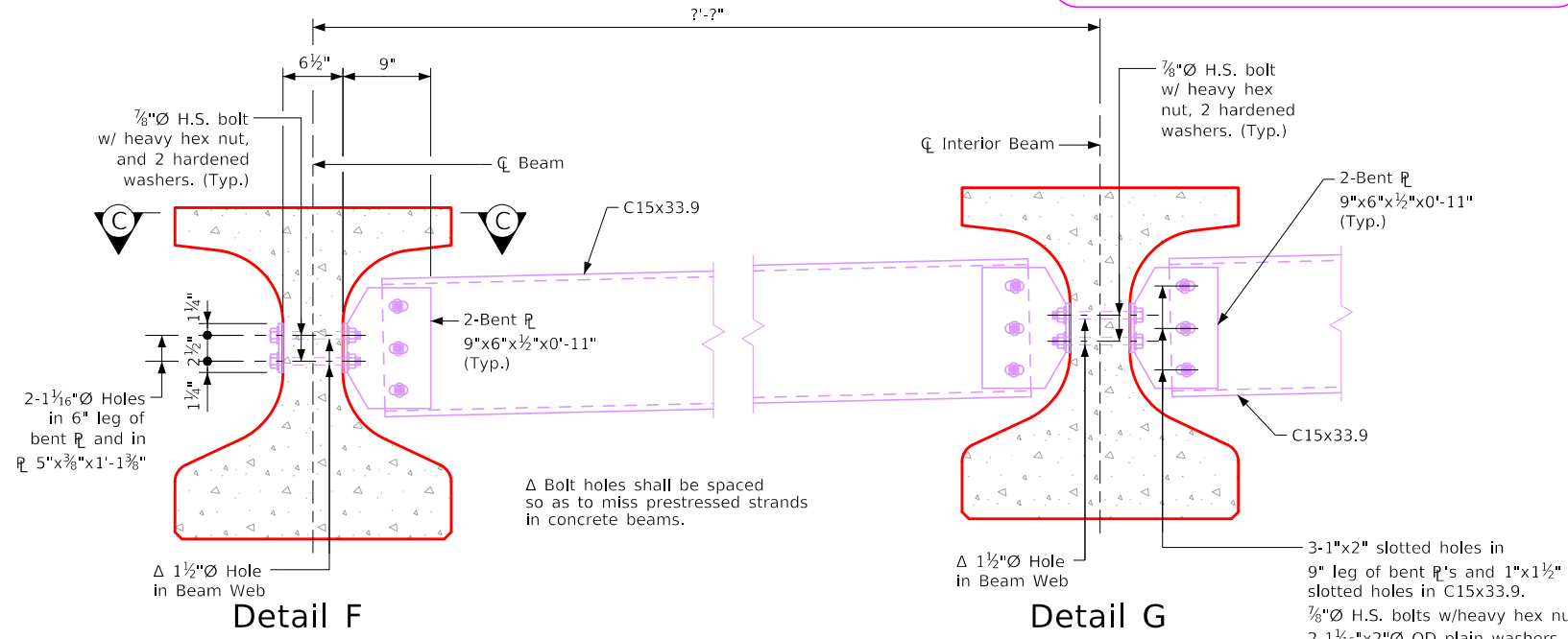


Part Section A-A  
For Bridges Skewed Greater Than 7°30'

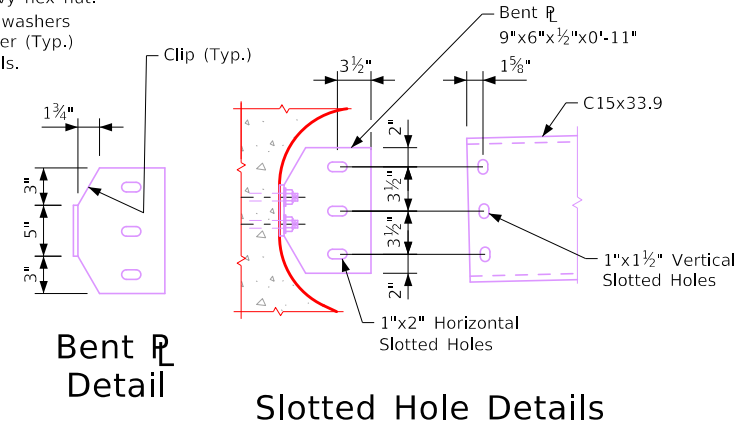


Part Section A-A  
For Bridges Skewed Less Than or Equal to 7°30'

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



Section Showing Intermediate Diaphragms At Exterior Bay



Bent Detail

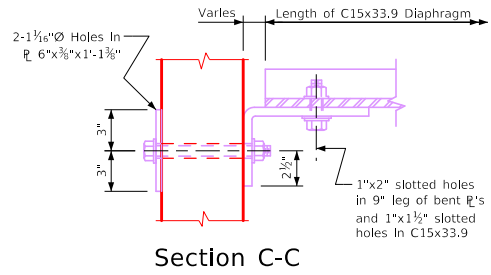
Slotted Hole Details

Steel Intern. Diaphragm - BTB Beam

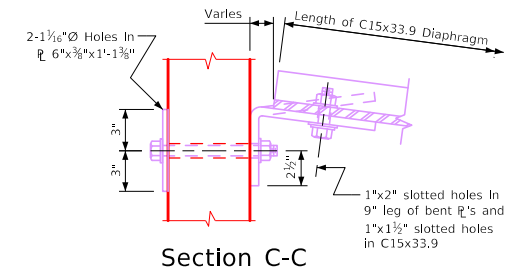
This Sheet Issued 06-14-2024, Sheet 2 of 2. Beams.dgn - 1036-2-BTB - This Sheet Re-Issued 04-2024, Sheet Format Update.

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
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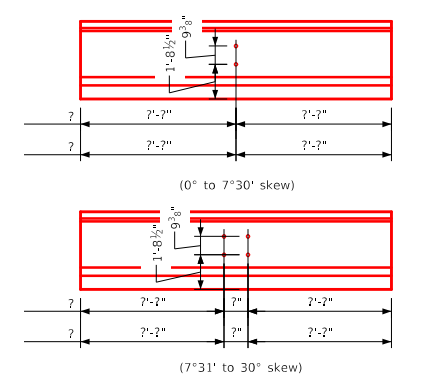
Bulb Tee "C" Beam Intermediate Diaphragm Structural Steel			
One Beam Connection (Detail "F" and/or Detail "G")		No. of Beam Connections	Weight
Two - $\frac{1}{8}$ " $\times$ 9 $\frac{1}{4}$ " H.S. Bolts with Nuts & Washers = 4.8 Lbs.		?	?
One Detail "G"	Two - Bent $\frac{1}{8}$ " $\times$ 9" $\times$ 6" $\times$ $\frac{1}{2}$ " $\times$ 1'-1 $\frac{3}{8}$ " = 57.0 Lbs.	?	?
One Detail "F"	One - Backing $\frac{1}{8}$ " $\times$ 6" $\times$ $\frac{3}{8}$ " $\times$ 1'-1 $\frac{3}{8}$ " = 8.5 Lbs. One - Bent $\frac{1}{8}$ " $\times$ 9" $\times$ 6" $\times$ $\frac{1}{2}$ " $\times$ 1'-1 $\frac{3}{8}$ " = 28.5 Lbs.	?	?
One Diaphragm		Number of Diaphragms	
Eight - $\frac{1}{8}$ " $\times$ 2 $\frac{3}{4}$ " H.S. Bolts w/ Nuts & Washers = 10.3 Lbs.		?	?
One - C15 x 33.9 = 33.9 Lbs./ft.	Length of Member	?	?
Intermediate Diaphragm Structural Steel - Total (Lbs.)			?



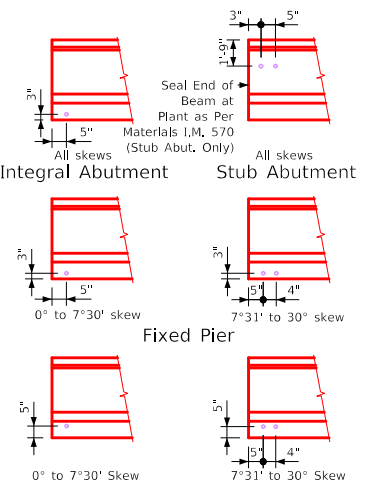
Note to Designer: Delete or Cross-Out non-applicable section C-C detail.



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



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  $\frac{1}{8}$ "  $\times$  2 $\frac{3}{4}$ " holes for the  $\frac{1}{8}$ "  $\times$  9" H.S. bolts shall be cast into the web. Drilling is not allowed.  
 The  $\frac{1}{8}$ "  $\times$  2 $\frac{3}{4}$ " 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.

Note to Designer: Chart outside of border contains diaphragm lengths

STRUCTURAL STEEL	
Weight	? lbs.

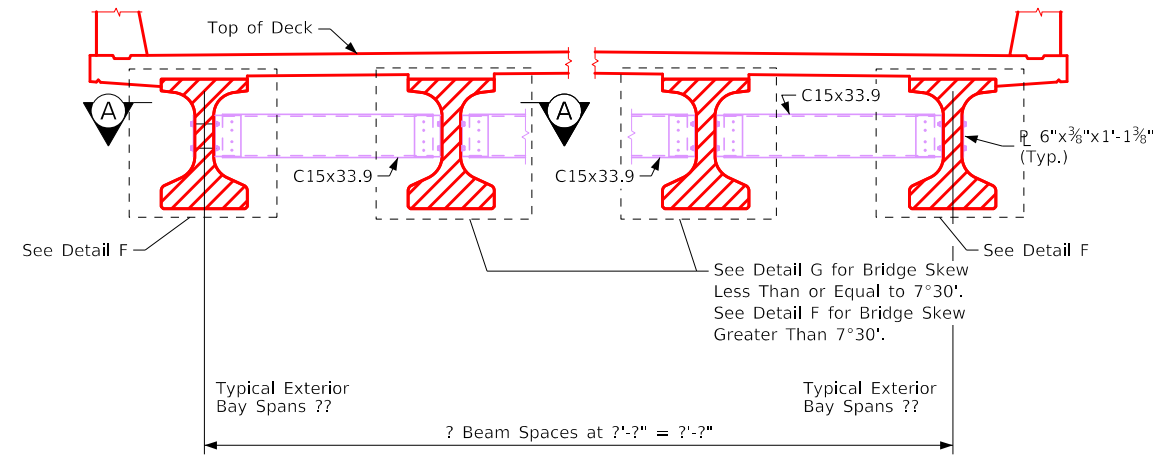
NOTE: Structural Steel weight Is Included on the Summary Quantities Sheet.

Bulb Tee "C" Beam Intermediate Diaphragm Structural Steel		
One Beam Connection Information		
Beam Spacing	Diaphragm Length	C15x33.9 Weight (Lbs.)
6'-6 $\frac{1}{2}$ "	5'-4 $\frac{1}{4}$ "	182
7'-2 $\frac{13}{16}$ "	6'-0 $\frac{3}{8}$ "	205
8'-0 $\frac{3}{16}$ "	6'-10 $\frac{1}{16}$ "	232
8'-8 $\frac{1}{16}$ "	7'-6 $\frac{3}{16}$ "	255
9'-0 $\frac{1}{2}$ "	7'-10 $\frac{3}{4}$ "	266

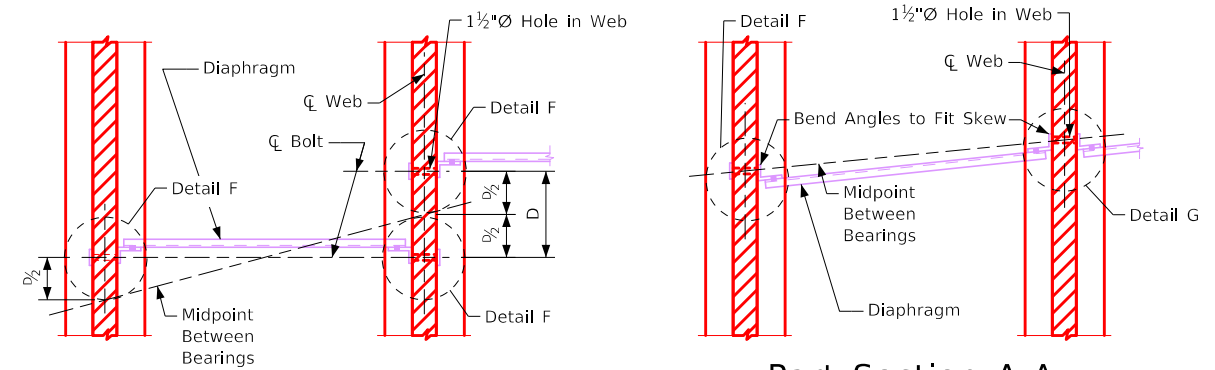
This Sheet Issued 06-14-2026, Sheet 1 of 2. Revised 04-2026: Corrected "One Detail F" in Diaphragm Structural Steel list to show One-Bent Plate 9"x6" (was incorrectly stating two). BeamSpagn - 1036-1-BTC - This Sheet Reissued 04-2024. Sheet Format Update.

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
3:48:17 PM	4/5/2026	bkloss	p:\w\ntpwint1.dot.int.lan:\P\Main\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				

Steel Intern. Diaphragm - BTC Beam



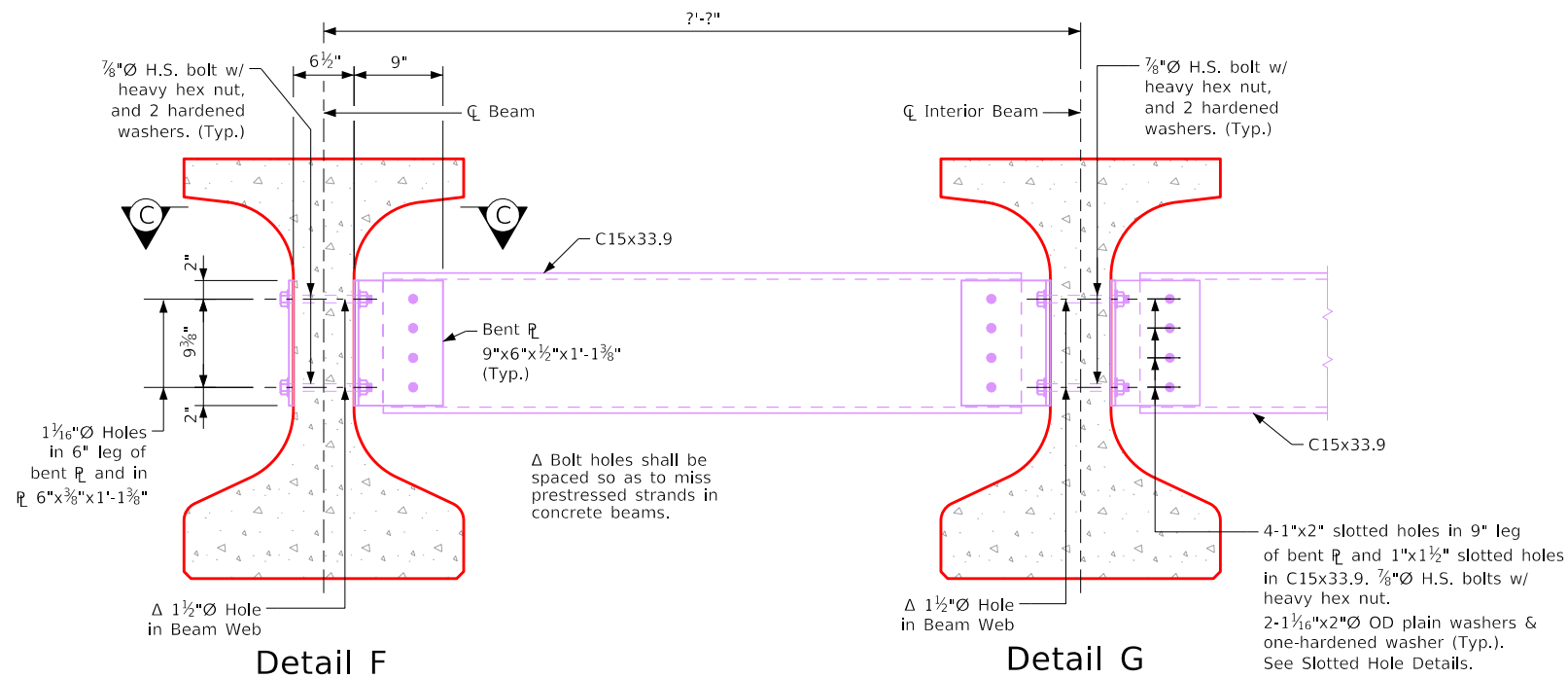
Section Showing Intermediate Diaphragms



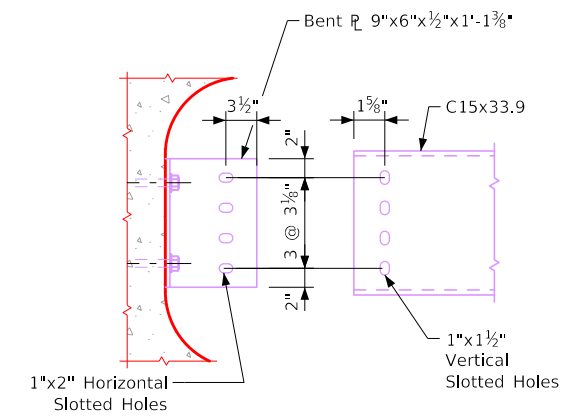
Part Section A-A  
For Bridges Skewed Greater Than 7°30'

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.



Section Showing Intermediate Diaphragms At Exterior Bay

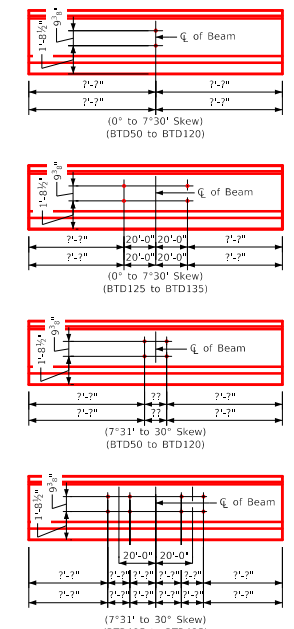


Slotted Hole Details

Steel Intern. Diaphragm - BTC Beam

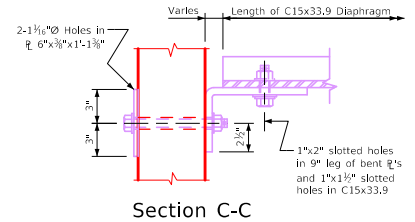
This Sheet Issued 06-14-2024, Sheet 2 of 2. Beams.dgn - 1036-2-BTC - This Sheet Re-Issued 04-2024, Sheet Format Update.

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
3:48:18 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

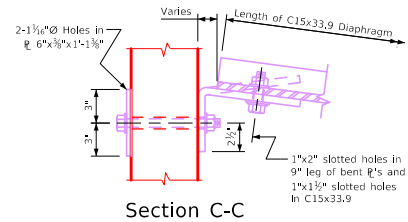


Intermediate Diaphragm Bolt Hole Locations

Bulb Tee "D" Beam Intermediate Diaphragm Structural Steel		
One Beam Connection (Detail "F" and/or Detail "G")		
	No. of Beam Connections	Weight
Two - 1/2"Ø X 9 1/2" H.S. Bolts with Nuts & Washers = 4.8 Lbs.	?	?
One Detail "G"	Two - Bent leg 9" x 6" x 1/2" x 1'-1 1/2" = 57.0 Lbs.	?
One Detail "F"	One - Backing leg 6" x 3/4" x 1'-1 1/2" = 6.5 Lbs.	?
	One - Bent leg 9" x 6" x 1/2" x 1'-1 1/2" = 28.5 Lbs.	?
One Diaphragm		
Eight - 1/2"Ø X 2 1/2" H.S. Bolts with Nuts & Washers = 10.3 Lbs.	Number of Diaphragms	?
	?	?
One - C15 x 33.9 = 33.9 Lbs./ft.	Length of Member	?
	7'-7"	?
Intermediate Diaphragm Structural Steel - Total (Lbs.)		?



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



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



Note to Designer: Beam examples are outside of border sheet

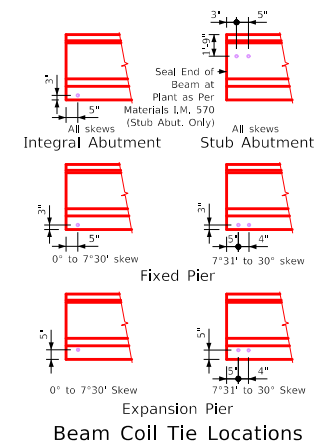
Bulb Tee "D" Beam Intermediate Diaphragm Structural Steel		
One Beam Connection Information		
Beam Spacing	Diaphragm Length	C15x33.9 Weight (Lbs.)
6'-6 1/2"	5'-4 1/2"	182
7'-2 1/2"	6'-0 1/2"	205
8'-0 1/2"	6'-10 1/2"	232
8'-8 1/2"	7'-4 1/2"	255
9'-0 1/2"	7'-10 1/2"	266

STRUCTURAL STEEL	
Weight	? lbs.

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

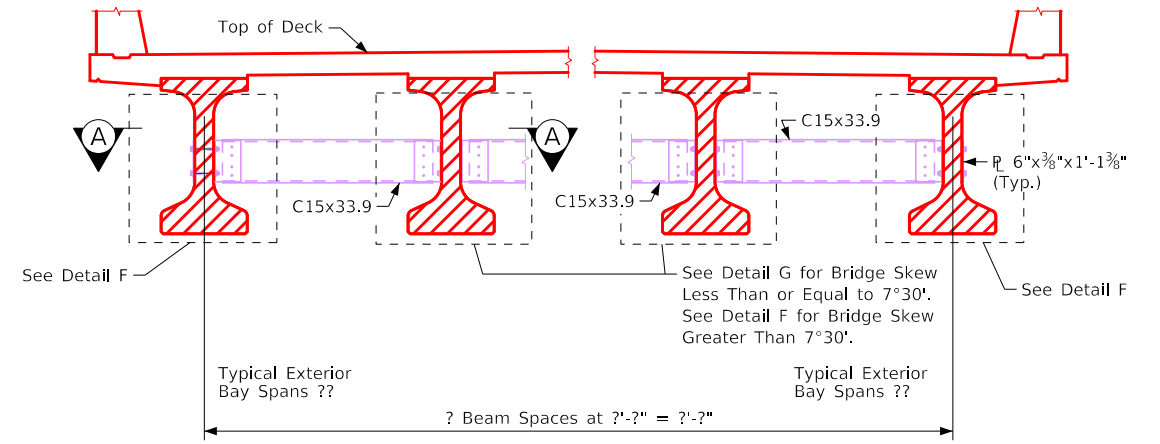
Note to Designer: Chart outside of border contains diaphragm lengths

**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 1 1/2"Ø holes for the 1/2"Ø H.S. bolts shall be cast into the web. Drilling is not allowed.  
 The 3/8"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.

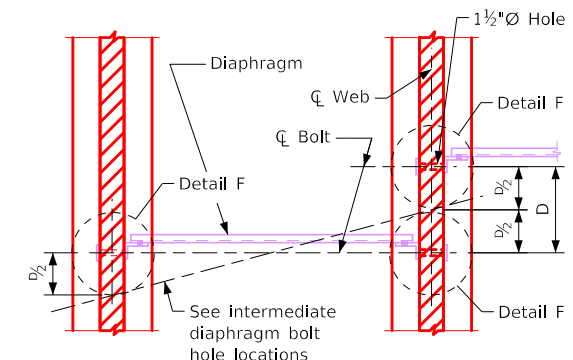


Steel Intern. Diaphragm - BTD Beam

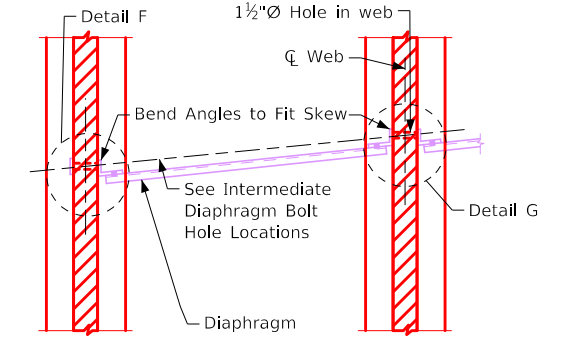
This Sheet Issued 06-14-2024, Sheet 1 of 2, Beams.dgn - 1036-1-BTD - This Sheet Re-issued 04-2024, Sheet Format Update.



Section Showing Intermediate Diaphragms

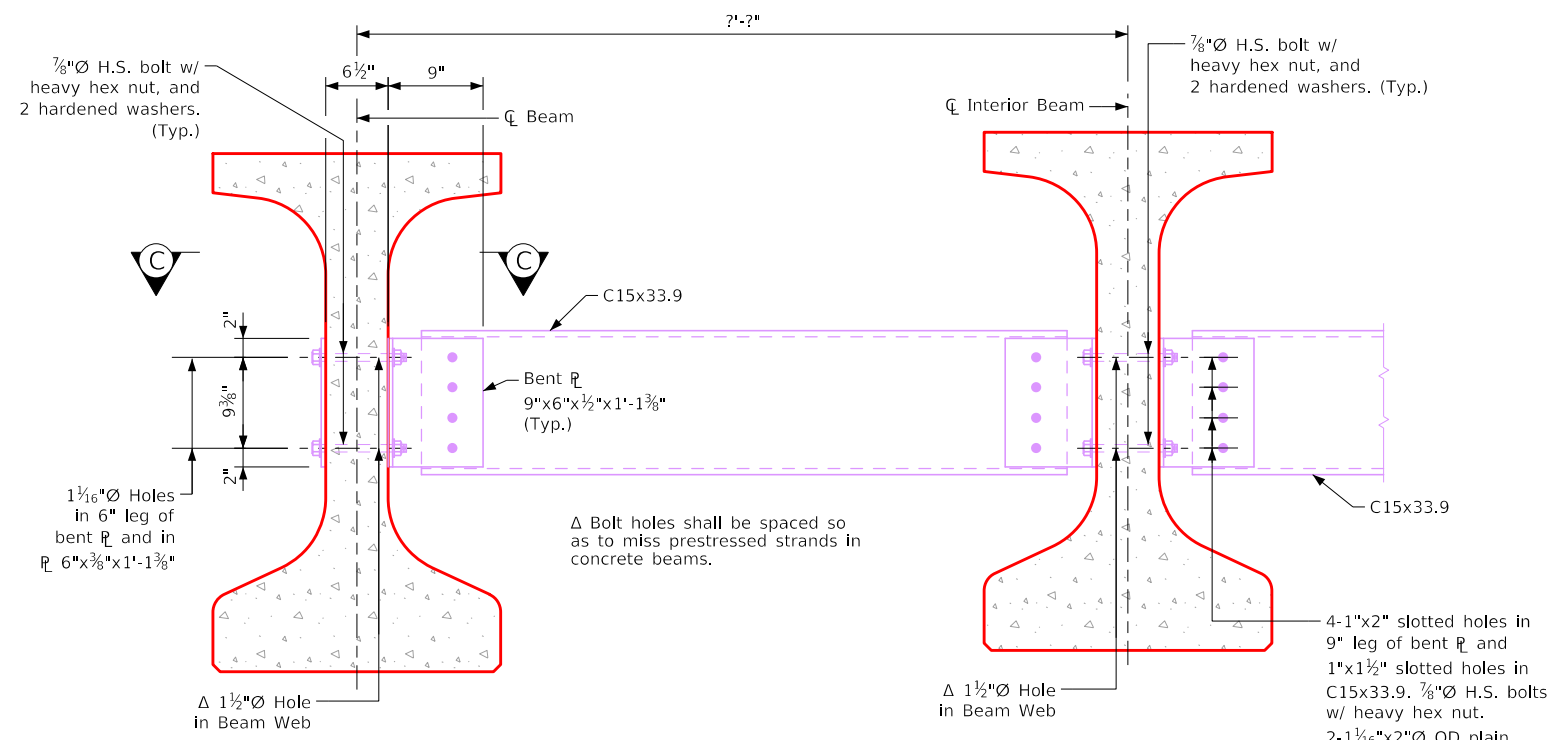


Part Section A-A  
For Bridges Skewed Greater Than 7°30'



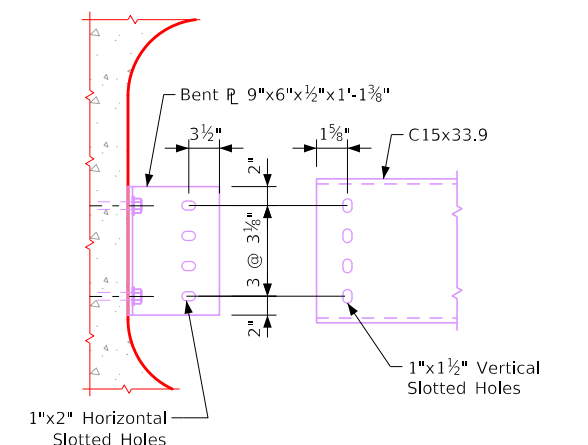
Part Section A-A  
For Bridges Skewed Less Than or Equal to 7°30'

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



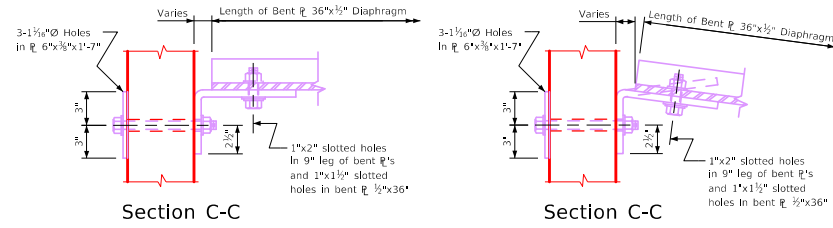
Slotted Hole Details

Steel Intern. Diaphragm - BTD Beam

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

Bulb Tee "E" Beam Intermediate Diaphragm Structural Steel		
One Beam Connection Information		
Beam Spacing	Diaphragm Length	Bent $\phi$ 36"x36" Weight (Lbs.)
6'-6 1/2"	5'-4 1/2"	328
7'-2 1/2"	6'-0 3/4"	370
8'-0 1/2"	6'-10 1/2"	419
8'-8 3/4"	7'-8 1/2"	461
9'-0 1/2"	7'-10 1/4"	481

Bulb Tee "E" Beam Intermediate Diaphragm Structural Steel			
One Beam Connection (Detail "F" and/or Detail "G")		No. of Beam Connections	Weight
Three - 3/4" X 9 1/4" H.S. Bolts with Nuts & Washers	= 7.2 Lbs.	?	?
One Detail "G"	Two - Bent $\phi$ 9" x 6" x 1/2" x 1'-7" = 80.8 Lbs.	?	?
One Detail "F"	One - Backing $\phi$ 6" x 3/8" x 1'-7" = 12.1 Lbs.	?	?
One - Bent $\phi$ 9" x 6" x 1/2" x 1'-7" = 40.4 Lbs.		?	?
One Diaphragm		Number of Diaphragms	Weight
Ten - 1/2" X 2 1/2" H.S. Bolts with Nuts & Washers	= 9.7 Lbs.	?	?
Length of Member	7'-7"	?	?
One - Bent $\phi$ 36"x36" = 61.3 Lbs./Fl.		?	?
Intermediate Diaphragm Structural Steel - Total (Lbs.)			?



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

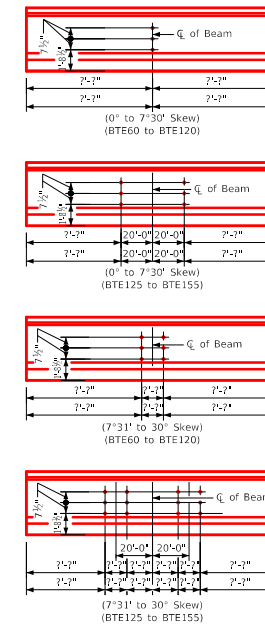
Note to Designer: Use when skew is 7:30' or less.

**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 1 1/2"  $\phi$  holes for the 3/4" H.S. bolts shall be cast into the web. Drilling is not allowed.  
 The 1/2" 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.

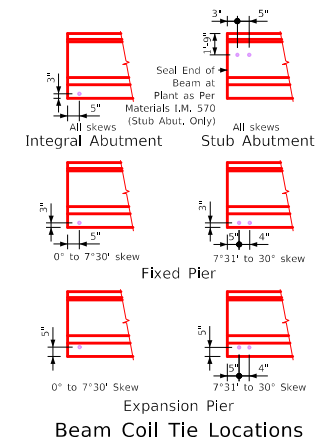
Note to Designer: Chart outside of border contains diaphragm lengths



Intermediate Diaphragm Bolt Hole Locations



Note to Designer: Beam examples are outside of border sheet

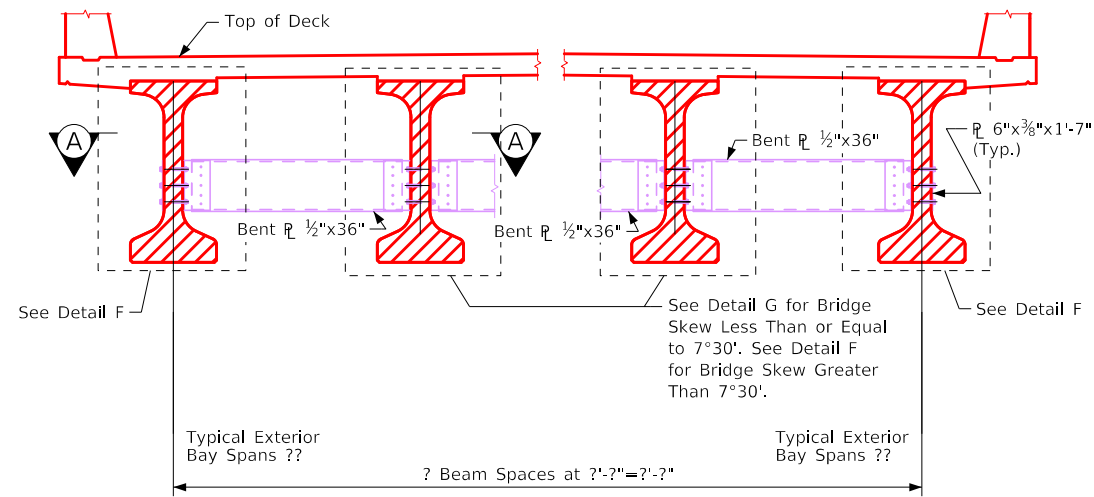


Beam Coil Tie Locations

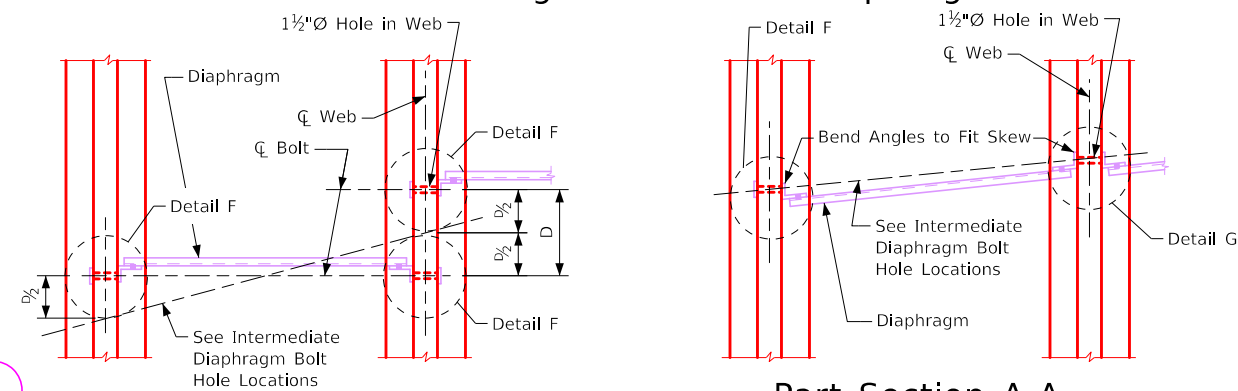
Steel Intern. Diaphragm - BTE Beam

This Sheet Issued 06-14-2024, Sheet 1 of 2. This Sheet Replaces: 06-2024, 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
314820 PM	4/5/2026	tkfoss	pw1\NT\pw1\1.dot;IntJan:PWMain\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				



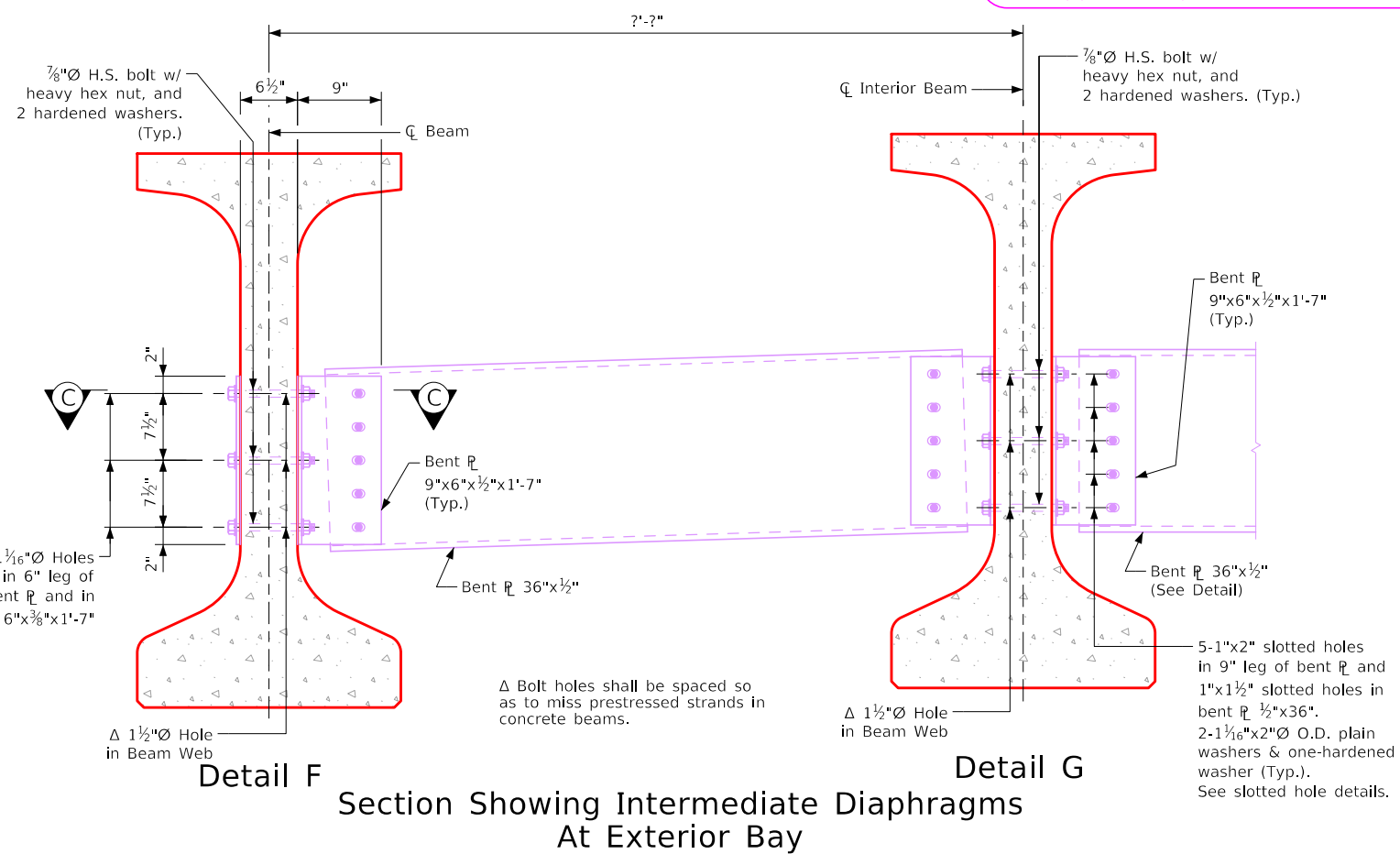
Section Showing Intermediate Diaphragms



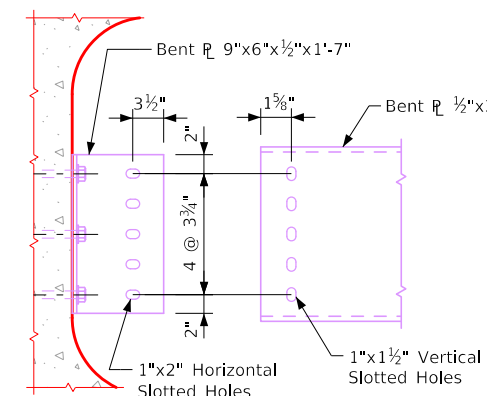
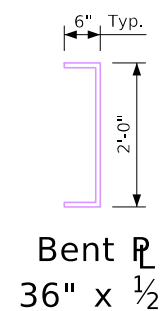
Part Section A-A  
For Bridges Skewed Greater Than 7°30'

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.

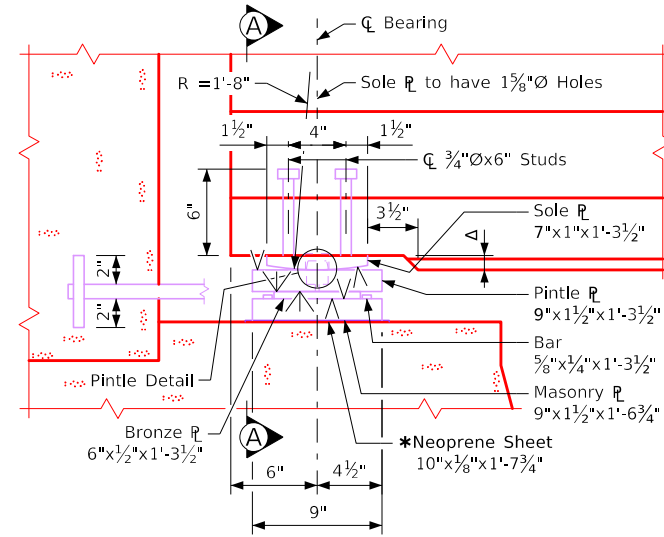
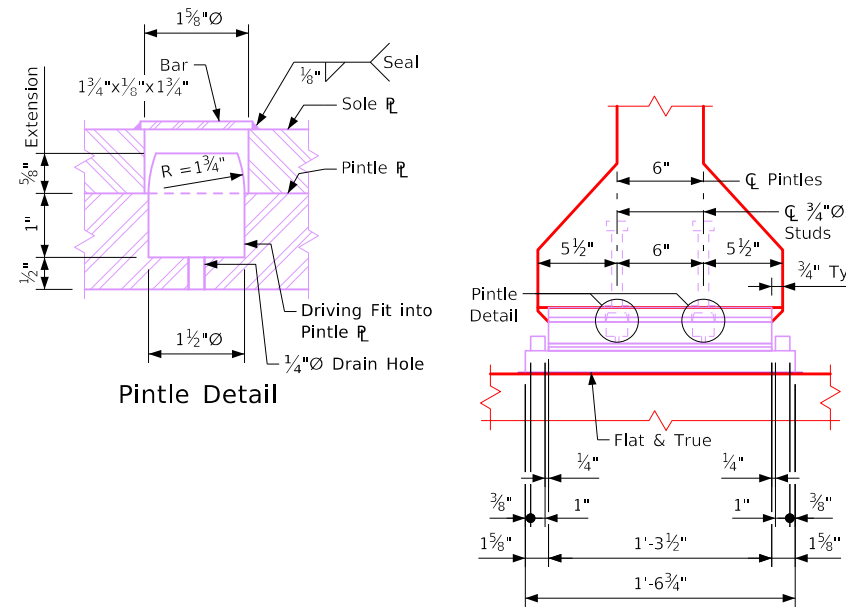


Section Showing Intermediate Diaphragms At Exterior Bay



Slotted Hole Details

Steel Intern. Diaphragm - BTE Beam



**Abutment Bearing Notes:**

The sliding surface of the bronze plate 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 plate shall be beveled 1/8".

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

Masonry plates are to be set on a 1/8" 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.

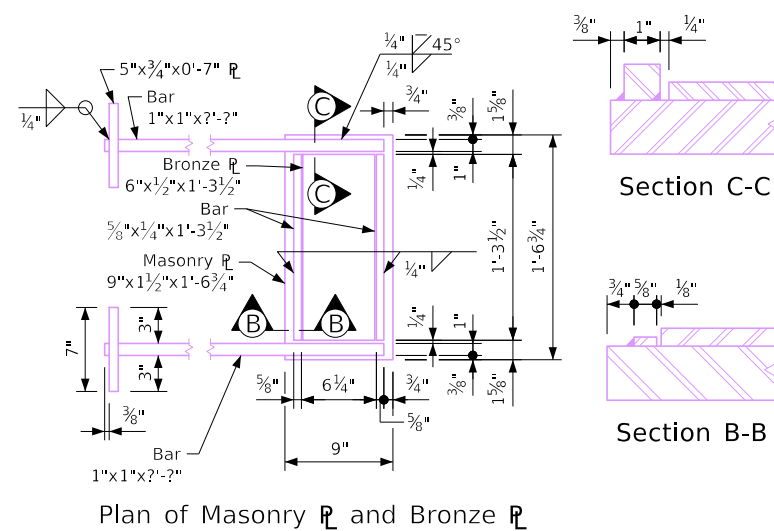
Sole plates shall comply with one of the following specifications:  
 ASTM A514 Grade B  
 ASTM A709 Grade HPS 70W

**Design Note:**

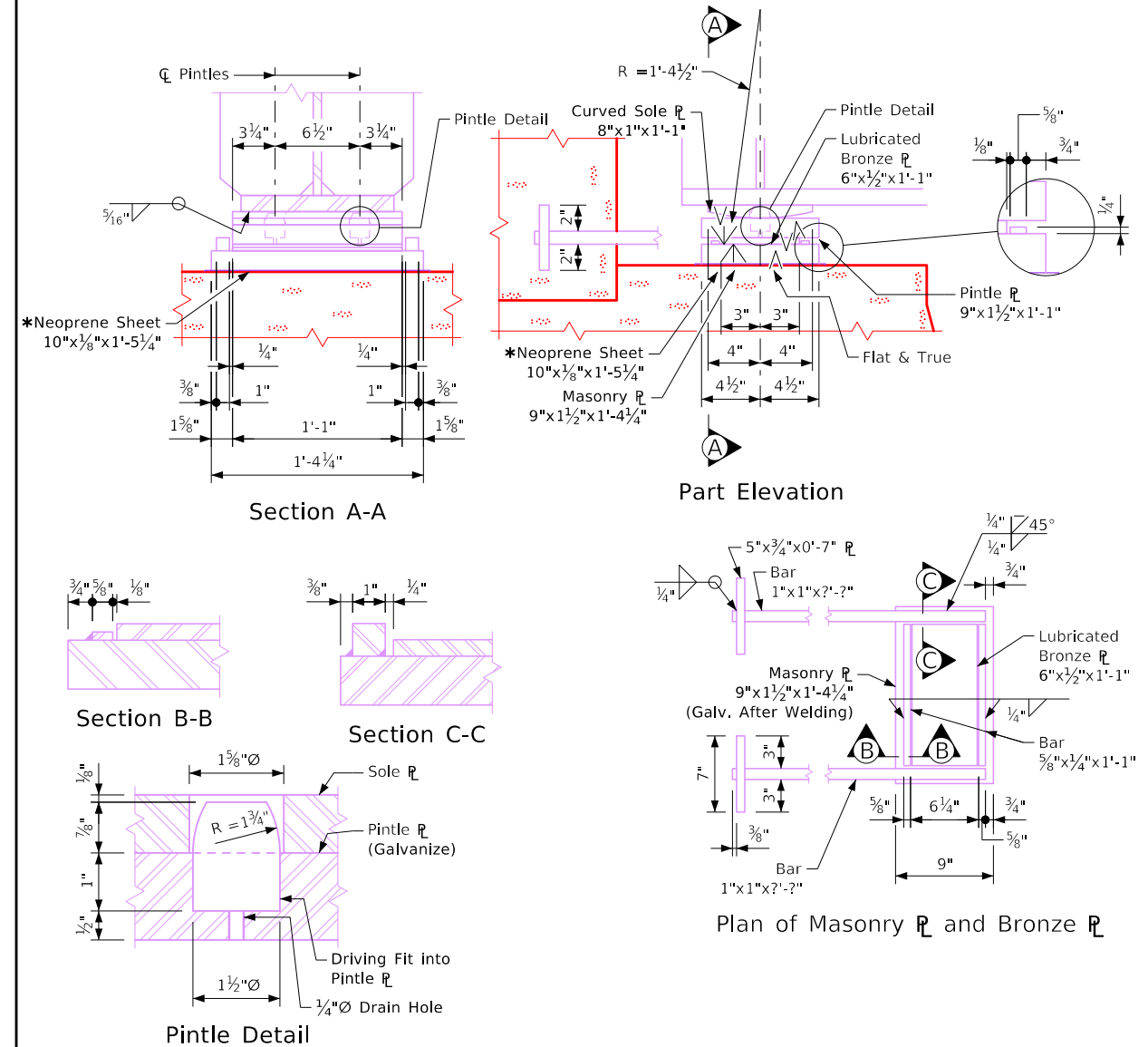
- Total vertical design load (DC+ DW + LL + IM) at service limit state = 177 k.
- Bearings as designed will allow up to 1.5 inches of movement each way of centerline of bearing.

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

\* 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.



Structural Steel	
Weight	? lbs.
Does Not Include Curved Sole Plate	
Note: Structural Steel weight is included on the Summary Quantities Sheet.	



**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 plate 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 plate shall be beveled 1/8".

Masonry plates are to be set on a 1/8" 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:**

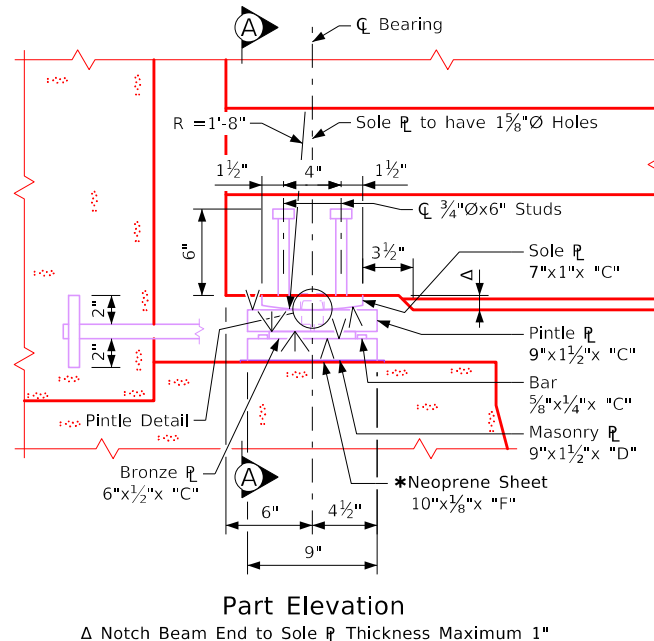
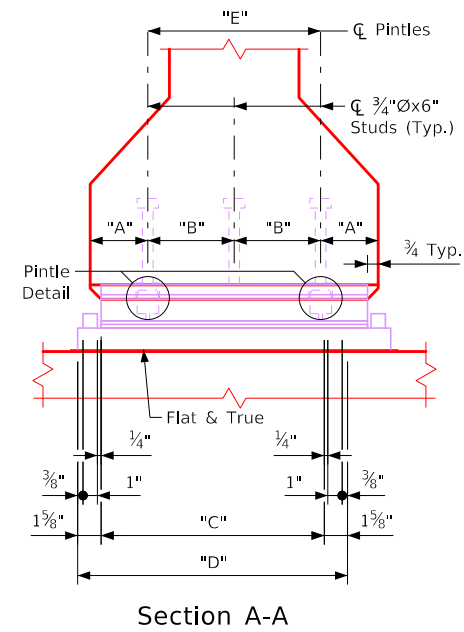
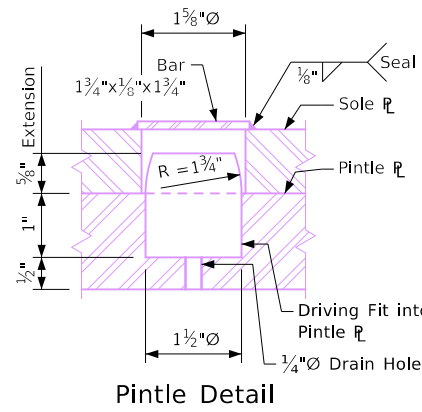
- Total vertical design load (DC+ DW + LL + IM) at service limit state = 153 k.
- Bearings as designed will allow up to 1.5 inches of movement each way of centerline of bearing.

**Masonry Plate / Bronze Bearing Assembly**

Structural Steel	
Weight	? lbs.
Includes Curved Sole Plate	
Note: Structural Steel weight is included on the Summary Quantities Sheet.	

**Stub Abutment Bearing Details**

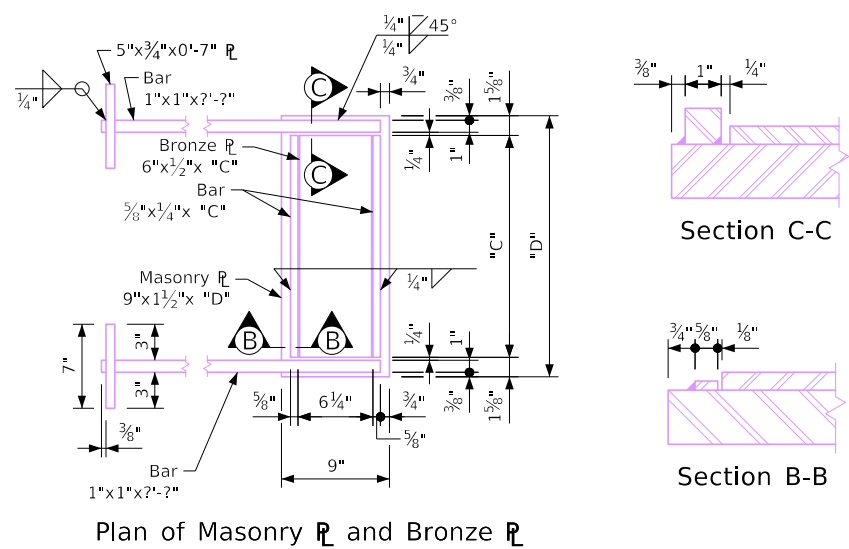
Correction 05-14: Added Weight Table & Titles/Descriptions to Agree with Summary Quantities Sheet. Added Note Referring to Summary Quantities Sheet. Issued 03-08. Beams.dgn - 4541 - This Sheet Re-Issued 04-2024. Sheet Format Update.



Bearing Dimension	Beam Bottom Flange Width	
	1'-8"	1'-10"
"A"	4"	5"
"B"	6"	6"
"C"	1'-6 1/2"	1'-8 1/2"
"D"	1'-9 3/4"	1'-11 3/4"
"E"	1'-0"	1'-0"
"F"	1'-10 3/4"	2'-0 3/4"

**Abutment Bearing Notes:**

The sliding surface of the bronze plate 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 plate shall be beveled 1/8". Surfaces marked "V" shall be finished ANSI 250 and surfaces marked "∇" shall be finished ANSI 125. Masonry plates are to be set on a 1/8" 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 Prestensioned Precast 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:**

- 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.
- Bearings as designed will allow up to 1.5 inches of movement each way of centerline of bearing.

**Prestensioned Precast Concrete Beam Abutment Bearing Details (C & D BeamS)**

\*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.

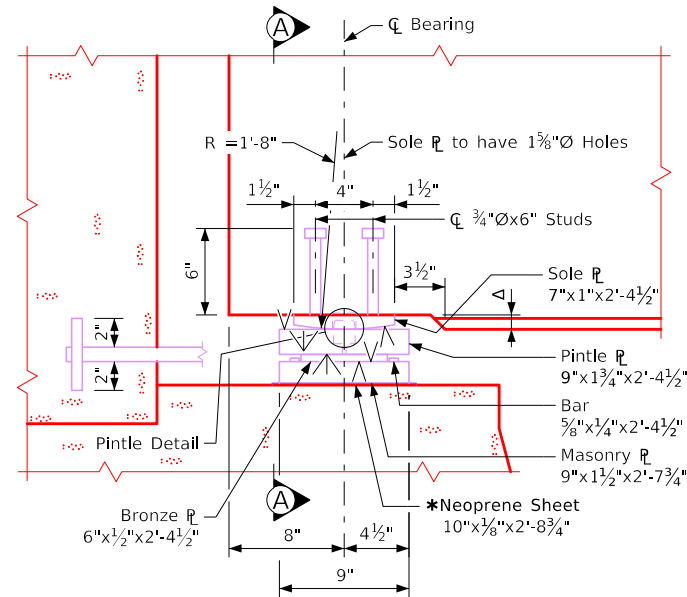
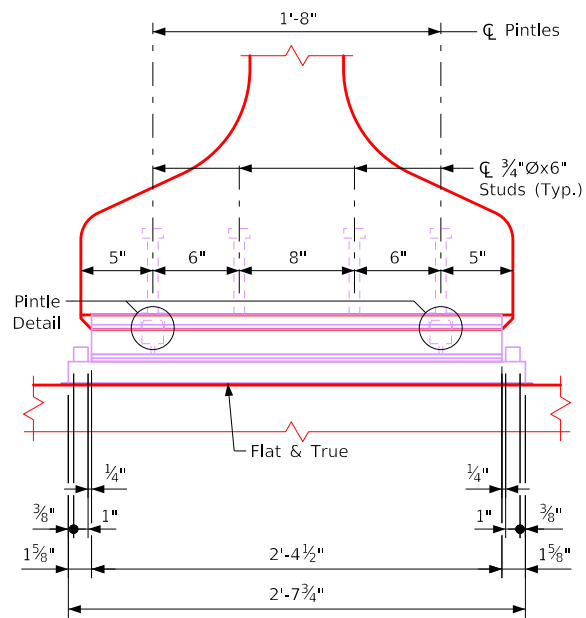
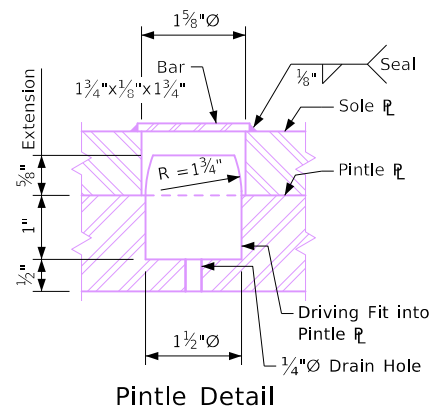
**Masonry Plate / Bronze Bearing Assembly**

Structural Steel	
Weight	? lbs.
Does Not Include Curved Sole Plate	
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.

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.



**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 1/8".

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

Masonry plates are to be set on a 1/8" 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.

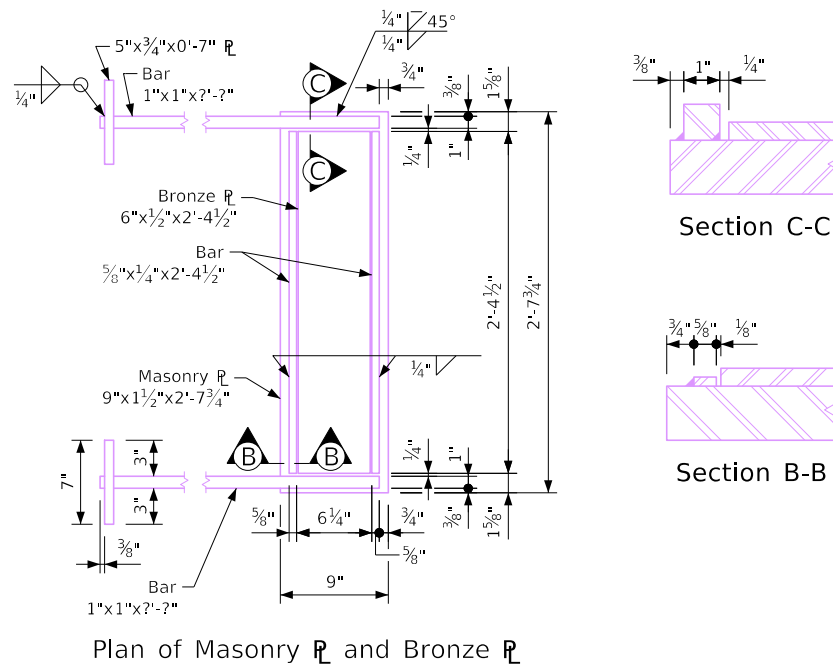
The sole plate, pintle, pintle plate and the masonry plate shall be galvanized. The sole plate and masonry plate shall be fitted up and welded prior to galvanizing. The pintle and pintle plate shall be assembled prior to galvanizing. The surface of pintle plate in contact with bronze bearing plate shall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

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



**Section C-C**

**Section B-B**

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

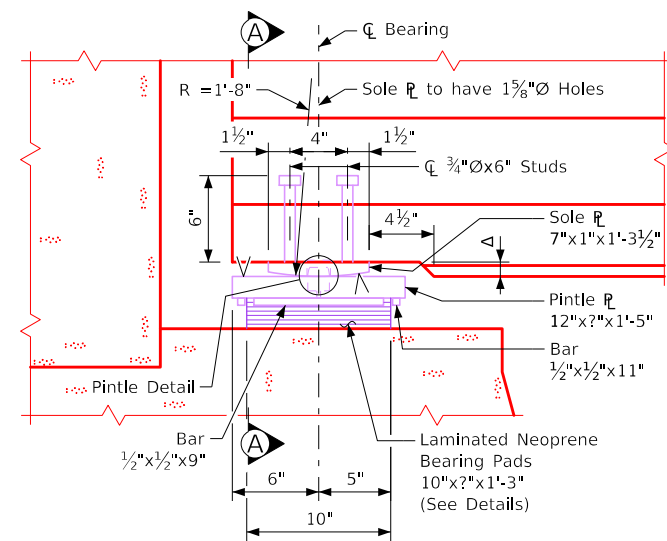
\*The 1/8 inch neoprene sheets are to be 50, 60, or 70 durometer hardness and shall be 1 inch greater in length and width than the bottom surface of the masonry plates or steel bearings.

**Masonry PL / Bronze Bearing Assembly**

<b>Structural Steel</b>	
Weight	? lbs.
Does Not Include Curved Sole PL	
Note: Structural Steel weight is included on the Summary Quantities Sheet.	

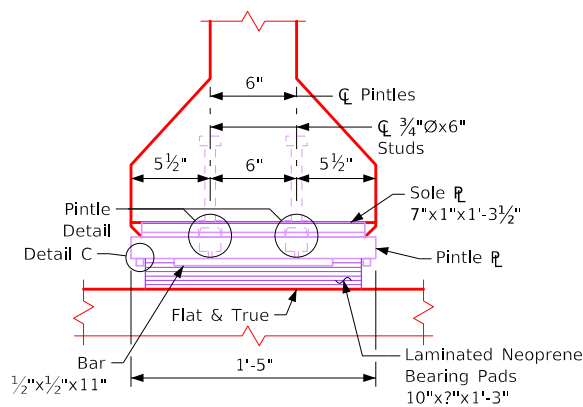
**Stub Abutment Bearing Details**

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 - 4541C - This Sheet Re-Issued 04-2024. Sheet Format Update.



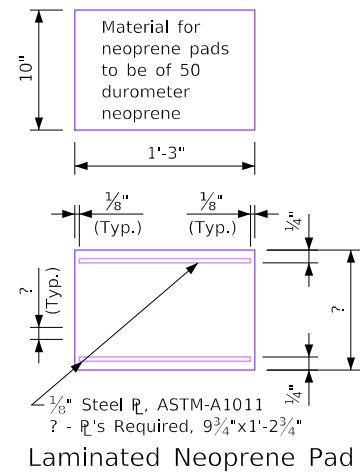
**Part Elevation**

Δ Notch Beam End to Sole Pl Thickness Maximum 1"

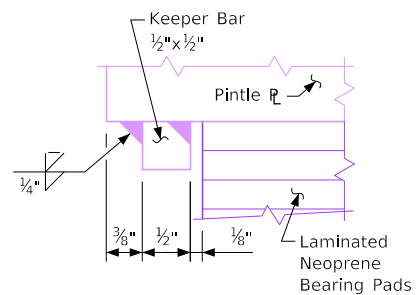


**Section A-A**

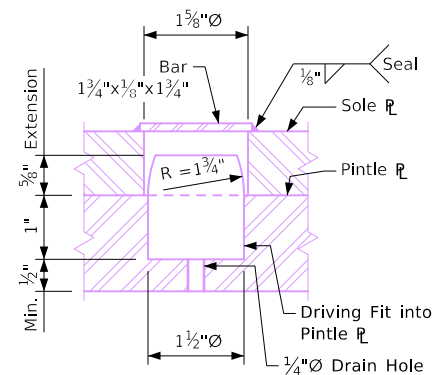
Abutment Bearing (A & B Beams)



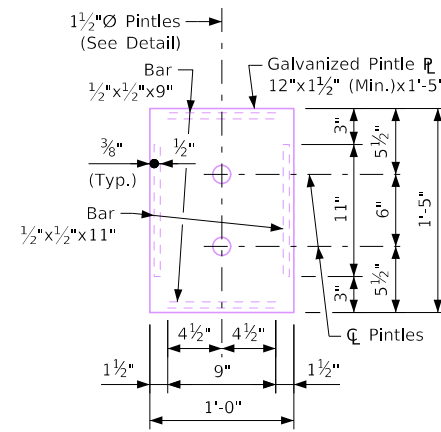
**Laminated Neoprene Pad**



**Detail C**



**Pintle Detail**



**Plan OF Pintle Plate**

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

**Laminated Neoprene Pad / Curved Sole Pl Assembly**

**Abutment Bearing Notes:**

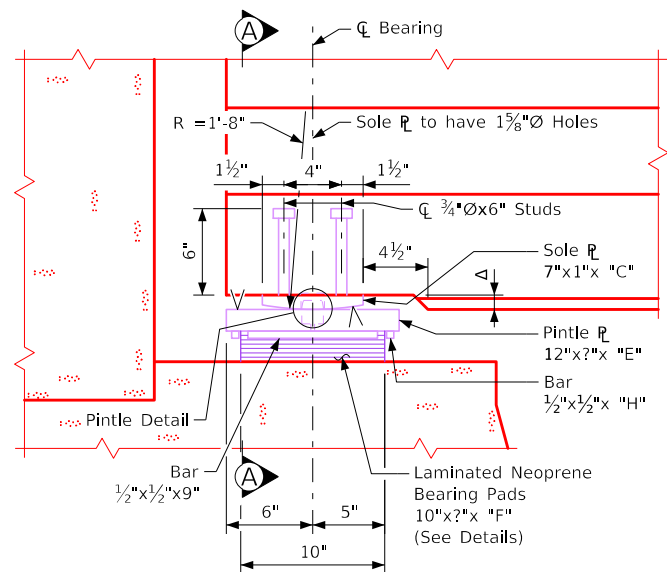
- Surfaces marked "V" shall be finished ANSI 250.
- Pintle plates are a part of the superstructure Structural Steel quantity.
- Cost of anchored curved sole plates is to be included in the price bid for Pretensioned Prestressed Concrete Beams.
- Cost of neoprene bearing pads shall be considered incidental 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 Pl	

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

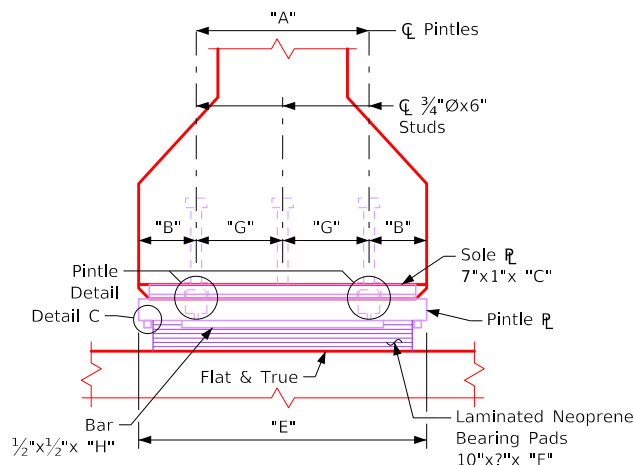
**Stub Abutment Bearing Details**

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 - 4541D - This Sheet Re-issued 04-2024. Sheet Format Update.



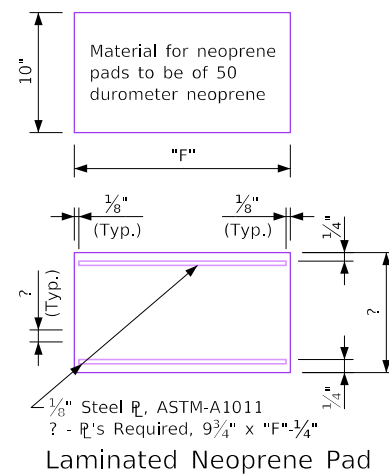
**Part Elevation**

Δ Notch Beam End to Sole Plate Thickness Maximum 1"

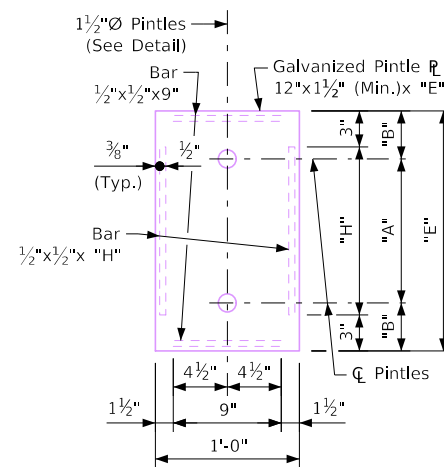


**Section A-A**

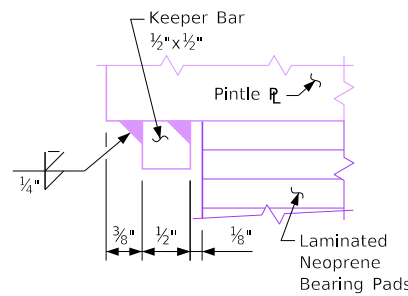
Abutment Bearing (C & D Beams)



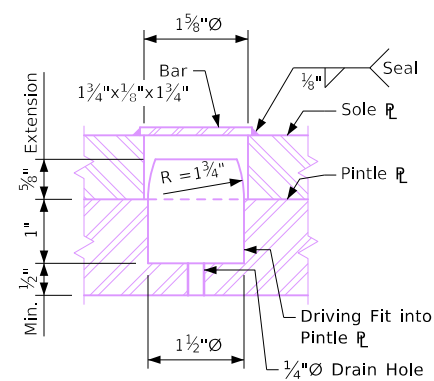
**Laminated Neoprene Pad**



**Plan OF  
Pintle Plate**



**Detail C**



**Pintle Detail**

Allowable Pintle Plate 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

Variable Dimensions		
Bearing Dimension	Beam Bottom Flange Width	
	1'-8"	1'-10"
"A"	1'-0"	1'-0"
"B"	4"	5"
"C"	1'-6 1/2"	1'-8 1/2"
"D"	3 3/4"	4 3/4"
"E"	1'-8"	1'-10"
"F"	1'-6"	1'-8"
"G"	6"	6"
"H"	1'-2"	1'-4"

**Laminated Neoprene Pad / Curved Sole Plate 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

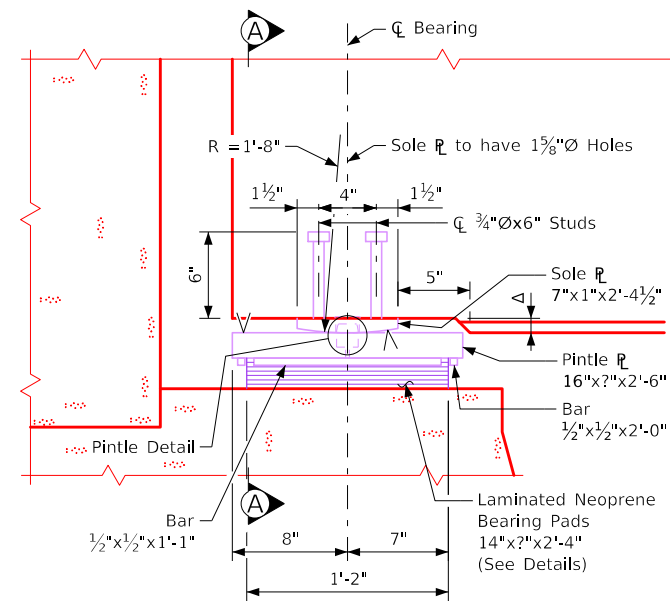
Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole Plate

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

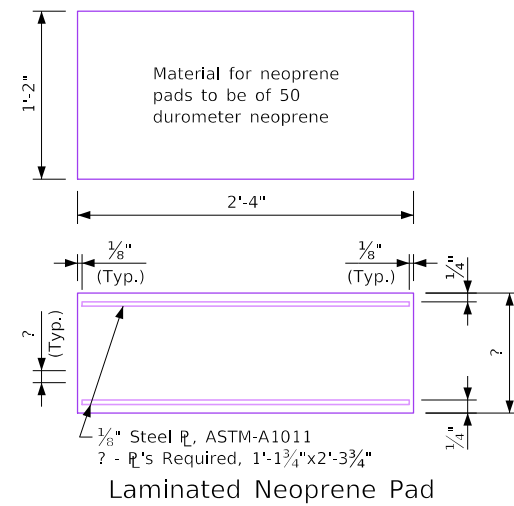
**Stub Abutment Bearing Details**

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.

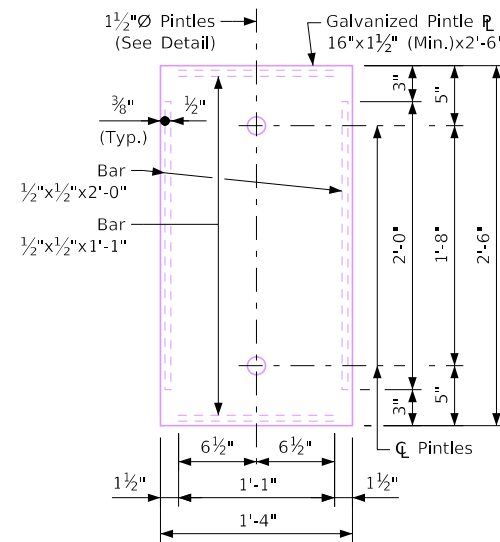


**Part Elevation**

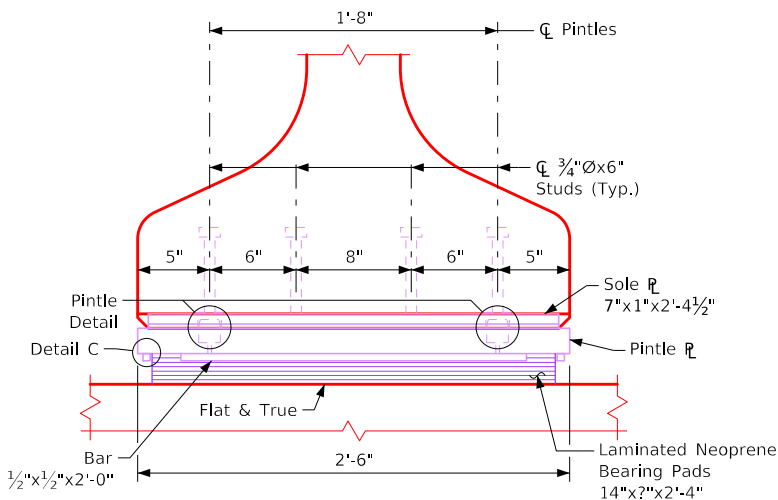
Δ Notch Beam End to Sole PL Thickness Maximum 1"



**Laminated Neoprene Pad**

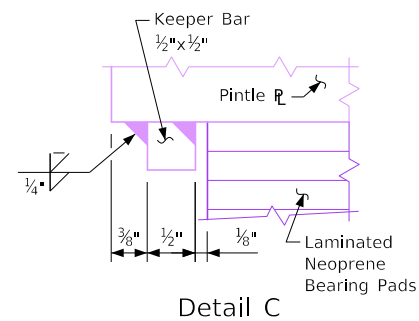


**Plan OF Pintle Plate**

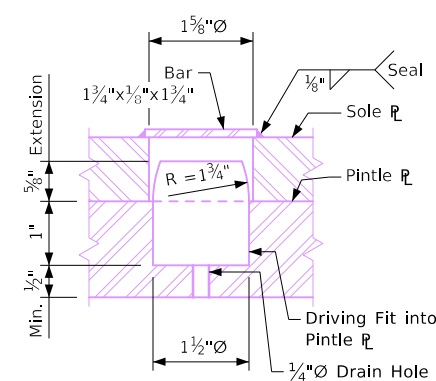


**Section A-A**

Abutment Bearing Bulb Tee Beams



**Detail C**



**Pintle Detail**

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

**Laminated Neoprene Pad / Curved Sole PL Assembly**

**Abutment Bearing Notes:**

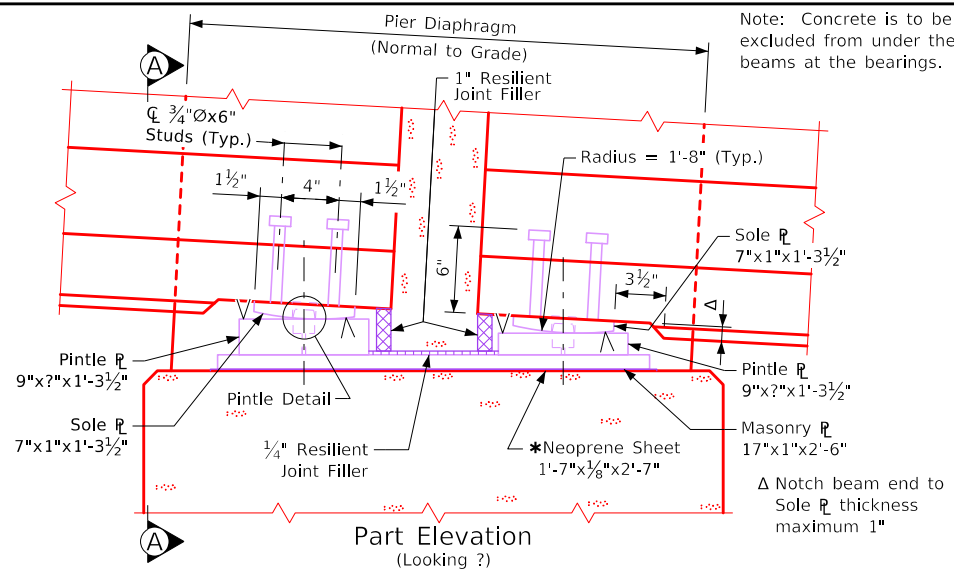
Surfaces marked "V" shall be finished ANSI 250.  
 Pintle plates are a part of the superstructure Structural Steel quantity.  
 Cost of anchored curved sole plates is to be included in the price bid for Prestensioned Prestressed Concrete Beams.  
 Cost of neoprene bearing pads shall be considered incidental to the bid item for Prestensioned 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.

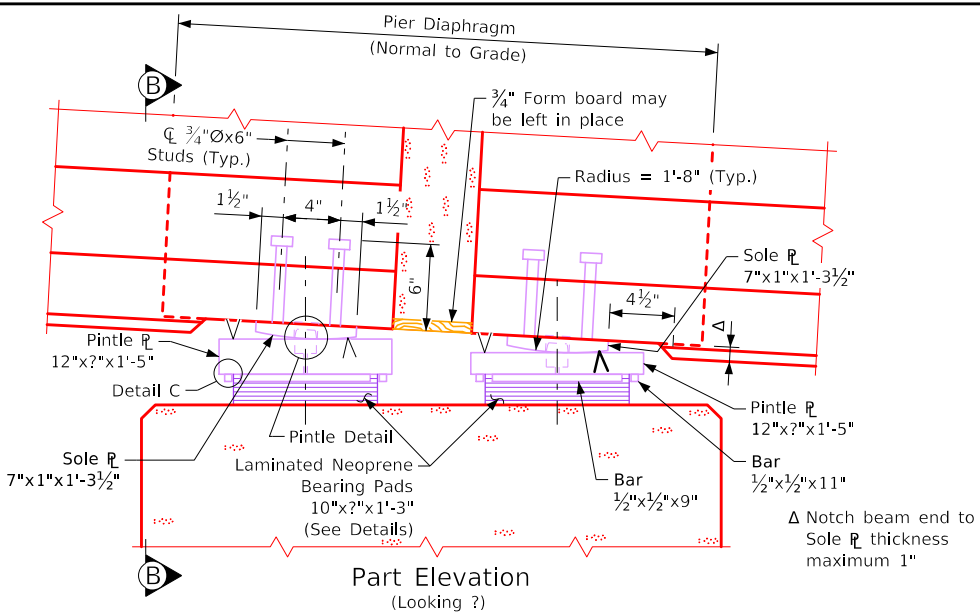
Does Not Include Curved Sole PL  
 Note: Structural Steel weight is included on the Summary Quantities Sheet.

**Stub Abutment Bearing Details**

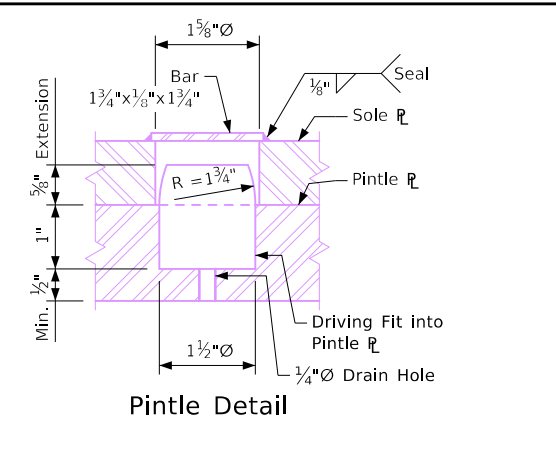
Correction 05-14: Added Weight Table & Titles/Descriptions to Agree with Summary Quantities Sheet. Added Note Referring to Summary Quantities Sheet. Issued 03-08. Beams.dgn - 4541F - This Sheet Re-Issued 04-2024. Sheet Format Update.



Part Elevation (Looking ?)

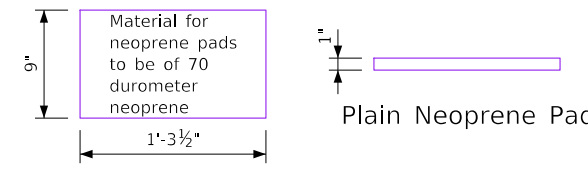


Part Elevation (Looking ?)



Pindle Detail

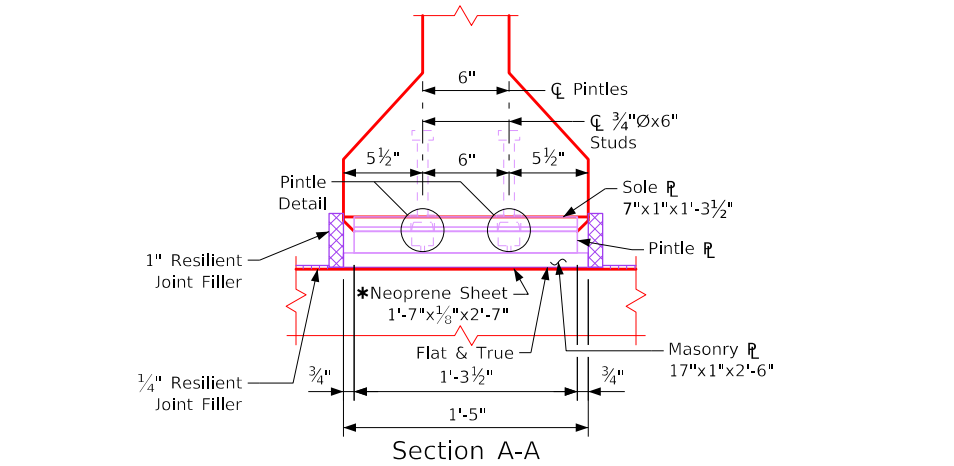
Allowable Pindle Thickness	
Allow Thickness Inches	Maximum Service Vertical Load, k
1.5	83
2.0	147



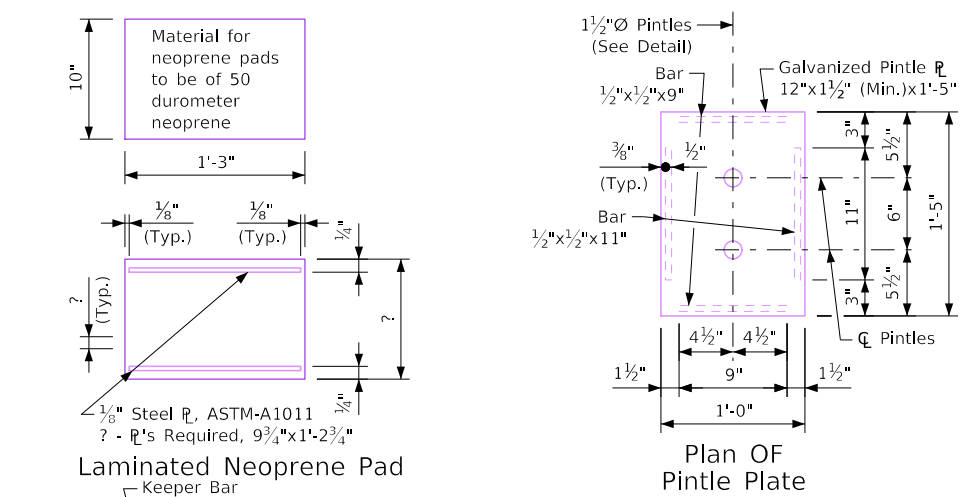
Plain Neoprene Pad

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

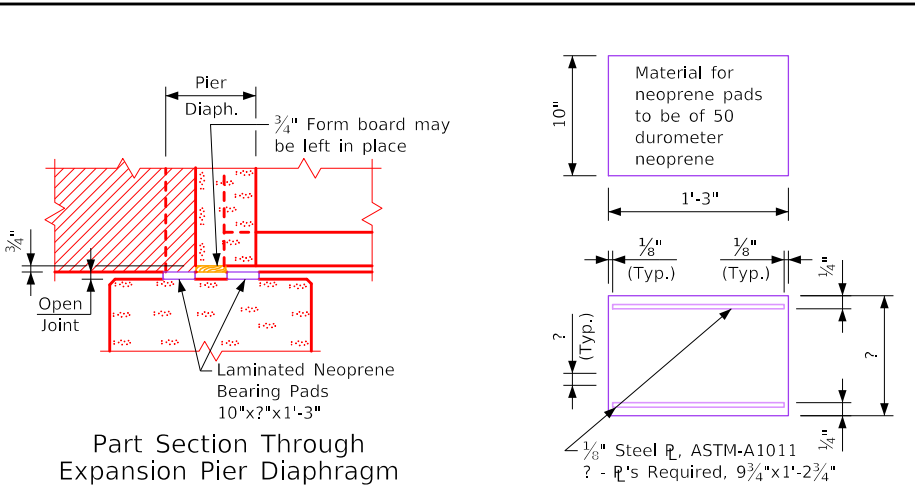
**Fixed Pier**



Section A-A



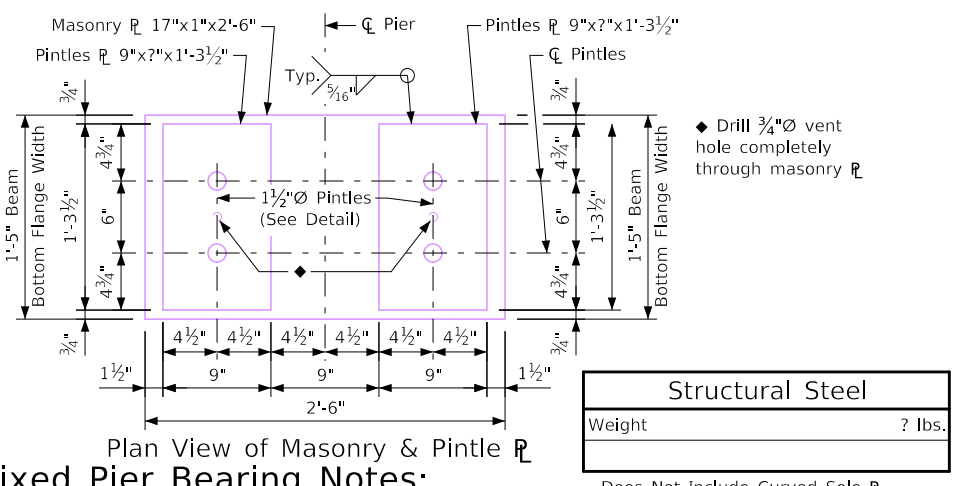
Plan of Pindle Plate



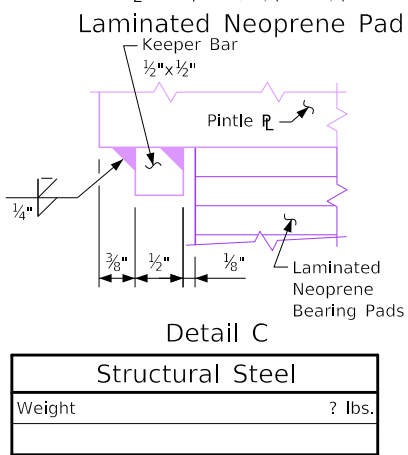
Part Section Through Expansion Pier Diaphragm

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

**Expansion Pier**



Plan View of Masonry & Pindle R



Detail C

Structural Steel	
Weight	? lbs.

**Expansion Pier Bearing Notes:**

Surfaces marked "V" shall be finished ANSI 250. Pindle 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 pads shall be considered incidental to the Pretensioned Prestressed Concrete Beams bid item. The sole plates, pindle, and pindle plates shall be galvanized. The pindle and pindle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The surface of the pindle 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

**Laminated Neoprene Pad / Curved Sole R Assembly**

**Fixed Pier Bearing Notes:**

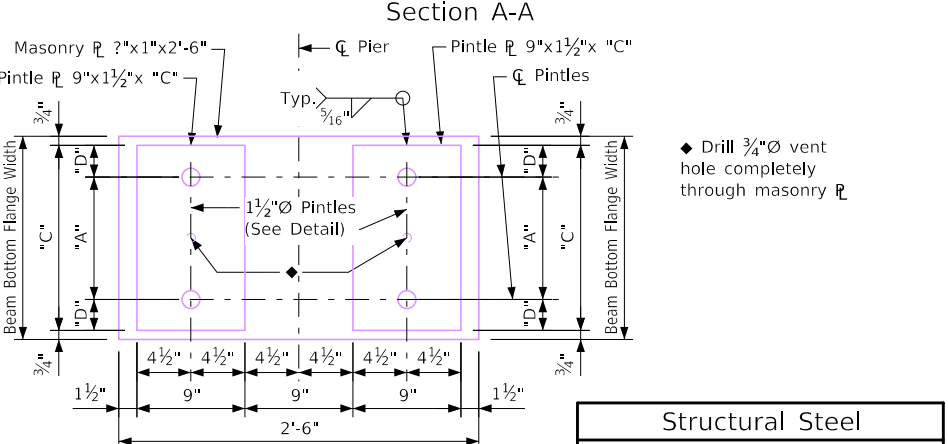
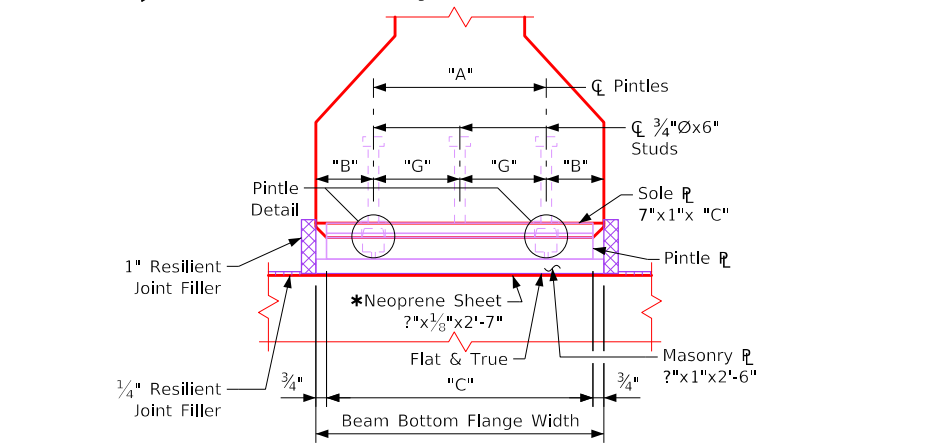
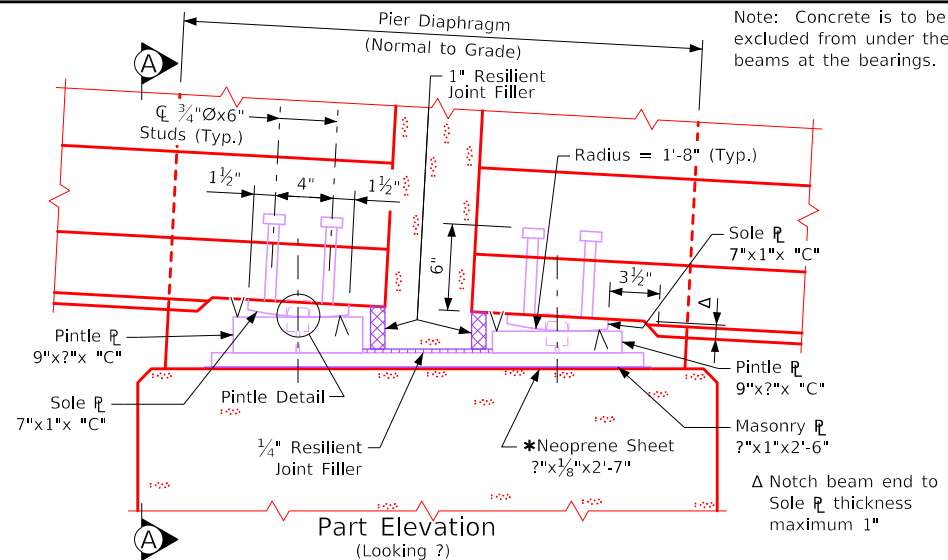
Surfaces marked "V" shall be finished ANSI 250. Masonry plates are to be set on a 1/8" neoprene sheet. Pindle plates, and masonry plates are a part of the superstructure Structural Steel quantity. Cost of neoprene sheets shall be considered incidental to the Structural Steel bid item. Cost of anchored curved sole plates is to be included in the price bid for Pretensioned Prestressed Concrete Beams. The sole plates, pindle, pindle plates, and masonry plates shall be galvanized. The pindle and pindle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The pindle and pindle plate shall be assembled prior to galvanizing. The surface of the pindle 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

**Masonry R / Curved Sole R Assembly**

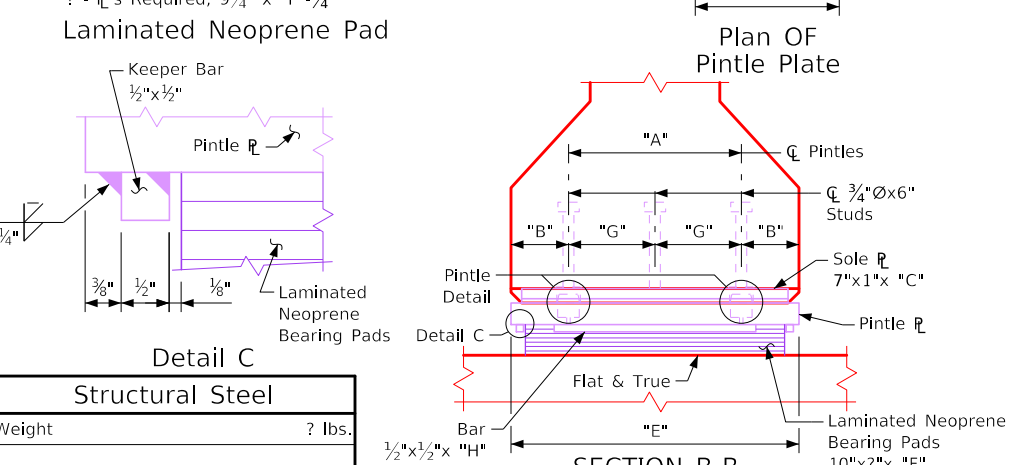
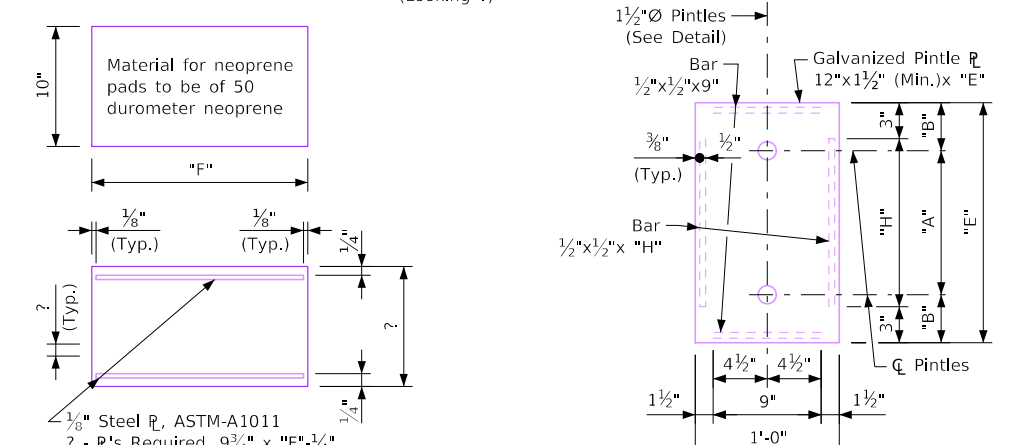
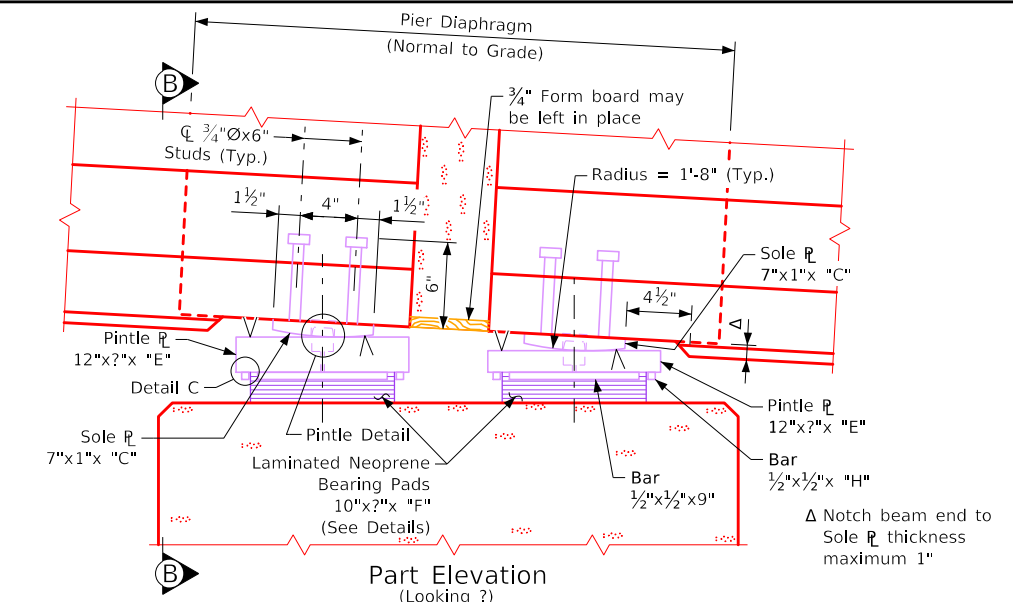
Note: Structural Steel weight is included on the Summary Quantities Sheet.

**Pier Bearing Details**

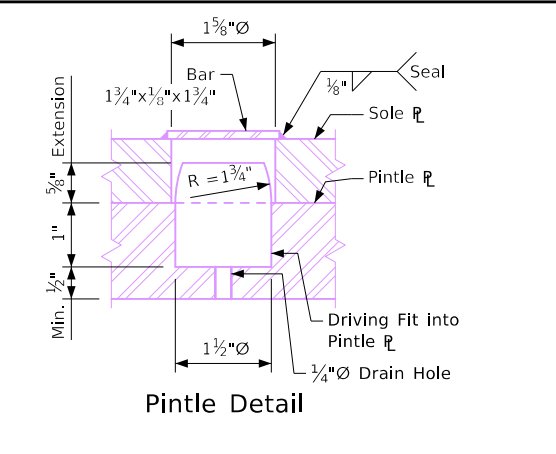
Correction 05-14: Added Weight Table & Titles/Descriptions to Agree with Summary Quantities Sheet. Added Note Referring to Summary Quantities Sheet.  
 Issued 03-08.  
 Beams.dgn - 4541G - This Sheet Re-Issued 04-2024. Sheet Format Update.



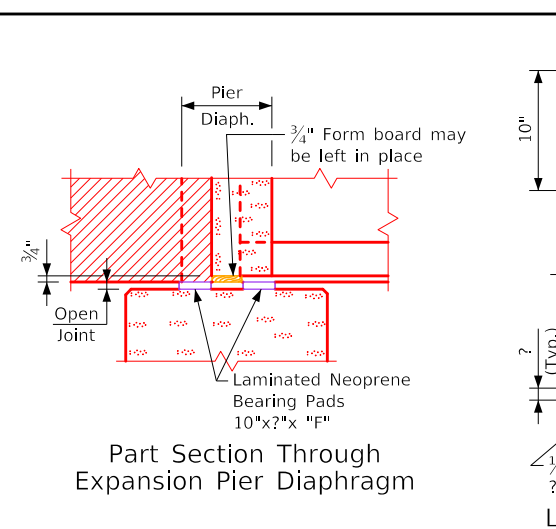
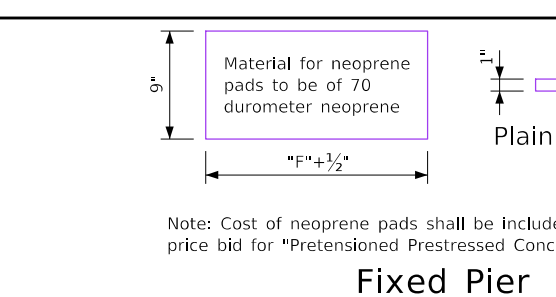
**Fixed Pier Bearing Notes:**  
 Surfaces marked "V" shall be finished ANSI 250.  
 Masonry plates are to be set on a 1/8" neoprene sheet.  
 Pindle plates, and masonry plates are a part of the superstructure Structural Steel quantity. Cost of neoprene sheets shall be considered incidental to the Structural 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, pindle, pindle plates, and masonry plates shall be galvanized. The pindle and pindle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The surface of the pindle 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 R / Curved Sole R Assembly**



**Expansion Pier Bearing Notes:**  
 Surfaces marked "V" shall be finished ANSI 250.  
 Pindle 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, pindle, and pindle plates shall be galvanized. The pindle and pindle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The surface of the pindle 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 R Assembly**



Variable Dimensions		
Bearing Dimension	Beam Bottom Flange Width	
	1'-8"	1'-10"
"A"	1'-0"	1'-0"
"B"	4"	5"
"C"	1'-6 1/2"	1'-8 1/2"
"D"	3 3/4"	4 1/4"
"E"	1'-8"	1'-10"
"F"	1'-6"	1'-8"
"G"	6"	6"
"H"	1'-2"	1'-4"



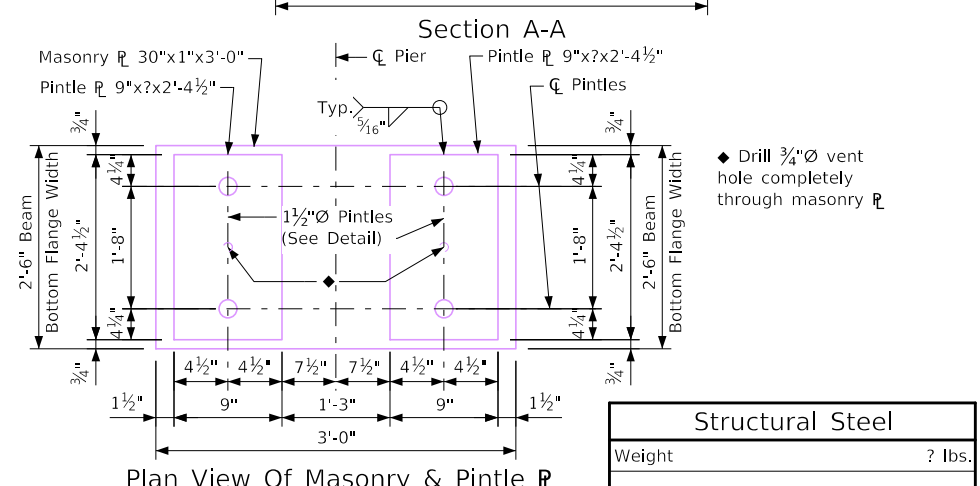
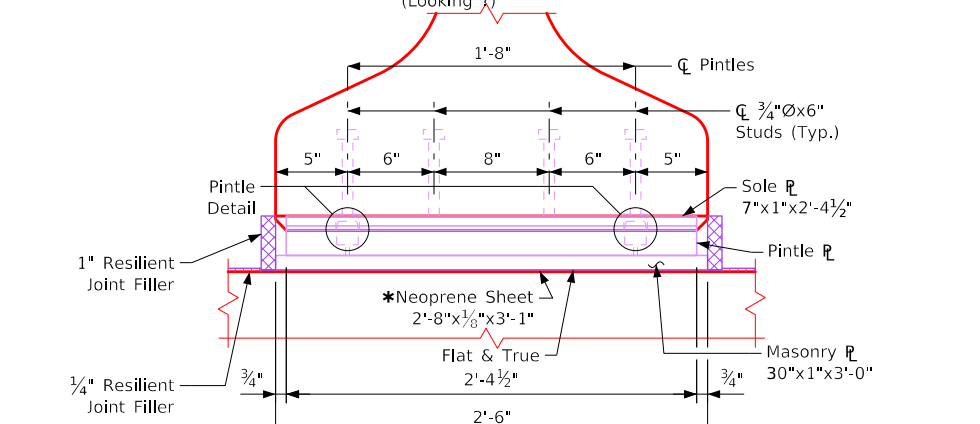
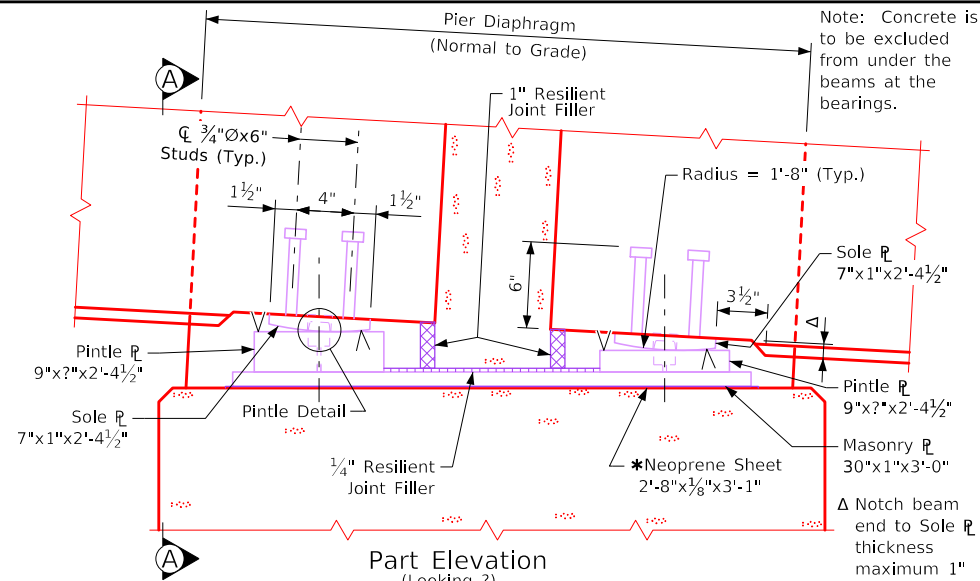
Note: Cost of neoprene pads shall be included in the price bid for "Pretensioned Prestressed Concrete Beams".

\* The 1/8 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 Pindle R 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 - 4541H - This Sheet Re-issued 04-2024. Sheet Format Update.



**Fixed Pier Bearing Notes:**  
 Surfaces marked "V" shall be finished ANSI 250.  
 Masonry plates are to be set on a 1/8" neoprene sheet.  
 Pindle 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, pindle, pindle plates, and masonry plates shall be galvanized. The pindle and pindle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The surface of the pindle 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

**Expansion Pier Bearing Notes:**  
 Surfaces marked "V" shall be finished ANSI 250.  
 Pindle 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, pindle, and pindle plates shall be galvanized. The pindle and pindle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The surface of the pindle 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

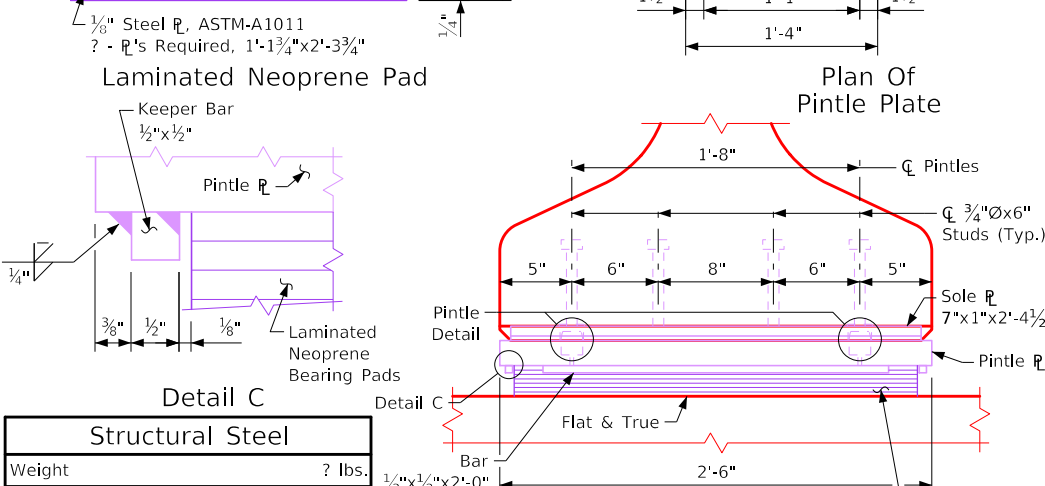
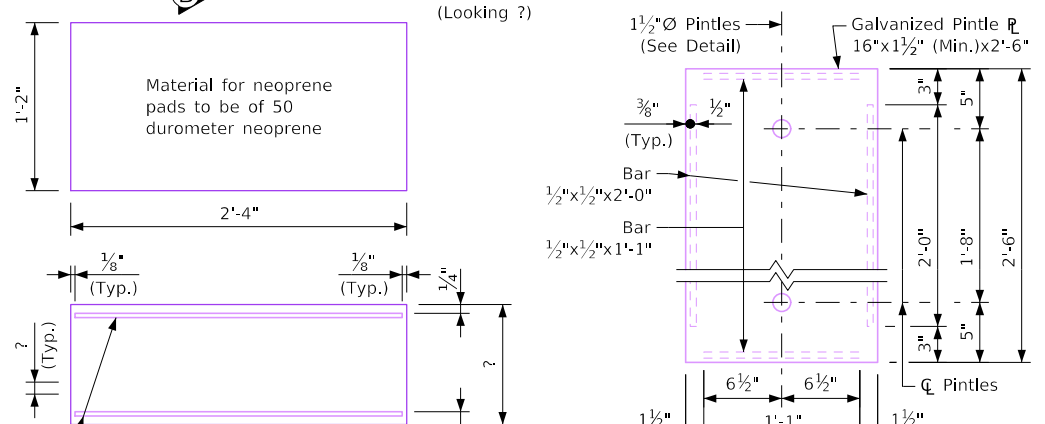
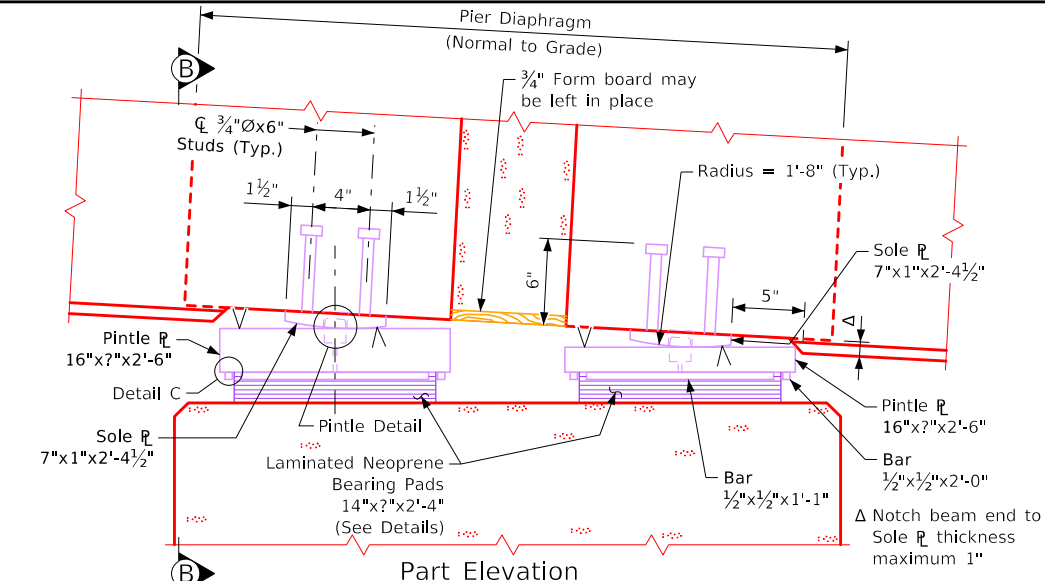
Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole R

Structural Steel	
Weight	? lbs.

Does Not Include Curved Sole R

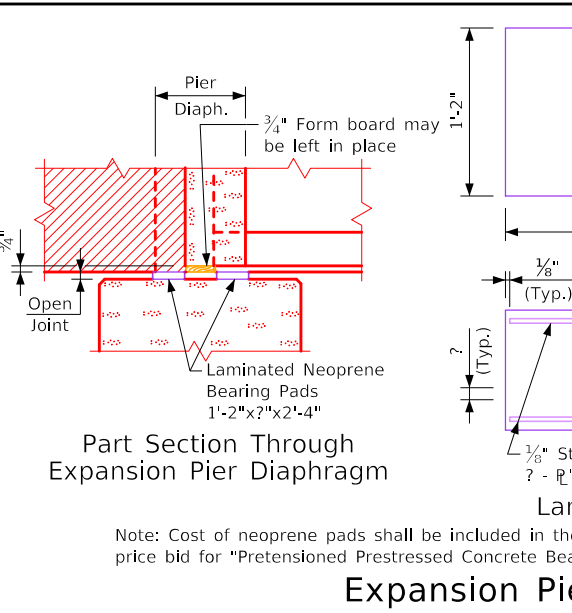
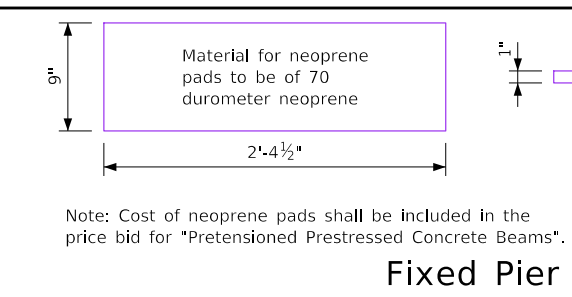
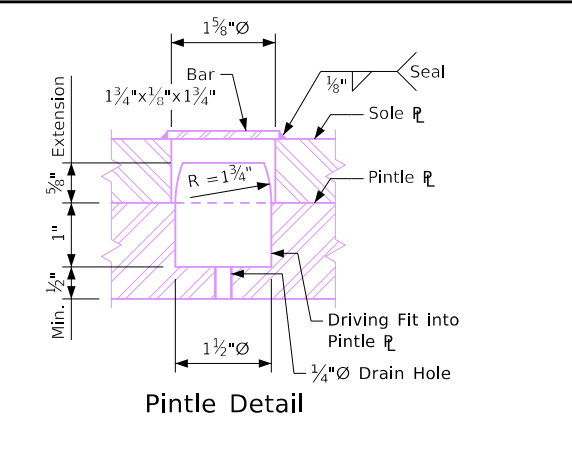
FILE NO.	ENGLISH	DESIGN TEAM	BTB, BTC, LTD, BTE Beam PPC Bridges - Pier Bearing Details	Standard Sheet 4541H	COUNTY	PROJECT NUMBER	SHEET NUMBER
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**Fixed Pier Bearing Notes:**  
 Surfaces marked "V" shall be finished ANSI 250.  
 Masonry plates are to be set on a 1/8" neoprene sheet.  
 Pindle 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, pindle, pindle plates, and masonry plates shall be galvanized. The pindle and pindle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The surface of the pindle 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

**Expansion Pier Bearing Notes:**  
 Surfaces marked "V" shall be finished ANSI 250.  
 Pindle 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, pindle, and pindle plates shall be galvanized. The pindle and pindle plate shall be assembled prior to galvanizing. All welding shall be completed prior to galvanizing. The surface of the pindle 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

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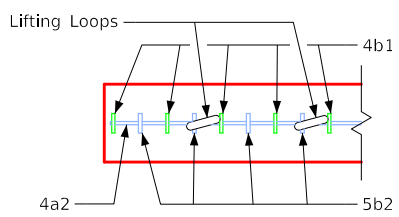
**Fixed Pier**

**Expansion Pier**

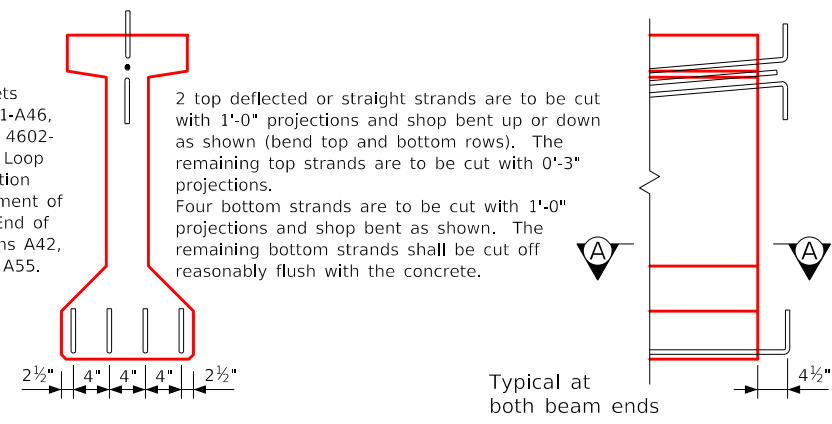
Note: Cost of neoprene pads shall be included in the price bid for "Pretensioned Prestressed Concrete Beams".

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

Note: Structural Steel weight is included on the Summary Quantities Sheet.	
<b>Pier Bearing Details</b>	



\*\*\* See Sheets 4601-A42, 4601-A46, 4602-A50, and 4602-A55 for Lifting Loop Detail and Section Showing Placement of Stirrups Near End of Beam for Beams A42, A46, A50, and A55.



**Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms**

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  $\bar{C}$  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  $\bar{C}$  of span,  $\Delta_D$ , 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  $A_s = 0.217$  sq. in.

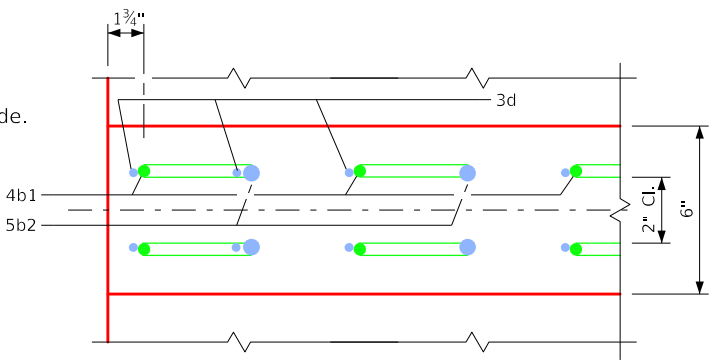
④ Calculated design cambers are based on multipliers developed from research in Iowa.

**\*\*\*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 - $\frac{7}{8}$ " $\bar{\phi}$	*
A46-A55	2 - 1" $\bar{\phi}$	*

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



**\*\*\*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:**

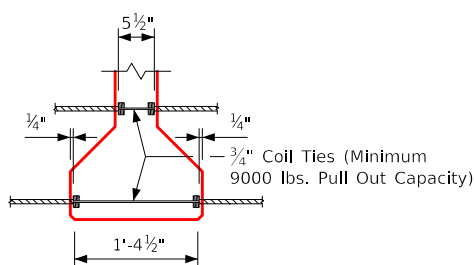
Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications. Design: AASHTO LRFD, Series of 2017, with minor modifications.

**A Beam Data**

A Beam	Span Length $\bar{C}$ - $\bar{C}$ Bearing	Overall Beam Length (L)	Concrete Strength		Strand Size Dia. (in.)	Number of Strands		Total Initial Prestress (kips) ③	Hold Down Force (kips)	Camber (in.) ④		Deflection (in.) $\Delta_D$		Permissible Maximum Spacing HL-93 Loading	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight-lb.)
			$f'_{ci}$ (ksi.)	$f'_c$ (ksi.)		Straight	Deflected			At Release	After Losses	Immediate ① (elastic) $\Delta_I$	Time ② (plastic) $\Delta_T$				
			Steel Diaphragm	Steel Diaphragm		Steel Diaphragm											
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	512
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	566
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	732
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	871
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	987

**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.<sup>2</sup>) 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 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).



**Coil Tie Detail**

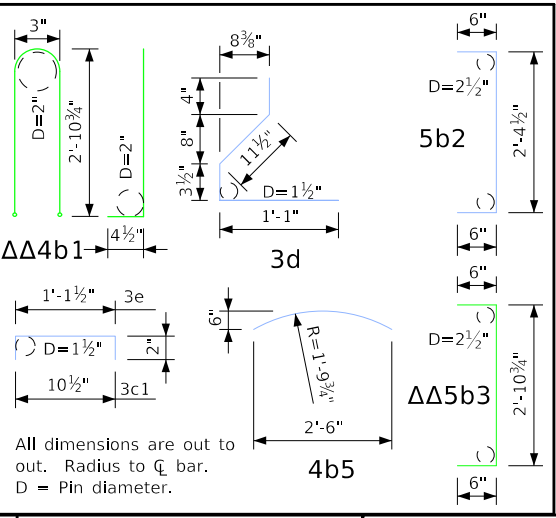
Number and exact location of coil ties to be as detailed on specific bridge design.

$\Delta\Delta$  4b1 and 5b3 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.

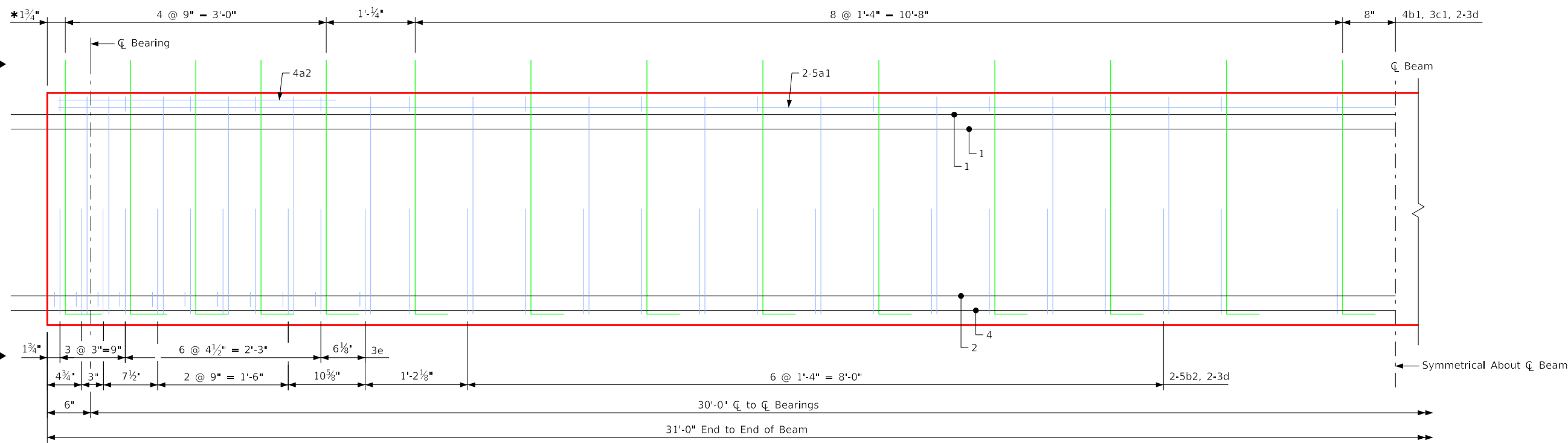
Reinforcing Bar List															
Beam	Span	A30	A34	A38	A42	A46	A50	A55							
		30'-0"	34'-2"	38'-4"	42'-6"	46'-8"	50'-10"	55'-0"	No.	Length	No.	Length	No.	Length	
5a1	—	2	30'-9"	2	34'-11"	2	39'-1"	4	23'-4"	4	25'-5"	4	27'-6"	4	29'-7"
4a2	—	2	3'-3"	2	3'-3"	2	3'-3"	2	3'-3"	2	3'-3"	2	3'-3"	2	3'-3"
$\Delta\Delta$ 4b1	—	28	6'-8"	32	6'-8"	36	6'-8"	42	6'-8"	46	6'-8"	49	6'-8"	53	6'-8"
5b2	—	52	3'-5"	56	3'-5"	60	3'-5"	36	3'-5"	40	3'-5"	28	3'-5"	32	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	—	108	2'-8"	120	2'-8"	132	2'-8"	152	2'-8"	168	2'-8"	174	2'-8"	202	2'-8"
3e	—	22	1'-6"	22	1'-6"	22	1'-6"	22	1'-6"	20	1'-6"	20	1'-6"	20	1'-6"
$\Delta\Delta$ 5b3	—	—	—	—	—	—	—	—	—	32	3'-11"	36	3'-11"	48	3'-11"



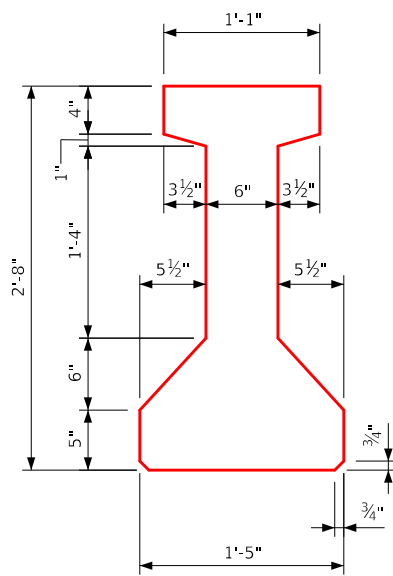
FILE NO.	ENGLISH	DESIGN TEAM	A Beams - LRFD Design
3:48:30 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn
COUNTY		PROJECT NUMBER	
SHEET NUMBER			

**A Beam - Data Details**

Revised 10-2024: Added one extra set of 5b2, 3e, and 3d bars at each beam end and revised rebar spacing. Beams.dgn - 4601-A30 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4601).

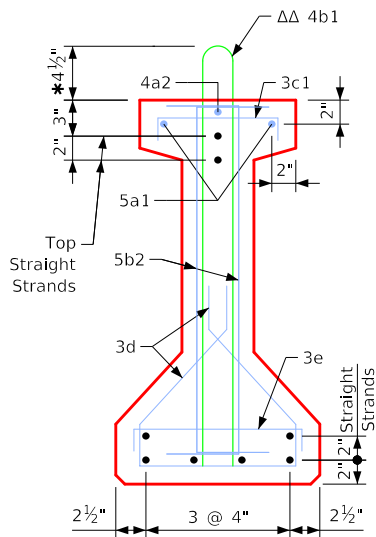


A30 Beam



"A" Beam Cross Section

Beam Section Properties  
 Area = 311.5 in.<sup>2</sup>  
 $\bar{y}_b = 14.05$  in.  
 $I = 34,082$  in.<sup>4</sup>



View A-A

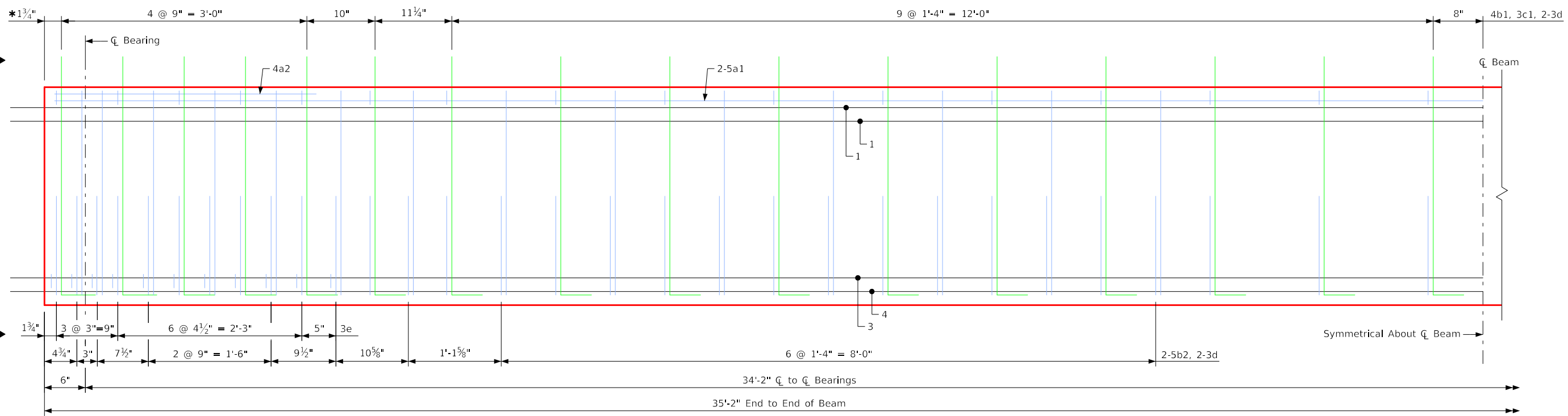
Note: Bars 3d and 5b2 are to be placed in pairs.

\* Keep  
 ΔΔ Epoxy Coated Bars

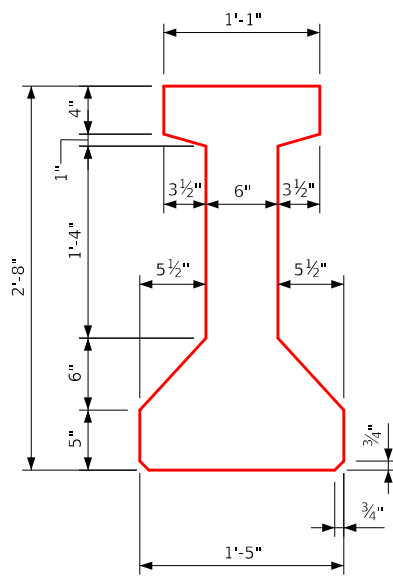
A30 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"A" Beam - 30'-0" Span	Standard Sheet 4601-A30	COUNTY	PROJECT NUMBER	SHEET NUMBER
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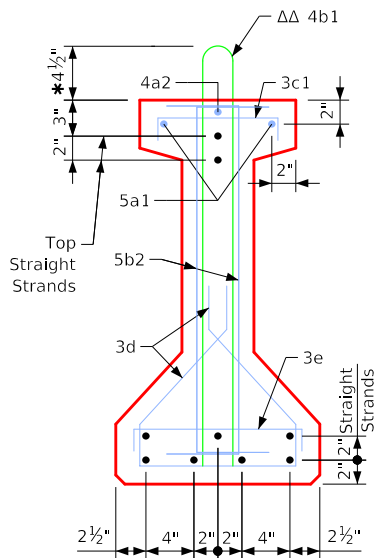
Revised 10-2024: Added one extra set of 5b2, 3e, and 3d bars at each beam end and revised rebar spacing. Beams.dgn - 4601-A34 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4601).



**A34 Beam**



**Beam Section Properties**  
 Area = 311.5 in.<sup>2</sup>  
 $\bar{y}_b = 14.05$  in.  
 $I = 34,082$  in.<sup>4</sup>



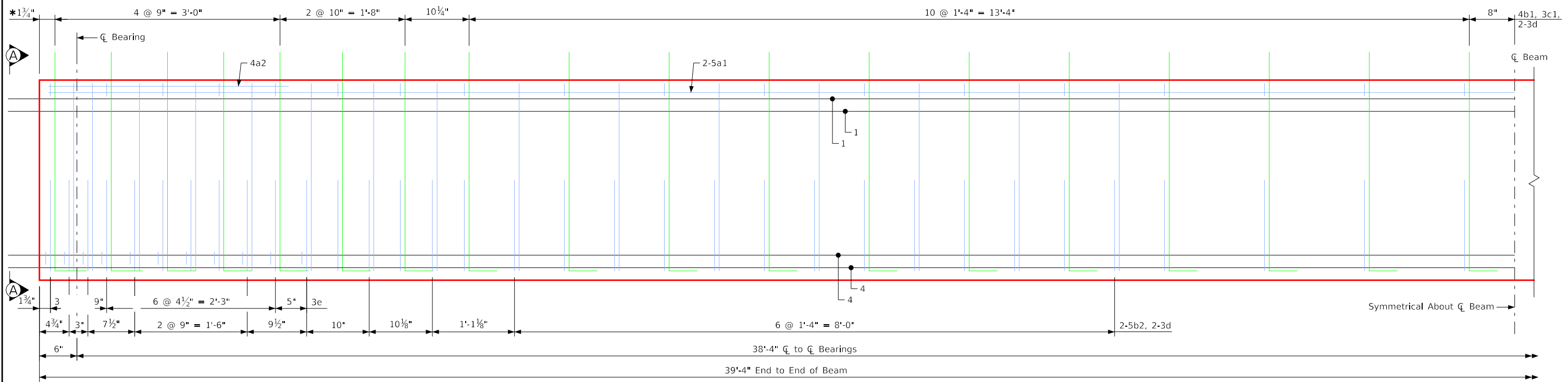
Note: Bars 3d and 5b2 are to be placed in pairs.

\* Keep  
 ΔΔ Epoxy Coated Bars

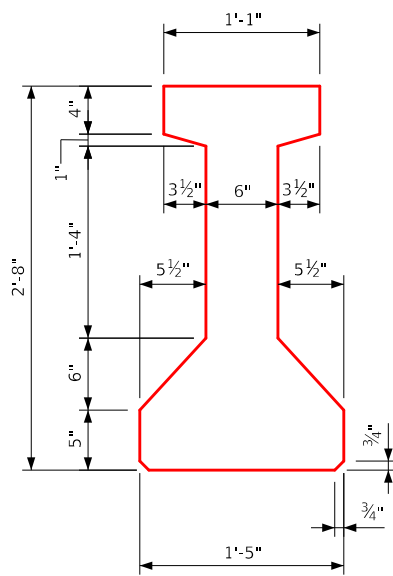
**View A-A**

A34 Beam Details

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

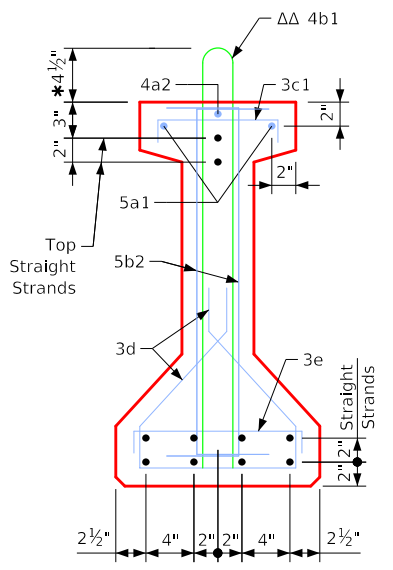


A38 Beam



Area = 311.5 in.<sup>2</sup>  
 $\bar{y}_b = 14.05$  in.  
 $I = 34,082$  in.<sup>4</sup>

**Beam Section Properties**



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

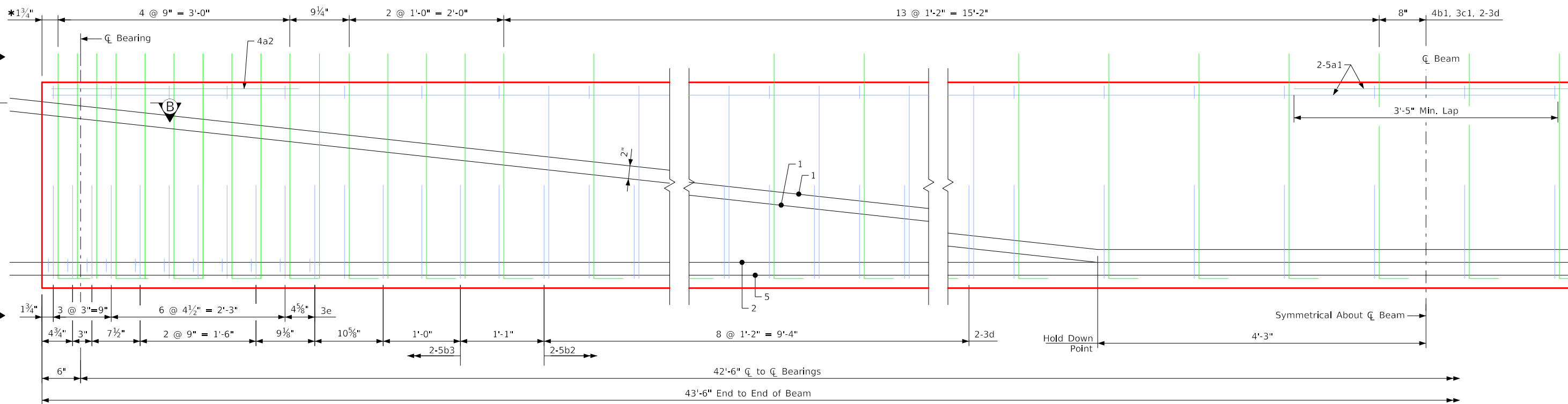
\* Keep  
 ΔΔ Epoxy Coated Bars

View A-A

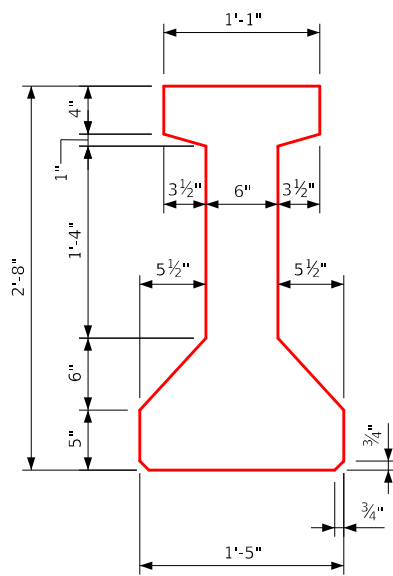
A38 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"A" Beam - 38'-4" Span	Standard Sheet 4601-A38	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:33 PM	4/5/2026	bkloss	pw:\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

Revised 05-09: A42 Bar Spacings were Changed.  
 Revised 06-2024: Epoxy Coated 5b3 Bars Replace Uncoated 5b2 Bars at Beam Ends. Revised Lifting Loop Details. Added Beams.dgn - 4601-A42 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4601).

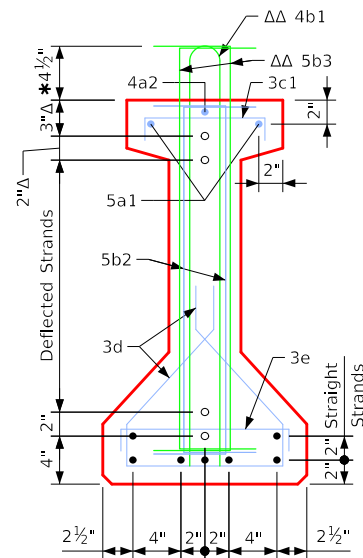


**A42 Beam**



**"A" Beam Cross Section**

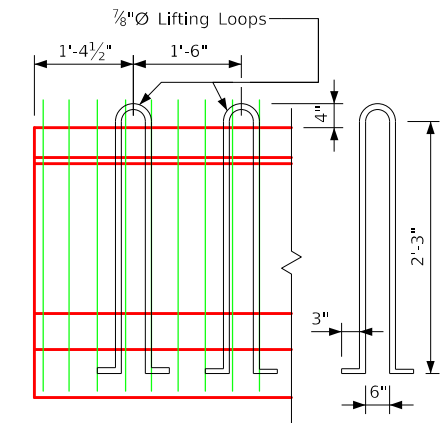
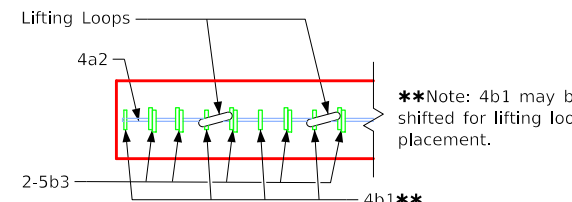
**Beam Section Properties**  
 Area = 311.5 in.<sup>2</sup>  
 $\bar{y}_b = 14.05$  in.  
 I = 34,082 in.<sup>4</sup>



**View A-A**

Note: Bars 3d, 5b2, and 5b3 are to be placed in pairs.

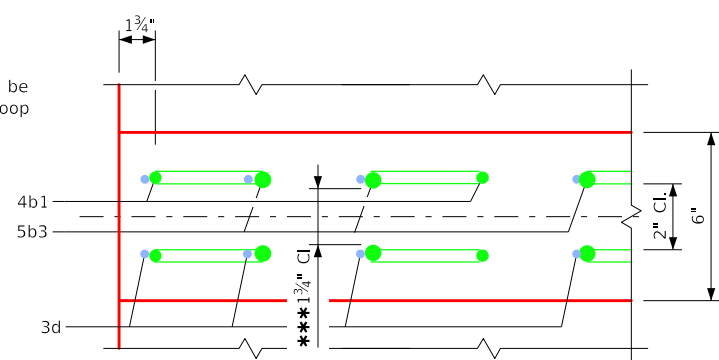
- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars



**Lifting Loop Detail**

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

Note: Dimensions for the location of the deflected strands are at  $\bar{c}$  beam and end of beam.



**Section B-B**

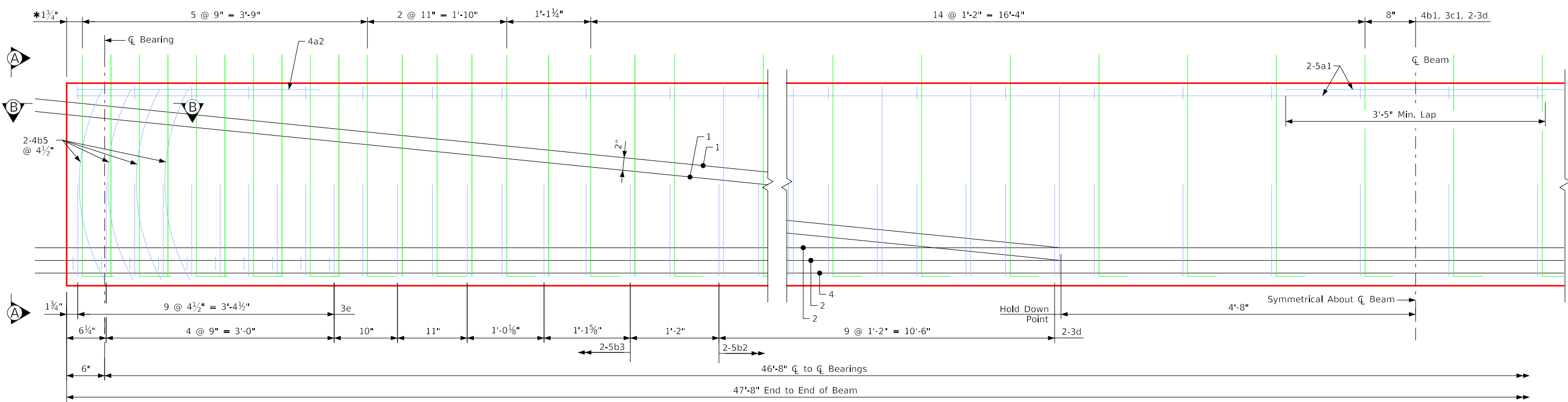
(Showing Placement Of Stirrups Near End Of Beam)

\*\*\*1 3/4" CI for 5b3 bars.

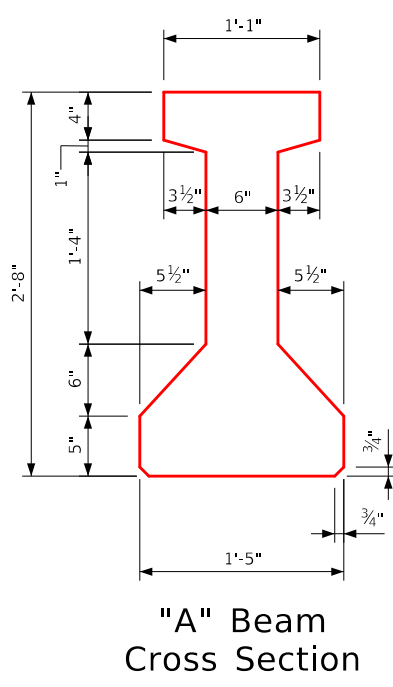
**A42 Beam Details**

FILE NO.	ENGLISH	DESIGN TEAM	"A" Beam - 42'-6" Span	Standard Sheet 4601-A42	COUNTY	PROJECT NUMBER	SHEET NUMBER
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Revised 05-09: A46 Bar Spacings were Changed.  
 Revised 06-2024: Epoxy Coated 5b3 Bars Replace Uncoated 5b2 Bars at Beam Ends. Revised Lifting Loop Details Added.  
 Revised 10-2024: Removed one set of 5b2, 3e, and 3d bars from each beam end and revised rebar spacing.  
 Beams.dgn - 4601-A46 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4601).

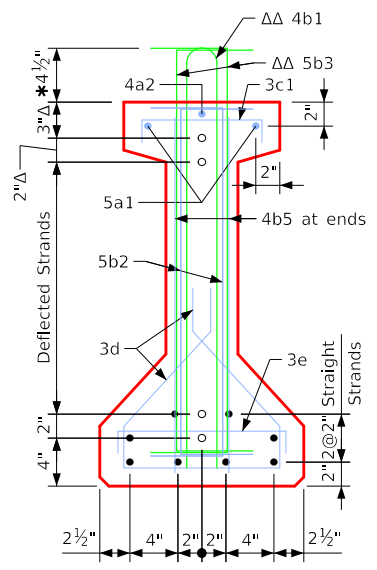


A46 Beam



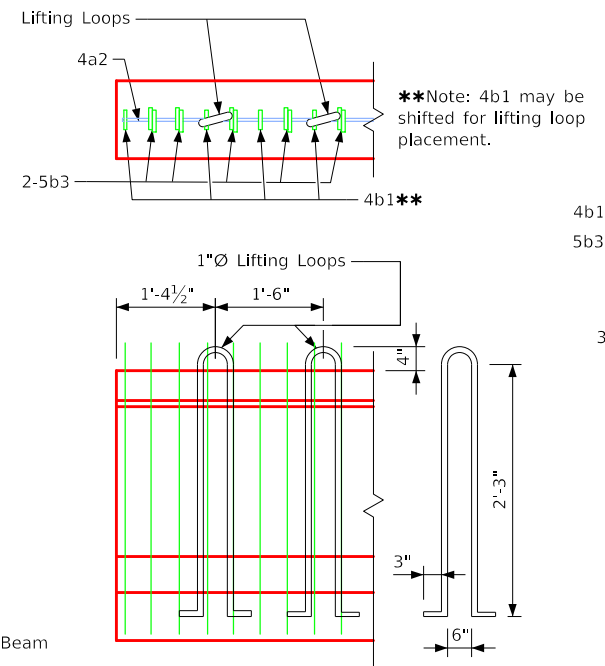
"A" Beam Cross Section

**Beam Section Properties**  
 Area = 311.5 in.<sup>2</sup>  
 $\bar{y}_b = 14.05$  in.  
 I = 34,082 in.<sup>4</sup>



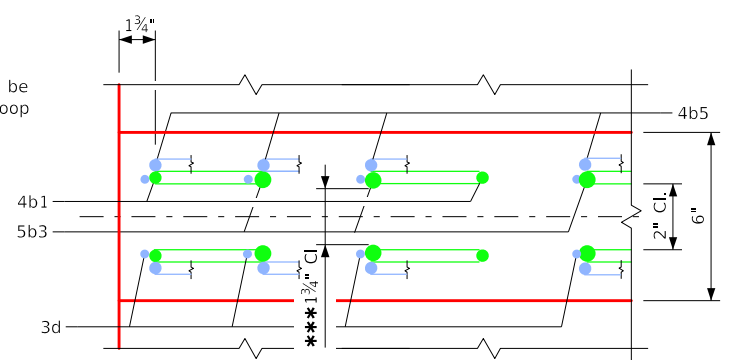
View A-A

Note: Bars 3d, 4b5, 5b2, and 5b3 are to be placed in pairs. Tie 4b5 bars to 4b1 & 5b3.  
 ○ Deflected Strands  
 \* Keep  
 Δ Dimensions at End of Beam  
 ΔΔ Epoxy Coated Bars



Lifting Loop Detail

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



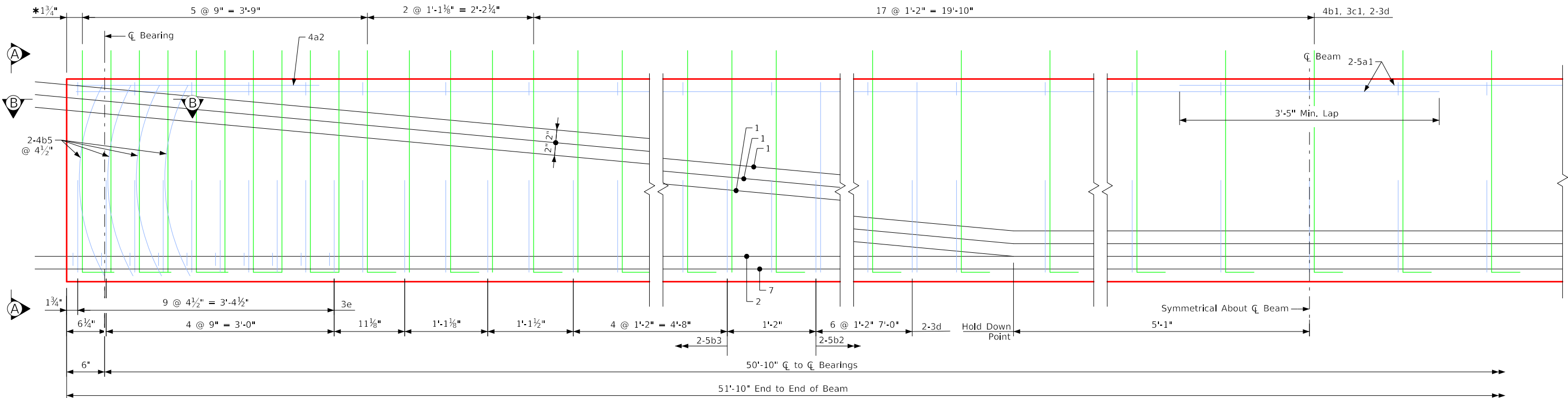
Section B-B

(Showing Placement Of Stirrups Near End Of Beam)  
 \*\*\*1 3/4" CI for 5b3 bars.

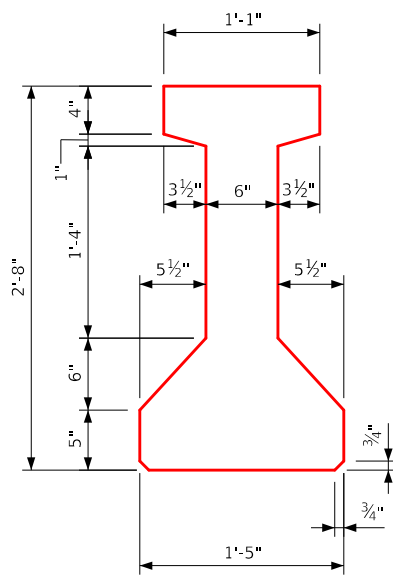
Note: Dimensions for the location of the deflected strands are at C beam and end of beam.

A46 Beam Details				
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Revised 05-09: A50 Bar Spacings were Changed.  
 Revised 06-2024: Epoxy Coated 5b3 Bars Replace Uncoated 5b2 Bars at Beam Ends. Revised Lifting Loop Details. Added Beams.dgn - 4602-A50 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4602).

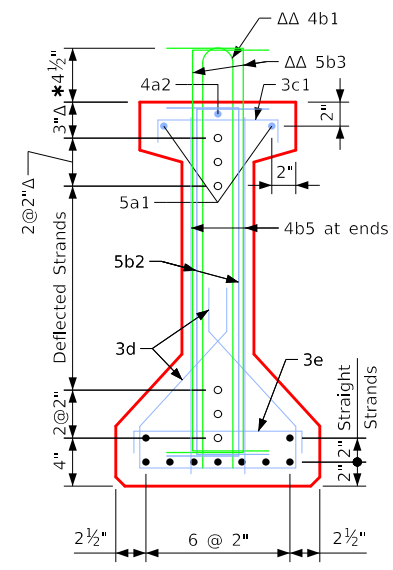


A50 Beam



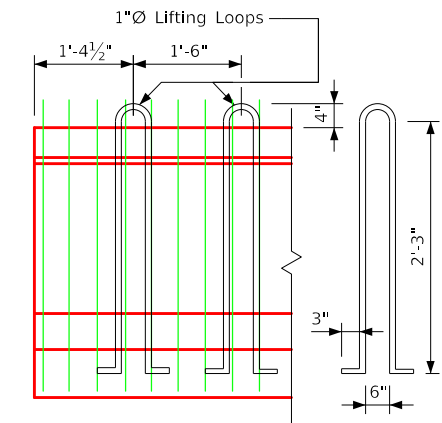
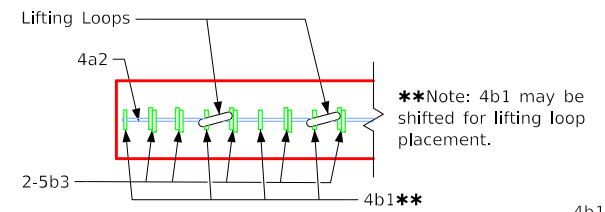
"A" Beam Cross Section

**Beam Section Properties**  
 Area = 311.5 in.<sup>2</sup>  
 $\bar{y}_b = 14.05$  in.  
 I = 34,082 in.<sup>4</sup>

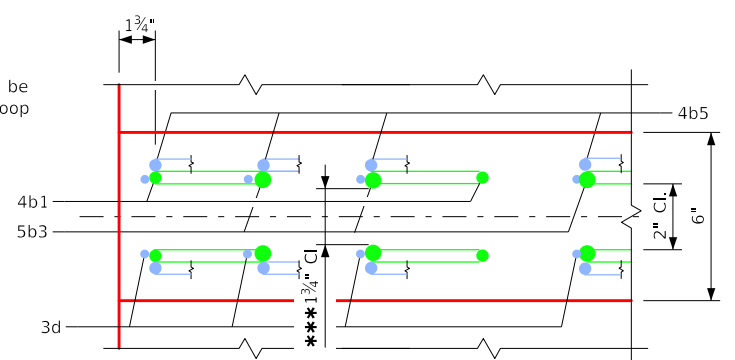


View A-A

Note: Bars 3d, 4b5, 5b2, and 5b3 are to be placed in pairs. Tie 4b5 bars to 4b1 & 5b3.  
 ○ Deflected Strands  
 \* Keep  
 $\Delta$  Dimensions at End of Beam  
 $\Delta\Delta$  Epoxy Coated Bars



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



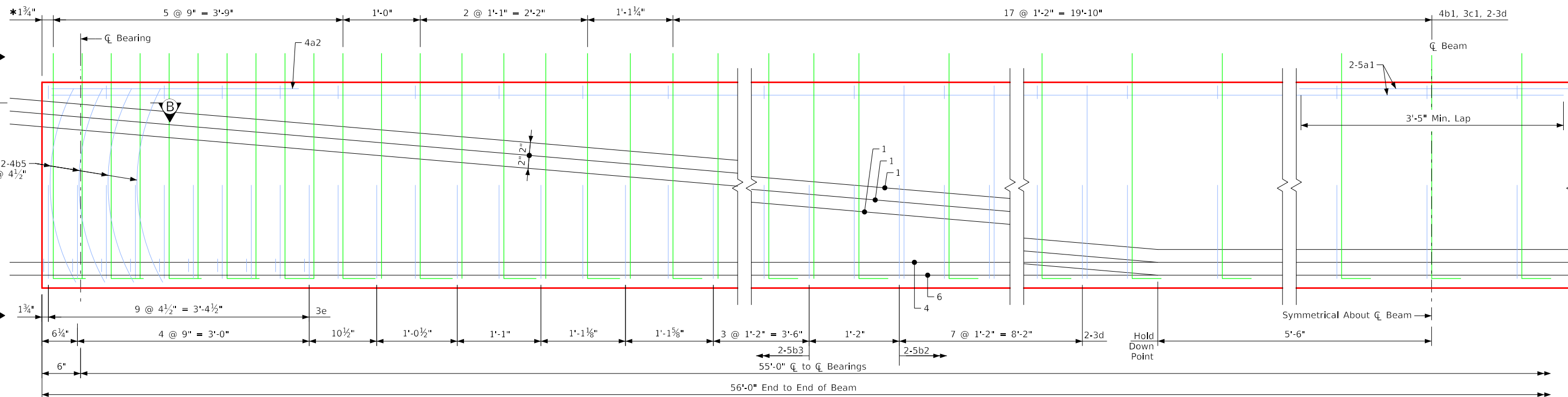
**Section B-B**  
 (Showing Placement Of Stirrups Near End Of Beam)  
 \*\*\* 1 3/4" CI for 5b3 bars.

Note: Dimensions for the location of the deflected strands are at  $\bar{C}$  beam and end of beam.

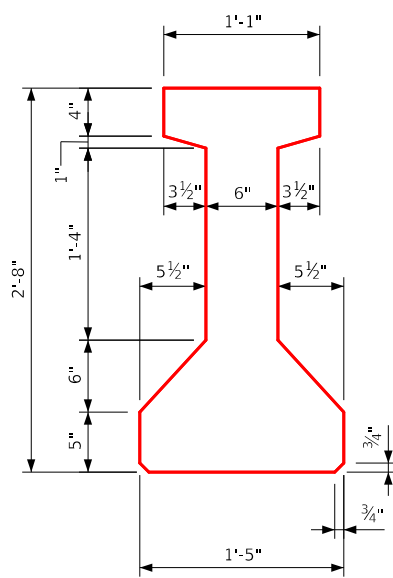
A50 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"A" Beam - 50'-10" Span	Standard Sheet 4602-A50	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:35 PM	4/5/2026	bkloss	pw:\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

Revised 05-09: A55 Bar Spacings were Changed.  
 Revised 06-2024: Epoxy Coated 5b3 Bars Replace Uncoated 5b2 bars at Beam Ends. Revised Lifting Loop Details added.  
 Revised 04-2026: Corrected detailing error where strands were not shown extending out from beam end.  
 Beams.dgn - 4602-A55 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4602).

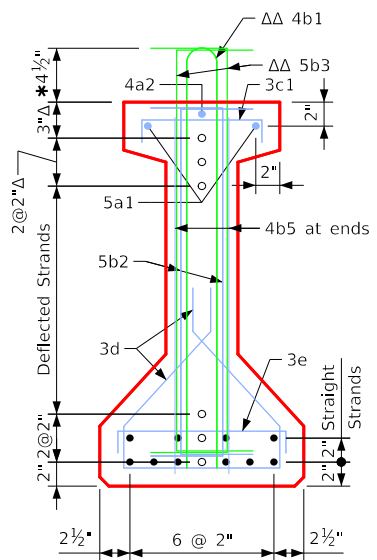


A55 Beam



Beam Section Properties

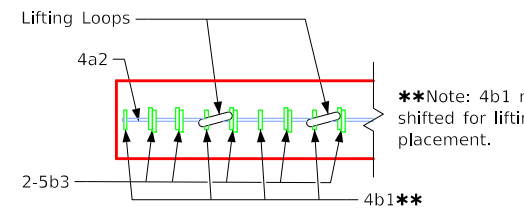
Area = 311.5 in.<sup>2</sup>  
 $\bar{y}_b = 14.05$  in.  
 $I = 34,082$  in.<sup>4</sup>



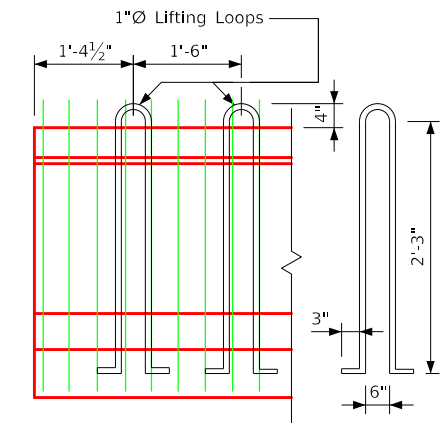
View A-A

Note: Bars 3d, 4b5, 5b2, and 5b3 are to be placed in pairs. Tie 4b5 bars to 4b1 & 5b3.

- o Deflected Strands
- \* Keep
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  Epoxy Coated Bars

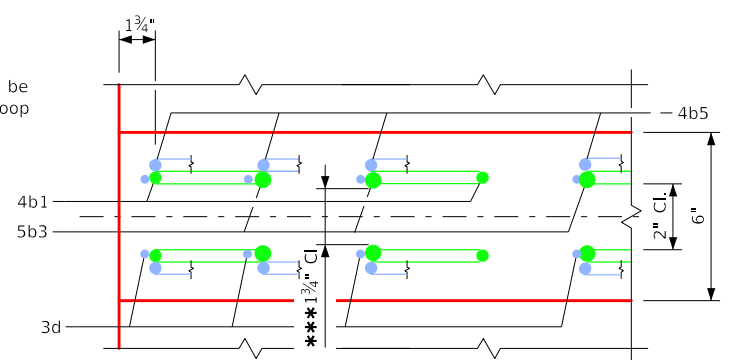


\*\*Note: 4b1 may be shifted for lifting loop placement.



Lifting Loop Detail

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



Section B-B

(Showing Placement Of Stirrups Near End Of Beam)

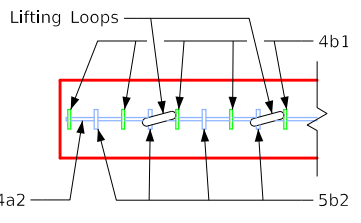
\*\*\* 1 3/4" CI for 5b3 bars.

Note: Dimensions for the location of the deflected strands are at  $\bar{C}$  beam and end of beam.

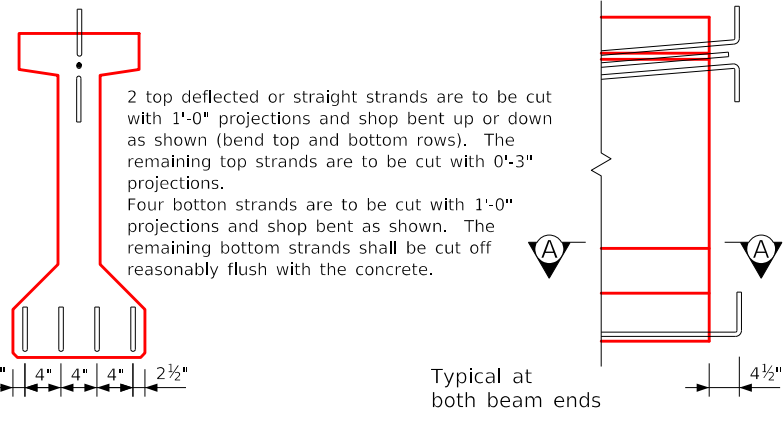
A55 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"A" Beam - 55'-0" Span	Standard Sheet 4602-A55	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:36 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

Revised 08-12: I.M. Reference Note for Sealing Beam Ends Distinguishes Between the Fabricator and Contractor.  
 Re-issued 09-06.  
 Revised 06-2024: Epoxy Coated 5b3 Bars Replace Uncoated 5b2 bars at Beam Ends in the "Reinforcing Bar List". Reinforcing Steel Quantities Updated for B55, B59, B63, and B67 Beams. Notes Added Referencing the Lifting Loop Details being provided on B55, B59, B63, and B67 Beam Sheets.  
 Loop Details being provided on B55, B59, B63, and B67 Beam Sheets.  
 Beams.dgn - 4610 - This Sheet Re-issued 04-2024. Sheet Format Update.



\*\*\* See Sheets 4612-B55, 4612-B59, 4612-B63, and 4612-B67 for Lifting Loop Detail and Section Showing Placement of Stirrups Near End of Beam for Beams B55, B59, B63, and B67.



**Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms**

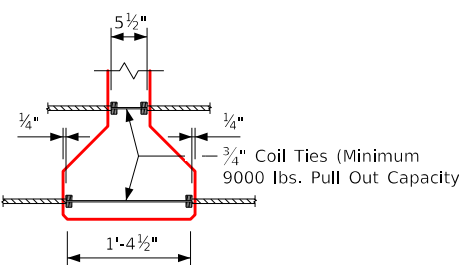
**Lifting Loop And Overhang Table**

Beams	Lifting Loops Each End	Beam Overhang (ft.)
B34-B50	2 - 7/8"Ø	*
B55-B67	2 - 1"Ø	*

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

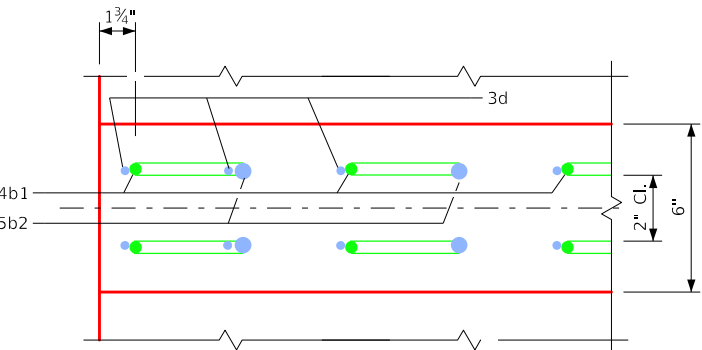
**\*\*\*Lifting Loop Detail**

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



**Coil Tie Detail**

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



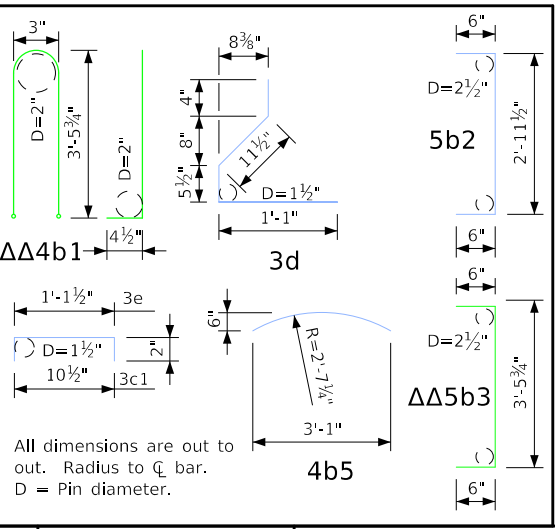
**\*\*\*Section A-A Showing Placement of Stirrups Near End of Beam**

ΔΔ 4b1 and 5b3 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.

		Reinforcing Bar List																												
Beam	Span	B34	B38	B42	B46	B50	B55	B59	B63	B67																				
		No.	No.	No.	No.	No.	No.	No.	No.	No.																				
		Length	Length	Length	Length	Length	Length	Length	Length	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"	44	4'-0"	44	4'-0"	28	4'-0"	32	4'-0"												
4b5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—												
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"												
ΔΔ 5b3	—	—	—	—	—	—	—	—	—	—	40	4'-6"	40	4'-6"	56	4'-6"	64	4'-6"												



All dimensions are out to out. Radius to  $\bar{c}$  bar. D = Pin diameter.

**B Beam Data**

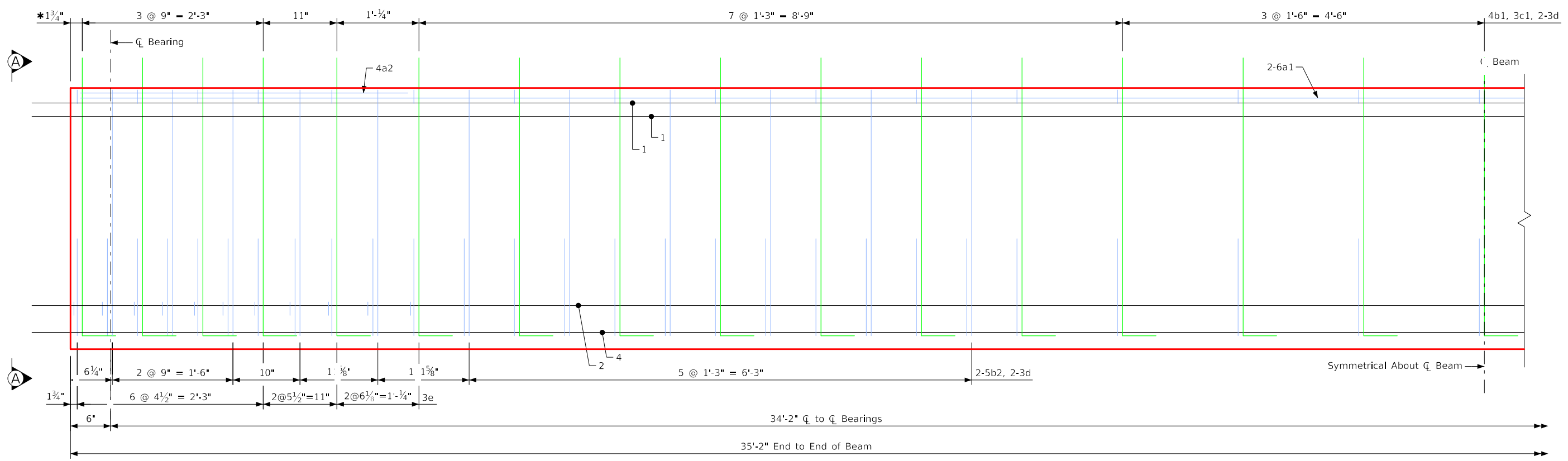
B Beam	Span Length $\bar{c}$ - $\bar{c}$ Bearing	Overall Beam Length (L)	Concrete strength		Strand Size Dia. (in.)	No. of Strands		Total Initial Prestress (kips) ③	Hold Down Force (kips)	Camber (in.) ④		Deflection (in.) $\Delta_D$		Permissible Maximum Spacing HL-93 Loading Steel Diaphragm	Weight (tons)	Concrete (cu. yd.)	Reinforcing Steel (weight-lb.)
			$f'_{ci}$ (ksi.)	$f'_c$ (ksi.)		Straight	Deflected			At Release	After Losses	Immediate ① (elastic) $\Delta_i$	Time ② (plastic) $\Delta_T$				
			Steel Diaphragm	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	877
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	1065
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	1101
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	1184
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	1291

**Beam Notes:**

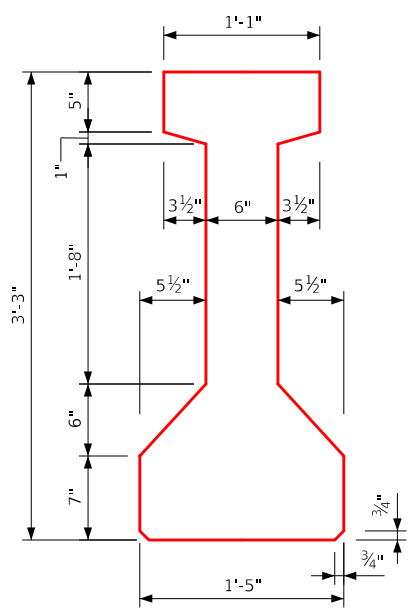
- These beams are designed for AASHTO live loads as indicated in above table with an allowance of 20 lbs. per square foot of roadway for future wearing surface.
- All PPC beams shall use high performance concrete ('HPC') in accordance with the Standard Specifications.
- Hold down points for deflected 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.<sup>2</sup>) 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).

**B Beam - Data Details**

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).

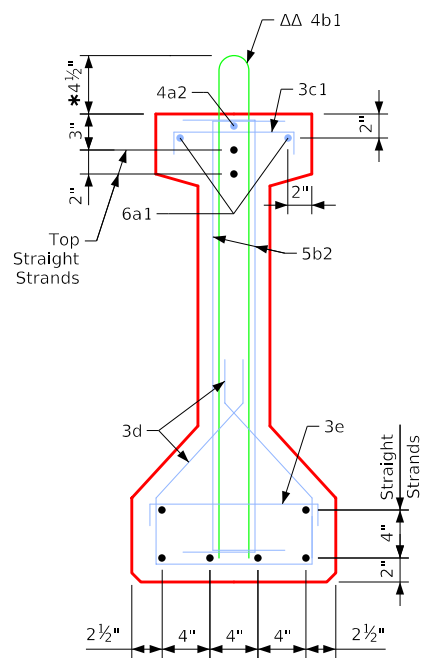


B34 Beam



"B" Beam Cross Section

Beam Section Properties  
 Area = 382.5 in.<sup>2</sup>  
 $\bar{y}_b = 17.06$  in.  
 $I = 62,000$  in.<sup>4</sup>



View A-A

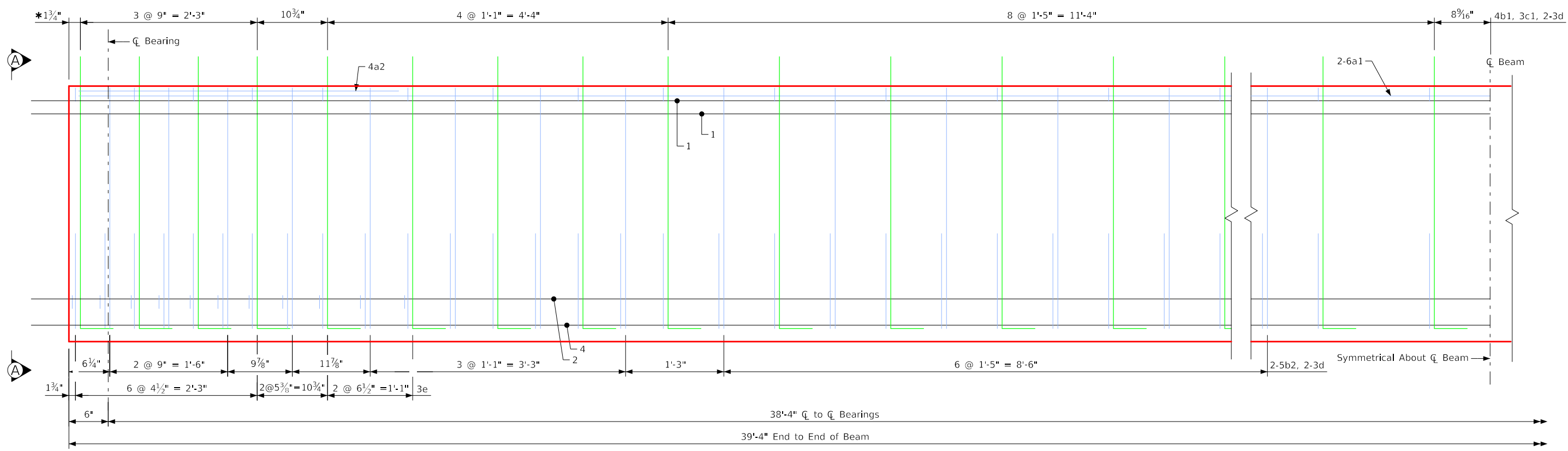
Note: Bars 5b2 and 3d are to be placed in pairs.

- \* Keep
- ΔΔ Epoxy Coated Bars

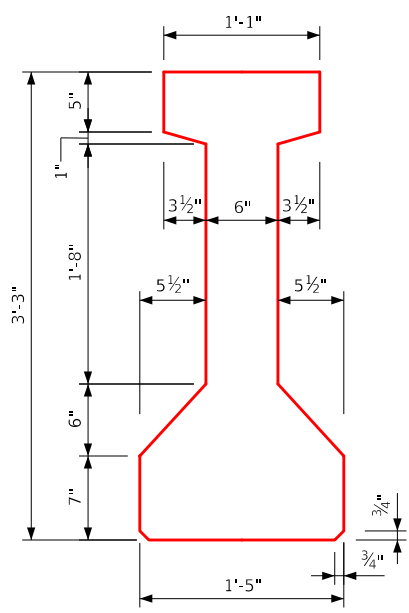
B34 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 34'-2" Span	Standard Sheet 4611-B34	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:38 PM	4/5/2026	bkloss	pw:\NTPwint1.dot.int.lan:PWMMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

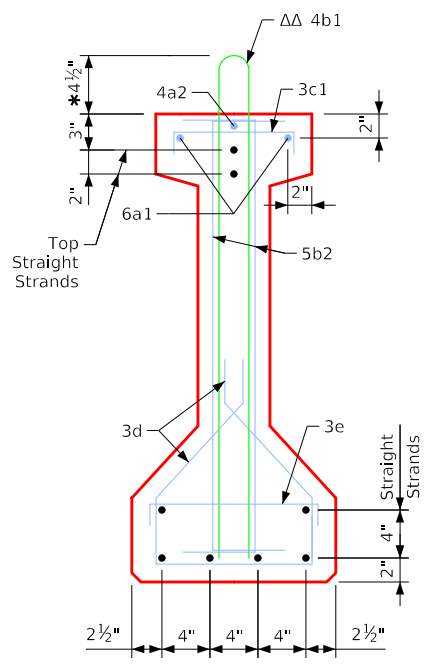
Revised 05-09: B38 Bar Spacings were Changed. Beams.dgn - 4611-B38 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4611).



B38 Beam



Beam Section Properties  
 Area = 382.5 in.<sup>2</sup>  
 $\bar{y}_b = 17.06$  in.  
 I = 62,000 in.<sup>4</sup>

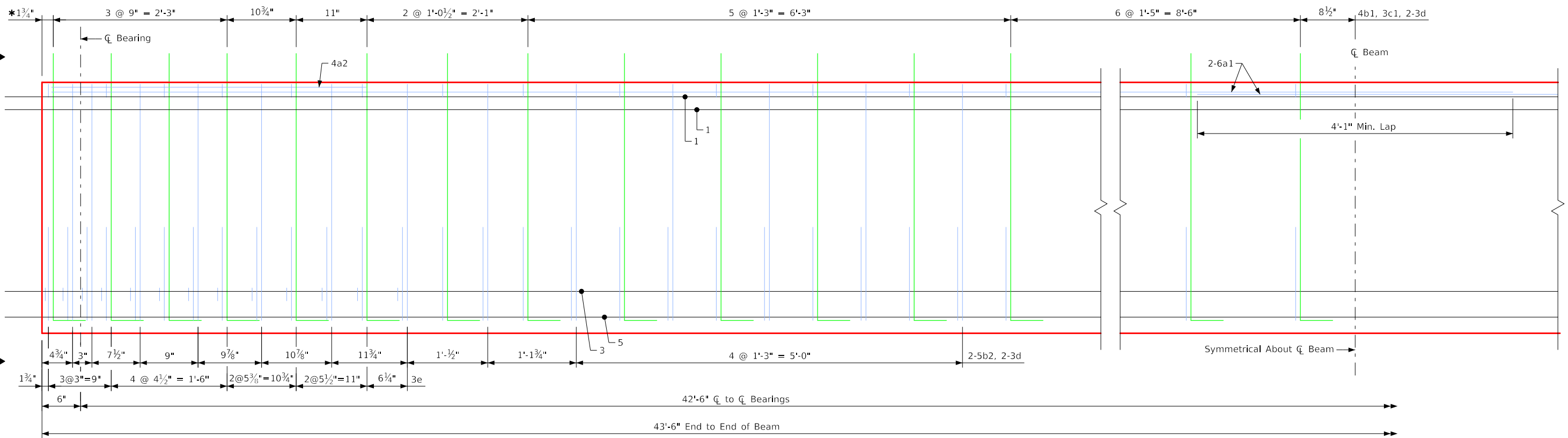


Note: Bars 5b2 and 3d are to be placed in pairs.  
 \* Keep  
 ΔΔ Epoxy Coated Bars

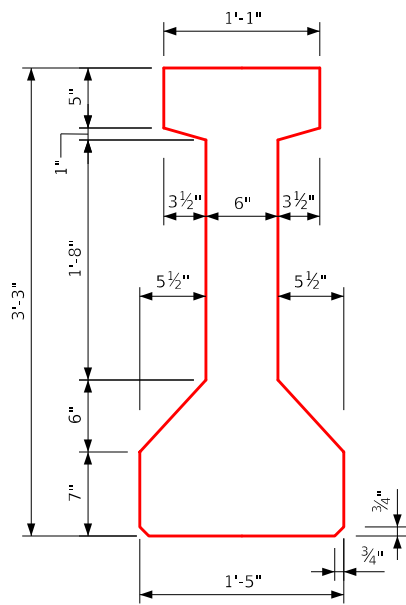
B38 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 38'-4" Span	Standard Sheet 4611-B38	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:39 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWM\Main\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				

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).

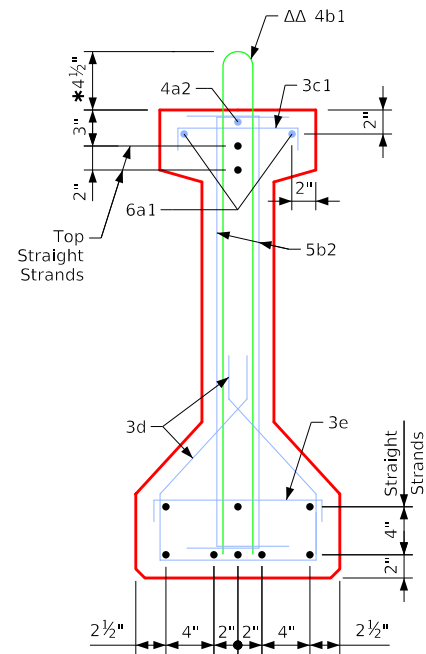


B42 Beam



Beam Section Properties

Area = 382.5 in.<sup>2</sup>  
 $\bar{y}_b = 17.06$  in.  
 $I = 62,000$  in.<sup>4</sup>



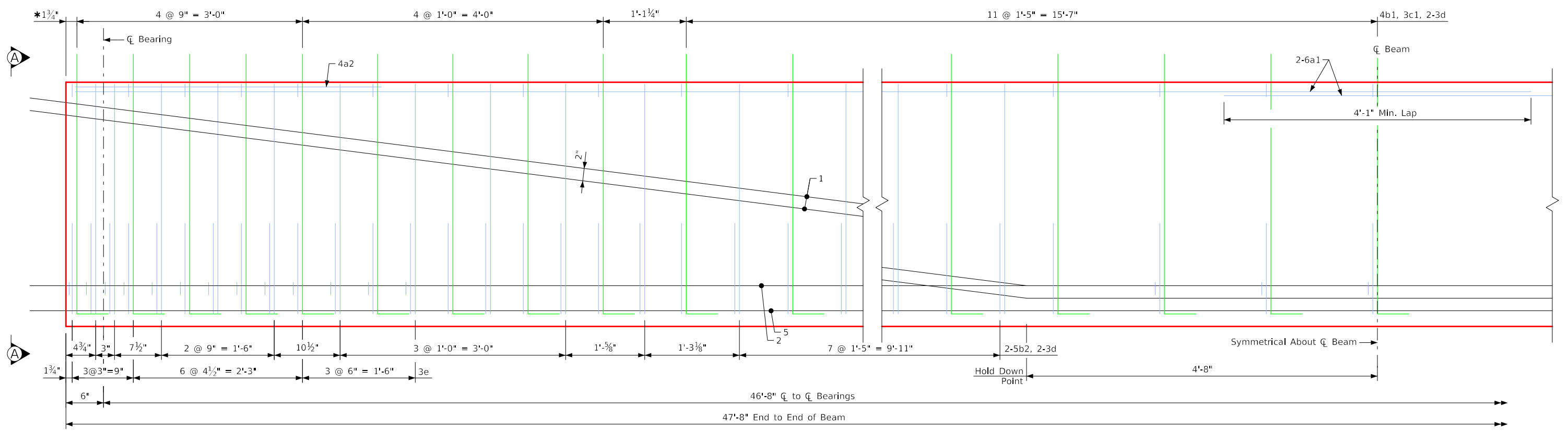
View A-A

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

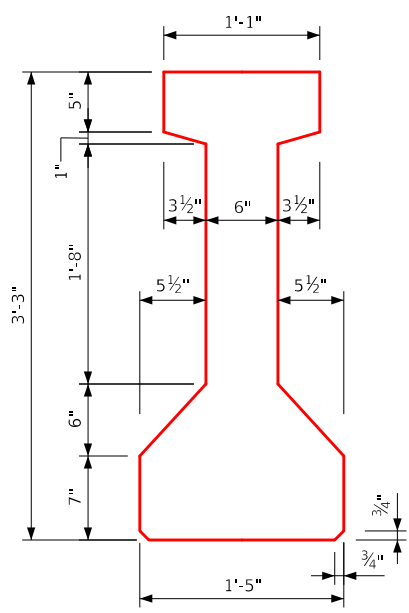
\* Keep  
 ΔΔ Epoxy Coated Bars

B42 Beam Details

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

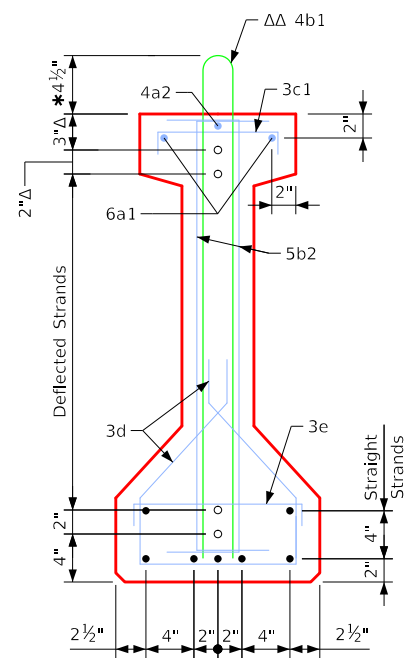


B46 Beam



"B" Beam Cross Section

Beam Section Properties  
 Area = 382.5 in.<sup>2</sup>  
 $\bar{y}_b = 17.06$  in.  
 $I = 62,000$  in.<sup>4</sup>



View A-A

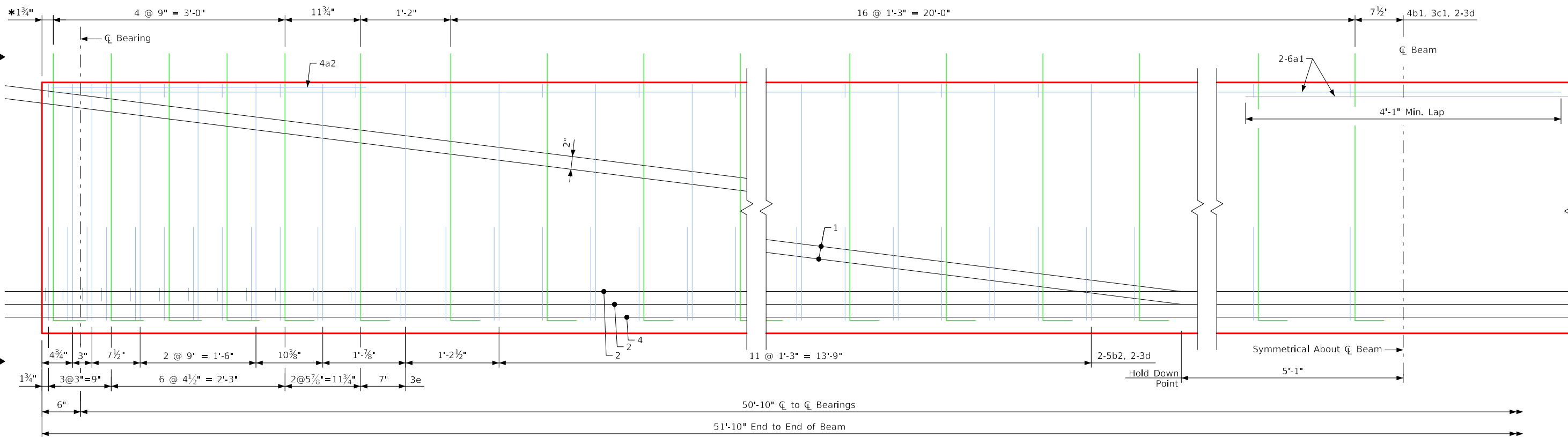
Note: Bars 5b2 and 3d are to be placed in pairs.

- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

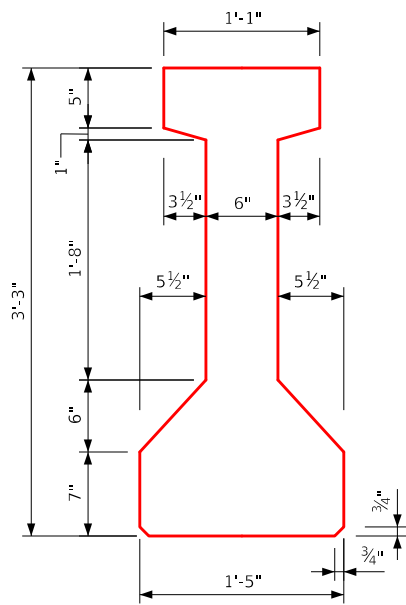
Note: Dimensions for the location of the deflected strands are at C/L beam and end of beam.

B46 Beam Details

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).



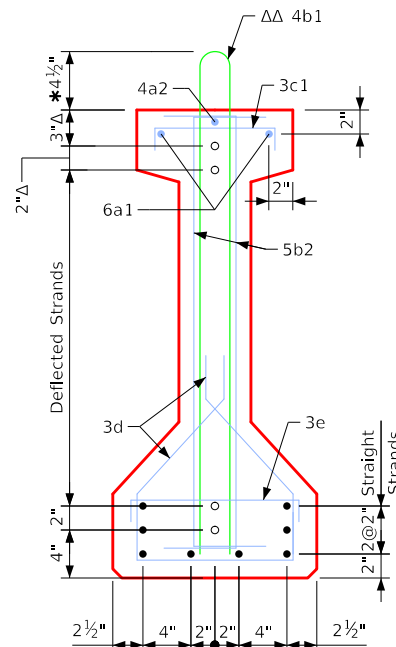
B50 Beam



"B" Beam Cross Section

Area = 382.5 in.<sup>2</sup>  
 $\bar{y}_b = 17.06$  in.  
 $I = 62,000$  in.<sup>4</sup>

**Beam Section Properties**



View A-A

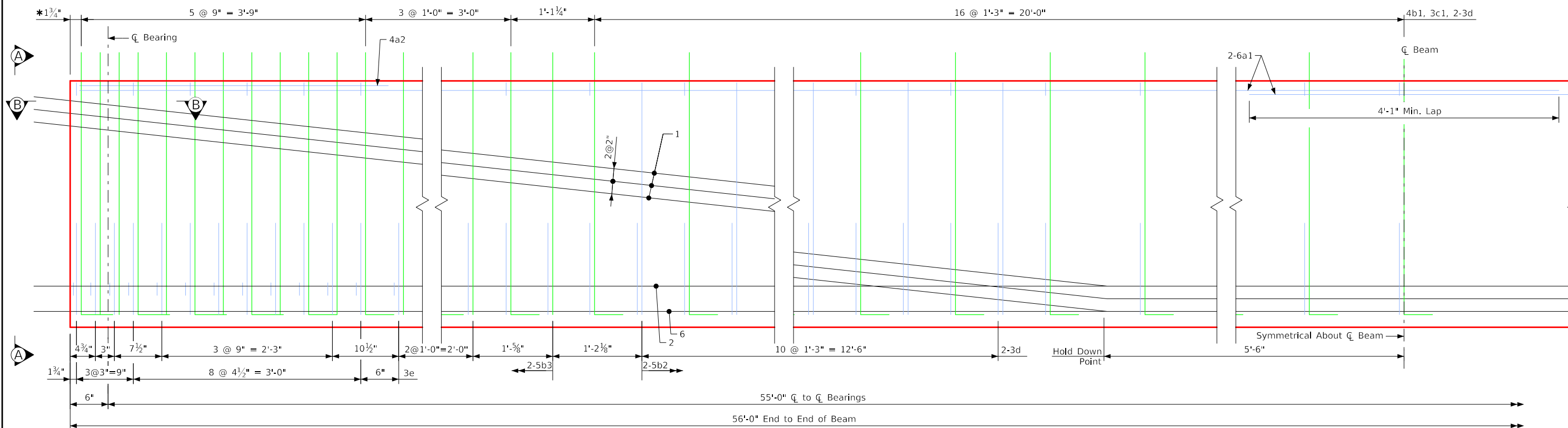
Note: Bars 5b2 and 3d are to be placed in pairs.

- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

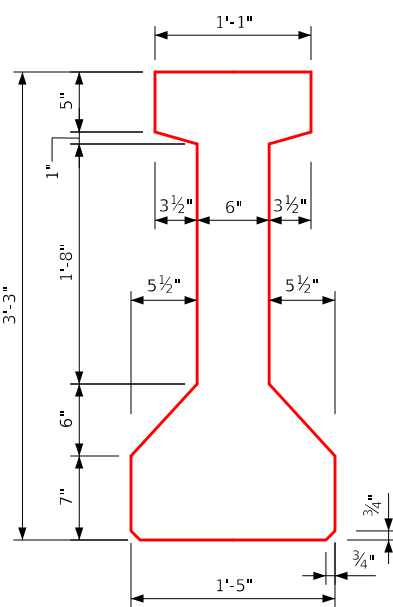
Note: Dimensions for the location of the deflected strands are at  $\bar{c}$  beam and end of beam.

B50 Beam Details

Revised 05-09: B55 Bar Spacings were Changed.  
 Revised 06-2024: Epoxy Coated 5b3 Bars Replace Uncoated 5b2 bars at Beam Ends. Revised Lifting Loop Details added.  
 Beams.dgn - 4612-B55 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4612).

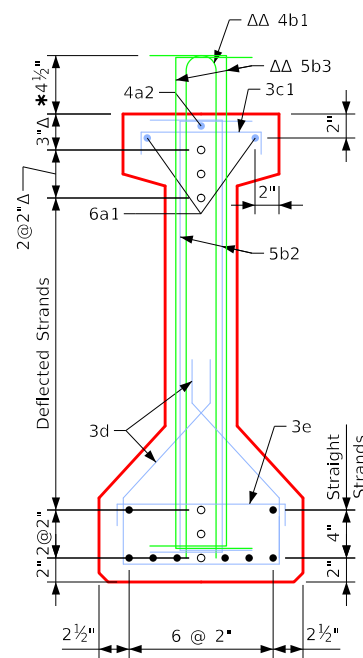


### B55 Beam



**"B" Beam Cross Section**

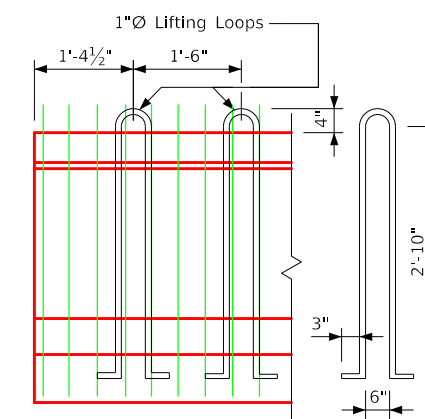
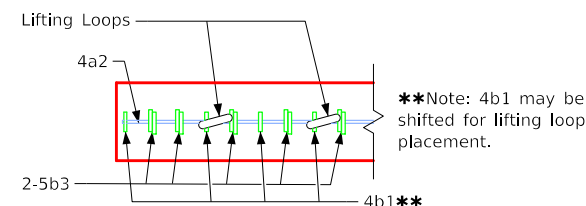
**Beam Section Properties**  
 Area = 382.5 in.<sup>2</sup>  
 $\bar{y}_b = 17.06$  in.  
 $I = 62,000$  in.<sup>4</sup>



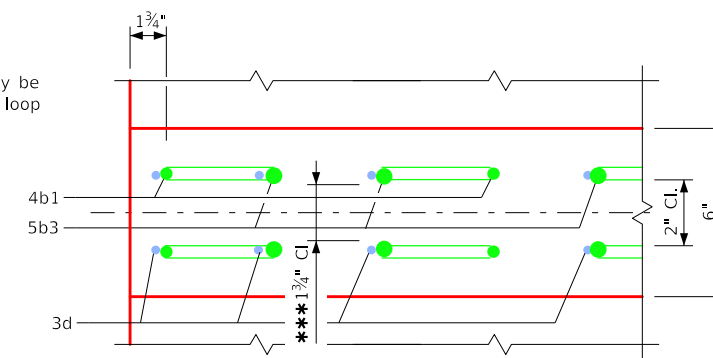
**View A-A**

Note: Bars 5b2, 5b3, and 3d are to be placed in pairs.

- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars



Note: Dimensions for the location of the deflected strands are at  $\bar{C}$  beam and end of beam.

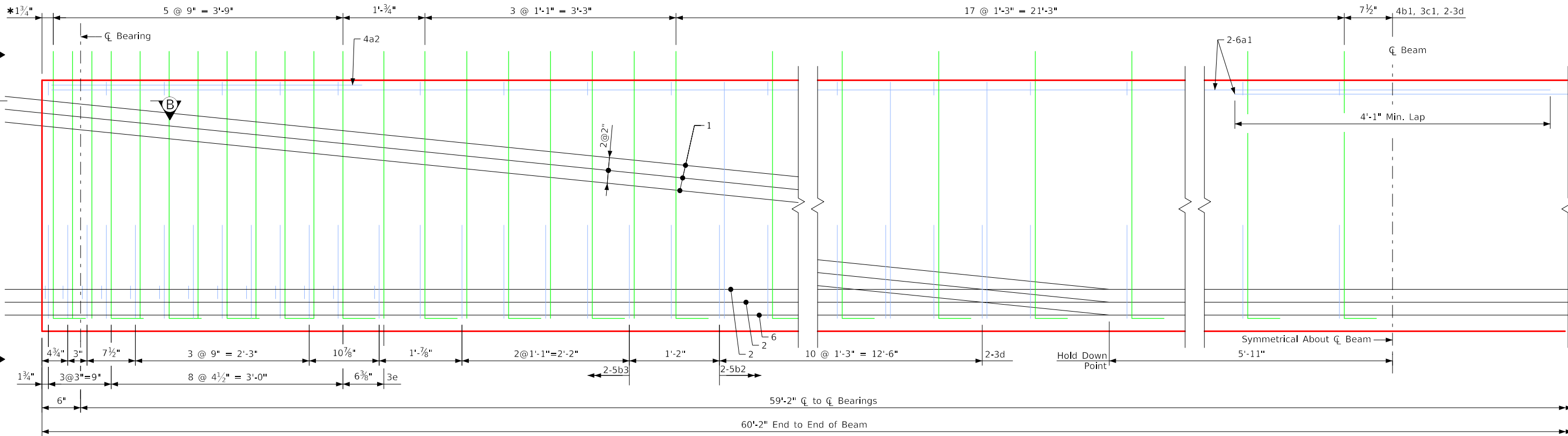


**Section B-B**  
 (Showing Placement Of Stirrups Near End Of Beam)  
 \*\*\*1 3/4" CI for 5b3 bars.

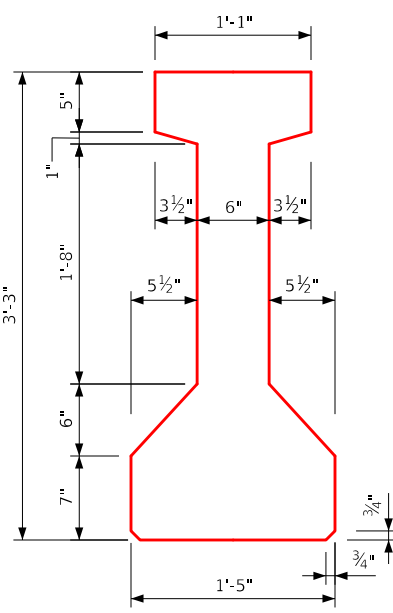
### B55 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 55'-0" Span	Standard Sheet 4612-B55	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:42 PM	4/5/2026	bkloss	pw:\NTP\pint1.dot.int.lan:PWMain\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				

Revised 05-09: B59 Bar Spacings were Changed.  
 Revised 06-2024: Epoxy Coated 5b2 Bars at Beam Ends, Revised Lifting Loop Details, Added.  
 Beams.dgn - 4612-B59 - This Sheet Issued 04-2024, Additional Sheet for Clarity. (Sheet Number was Originally 4612).

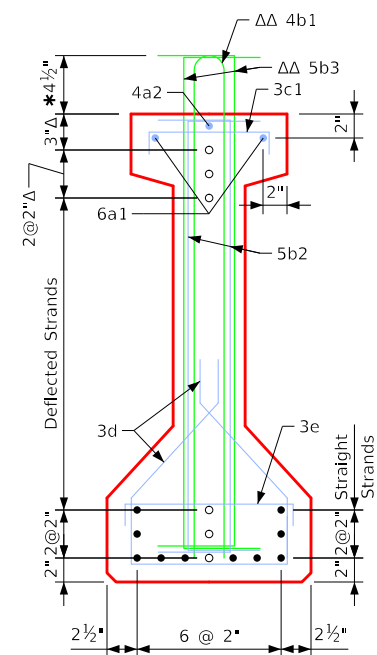


**B59 Beam**

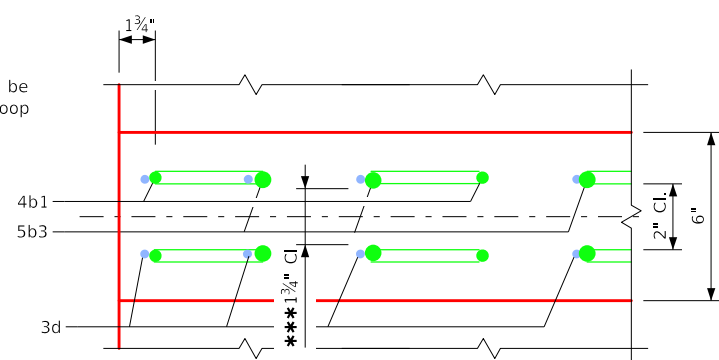
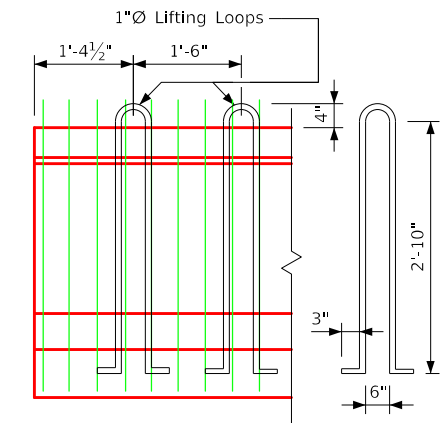
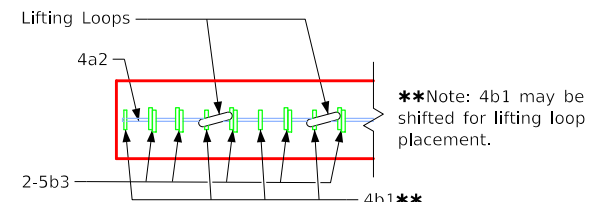


**Beam Section Properties**

Area = 382.5 in.<sup>2</sup>  
 $\bar{y}_b = 17.06$  in.  
 $I = 62,000$  in.<sup>4</sup>



- Note: Bars 5b2, 5b3, and 3d are to be placed in pairs.
- Deflected Strands
  - \* Keep
  - △ Dimensions at End of Beam
  - △△ Epoxy Coated Bars

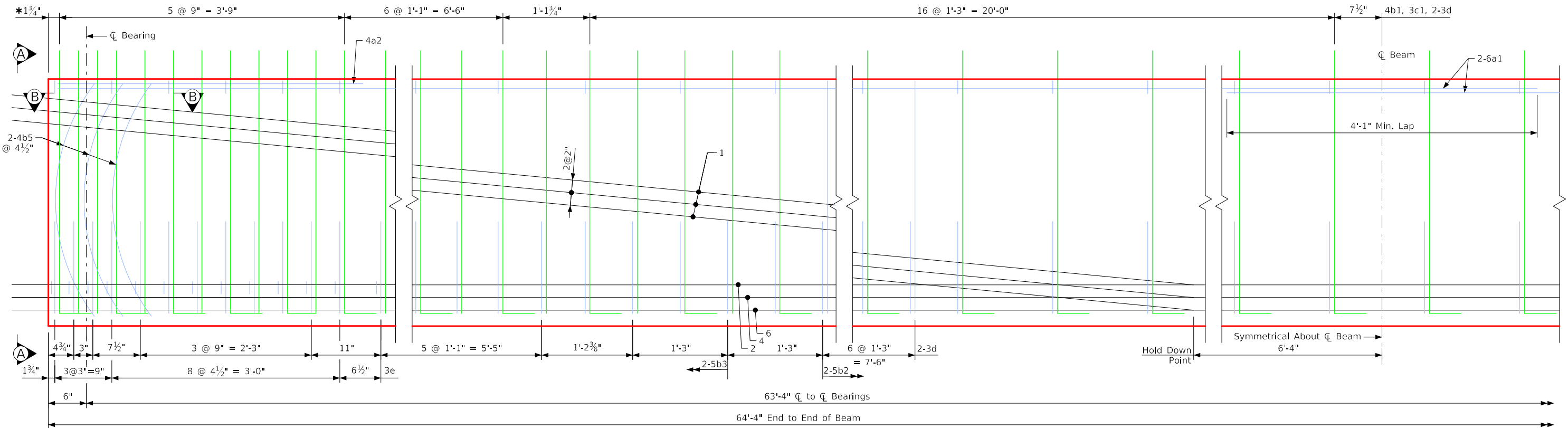


**B59 Beam Details**

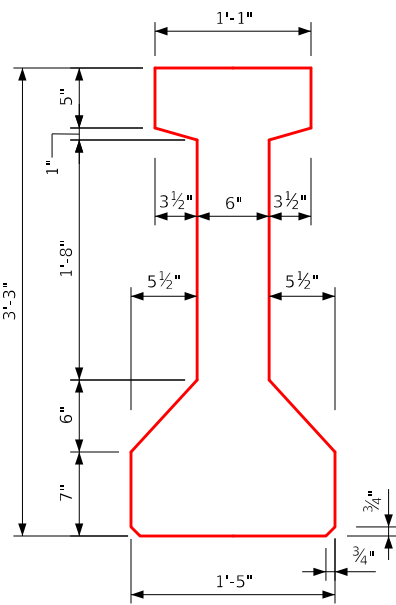
Note: Dimensions for the location of the deflected strands are at  $\bar{C}$  beam and end of beam.

FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 59'-2" Span	Standard Sheet 4612-B59	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:43 PM	4/5/2026	bkloss	pw:\NTP\int1.dot.int.lan:PWMain\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				

Revised 05-09: B63 Bar Spacings were Changed.  
 Revised 06-2024: Epoxy Coated 5b2 bars at Beam Ends. Revised Lifting Loop Details added.  
 Revised 04-2026: Corrected detailing error where strands were not shown extending out from beam end.  
 Beams.dgn - 4612-B63 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4612).

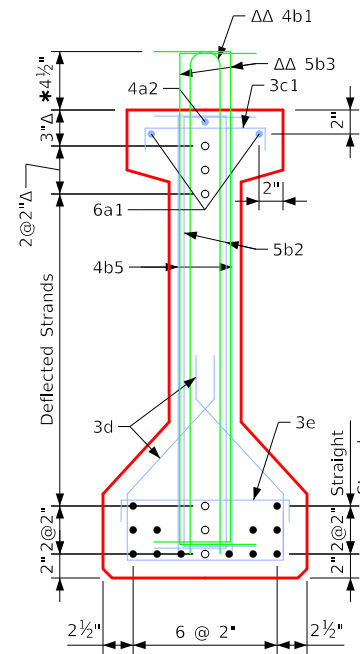


### B63 Beam



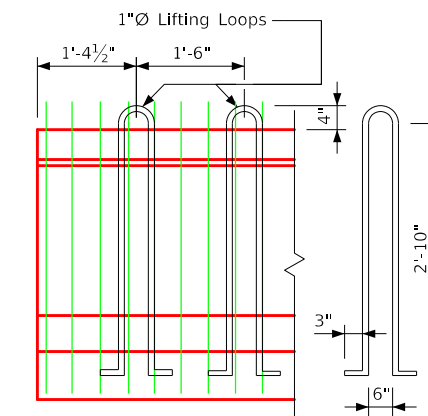
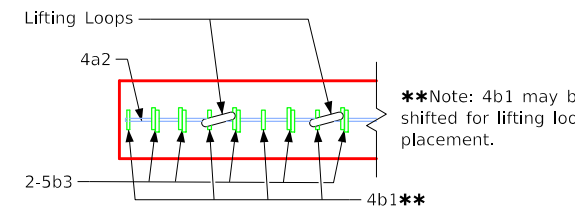
### Beam Section Properties

Area = 382.5 in.<sup>2</sup>  
 $\bar{y}_b = 17.06$  in.  
 $I = 62,000$  in.<sup>4</sup>



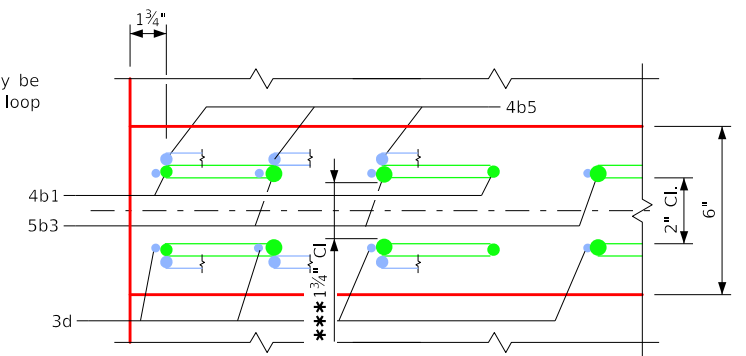
Note: Bars 4b5, 5b2, 5b3, and 3d are to be placed in pairs.  
 Tie 4b5 bars to 4b1 & 5b3.

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



### Lifting Loop Detail

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



### Section B-B

(Showing Placement Of Stirrups Near End Of Beam)

\*\*\*1 3/4" CI for 5b3 bars.

### "B" Beam Cross Section

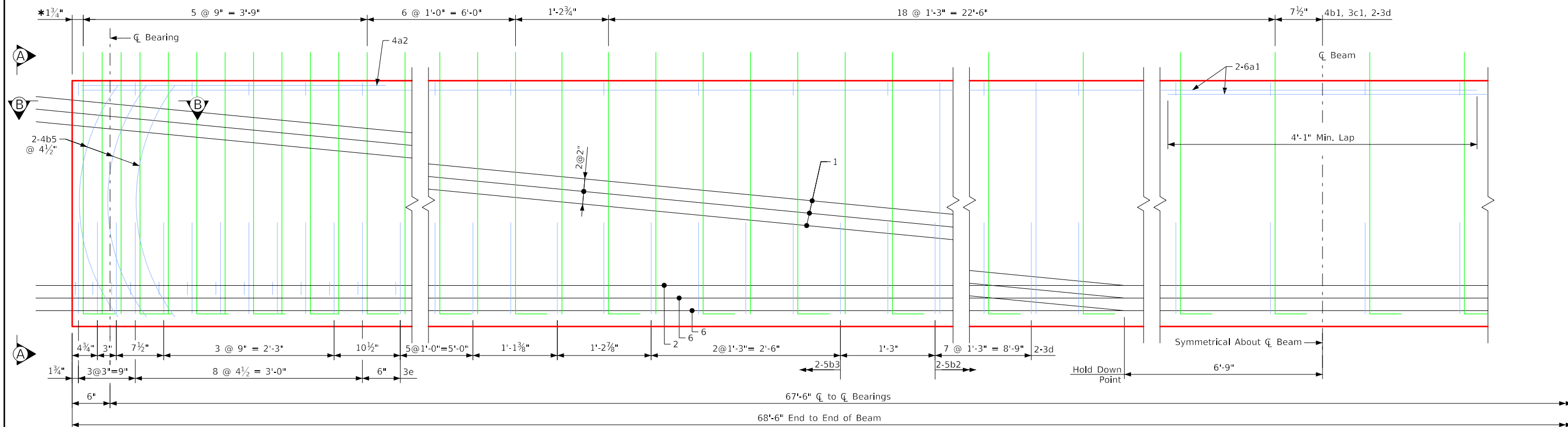
### View A-A

### B63 Beam Details

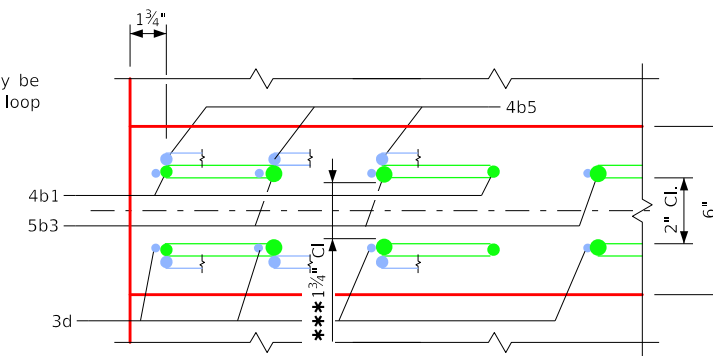
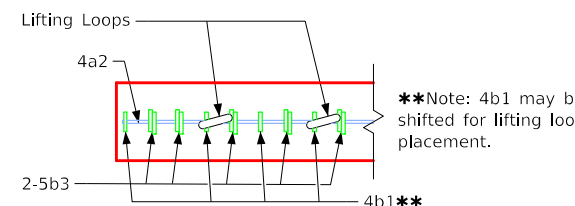
Note: Dimensions for the location of the deflected strands are at C beam and end of beam.

FILE NO.	ENGLISH	DESIGN TEAM	"B" Beam - 63'-4" Span	Standard Sheet 4612-B63	COUNTY	PROJECT NUMBER	SHEET NUMBER
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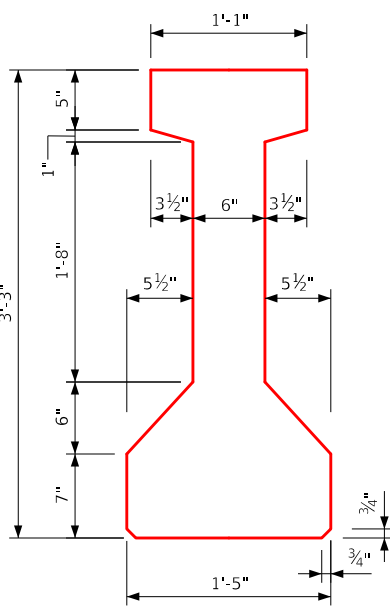
Revised 05-09: B67 Bar Spacings were Changed.  
Revised 06-2024: Epoxy Coated 5b3 Bars Replace Uncoated 5b2 bars at Beam Ends. Revised Lifting Loop Details added.  
Beams.dgn - 4612-B67 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4612).



**B67 Beam**

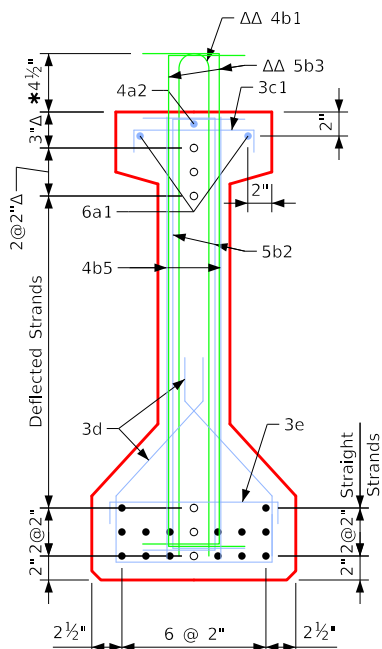


**Section B-B**  
(Showing Placement Of Stirrups Near End Of Beam)  
\*\*\*1 3/4" CI for 5b3 bars.



**Beam Section Properties**

Area = 382.5 in.<sup>2</sup>  
 $\bar{y}_b = 17.06$  in.  
 $I = 62,000$  in.<sup>4</sup>



**View A-A**

Note: Bars 4b5, 5b2, 5b3, and 3d are to be placed in pairs. Tie 4b5 bars to 4b1 & 5b3.

- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

**Lifting Loop Detail**

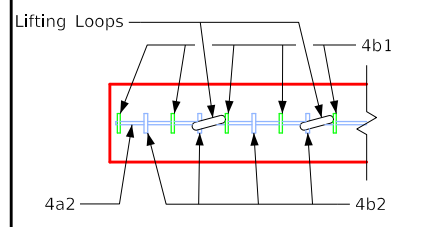
Alternate types may be substituted with the approval of the Engineer. Lifting loops are to be structural grade.

Note: Dimensions for the location of the deflected strands are at C 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
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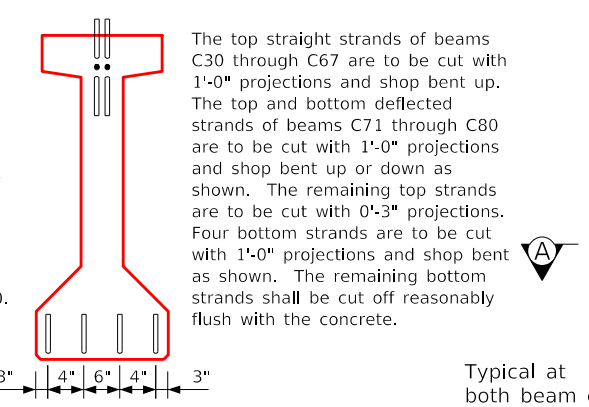


### Lifting Loop And Overhang Table

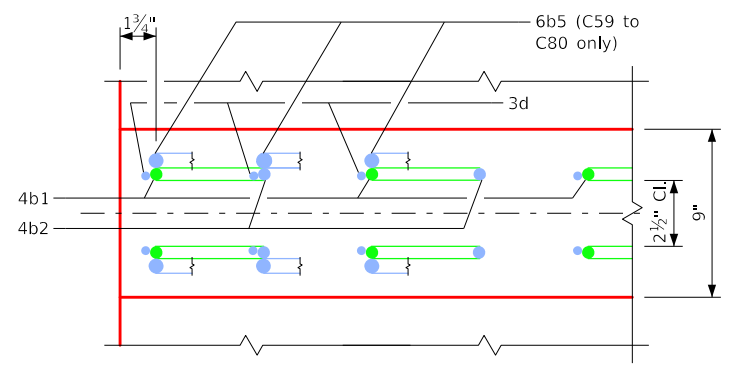
Beams	Lifting Loops Each End	Beam Overhang (ft.)
C30-C80	2 - 1"Ø	*

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

\*\*\* See Sheets 4623-C75 and 4623-80 for Lifting Loop Detail and Section Showing Placement of Stirrups Near End of Beam for Beams C75 and C-80.



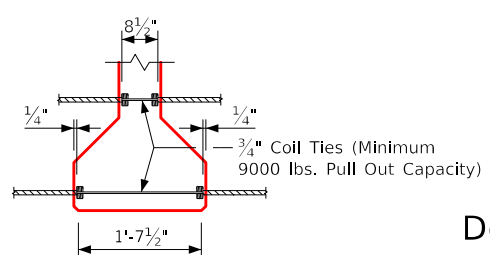
### Strand Projection At Beam Ends When Embedded In Concrete End Diaphragms



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

### 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. 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		Strand Size Dia. (in.)	No. of Strands		Total Initial Prestress (kips) ③	Hold Down Force (kips)	Camber (in.) ④		Deflection (in.) Δ <sub>D</sub>		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 <sub>I</sub>	Time ② (plastic) Δ <sub>T</sub>	HL-93 Loading			
			Steel Diaphragm	Steel Diaphragm		Steel Diaphragm											
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	601
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	678
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	1119
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	1422

### 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.<sup>2</sup>) 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.

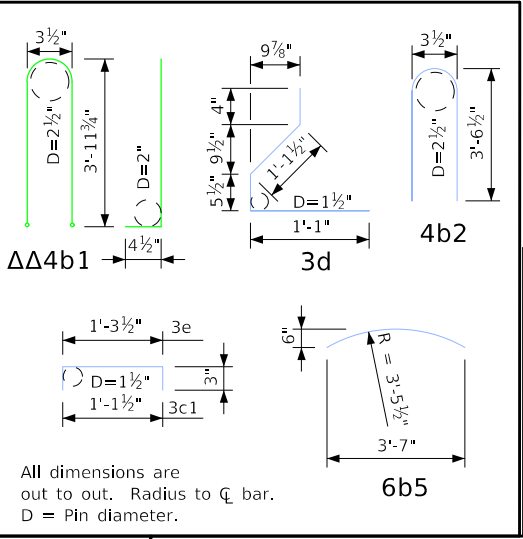
- Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.0") weight of: 0.81 kips/ft. for 7'-6" beam spacing and one steel diaphragm (0.285 kips) at  $\bar{C}$  of span. For different deck and diaphragm weights, deflections will be directly proportional.
- Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck. Total beam deflections at  $\bar{C}$  of span, Δ<sub>D</sub>, due to weight of deck and diaphragms for detailing purpose:
  - (A) Δ<sub>D</sub>=Δ<sub>I</sub> + Δ<sub>T</sub> for simple span.
  - (B) Δ<sub>D</sub>=Δ<sub>I</sub> + 3/4Δ<sub>T</sub> for end spans of continuous bridge.
  - (C) Δ<sub>D</sub>=Δ<sub>I</sub> + 1/2Δ<sub>T</sub> for interior spans of continuous bridge.
- Total initial prestress is based on 72.6% f's. f's = 270 ksi. and A<sub>s</sub> = 0.217 sq. in.
- 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).

### Reinforcing Bar List

Beam	Span	C30		C34		C38		C42		C46		C50		C55		C59		C63		C67		C71		C75		C80		Beam	Span			
		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	Shape	
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"	2	5'-0"	2	5'-0"	4a2	
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"	70	8'-10"	86	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"	38	7'-2"	18	7'-2"	30	7'-2"	22	7'-2"	14	7'-2"	4b2	—	—	
6b5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	3'-9"	8	3'-9"	12	3'-9"	12	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"	26	1'-10"	3e	—	—	—

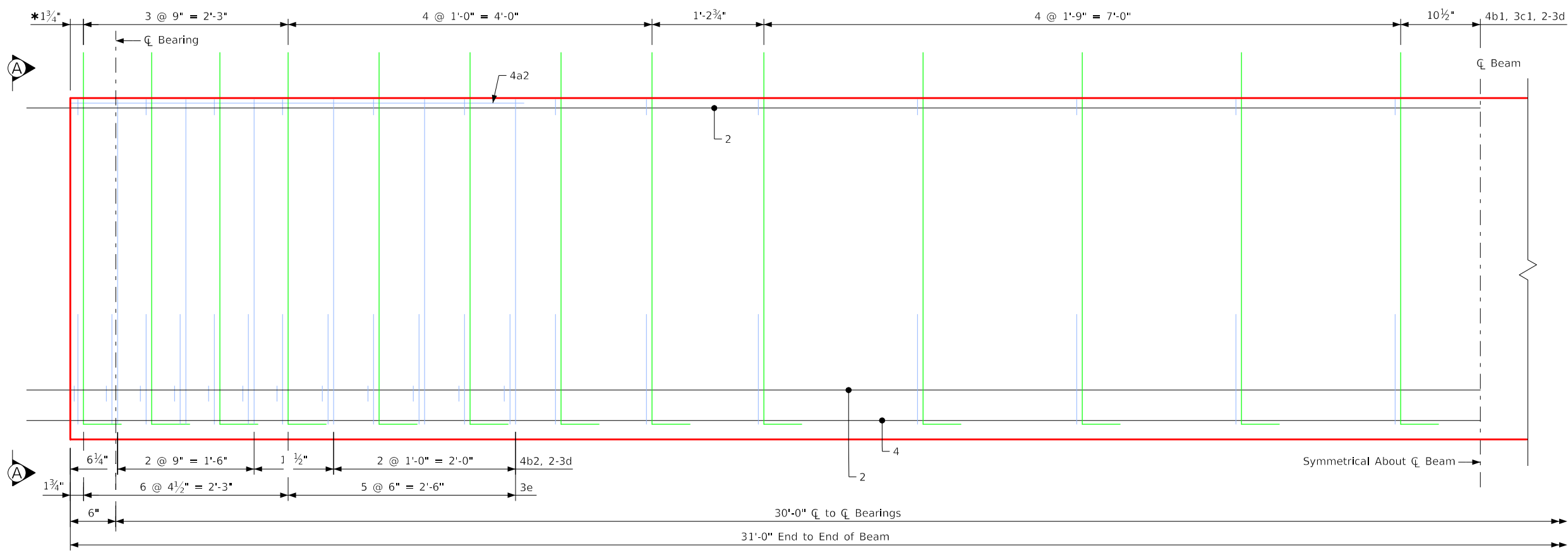


0.6" diameter strands stressed to not more than 5,000 lbs. Each may be used in lieu of the a bars which run the full length of the beam in the top flange. Holes must be cast in the web to accommodate the steel diaphragm attachments as detailed on the Steel Diaphragm Detail Sheet. If sole plate is required 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.

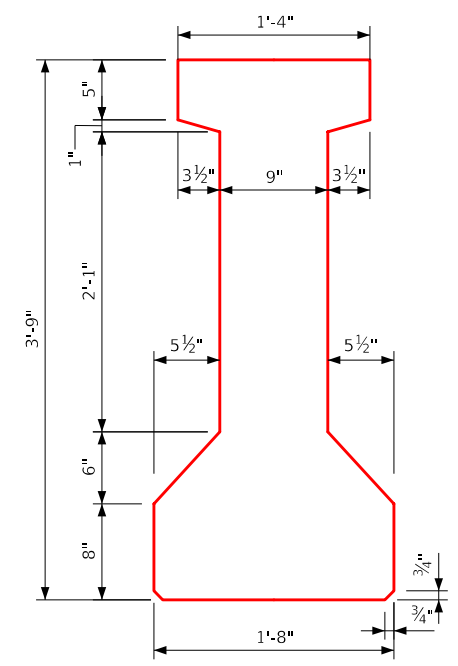
### C Beam - Data Details

Revised 08-12: I.M. Reference Note for Sealing Beam Ends Distinguishes Between the Fabricator and Contractor. Re-issued 09-06. Revised 06-2024: 4b1 Added and 4b2 Reduced in the "Reinforcing Bar List" for the C75 and C80 beams. Reinforcing Steel Quantities Updated for C75 and C80 Beams. Notes Added Referencing the Lifting Loop Details being provided on C75 and C80 beam sheets. Revised 10-2024: Revised "Reinforcing Bar List" and "Reinforcing Steel weight in the "C Beam Data" table for C50 and C55 beams, due to addition of 6b5 bars. Beams.dgn - 4620 - This Sheet Issued 04-2024 - Sheet Format Update.

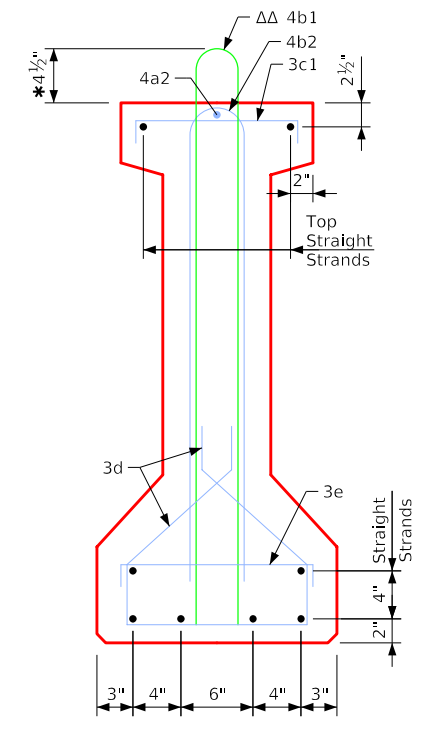
Beams.dgn - 4621-C30 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4621).



**C30 Beam**



**Beam Section Properties**  
 Area = 564.5 in.<sup>2</sup>  
 $\bar{y}_b = 20.23$  in.  
 $I = 116,354$  in.<sup>4</sup>

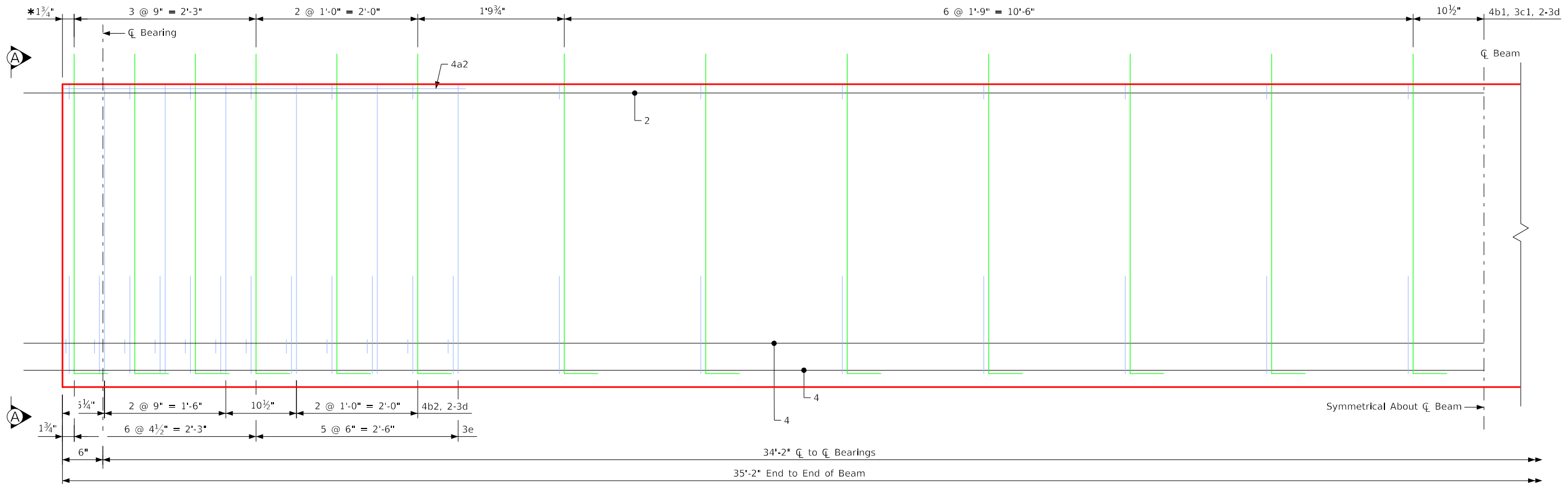


Note: Bars 3d are to be placed in pairs.  
 \* Keep  
 ΔΔ Epoxy Coated Bars

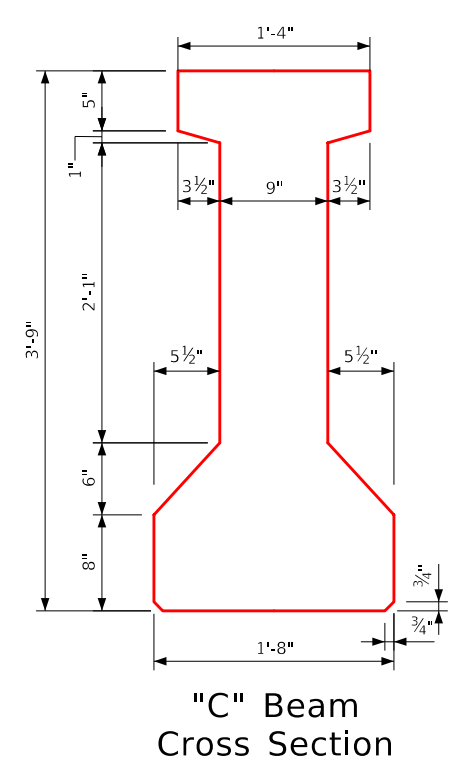
**View A-A**

C30 Beam Details

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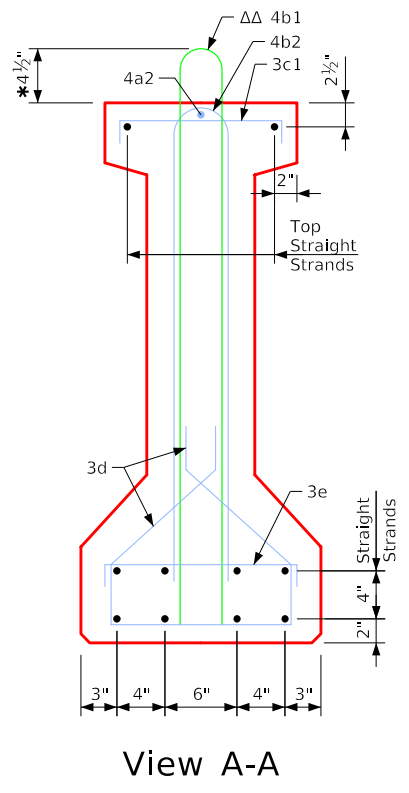


C34 Beam



Beam Section Properties

Area = 564.5 in.<sup>2</sup>  
 $\bar{y}_b = 20.23$  in.  
 $I = 116,354$  in.<sup>4</sup>



View A-A

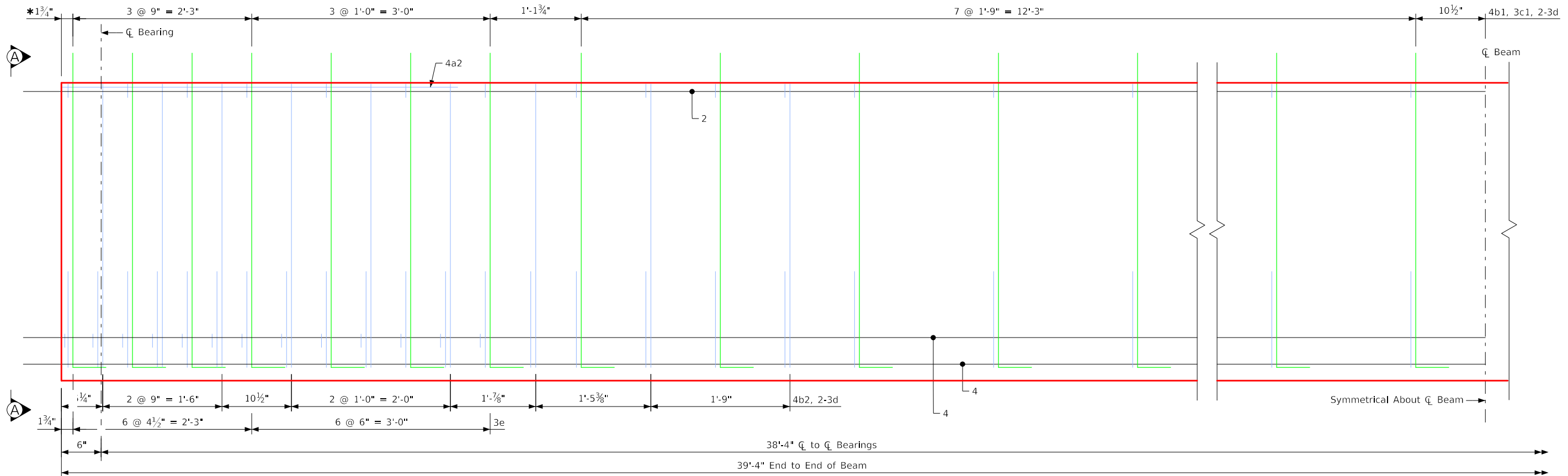
Note: Bars 3d are to be placed in pairs.

- \* Keep
- ΔΔ Epoxy Coated Bars

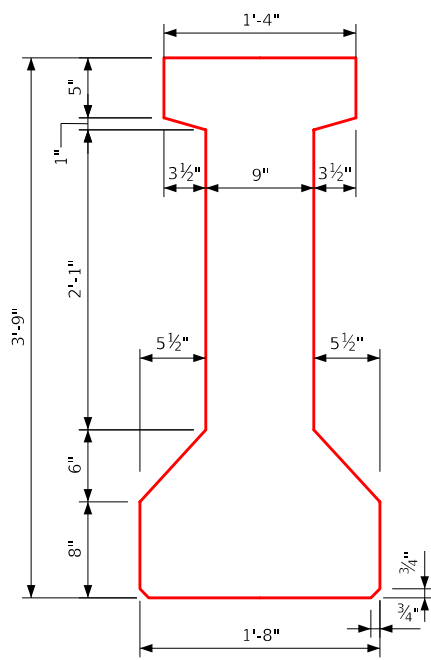
C34 Beam Details

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).

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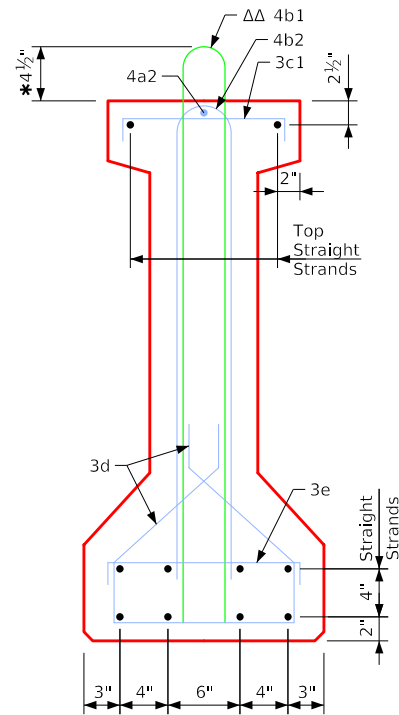


C38 Beam



"C" Beam Cross Section

Beam Section Properties  
 Area = 564.5 in.<sup>2</sup>  
 $\bar{y}_b = 20.23$  in.  
 $I = 116,354$  in.<sup>4</sup>



View A-A

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

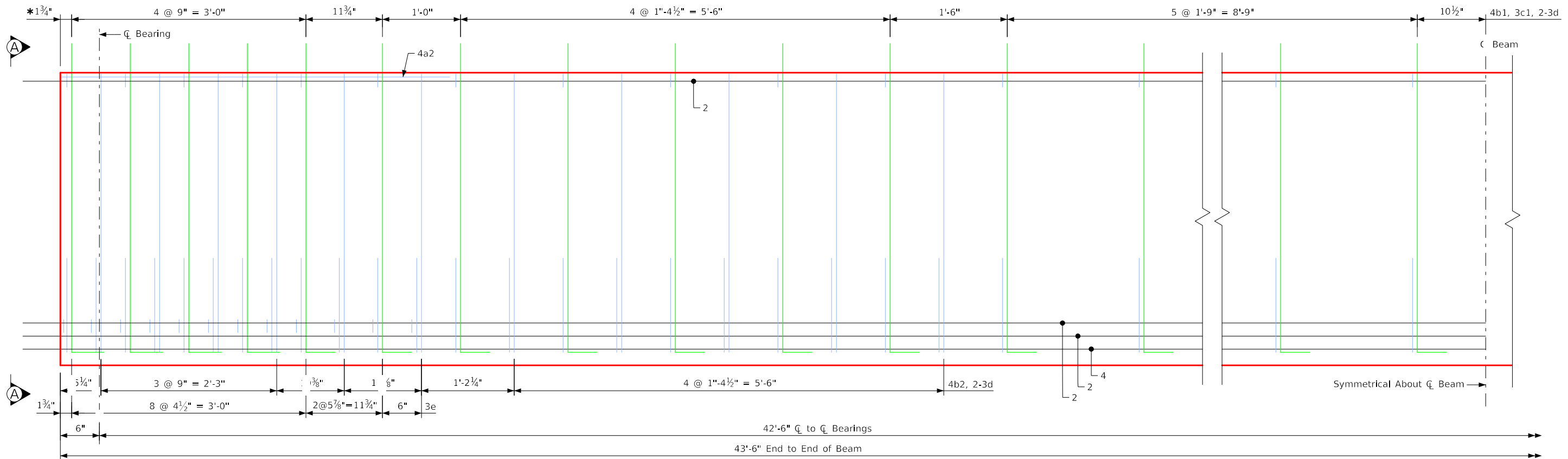
\* Keep  
 $\Delta\Delta$  Epoxy Coated Bars

C38 Beam Details

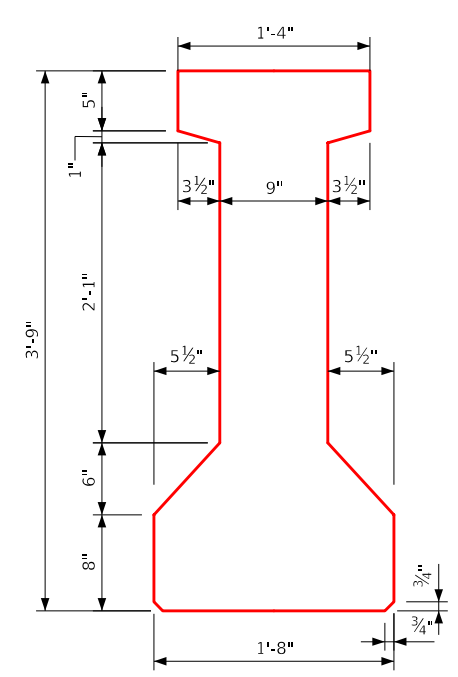
Revised 08-09: Added Prestressed Strands to C38 Beam X-Sections. Beams.dgn - 4621-C38 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4621).

FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 38'-4" Span	Standard Sheet 4621-C38	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:48 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

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

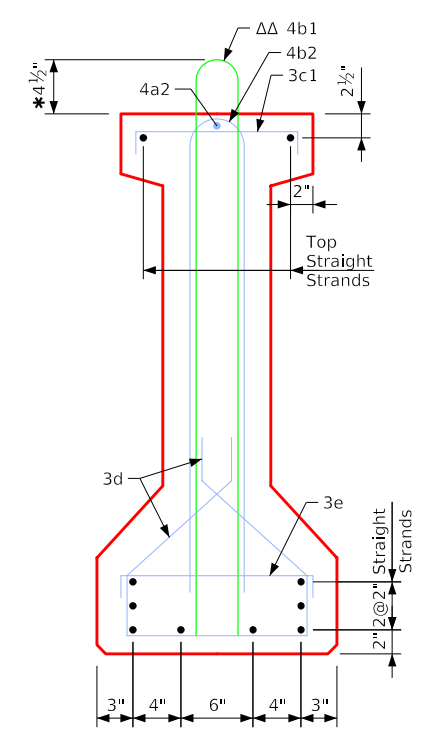


C42 Beam



"C" Beam Cross Section

Beam Section Properties  
 Area = 564.5 in.<sup>2</sup>  
 $\bar{y}_b = 20.23$  in.  
 $I = 116,354$  in.<sup>4</sup>



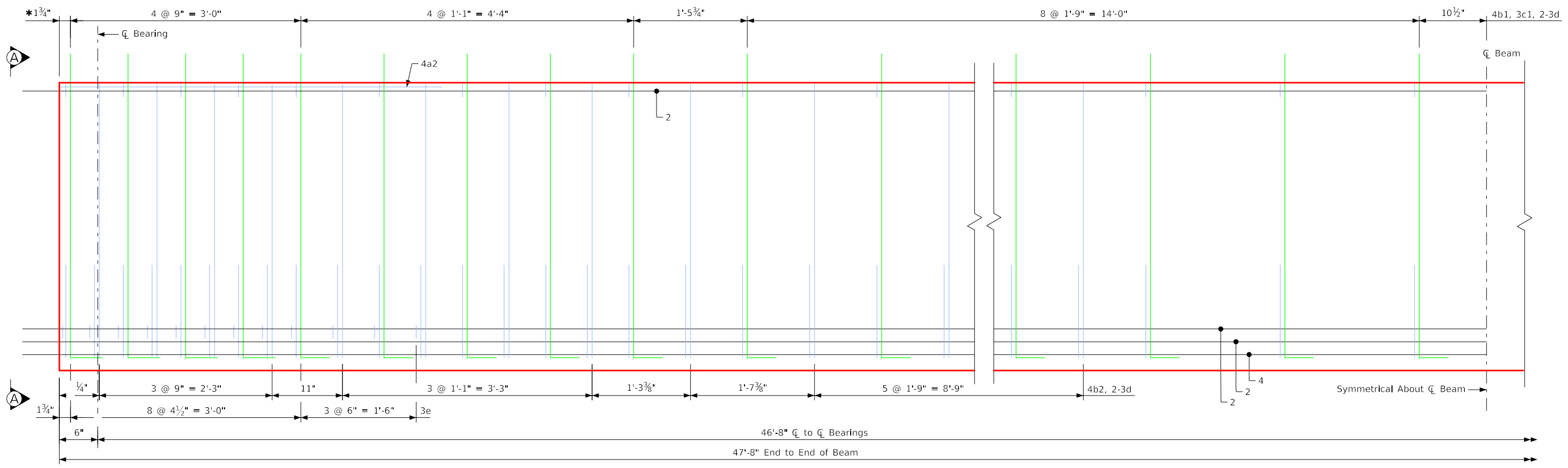
View A-A

Note: Bars 3d are to be placed in pairs.  
 \* Keep  
 ΔΔ Epoxy Coated Bars

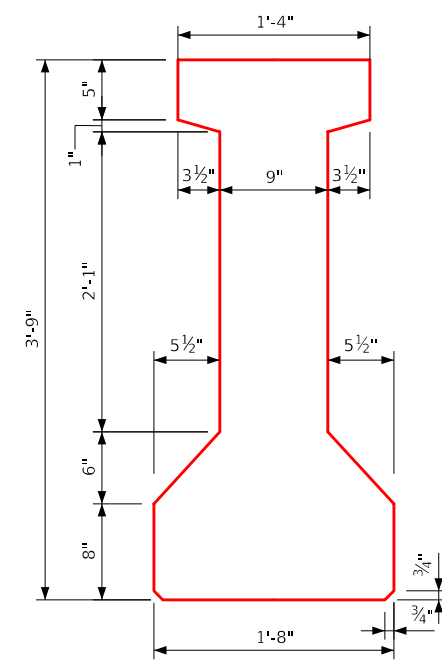
C42 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 42'-6" Span	Standard Sheet 4621-C42	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:49 PM	4/5/2026	bkloss	pw:\NTP\wint1.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).

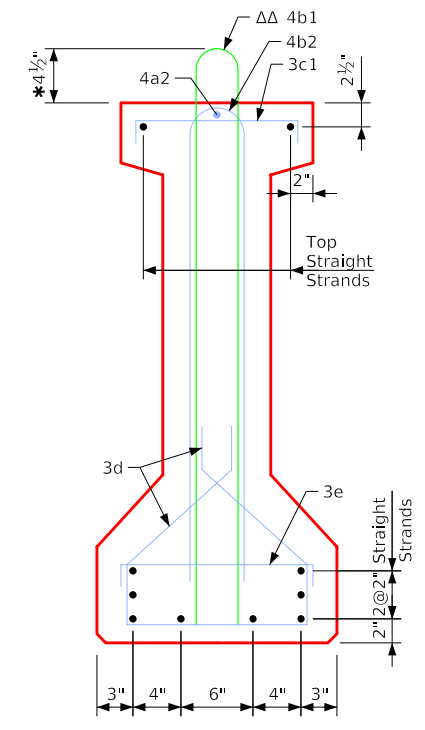


C46 Beam



"C" Beam Cross Section

Beam Section Properties  
 Area = 564.5 in.<sup>2</sup>  
 $\bar{y}_b = 20.23$  in.  
 $I = 116,354$  in.<sup>4</sup>



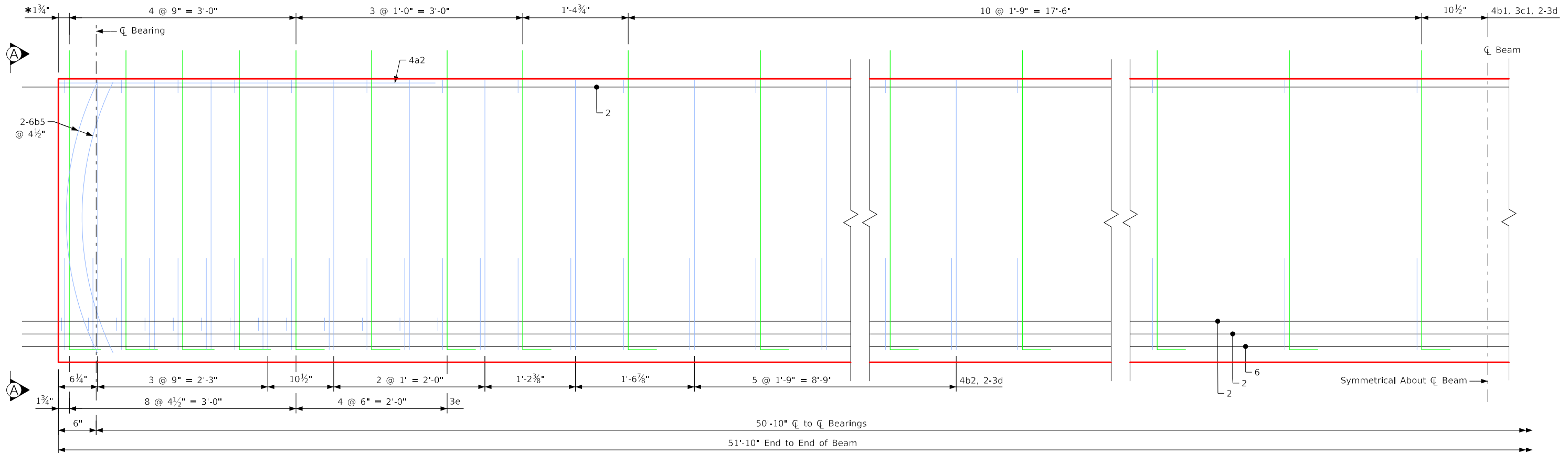
View A-A

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

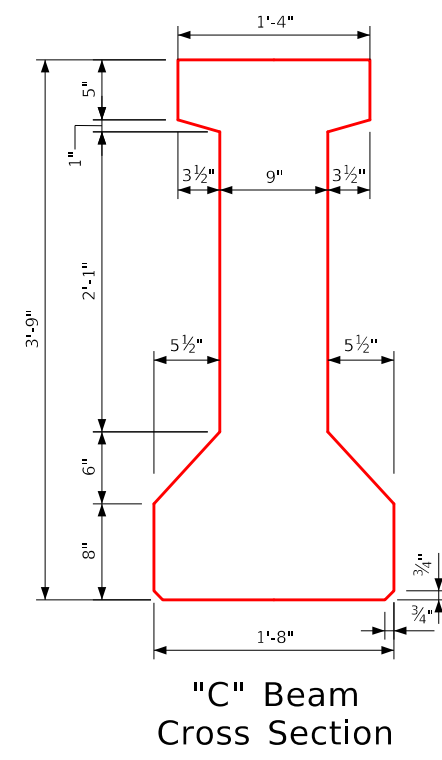
- \* Keep
- ΔΔ Epoxy Coated Bars

C46 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 46'-8" Span	Standard Sheet 4621-C46	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:50 PM	4/5/2026	bkloss	pw:\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

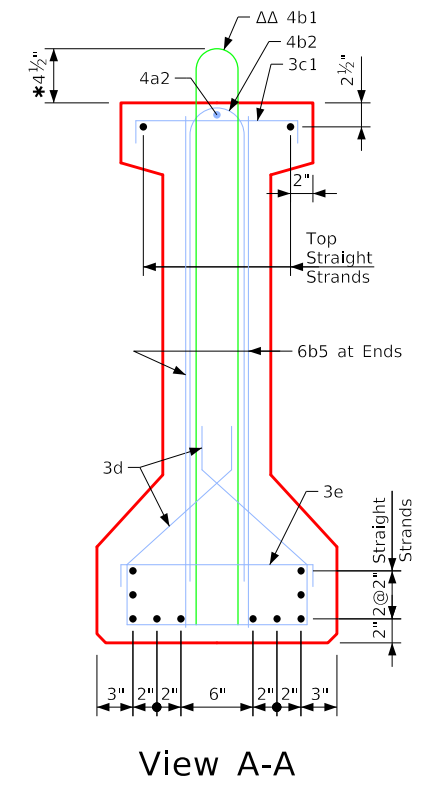


C50 Beam



Beam Section Properties

Area = 564.5 in.<sup>2</sup>  
 $\bar{y}_b = 20.23$  in.  
 $I = 116,354$  in.<sup>4</sup>



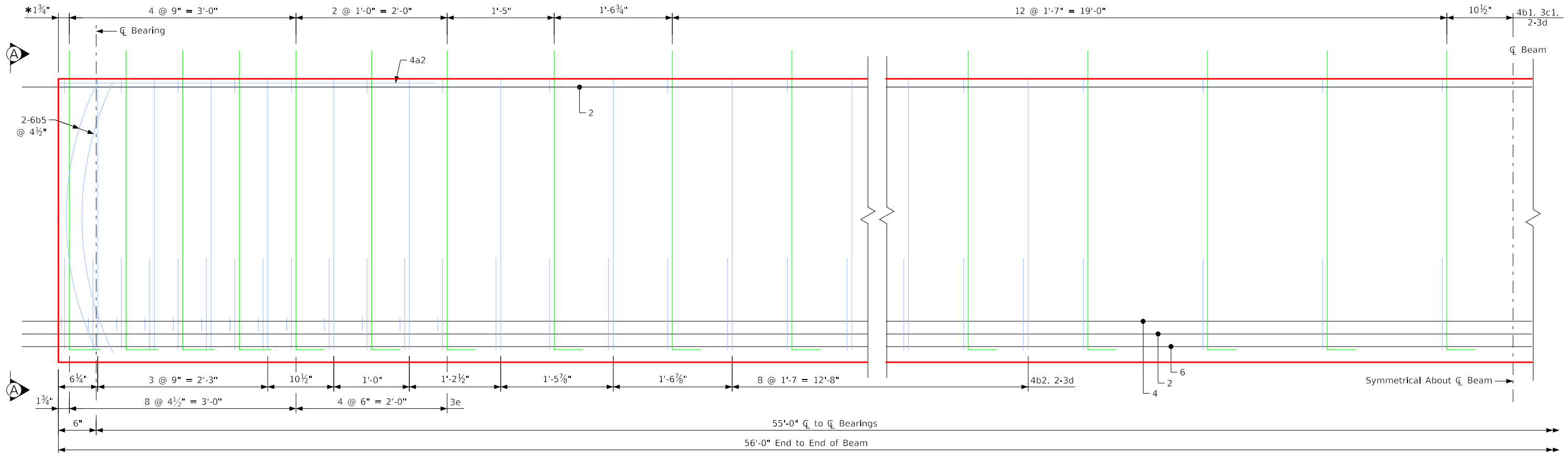
Note: Bars 3d and 6b5 are to be placed in pairs. Tie 6b5 bars to 4b1 & 4b2.

\* Keep  
 ΔΔ Epoxy Coated Bars

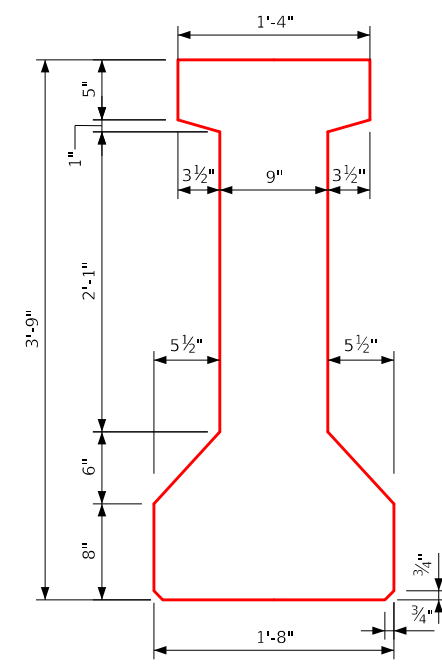
C50 Beam Details

Correction 07-08: Removed the Duplicate 4b2 Bar Labeling in the Cross Sections for C50 Beams. Revised 10-2024: Added 6b5 bars to "C55 Beam" and "View A-A" details. 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
3:48:50 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

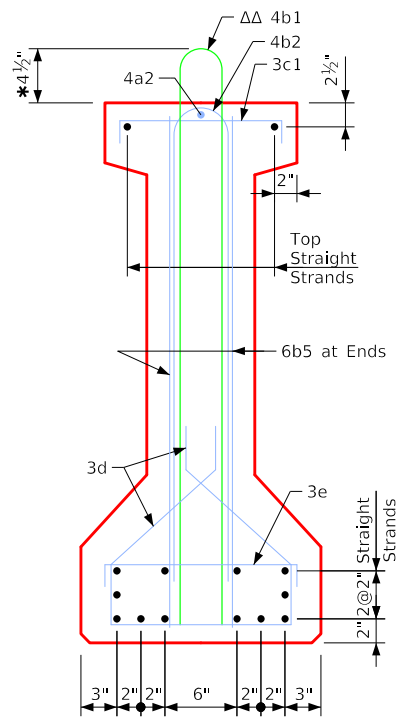


C55 Beam



Beam Section Properties

Area = 564.5 in.<sup>2</sup>  
 $\bar{y}_b = 20.23$  in.  
 $I = 116,354$  in.<sup>4</sup>



View A-A

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

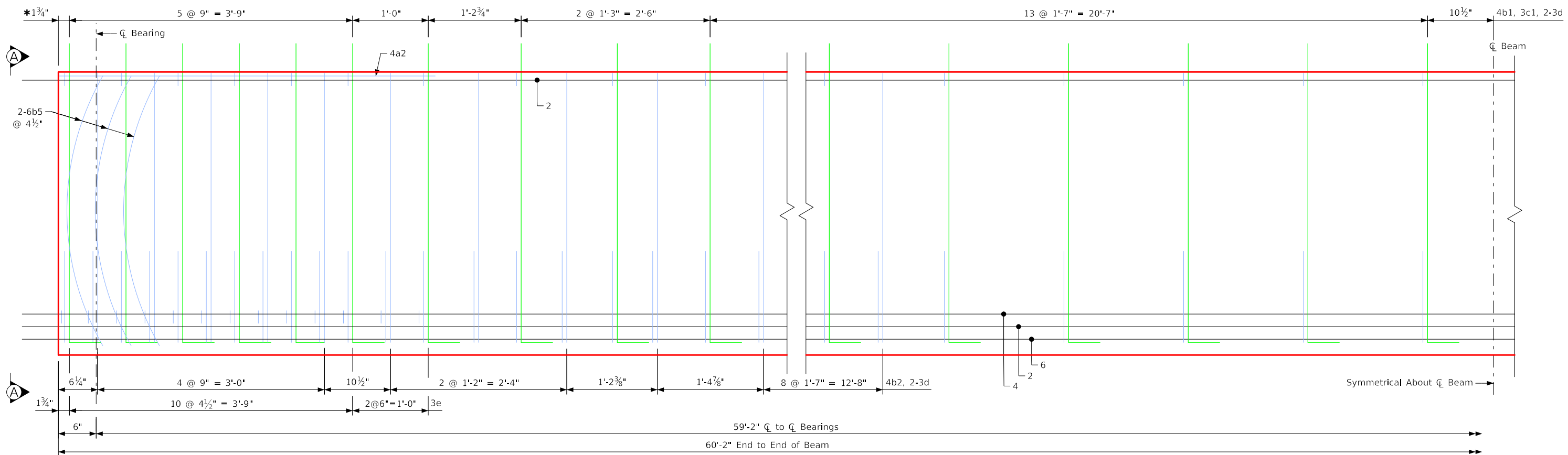
- \* Keep
- ΔΔ Epoxy Coated Bars

C55 Beam Details

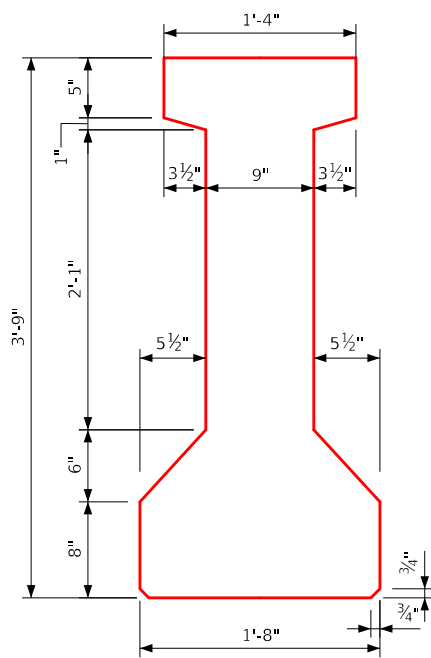
Correction 07-08: Removed the Duplicate 4b2 Bar Labeling in the Cross Sections for C55 Beams. Revised 10-2024: Added 6b5 bars to "C55 Beam" and "View A-A" details. Beams.dgn - 4622-C55 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4622).

FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 55'-0" Span	Standard Sheet 4622-C55	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:51 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

Correction 07-08: Removed the Duplicate 4b2 Bar Labeling 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).

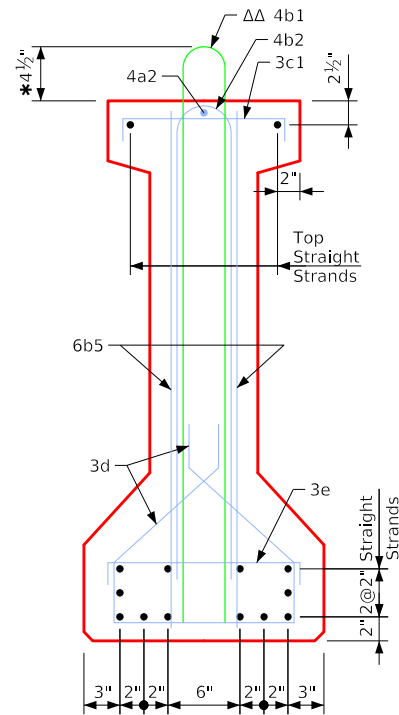


C59 Beam



"C" Beam Cross Section

Area = 564.5 in.<sup>2</sup>  
 $\bar{y}_b = 20.23$  in.  
 $I = 116,354$  in.<sup>4</sup>  
**Beam Section Properties**



View A-A

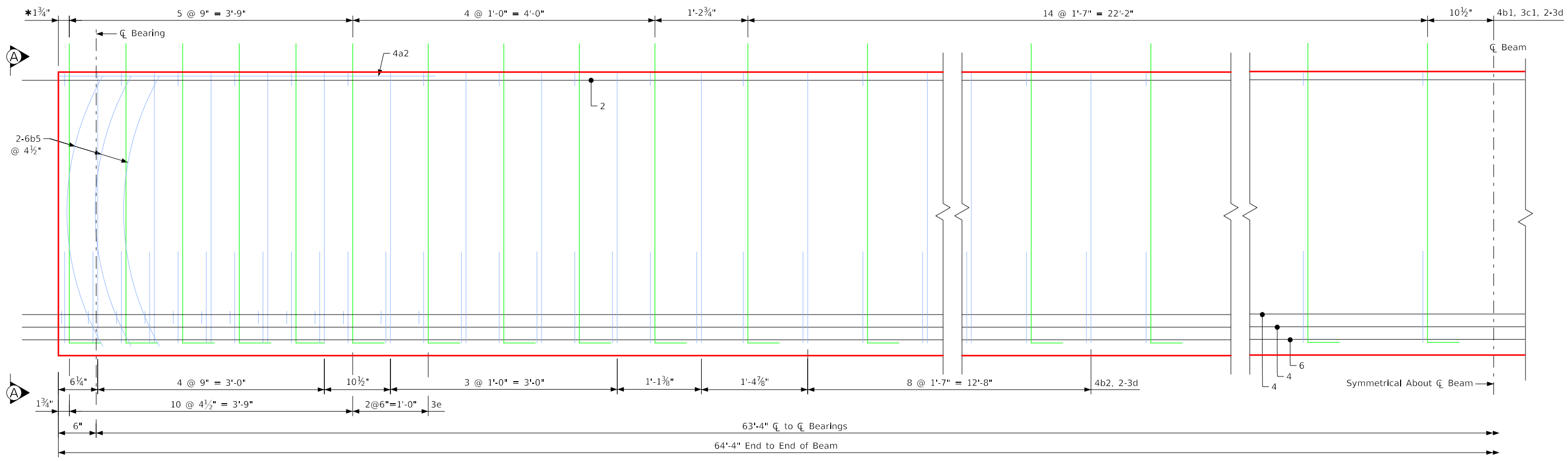
Note: Bars 6b5 and 3d are to be placed in pairs. Tie 6b5 bars to 4b1 & 4b2.

- \* Keep
- $\Delta\Delta$  Epoxy Coated Bars

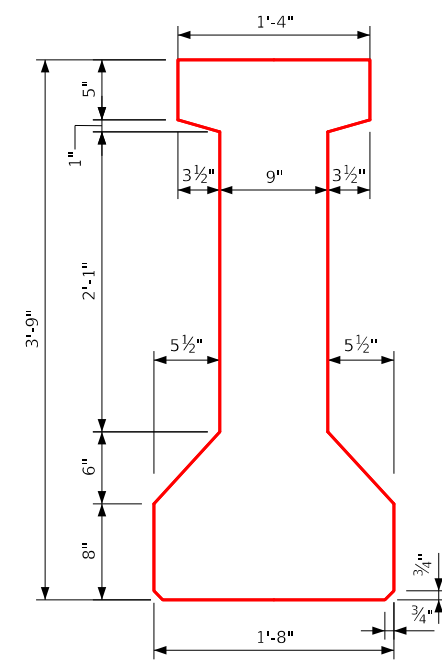
C59 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 59'-2" Span	Standard Sheet 4622-C59	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:52 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

Correction 07-08: Corrected the 4b2 Bars to 6b5 Bars for C63 Beams.  
 Revised 06-2024: Added the straight strands to the lower part of beam in View A-A.  
 Beams.dgn - 4622-C63 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4622).

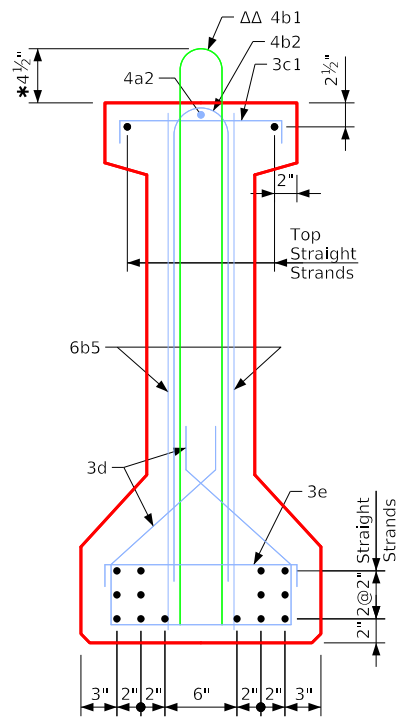


C63 Beam



"C" Beam Cross Section

**Beam Section Properties**  
 Area = 564.5 in.<sup>2</sup>  
 $\bar{y}_b = 20.23$  in.  
 $I = 116,354$  in.<sup>4</sup>

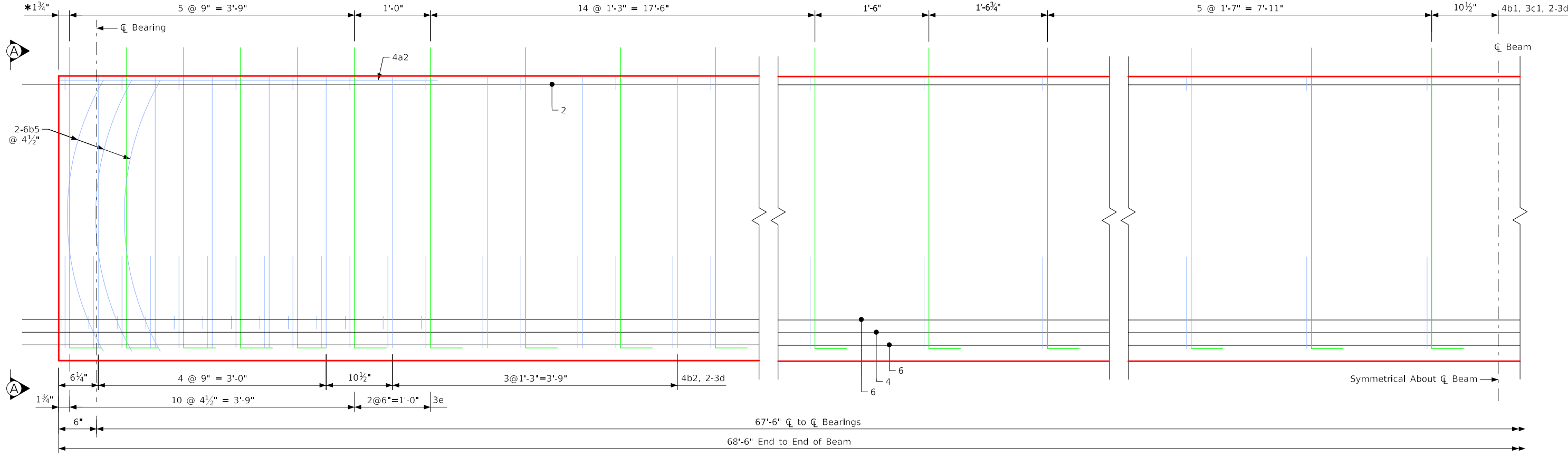


View A-A

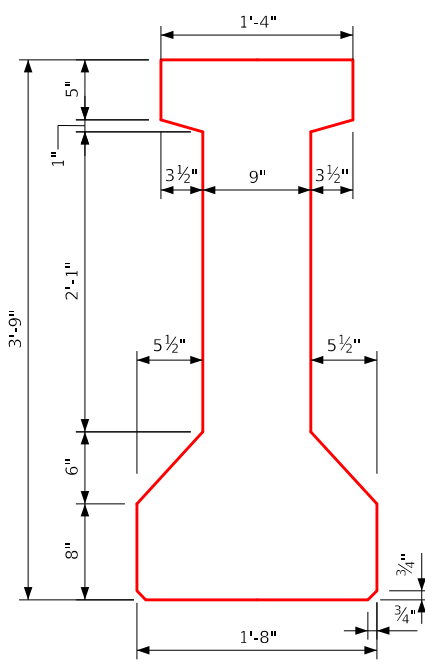
Note: Bars 6b5 and 3d are to be placed in pairs. Tie 6b5 bars to 4b1 & 4b2.  
 \* Keep  
 ΔΔ Epoxy Coated Bars

C63 Beam Details

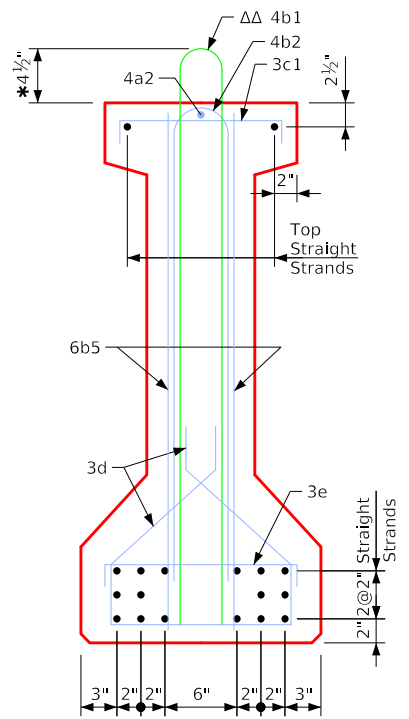
FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 63'-4" Span	Standard Sheet 4622-C63	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:53 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



C67 Beam



Beam Section Properties  
 Area = 564.5 in.<sup>2</sup>  
 $\bar{y}_b = 20.23$  in.  
 $I = 116,354$  in.<sup>4</sup>



Note: Bars 6b5 and 3d are to be placed in pairs. Tie 6b5 bars to 4b1 & 4b2.  
 \* Keep  
 ΔΔ Epoxy Coated Bars

"C" Beam Cross Section

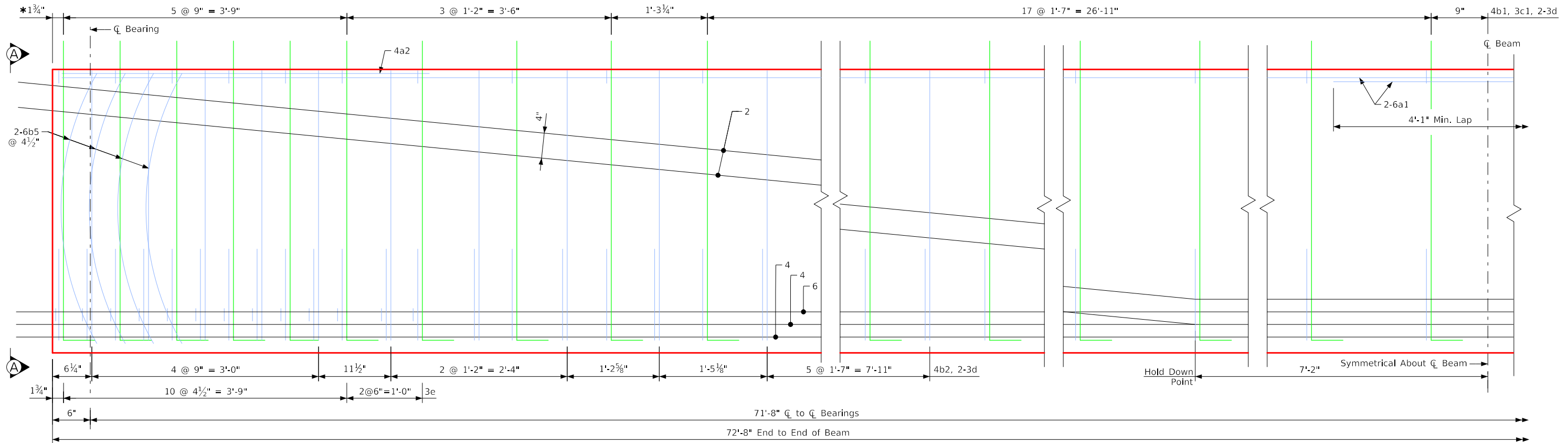
View A-A

C67 Beam Details

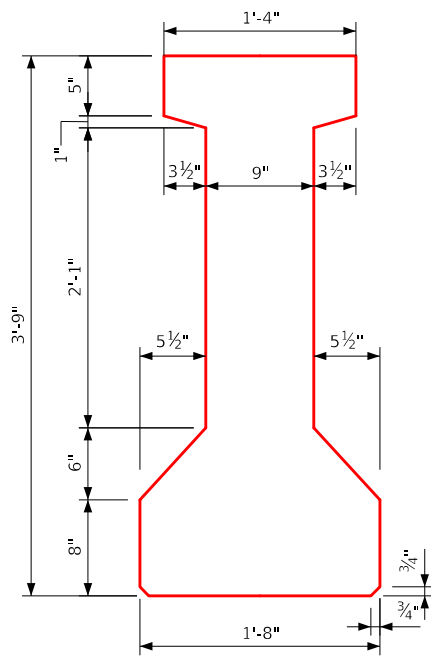
Correction 07-08: Corrected the 4b2 Bars to 6b5 Bars for C67 Beams. Beams.dgn - 4622-C67 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4622).

FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 67'-6" Span	Standard Sheet 4622-C67	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:54 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

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).



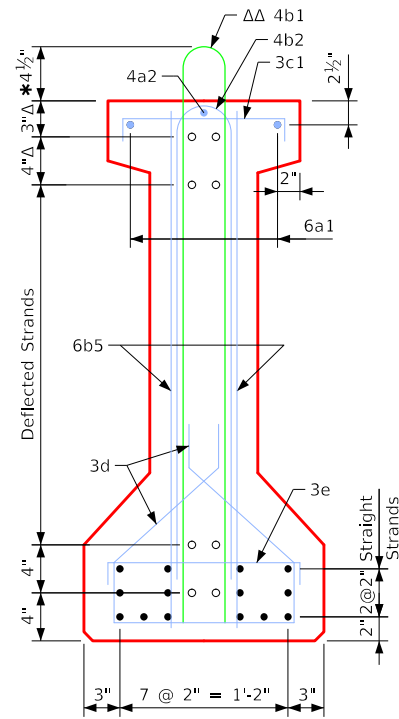
C71 Beam



"C" Beam Cross Section

Area = 564.5 in.<sup>2</sup>  
 $\bar{y}_b = 20.23$  in.  
 $I = 116,354$  in.<sup>4</sup>

**Beam Section Properties**



View A-A

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

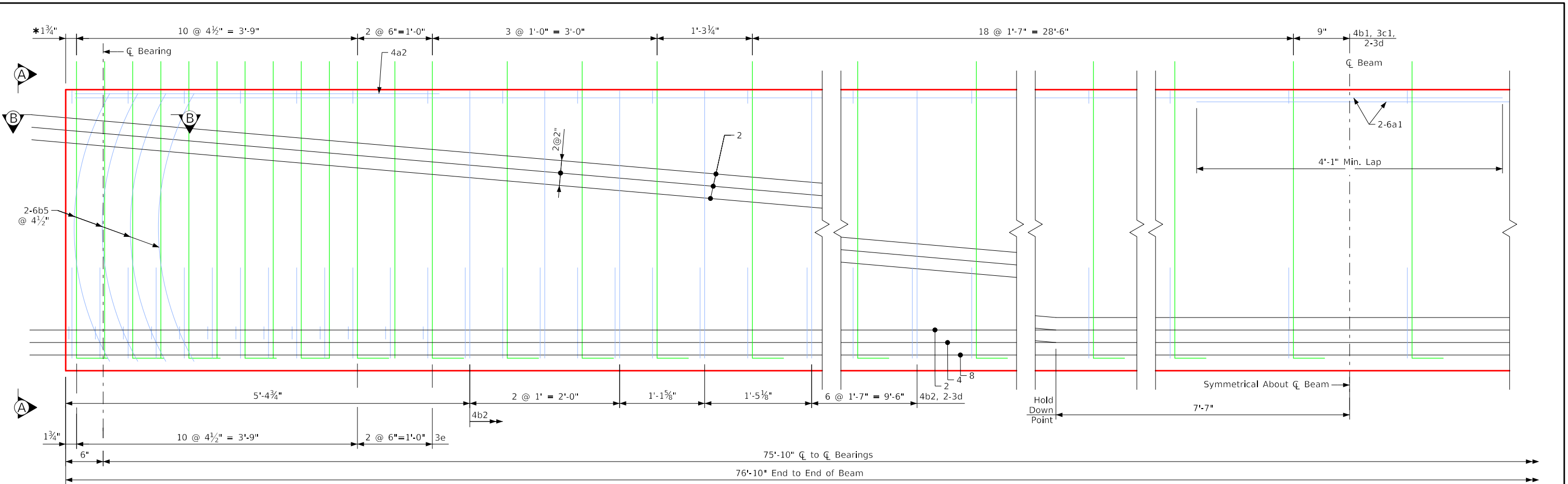
- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

Note: Dimensions for the location of the deflected strands are at  $\bar{c}$  beam and end of beam.

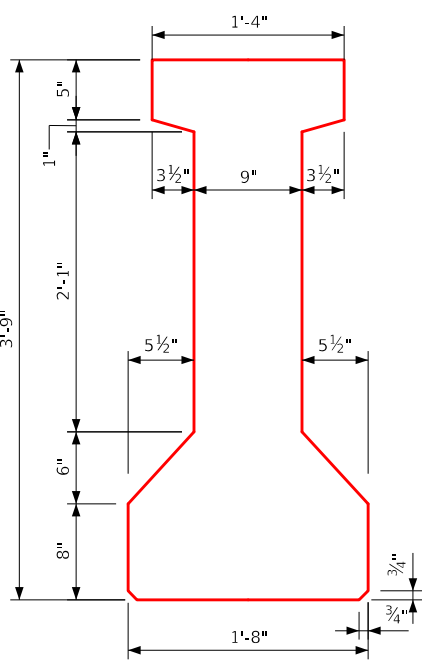
C71 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 71'-8" Span	Standard Sheet 4623-C71	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:55 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

Correction 07-08: The 6d5 bars were corrected to 6b5. Revised 06-2024: Epoxy Coated 4b1 Bars Replace Uncoated 4b2 Bars at Beam Ends. Revised Lifting Loop Details. Added Beams.dgn - 4623-C75 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4623).

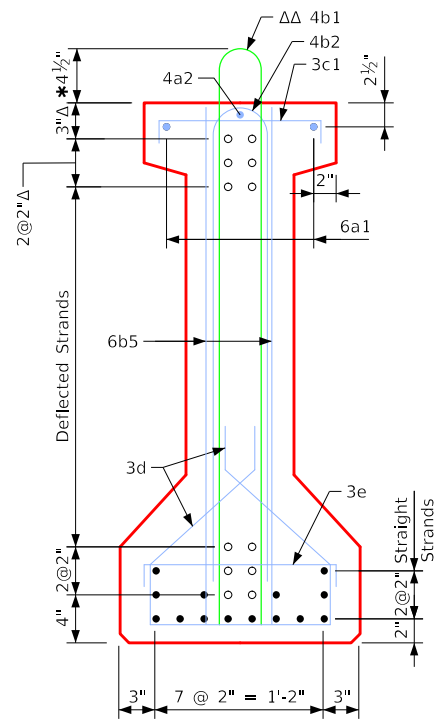


**C75 Beam**



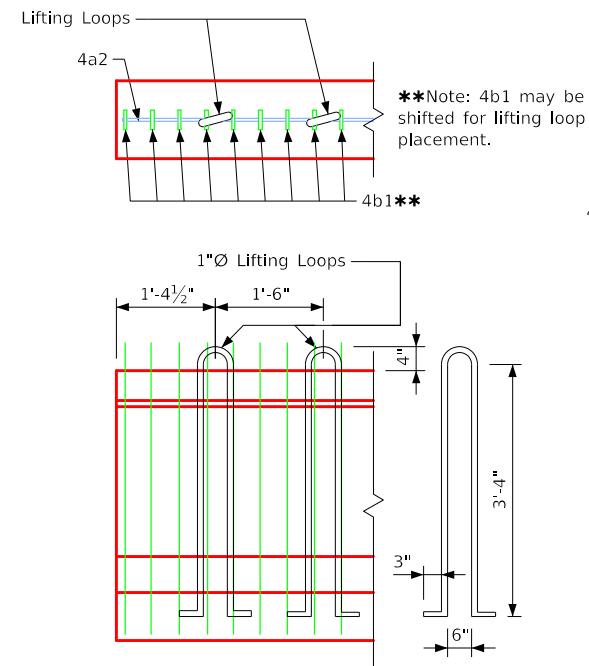
**Beam Section Properties**  
 Area = 564.5 in.<sup>2</sup>  
 $\bar{y}_b = 20.23$  in.  
 $I = 116,354$  in.<sup>4</sup>

**"C" Beam Cross Section**



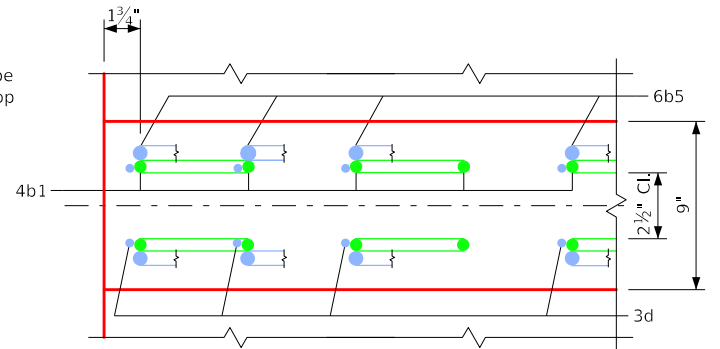
**View A-A**

- Note: Bars 6b5 and 3d are to be placed in pairs. Tie 6b5 bars to 4b1.
- Deflected Strands
  - \* Keep
  - Δ Dimensions at End of Beam
  - ΔΔ Epoxy Coated Bars



**Lifting Loop Detail**

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

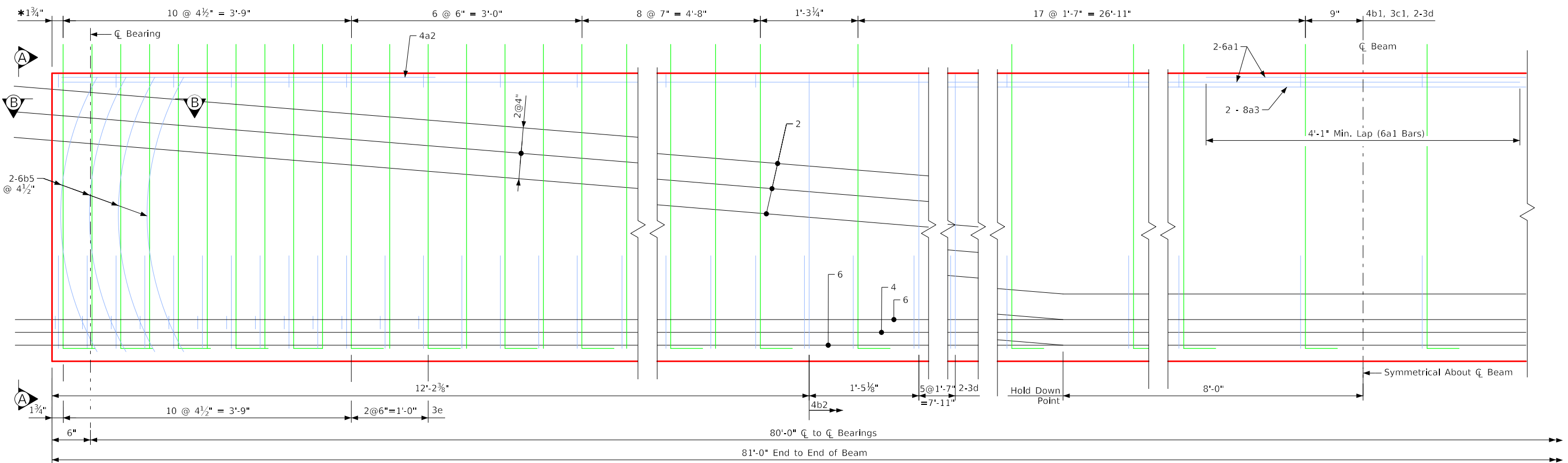


**Section B-B**  
 (Showing Placement Of Stirrups Near End Of Beam)

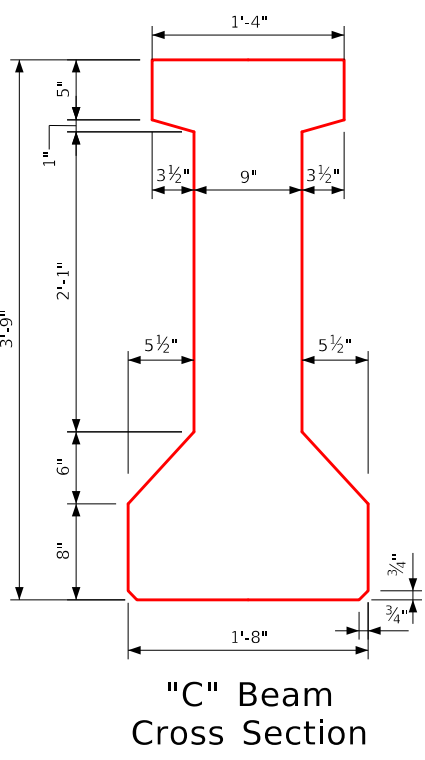
**C75 Beam Details**

Note: Dimensions for the location of the deflected strands are at  $\bar{c}$  beam and end of beam.

Correction 07-08: The 6d5 bars were corrected to 6b5. Revised 06-2024: Epoxy Coated 4b1 Bars Replace Uncoated 4b2 Bars at Beam Ends. Revised Lifting Loop Details. Added Beams.dgn - 4623-C80 - This Sheet Issued 04-2024. Additional Sheet for Clarity. (Sheet Number was Originally 4623).

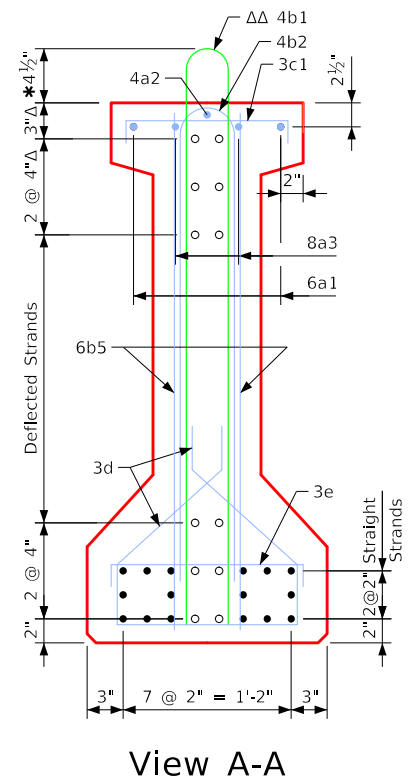


### C80 Beam



**Beam Section Properties**

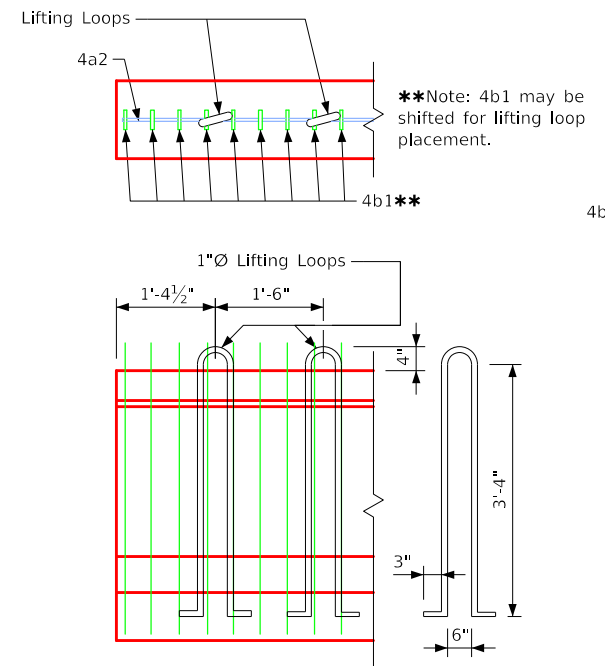
Area = 564.5 in.<sup>2</sup>  
 $\bar{y}_b = 20.23$  in.  
 $I = 116,354$  in.<sup>4</sup>



View A-A

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

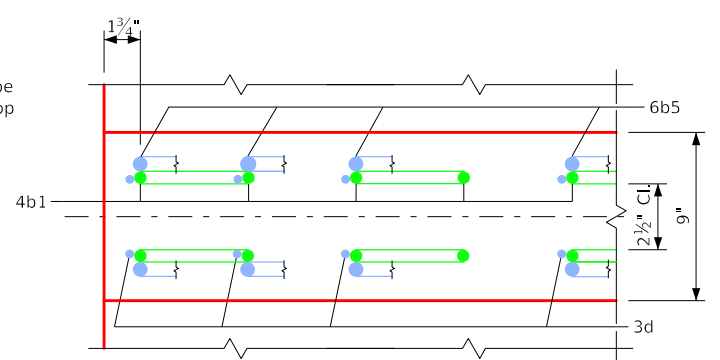
- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars



#### Lifting Loop Detail

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

Note: Dimensions for the location of the deflected strands are at  $\bar{C}$  beam and end of beam.

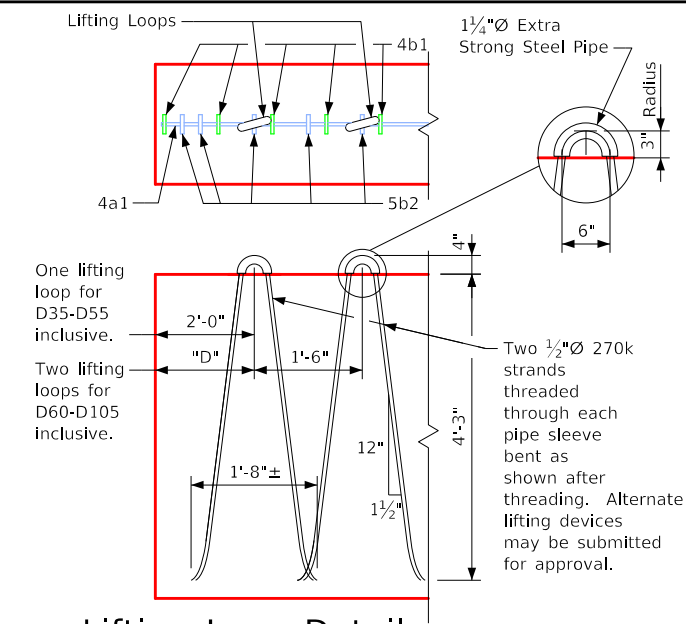


Section B-B  
(Showing Placement Of Stirrups Near End Of Beam)

## C80 Beam Details

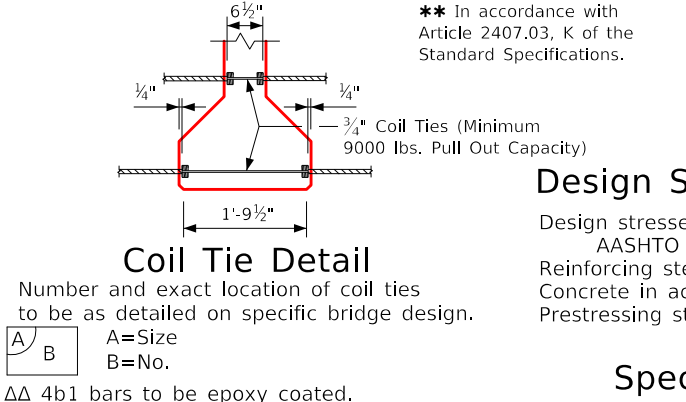
FILE NO.	ENGLISH	DESIGN TEAM	"C" Beam - 80'-0" Span	Standard Sheet 4623-C80	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:48:57 PM	4/5/2026	bkloss	pw:\NTP\int1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

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



### 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'

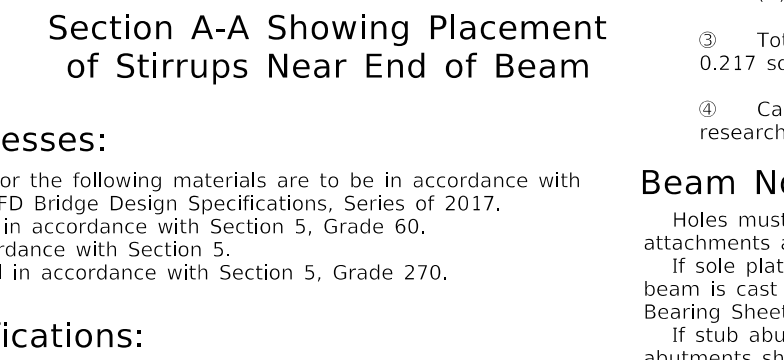
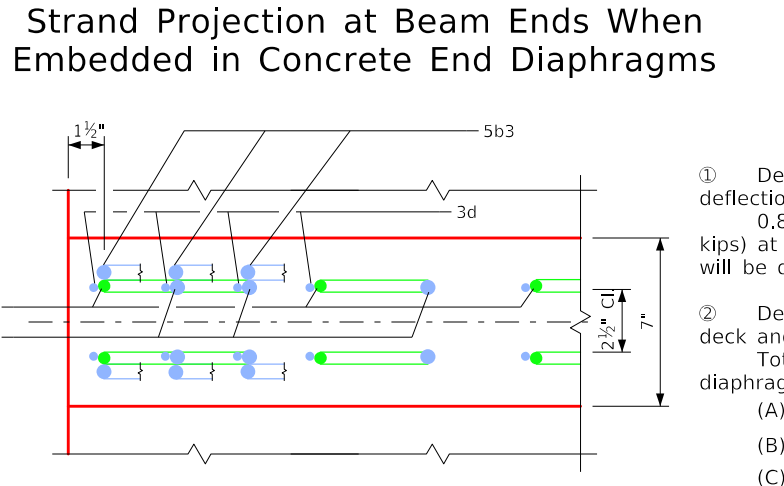
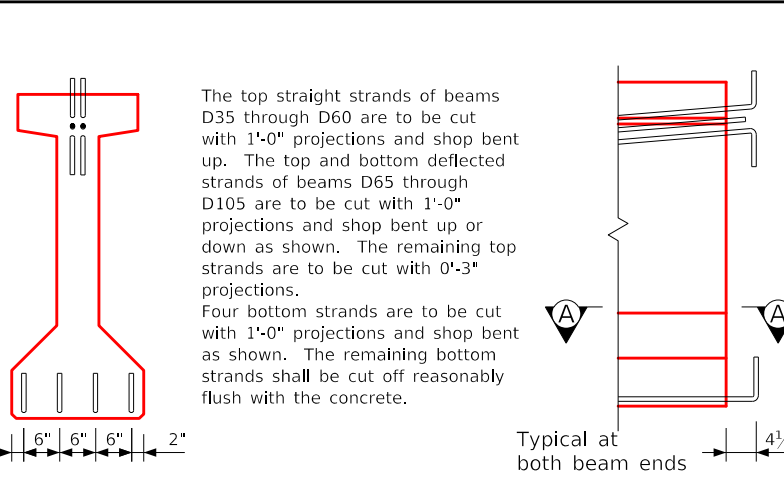


**Design Stresses:**  
Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications, Series of 2017.  
Reinforcing steel in accordance with Section 5, Grade 60.  
Concrete in accordance with Section 5.  
Prestressing steel in accordance with Section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

### Reinforcing Bar List

Beam	Span	D35	D40	D45	D50	D55	D60	D65	D70	D75	D80	D85	D90	D95	D100	D105	
Bar Shape	No.	Length		Length		Length		Length		Length		Length		Length		Length	
4a1	2	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"	4'-0"
a2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
a3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ΔΔ4b1	33	10'-4"	10'-4"	10'-4"	10'-4"	10'-4"	10'-4"	10'-4"	10'-4"	10'-4"	10'-4"	10'-4"	10'-4"	10'-4"	10'-4"	10'-4"	10'-4"
5b2	14	8'-8"	8'-8"	8'-8"	8'-8"	8'-8"	8'-8"	8'-8"	8'-8"	8'-8"	8'-8"	8'-8"	8'-8"	8'-8"	8'-8"	8'-8"	8'-8"
5b3	4	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"	4'-4"
3c	33	2'-1"	2'-1"	2'-1"	2'-1"	2'-1"	2'-1"	2'-1"	2'-1"	2'-1"	2'-1"	2'-1"	2'-1"	2'-1"	2'-1"	2'-1"	2'-1"
3d	47	5'-7"	5'-7"	5'-7"	5'-7"	5'-7"	5'-7"	5'-7"	5'-7"	5'-7"	5'-7"	5'-7"	5'-7"	5'-7"	5'-7"	5'-7"	5'-7"
3e	28	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"



### D Beam Data

D Beam	Span Length @ Bearing	Overall Beam Length (L)	Concrete Strength		Strand Size Dia. (in.)	No. of Strands		Total Initial Prestress (kips) ③	Hold Down Force (kips)	Camber (in.) ④		Deflection (in.) Δ <sub>D</sub>		Permissible Maximum Spacing HL-93 Loading	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 <sub>I</sub>	Time ② (plastic) Δ <sub>T</sub>				
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

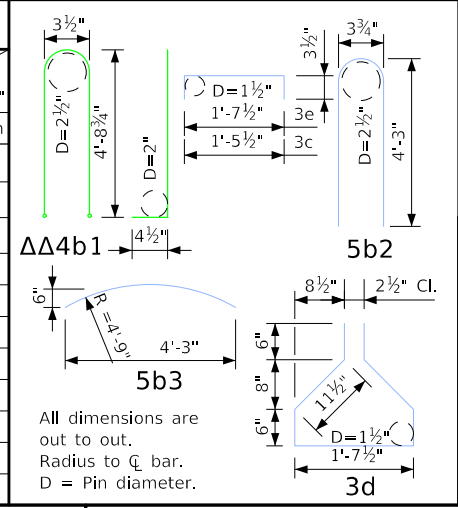
- Deflections at mid-span due to weight of deck and diaphragm. The deflections shown are for a deck (8.5") and haunch (1.0") weight of 0.81 kips/ft. for 7'-6" beam spacing and one steel diaphragm (0.285 kips) at C of span. For different deck and diaphragm weights, deflections will be directly proportional.
- Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck. Total beam deflections at C of span, Δ<sub>D</sub>, due to weight of deck and diaphragms for detailing purpose:  
 (A) Δ<sub>D</sub> = Δ<sub>I</sub> + Δ<sub>T</sub> for simple span.  
 (B) Δ<sub>D</sub> = Δ<sub>I</sub> + 3/4 Δ<sub>T</sub> for end spans of continuous bridge.  
 (C) Δ<sub>D</sub> = Δ<sub>I</sub> + 1/2 Δ<sub>T</sub> for interior spans of continuous bridge.
- Total initial prestress is based on 72.6% f's. f's = 270 ksi. and A<sub>s</sub> = 0.217 sq. in.
- 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).

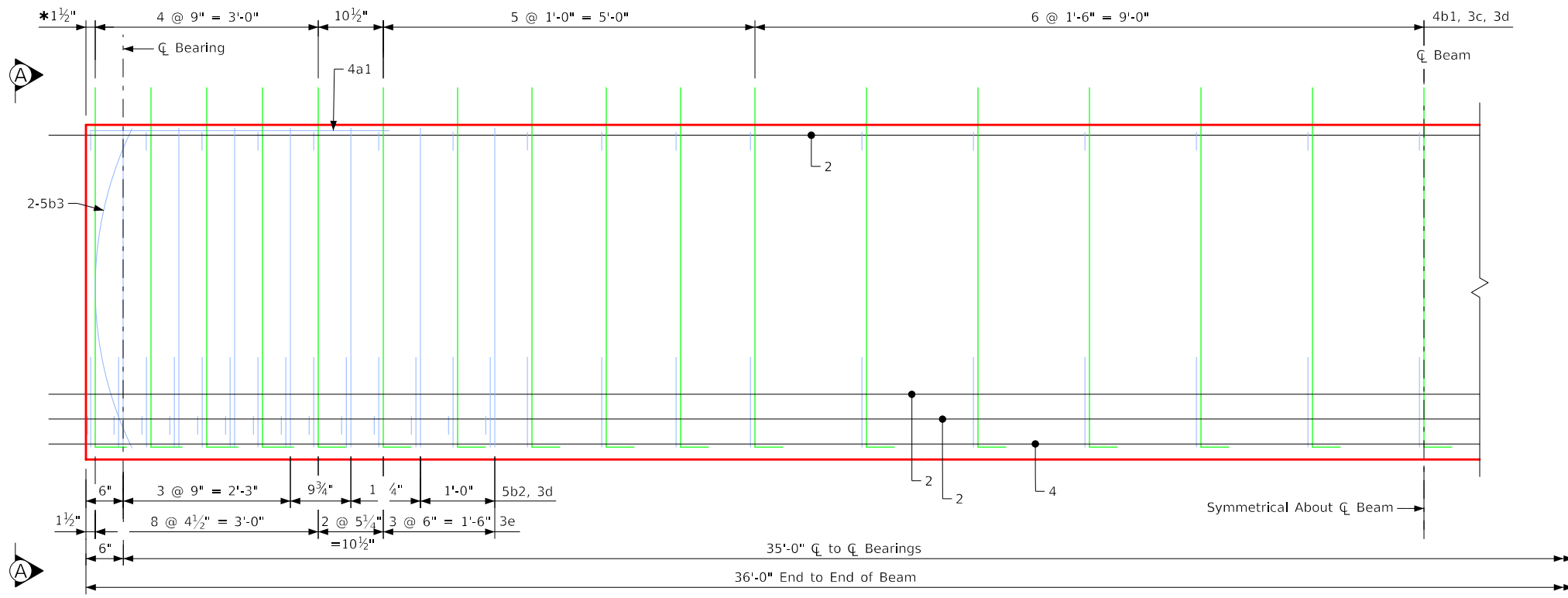
**Beam Notes:**

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.<sup>2</sup>) 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 a bars which run the full length of the beam in the top flange.

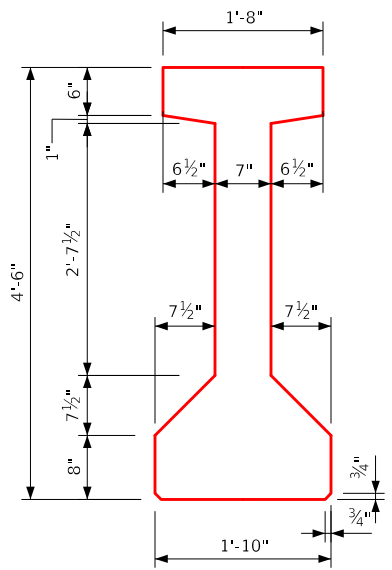


**D Beam - Data Details**

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



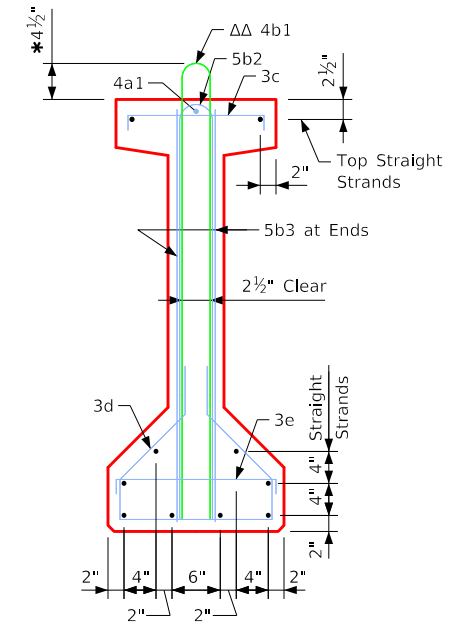
D35 Beam



"D" Beam Cross Section

Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



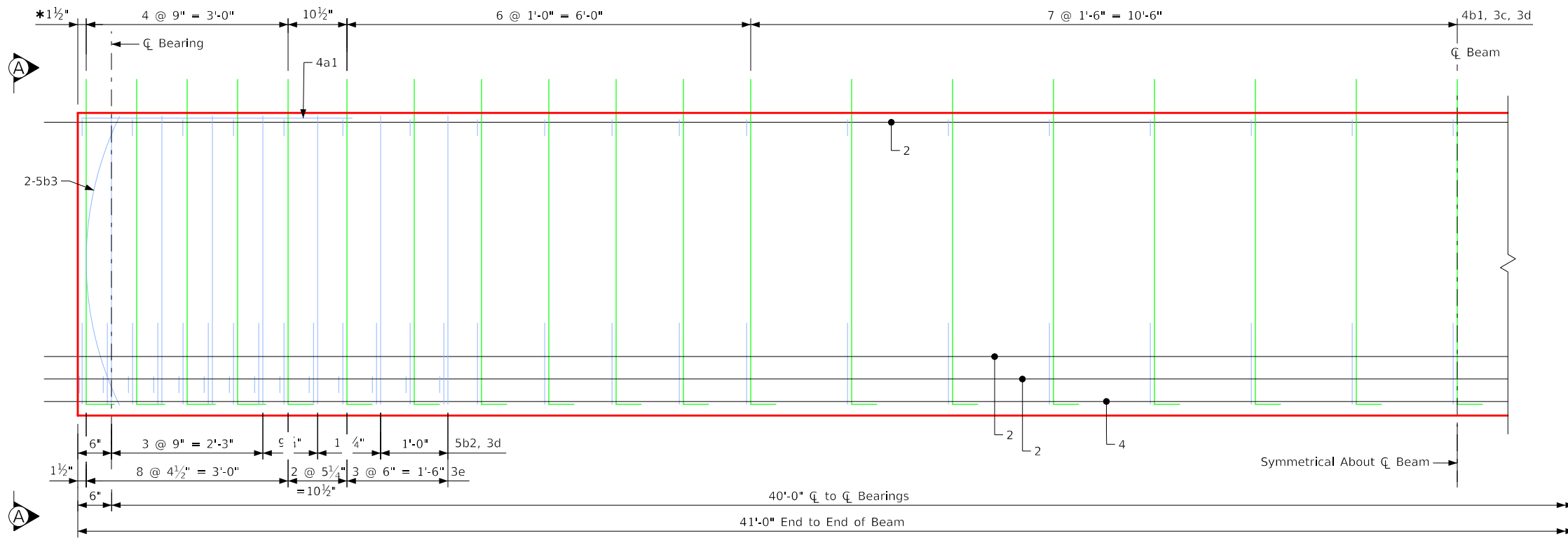
View A-A

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

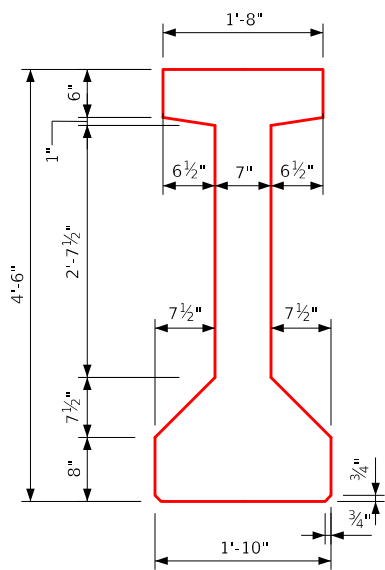
- \* Keep
- ΔΔ Epoxy Coated Bars

D35 Beam Details

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



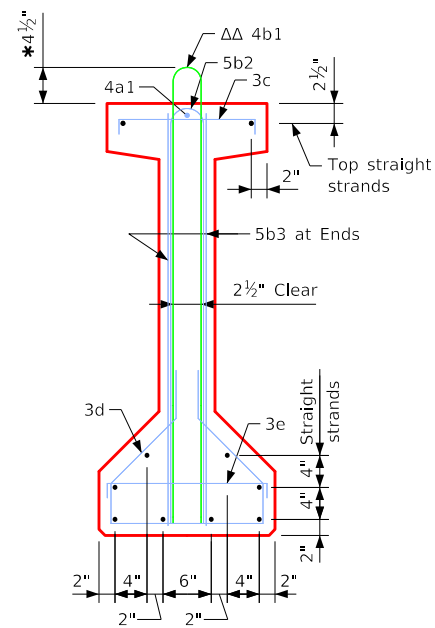
D40 Beam



"D" Beam Cross Section

Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



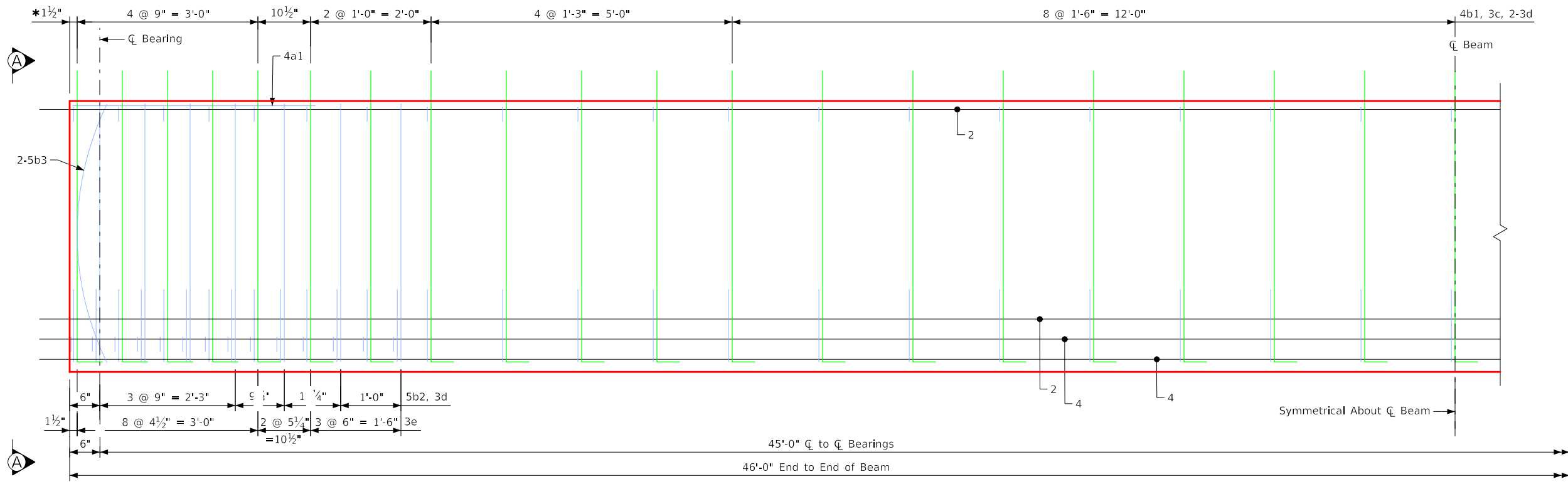
View A-A

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

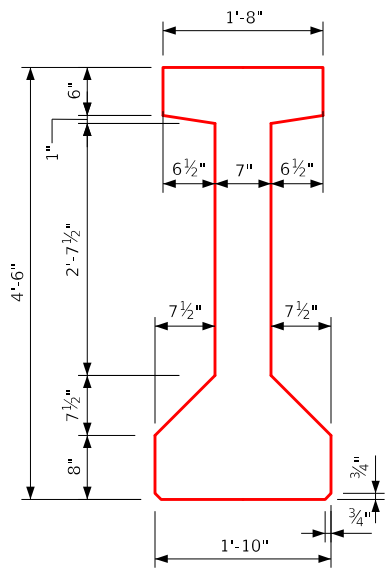
- \* Keep
- ΔΔ Epoxy Coated Bars

D40 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 40'-0" Span	Standard Sheet 4631-D40	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:00 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWM\Main\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				



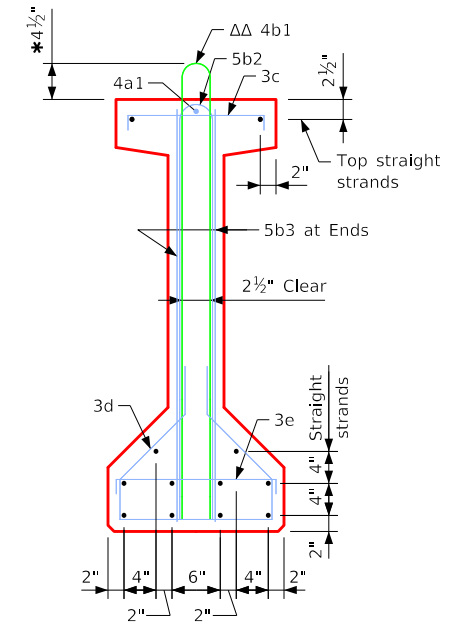
D45 Beam



"D" Beam Cross Section

Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



View A-A

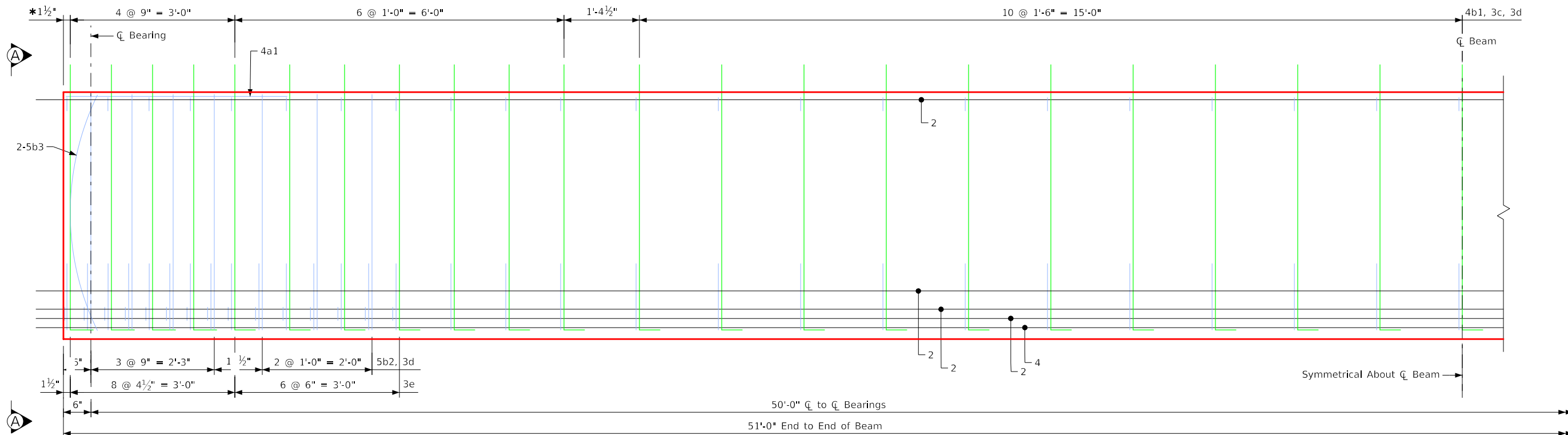
Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

- \* Keep
- ΔΔ Epoxy Coated Bars

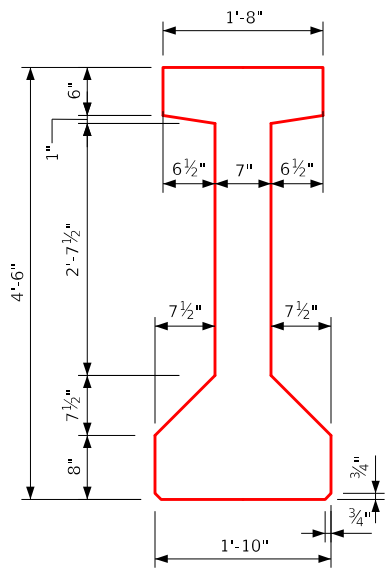
D45 Beam Details

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
3:49:00 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

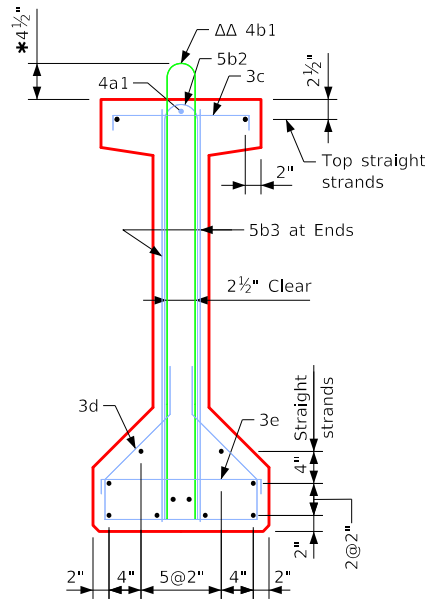


D50 Beam



Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



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

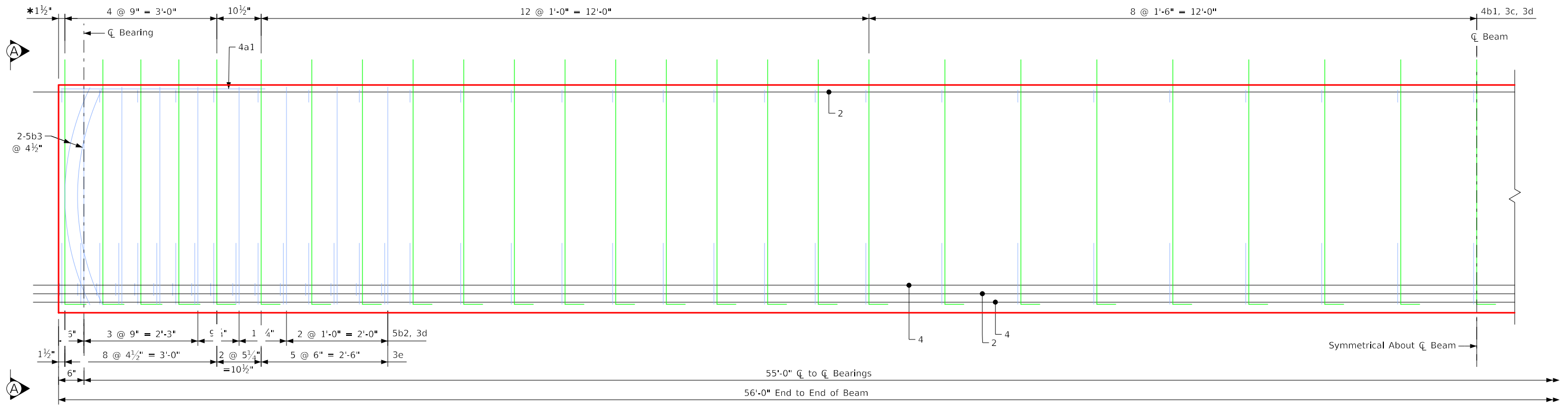
\* Keep  
 $\Delta\Delta$  Epoxy Coated Bars

View A-A

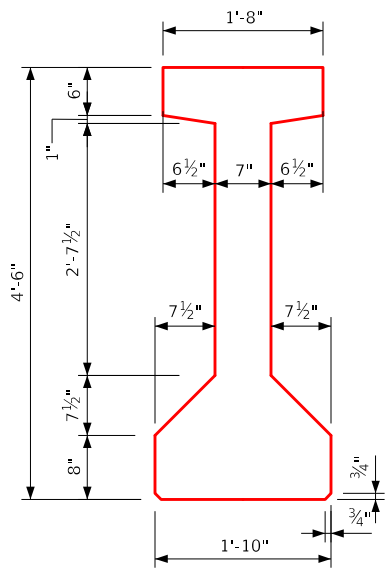
D50 Beam Details

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

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

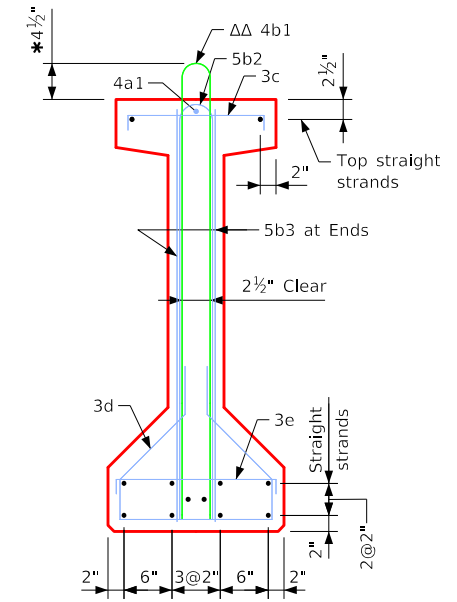


D55 Beam



Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



View A-A

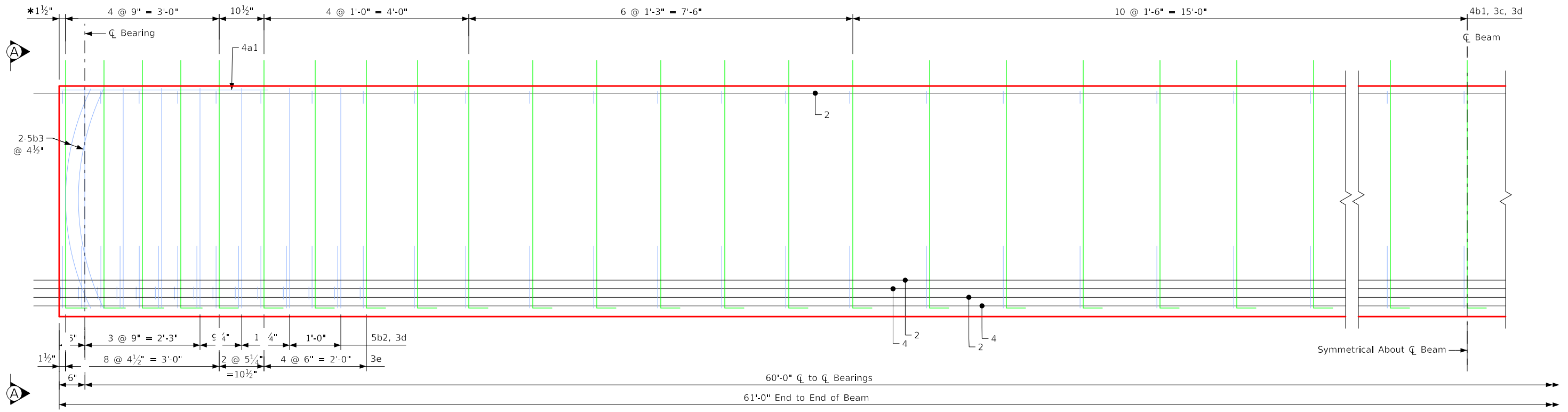
Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

\* Keep  
 $\Delta\Delta$  Epoxy Coated Bars

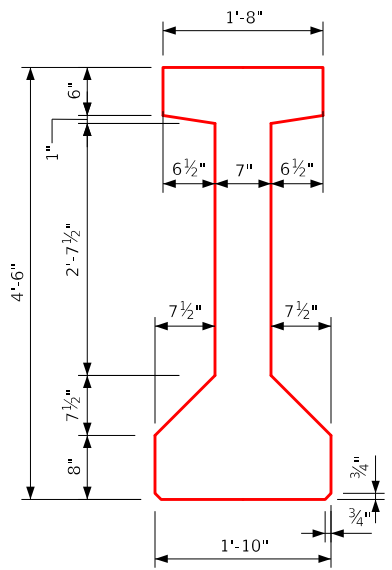
D55 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 55'-0" Span	Standard Sheet 4632-D55	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:02 PM	4/5/2026	bkloss	pw:\NTPwint1.dot.int.lan:PWMMain\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).

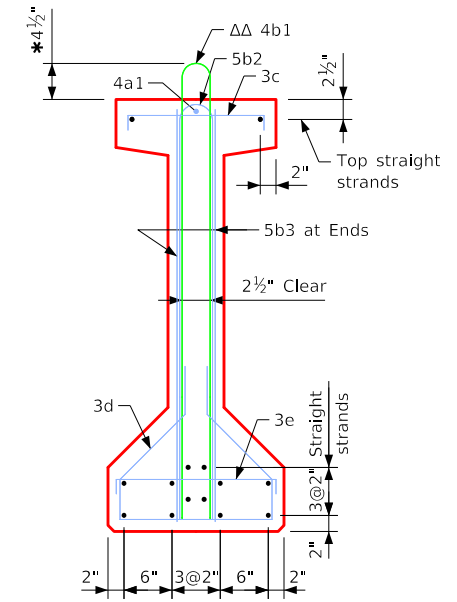


D60 Beam



Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



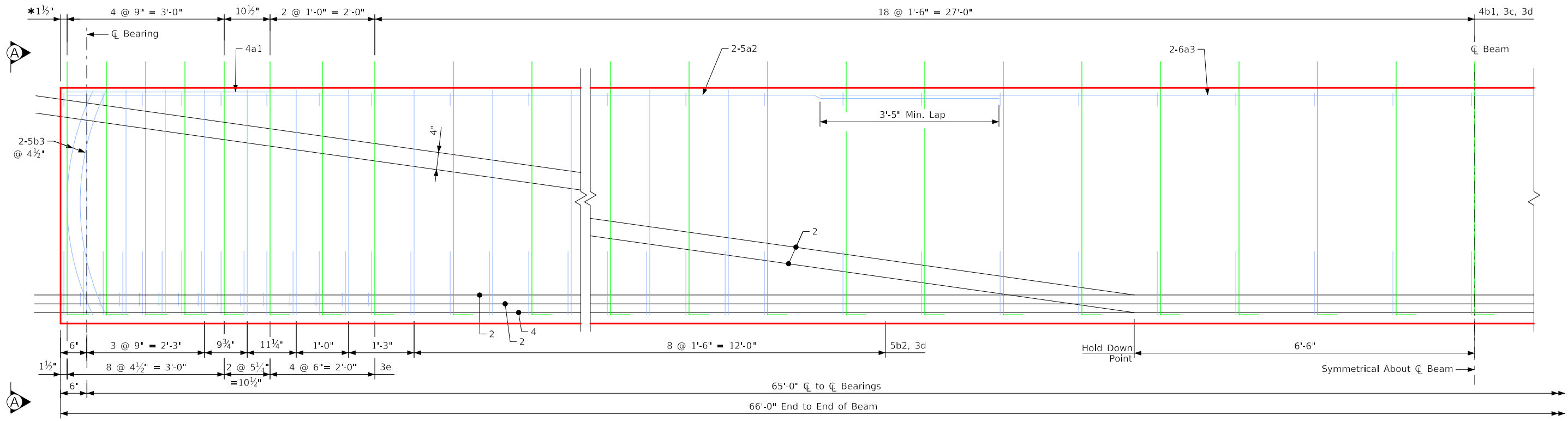
Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

\* Keep  
 ΔΔ Epoxy Coated Bars

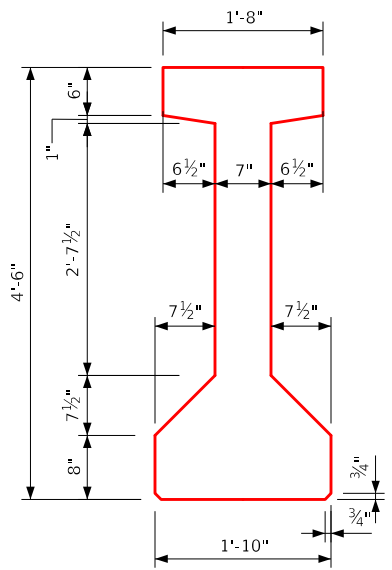
D60 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 60'-0" Span	Standard Sheet 4632-D60	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:03 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				

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

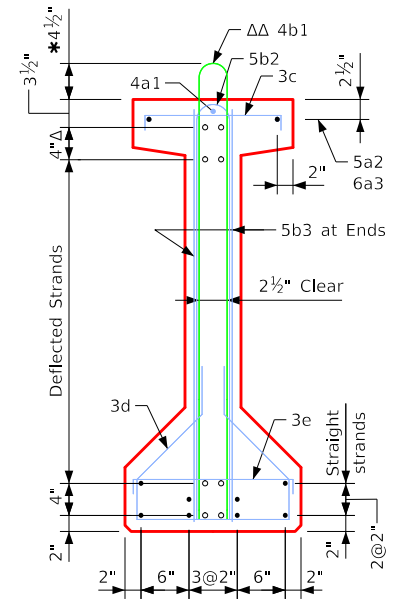


### D65 Beam



Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



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

- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

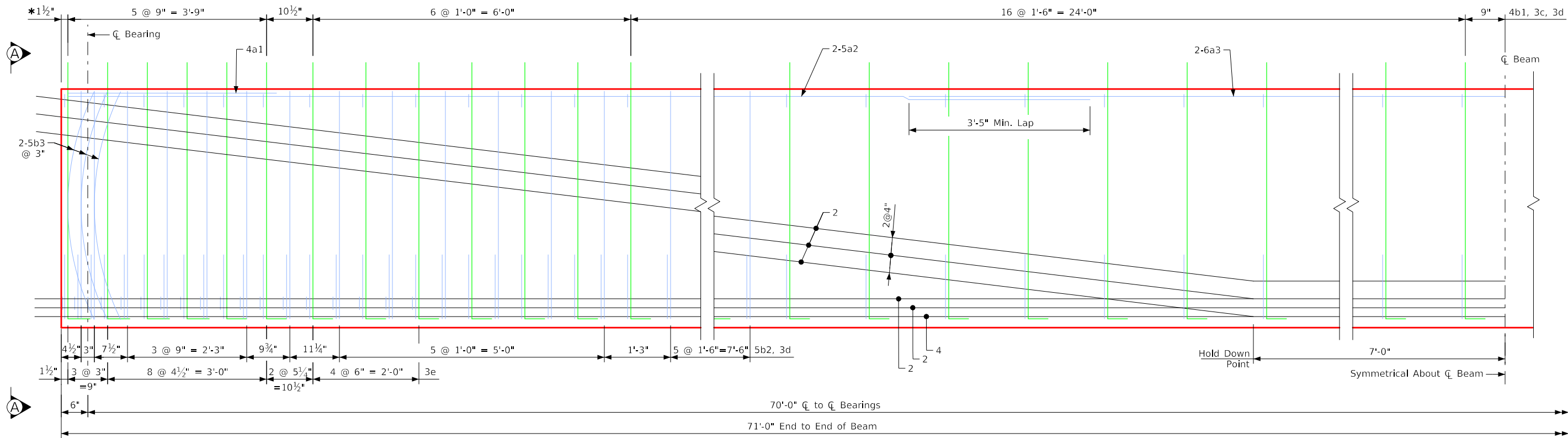
View A-A

D65 Beam Details

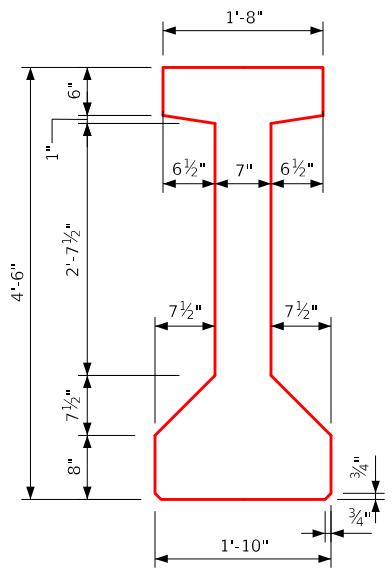
Note: Dimensions for the location of the deflected strands are at  $\bar{C}$  beam and end of beam.

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 65'-0" Span	Standard Sheet 4633-D65	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:04 PM	4/5/2026	bkloss	pw:\NTP\int1.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).

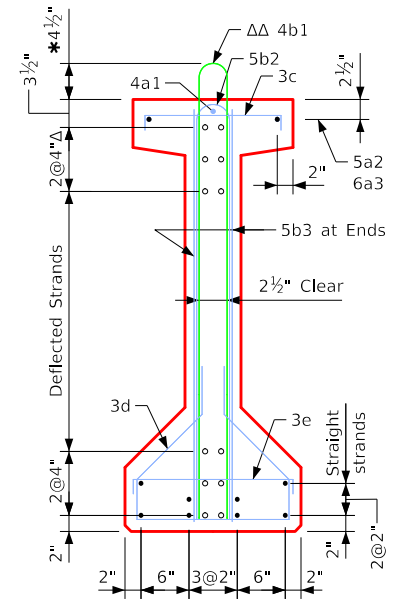


D70 Beam



Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



View A-A

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

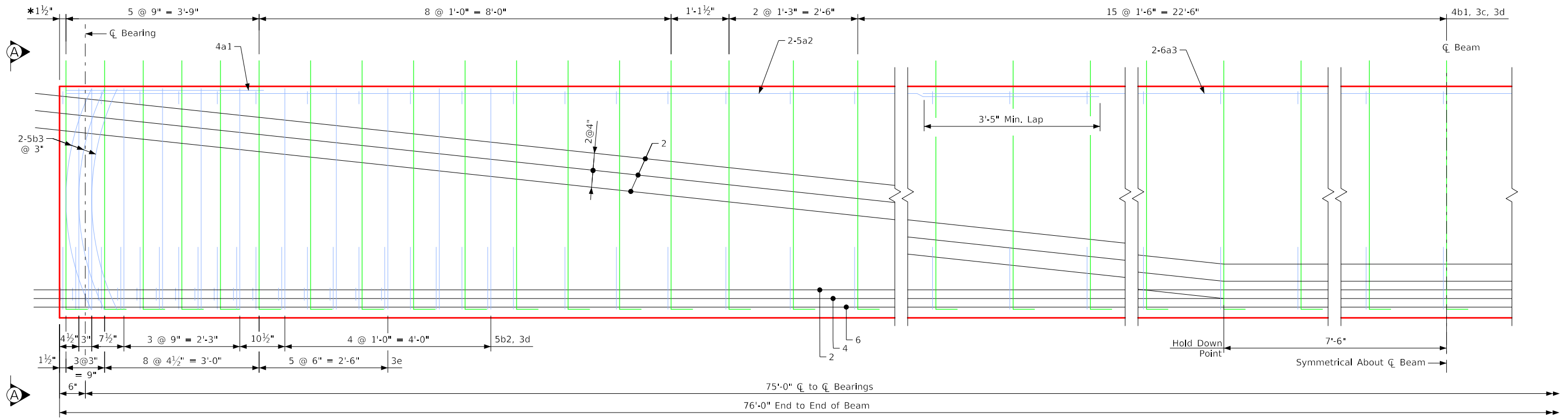
- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

D70 Beam Details

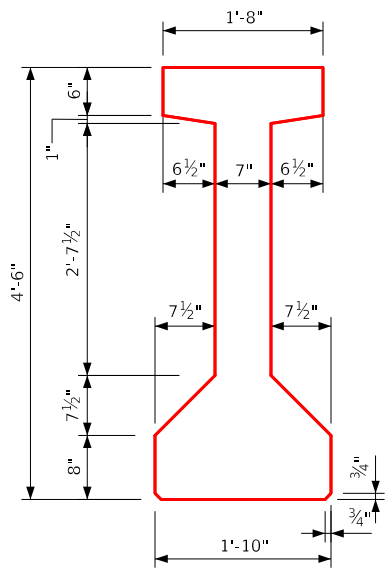
Note: Dimensions for the location of the deflected strands are at  $\bar{c}$  beam and end of beam.

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 70'-0" Span	Standard Sheet 4633-D70	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:04 PM	4/5/2026	bkloss	pw:\NTP\pint1.dot.int.lan:PWM\Main\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				

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

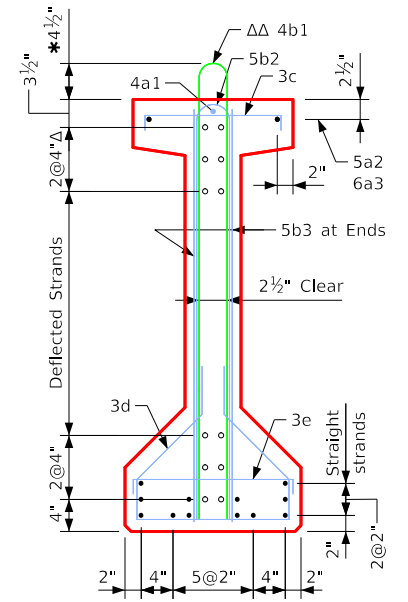


D75 Beam



Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



View A-A

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

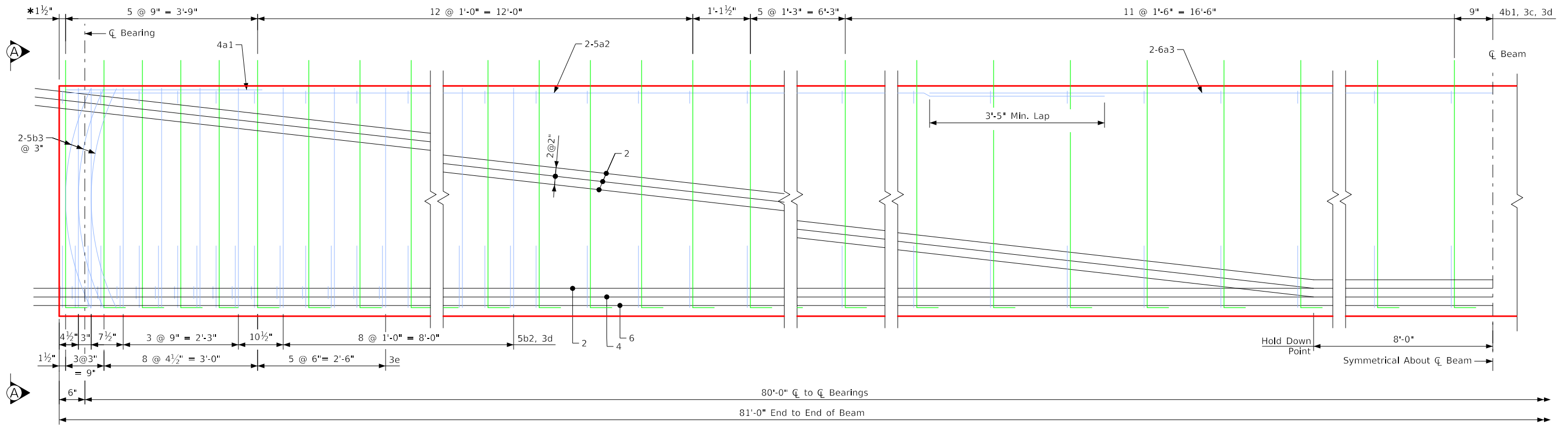
- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

Note: Dimensions for the location of the deflected strands are at  $\bar{c}$  beam and end of beam.

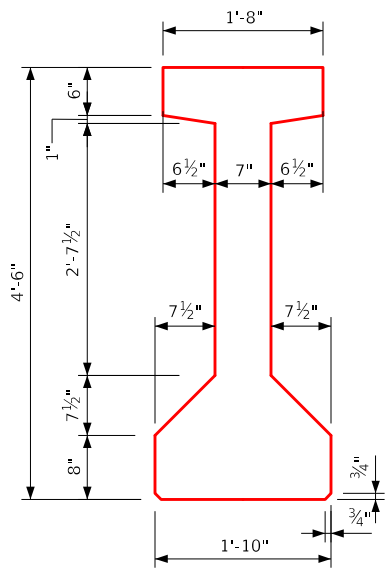
D75 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 75'-0" Span	Standard Sheet 4633-D75	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:05 PM	4/5/2026	bkloss	pw:\NTP\wint1.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).

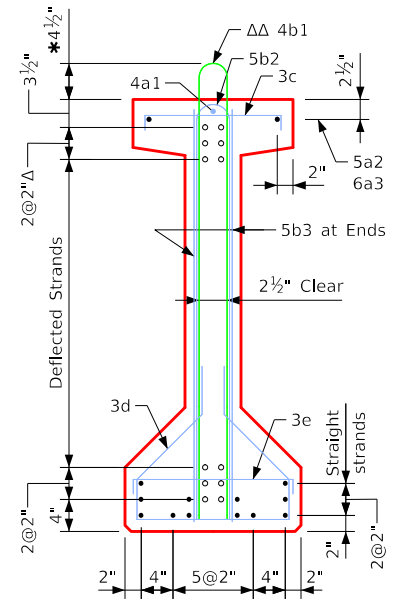


D80 Beam



Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



View A-A

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

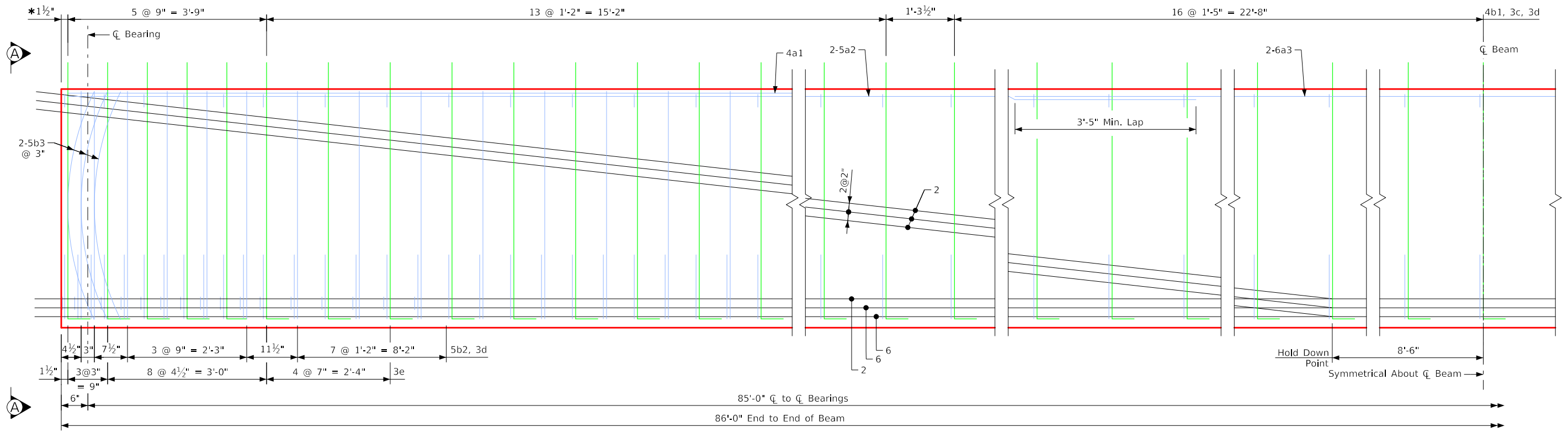
- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

Note: Dimensions for the location of the deflected strands are at  $\bar{c}$  beam and end of beam.

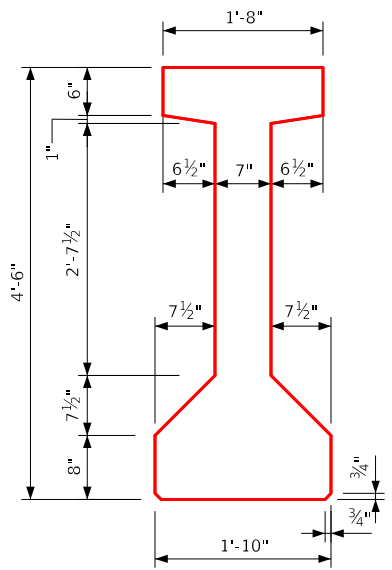
D80 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 80'-0" Span	Standard Sheet 4633-D80	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:07 PM	4/5/2026	bkloss	pw:\NTPwint1.dot.int.lan:PWMMain\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).



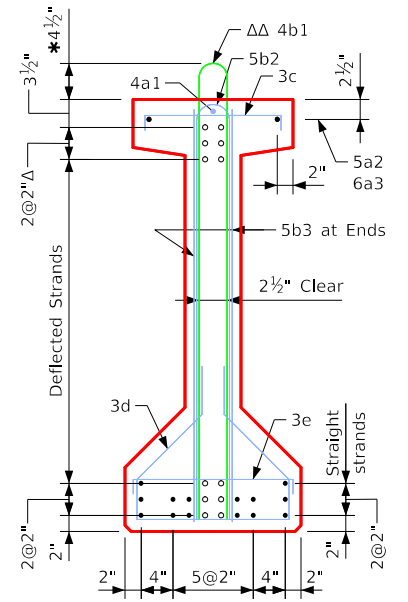
D85 Beam



"D" Beam Cross Section

Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



View A-A

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

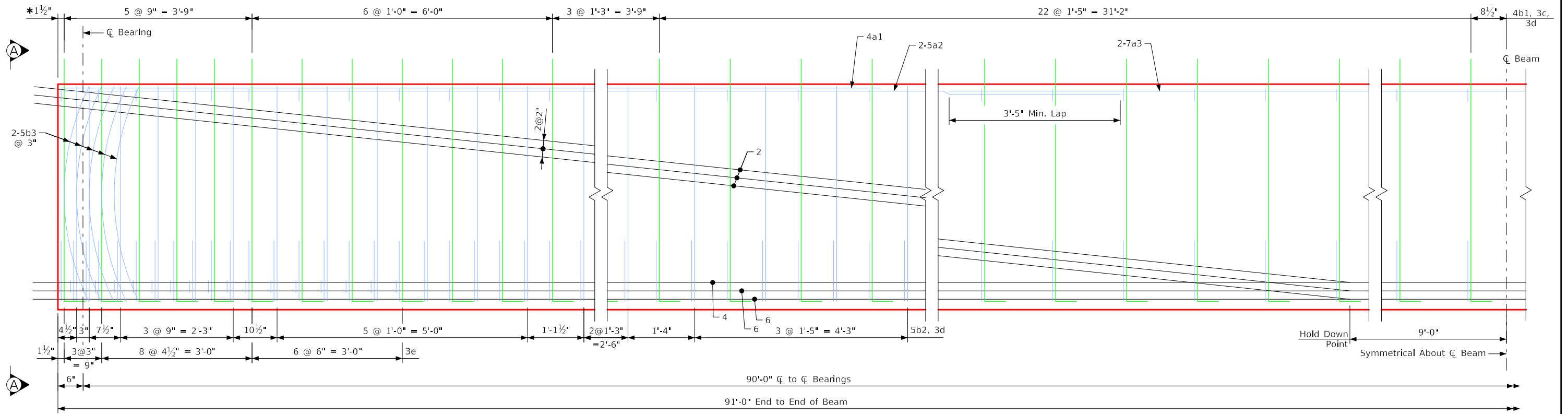
- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

Note: Dimensions for the location of the deflected strands are at  $\bar{c}$  beam and end of beam.

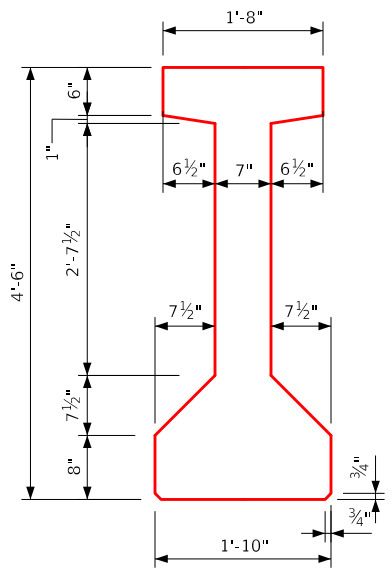
D85 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 85'-0" Span	Standard Sheet 4634-D85	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:08 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWM\Main\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).



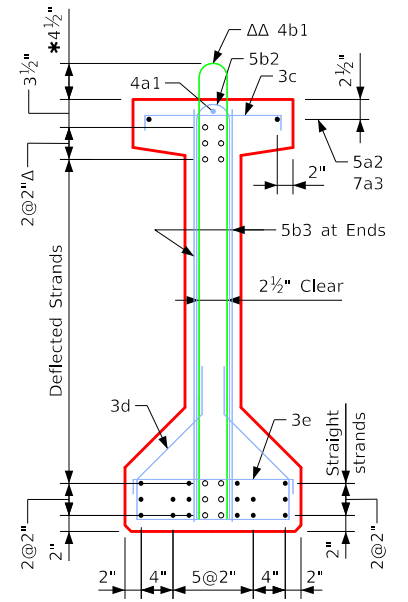
D90 Beam



Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**

"D" Beam Cross Section



View A-A

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

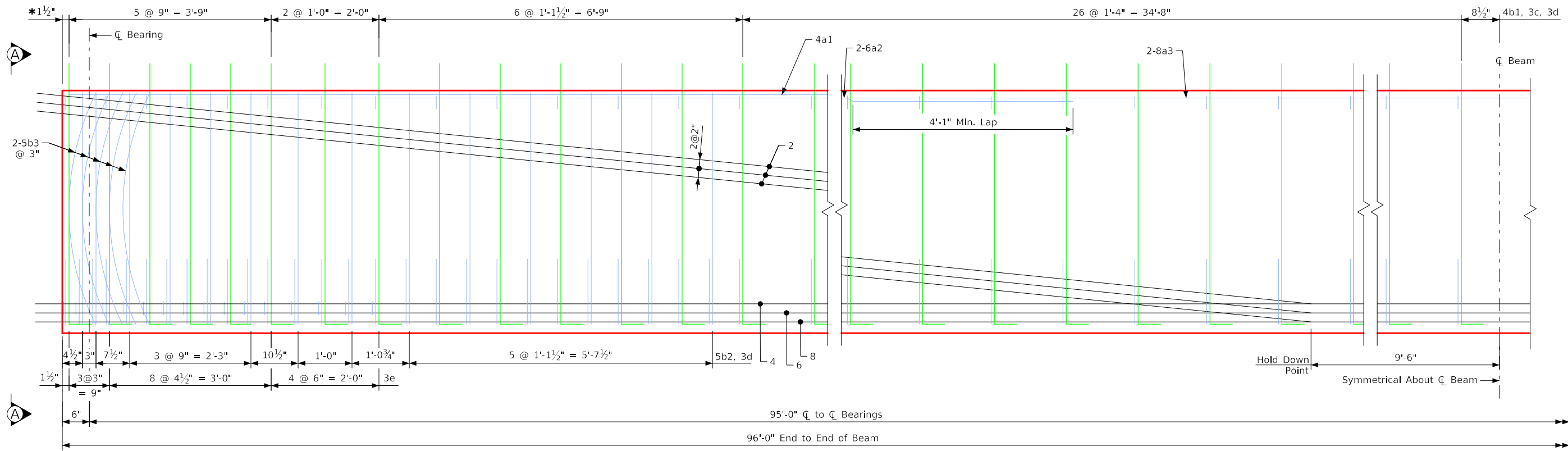
- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

Note: Dimensions for the location of the deflected strands are at  $\bar{c}$  beam and end of beam.

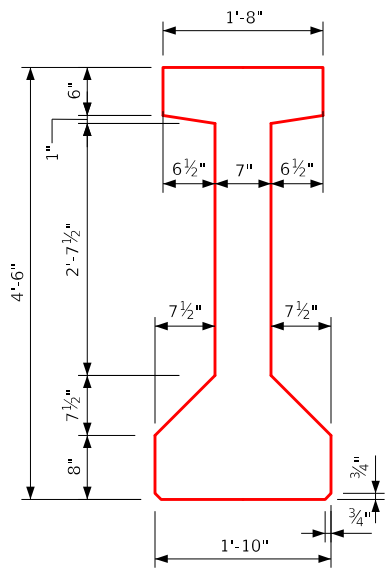
D90 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 90'-0" Span	Standard Sheet 4634-D90	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:09 PM	4/5/2026	bkloss	pw:\NTPwint1.dot.int.lan:PWMMain\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).



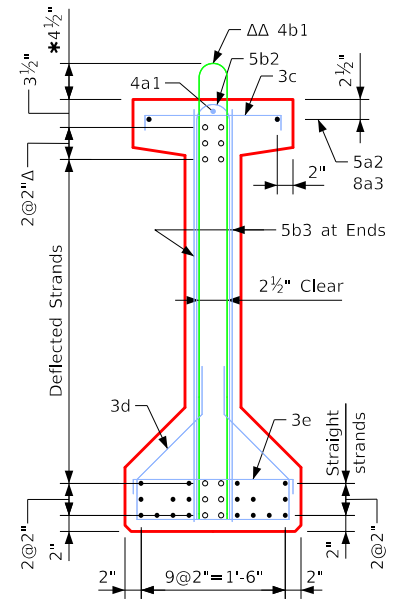
D95 Beam



"D" Beam Cross Section

Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



View A-A

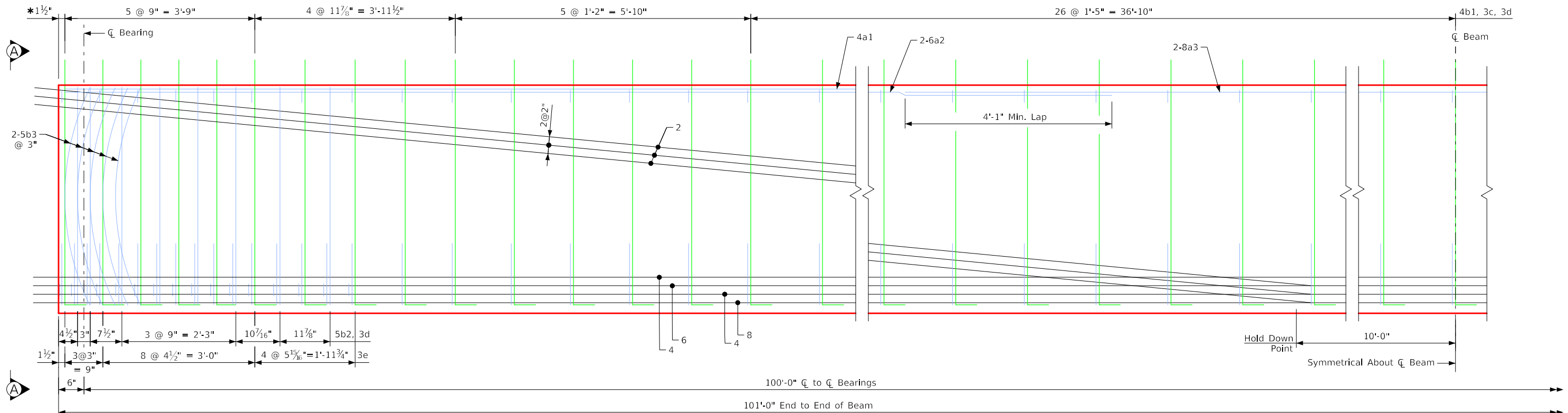
Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

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

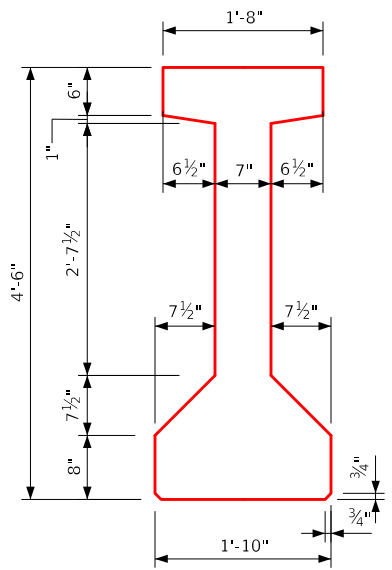
Note: Dimensions for the location of the deflected strands are at  $\bar{c}$  beam and end of beam.

D95 Beam Details

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

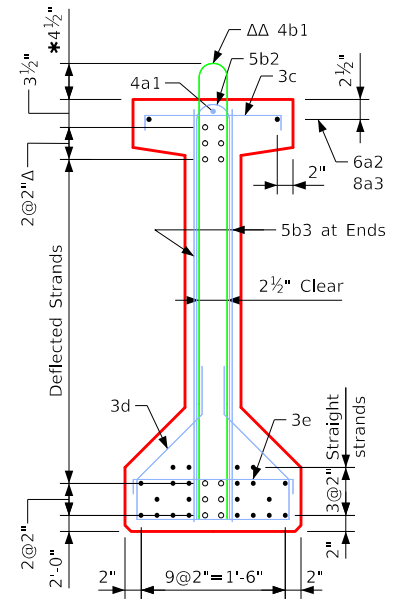


D100 Beam



Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



View A-A

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

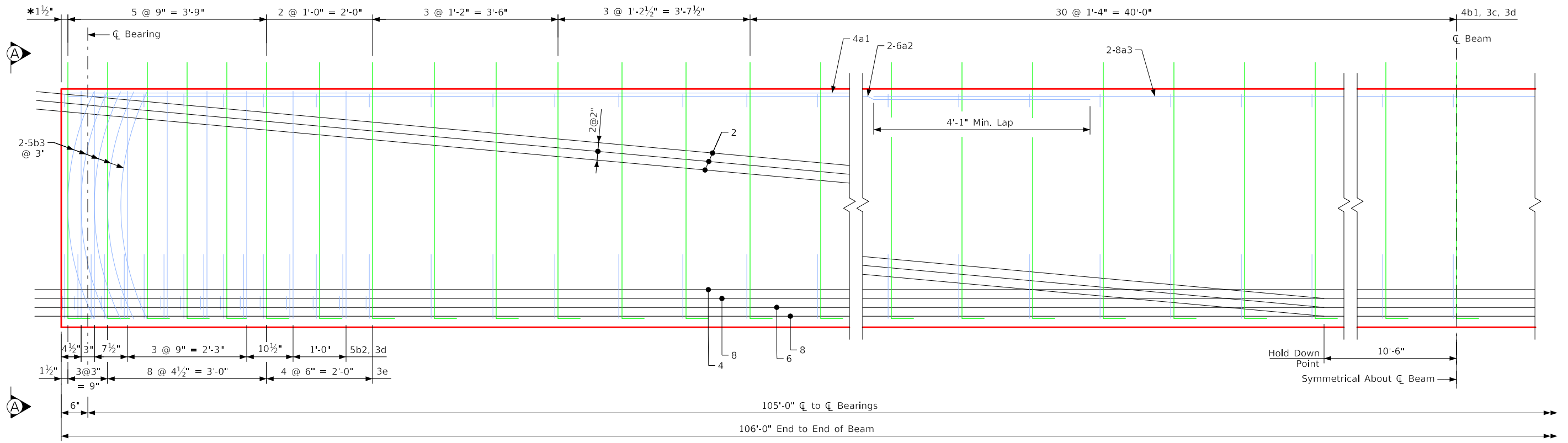
- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

Note: Dimensions for the location of the deflected strands are at  $\bar{C}$  beam and end of beam.

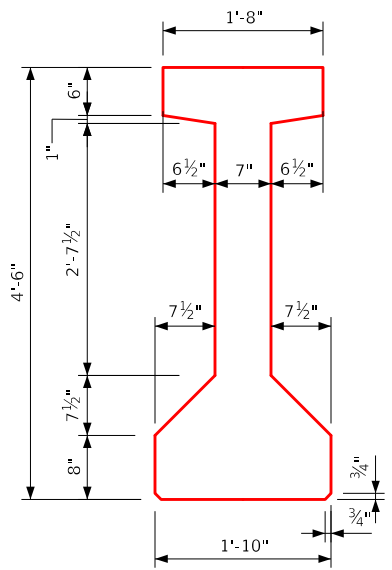
D100 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 100'-0" Span	Standard Sheet 4635-D100	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:10 PM	4/5/2026	bkloss	pw:\NTPwint1.dot.int.lan:PWMMain\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).



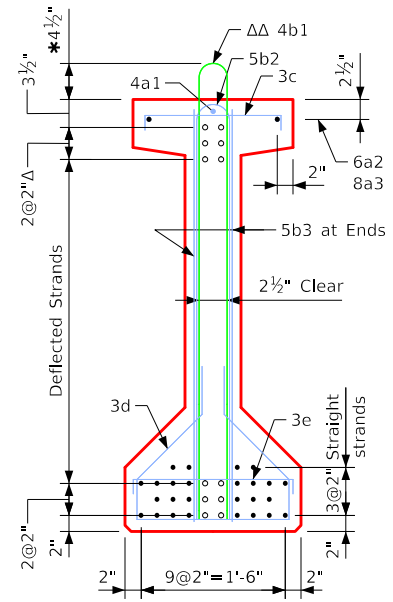
D105 Beam



"D" Beam Cross Section

Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



View A-A

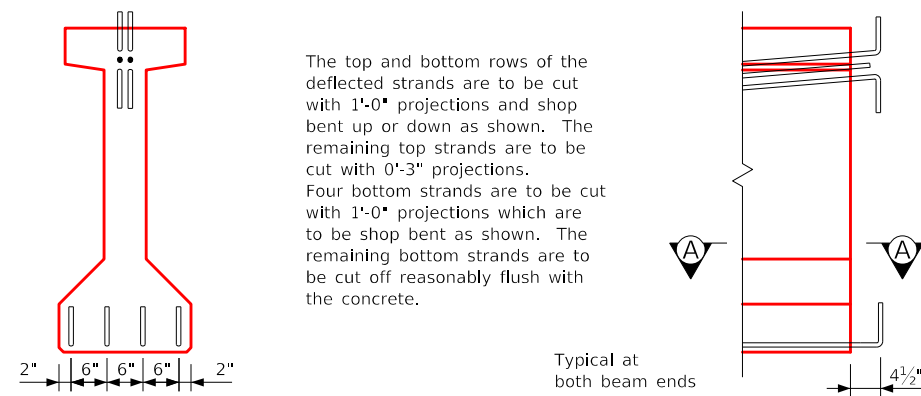
Note: Bars 5b3 are to be placed in pairs. Tie 5b3 bars to 4b1 & 5b2.

- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

Note: Dimensions for the location of the deflected strands are at  $\bar{C}$  beam and end of beam.

D105 Beam Details

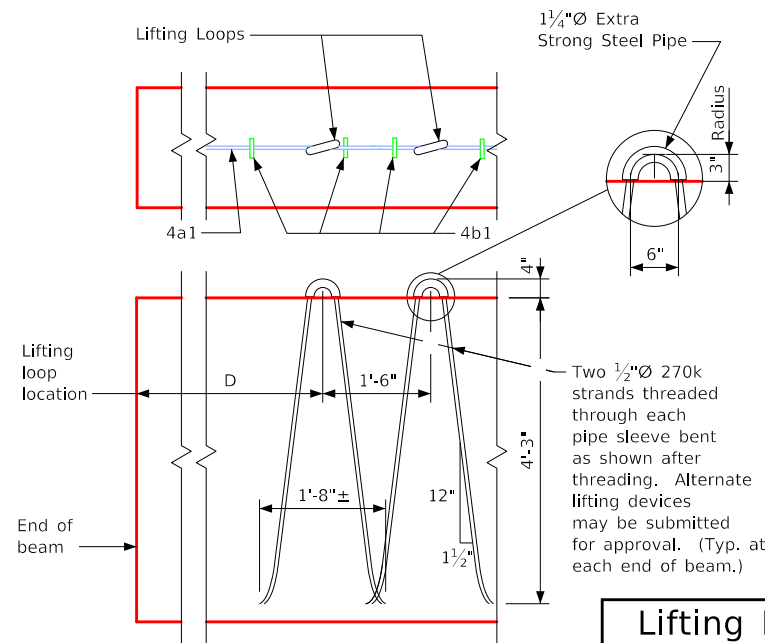
FILE NO.	ENGLISH	DESIGN TEAM	"D" Beam - 105'-0" Span	Standard Sheet 4635-D105	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:11 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



The top and bottom rows of the deflected strands are to be cut with 1'-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.

Typical at both beam ends

### Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms

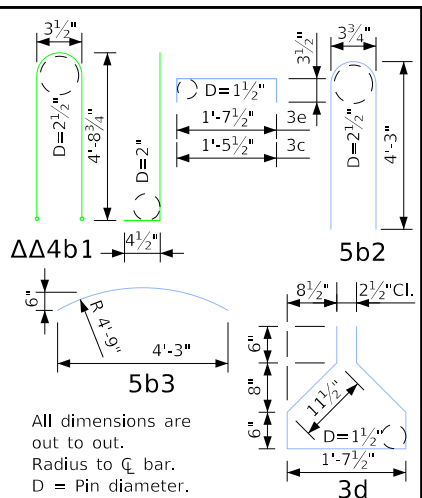


Beams	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
D110	2	2	6'-3"	10.00'

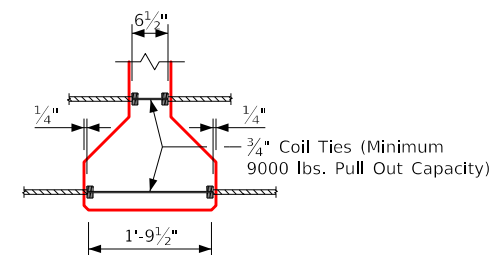
### Lifting Loop Detail Beam D110

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 D110			
Bar	Shape	No.	Length
4a1		2	26'-6"
6a2		4	39'-6"
8a3		2	40'-0"
4b1		91	10'-4"
5b2		16	8'-8"
5b3		20	4'-4"
3c		91	2'-1"
3d		107	5'-7"
3e		32	2'-3"

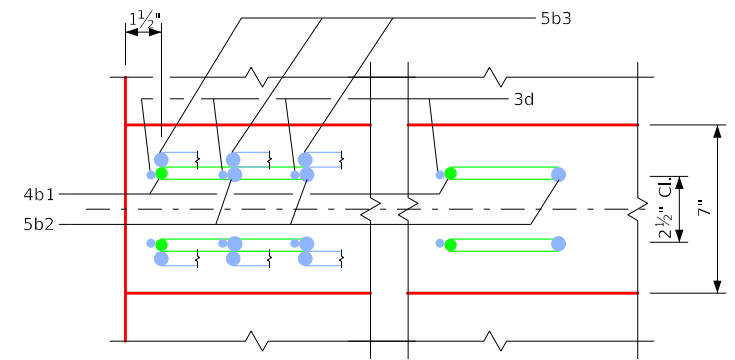


All dimensions are out to out. Radius to  $\bar{C}$  bar. D = Pin diameter.



### Coil Tie Detail

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



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

### D110 Beam Data

D Beam	Span Length $\bar{C}$ - $\bar{C}$ Bearing	Overall Beam Length (L)	Concrete Strength		Strand Size Dia. (in.)	No. of Strands		Total Initial Prestress (kips) <sup>③</sup>	Hold Down Force (kips)	Camber (in.) <sup>④</sup>		Deflection (in.) $\Delta_D$		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 <sup>①</sup> (elastic) $\Delta_I$	Time <sup>②</sup> (plastic) $\Delta_T$				
			Steel Diaphragm	Steel Diaphragm		Steel Diaphragm											
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

### Beam Notes:

- 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  $\bar{C}$  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  $\bar{C}$  of span,  $\Delta_D$ , 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  $A_s = 0.217$  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:

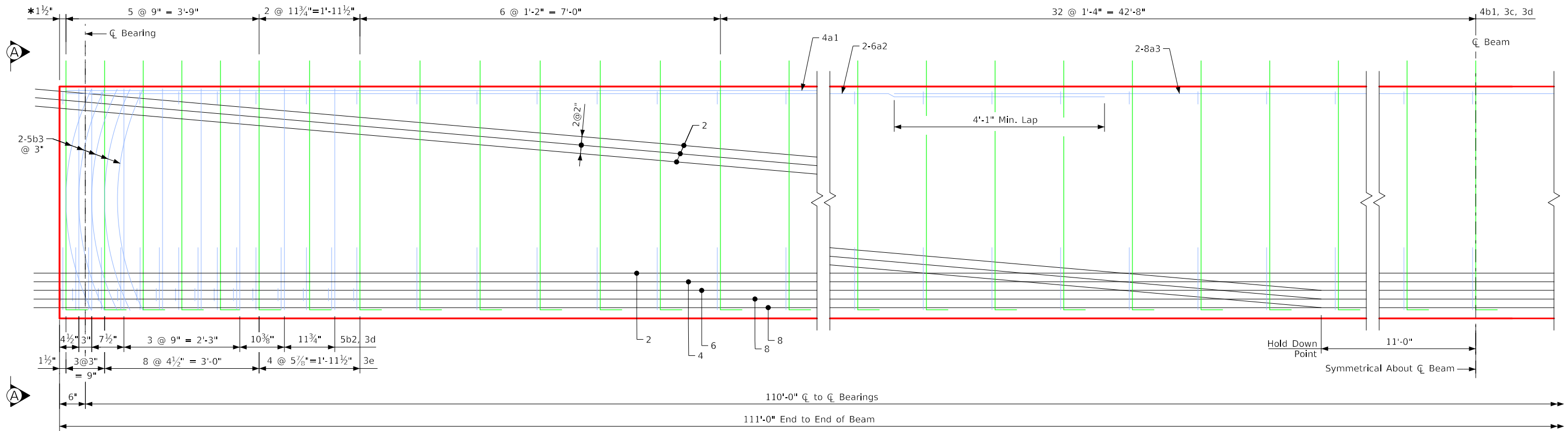
Design stresses for the following materials are to be in accordance with AASHTO LRFD Bridge Design Specifications Series of 2017.  
 Reinforcing steel in accordance with Section 5, Grade 60.  
 Concrete in accordance with Section 5.  
 Prestressing steel in accordance with Section 5, Grade 270.

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.<sup>2</sup>) 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 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).

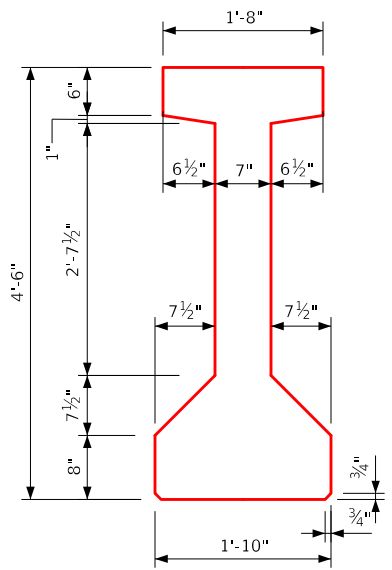
### D110 Beam - Data Details

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

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



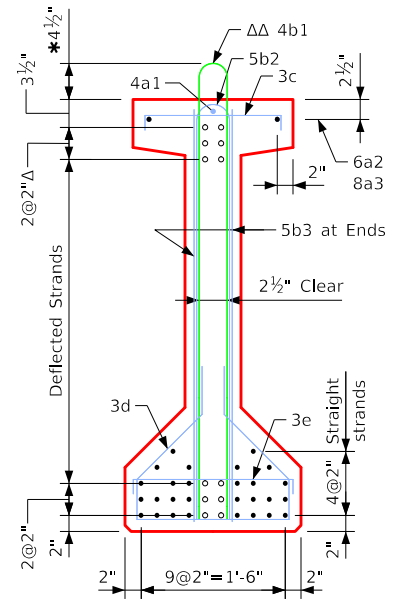
D110 Beam



"D" Beam Cross Section

Area = 638.75 in.<sup>2</sup>  
 $\bar{y}_b = 24.37$  in.  
 $I = 214,974$  in.<sup>4</sup>

**Beam Section Properties**



View A-A

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

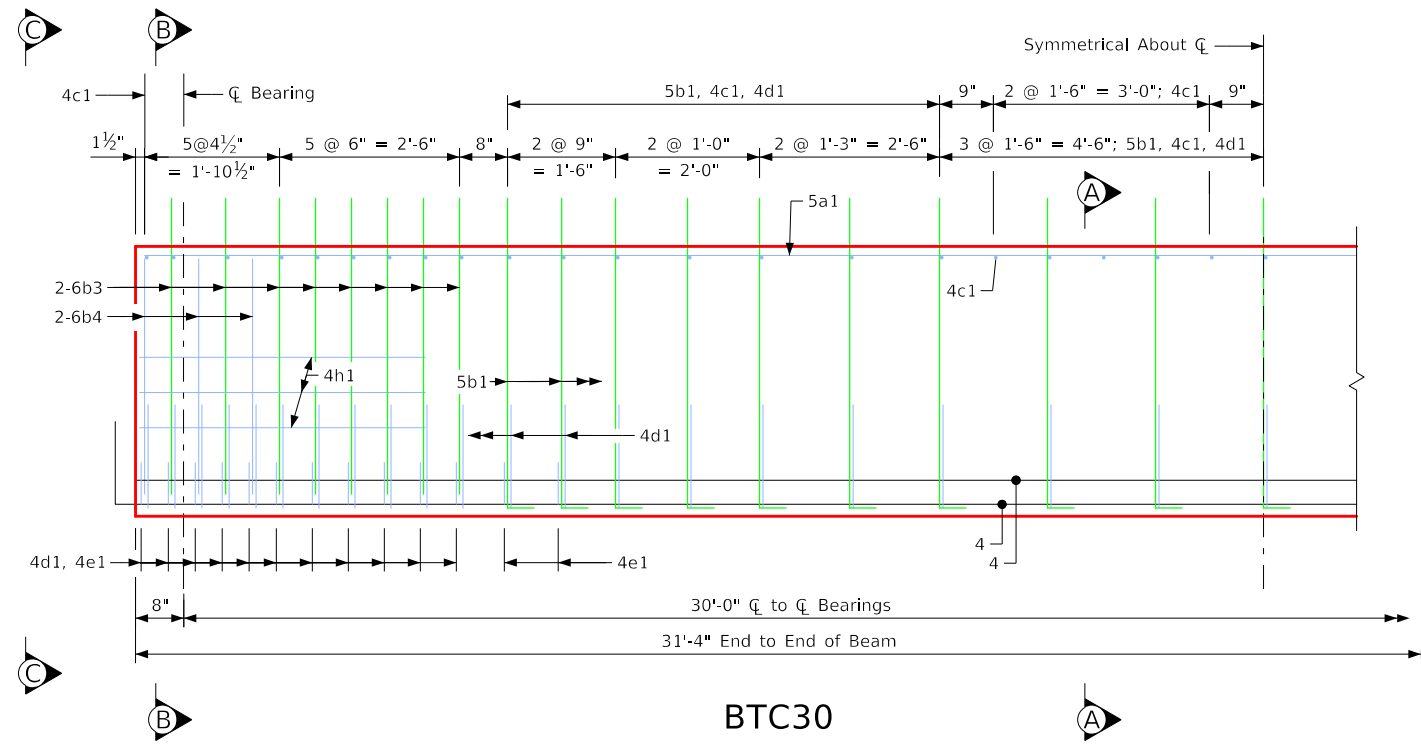
- Deflected Strands
- \* Keep
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

Note: Dimensions for the location of the deflected strands are at  $\bar{c}$  beam and end of beam.

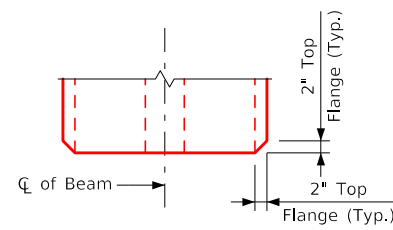
D110 Beam Details



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.

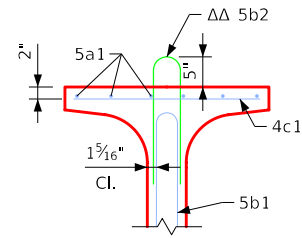


**BTC30**



**Top View**

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

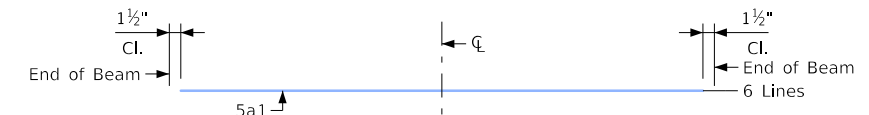


**Section A-A (Alternate)**

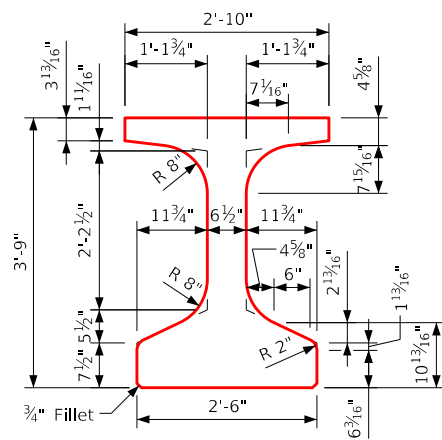
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

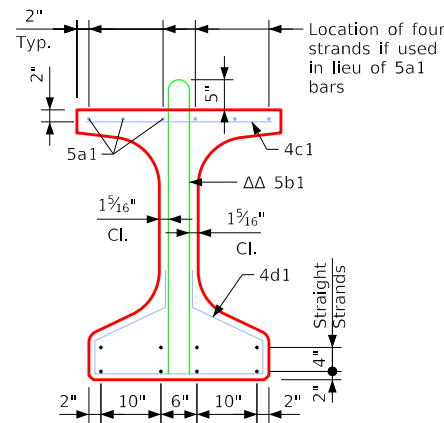
**Beam Section Properties**



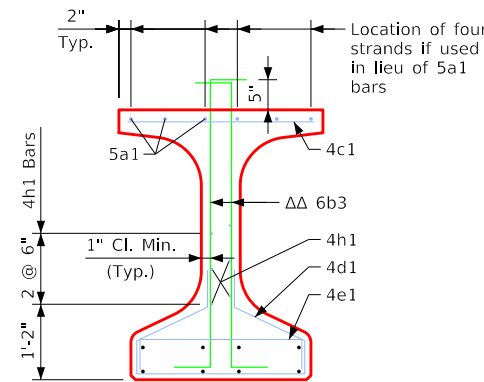
**Top Flange Longitudinal Bar Layout**



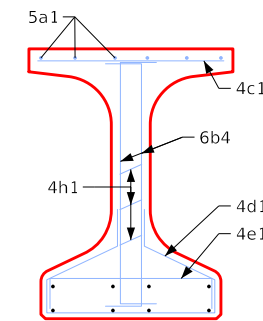
**BTC Beam Cross Section**



**Section A-A**



**Section B-B**



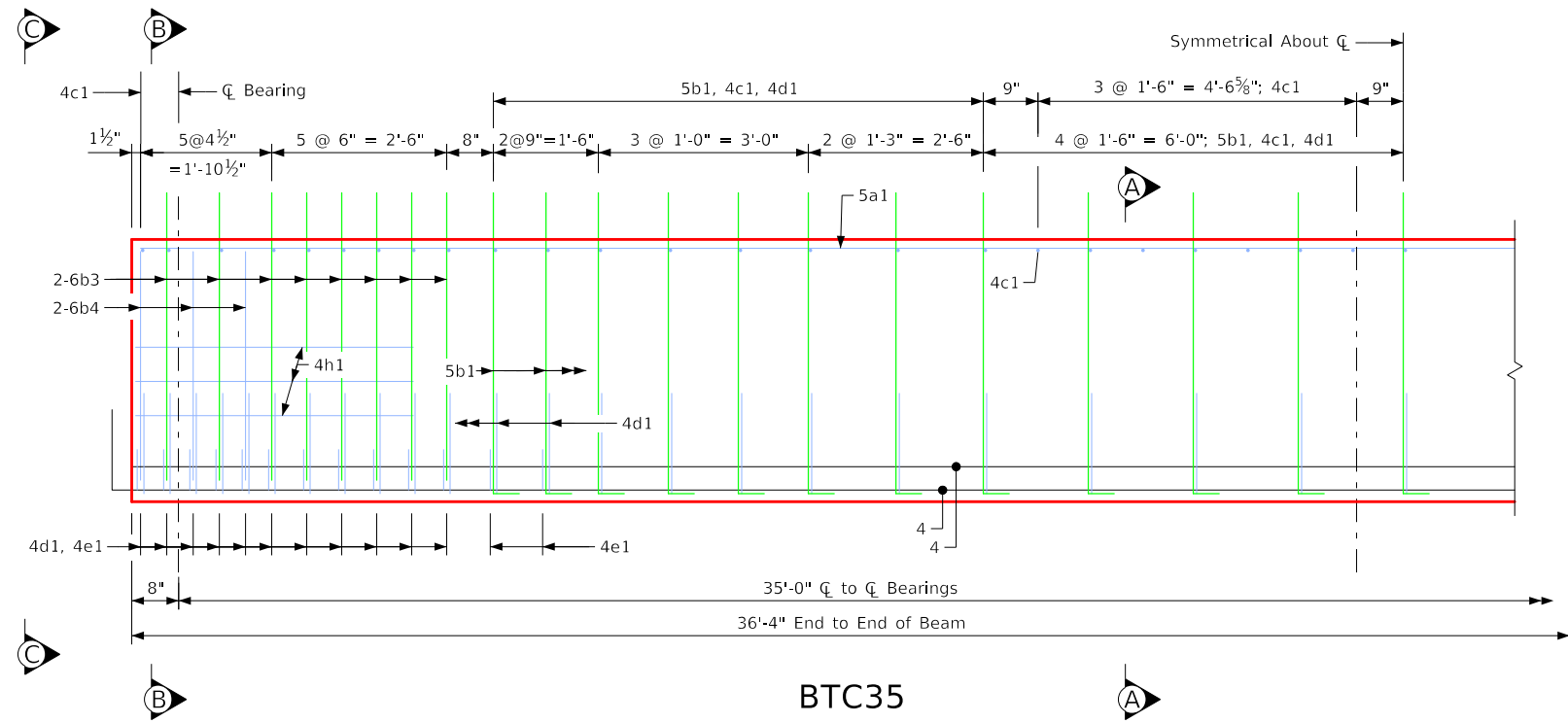
**View C-C**

ΔΔ Epoxy Coated Bars

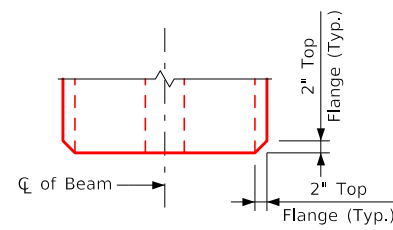
**BTC30 Beam Details**

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 30'-0" Span	Standard Sheet 4701	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:15 PM	4/5/2026	bkloss	pw:\NTP\wint1.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 - 4702 - This Sheet Re-Issued 04-2024. Sheet Format Update.

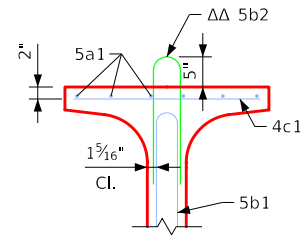


**BTC35**



**Top View**

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

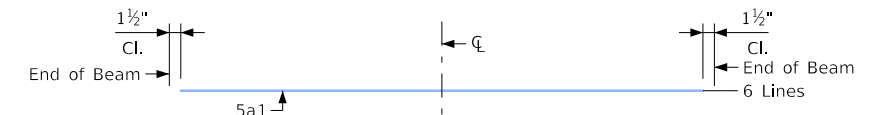


**Section A-A (Alternate)**

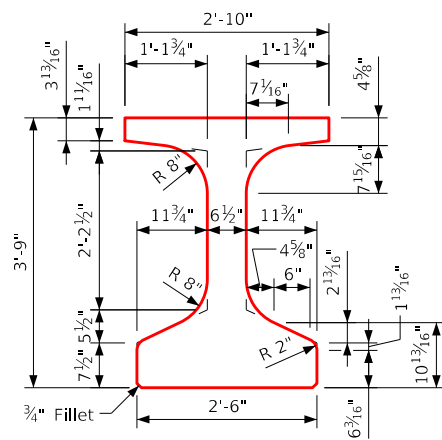
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

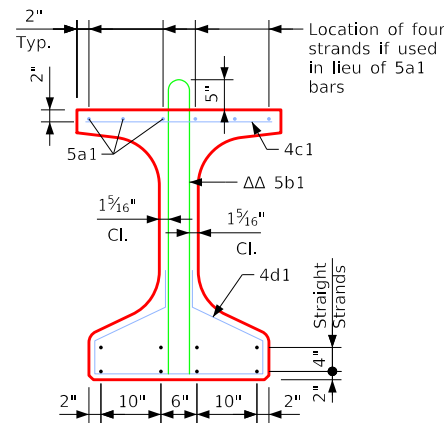
**Beam Section Properties**



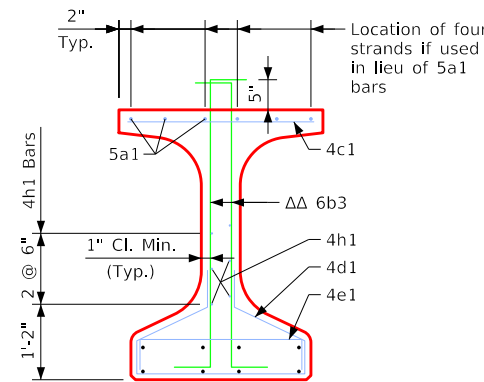
**Top Flange Longitudinal Bar Layout**



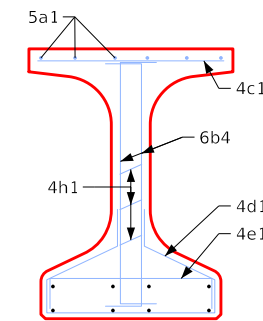
**BTC Beam Cross Section**



**Section A-A**



**Section B-B**

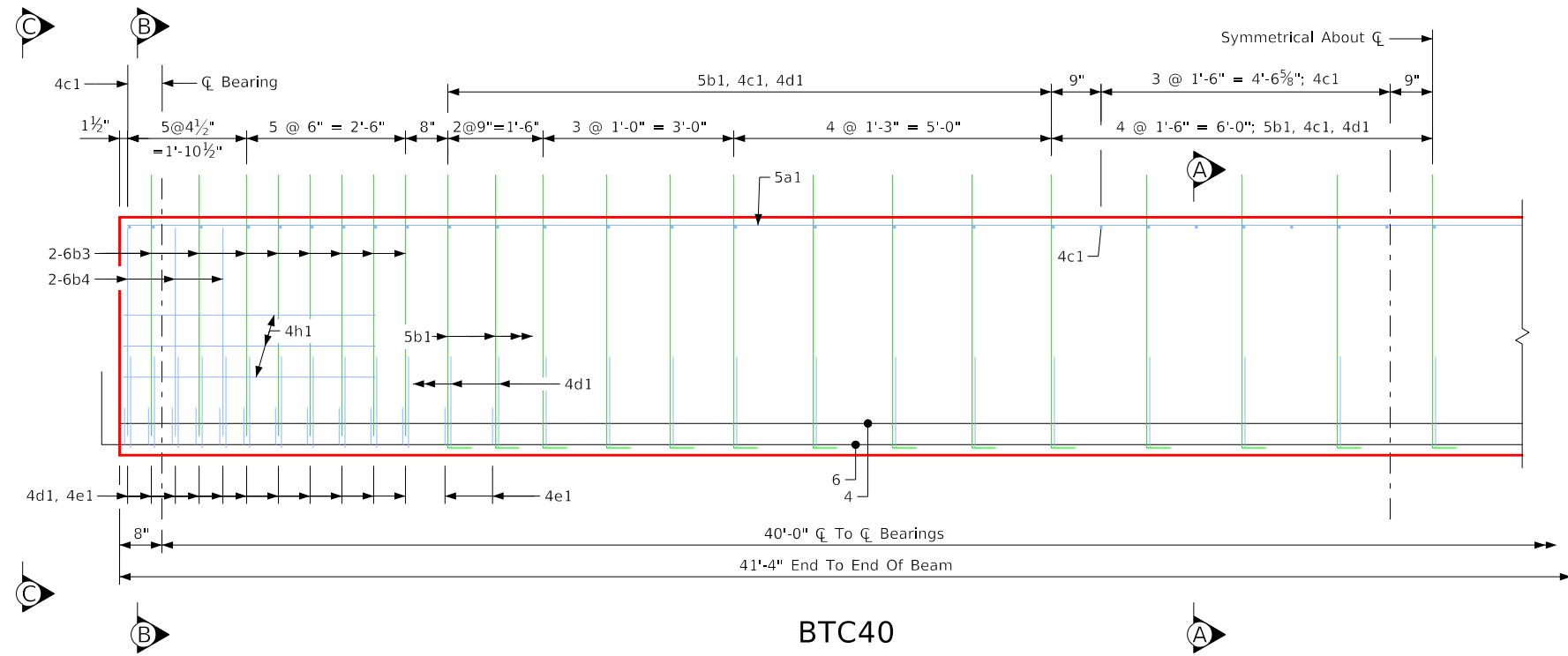


**View C-C**

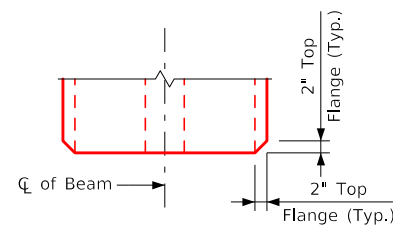
Δ Epoxy Coated Bars

**BTC35 Beam Details**

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 35'-0" Span	Standard Sheet 4702	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:16 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

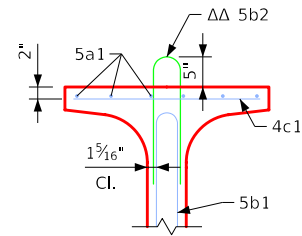


BTC40



Top View

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

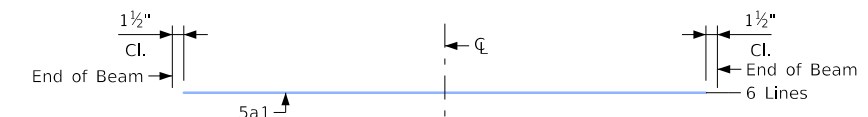


Section A-A (Alternate)

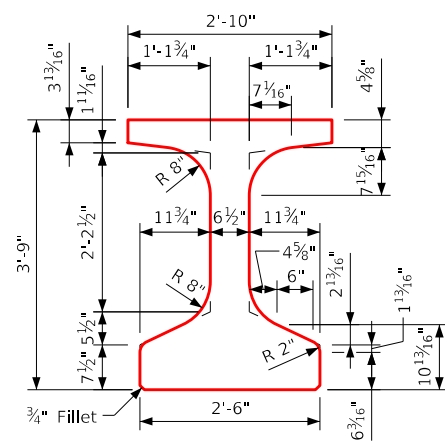
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

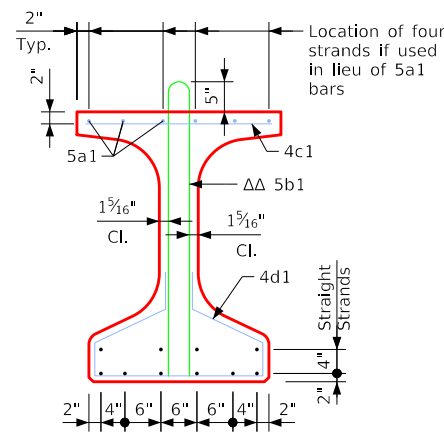
Beam Section Properties



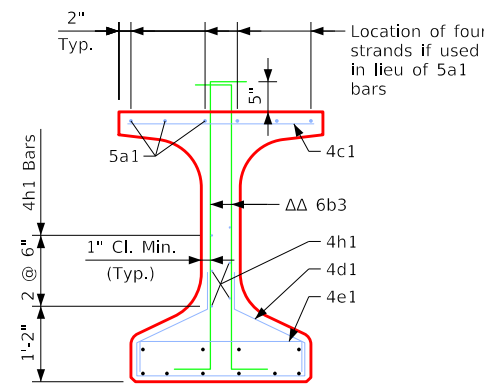
Top Flange Longitudinal Bar Layout



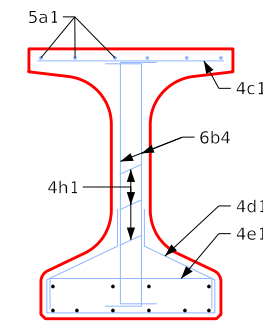
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

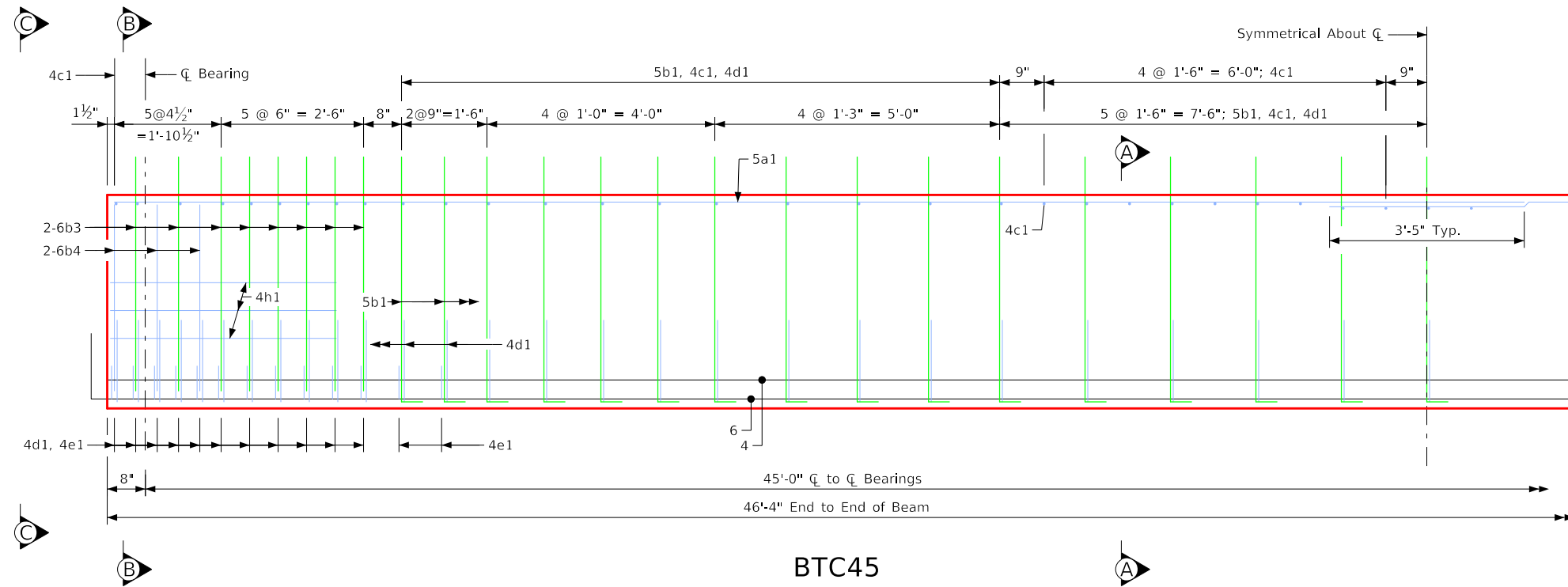
Δ Epoxy Coated Bars

BTC40 Beam Details

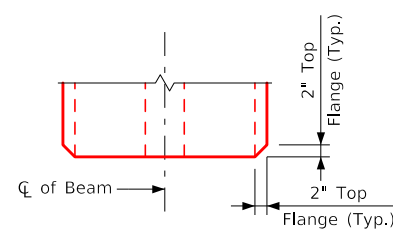
Revision 08-09: Added Strands to Sections A-A, B-B, & C-C. Issued 05-04. Beams.dgn - 4703 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 40'-0" Span	Standard Sheet 4703	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:17 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

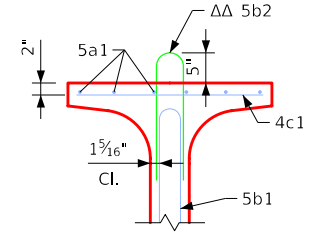
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added. Issued 05-04. Beams.dgn - 4704 - This Sheet Re-Issued 04-2024. Sheet Format Update.



**BTC45**



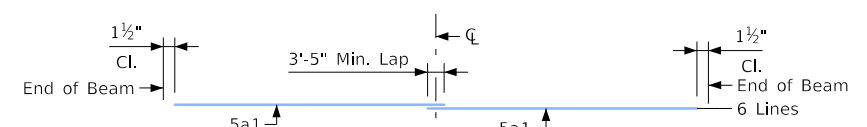
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



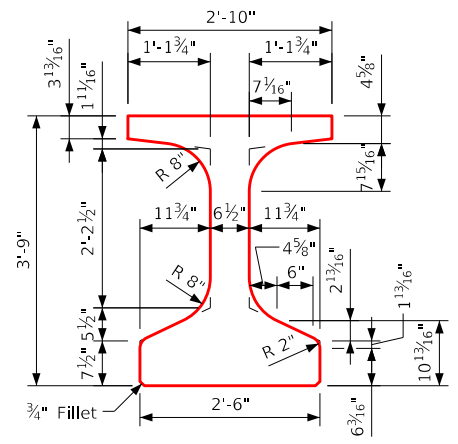
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

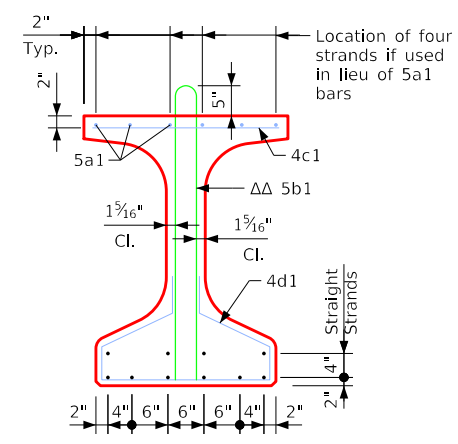
**Beam Section Properties**



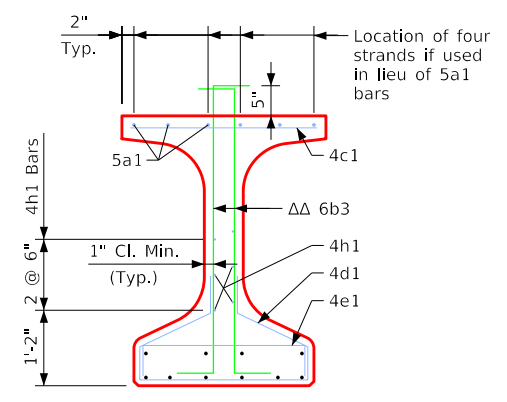
**Top Flange Longitudinal Bar Layout**



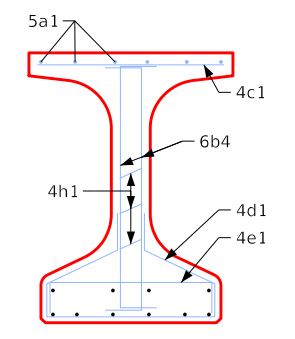
**BTC Beam Cross Section**



**Section A-A**

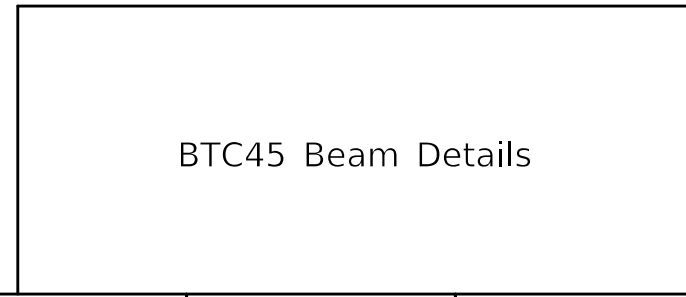


**Section B-B**



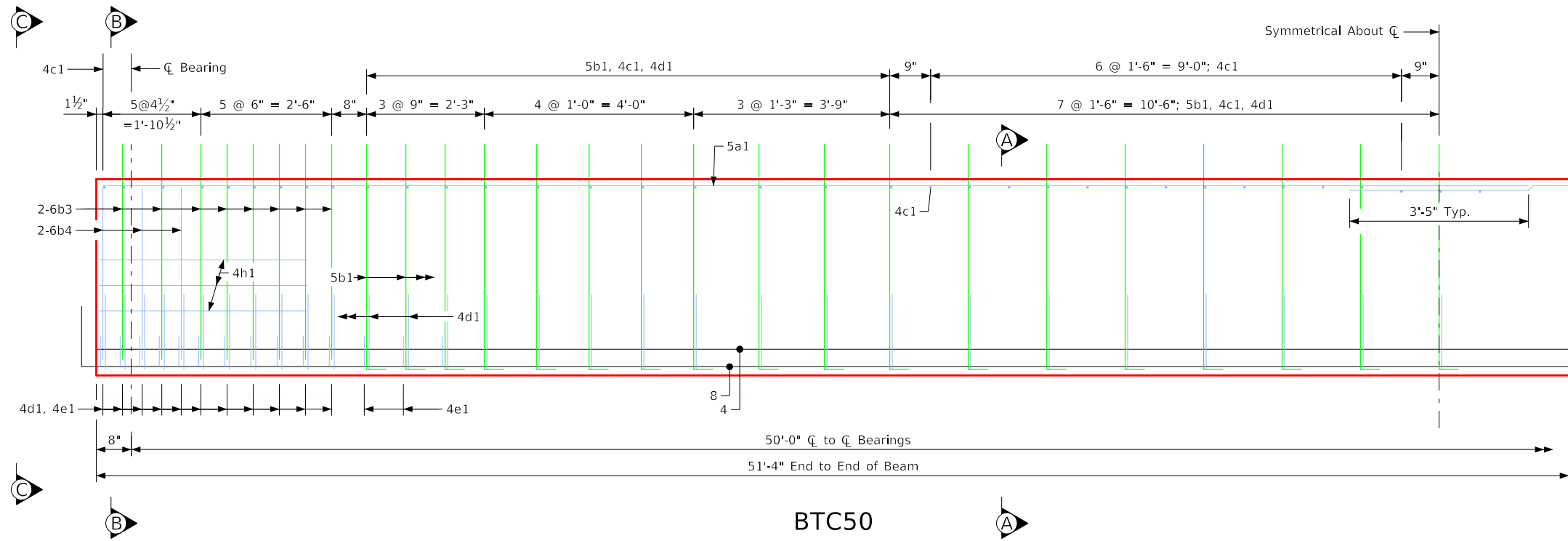
**View C-C**

Δ Epoxy Coated Bars

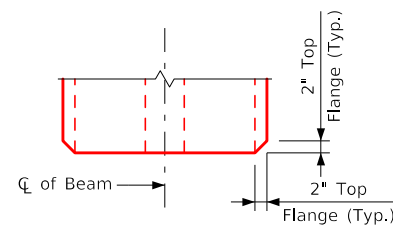


**BTC45 Beam Details**

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 45'-0" Span	Standard Sheet 4704	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:18 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

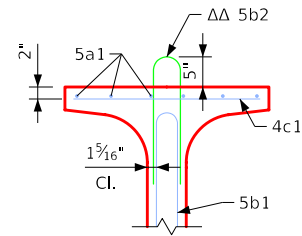


BTC50



Top View

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

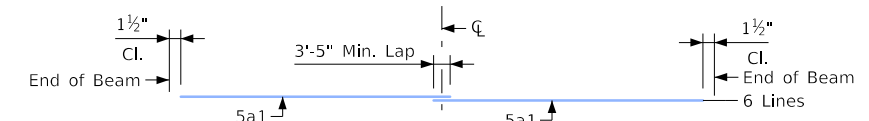


Section A-A (Alternate)

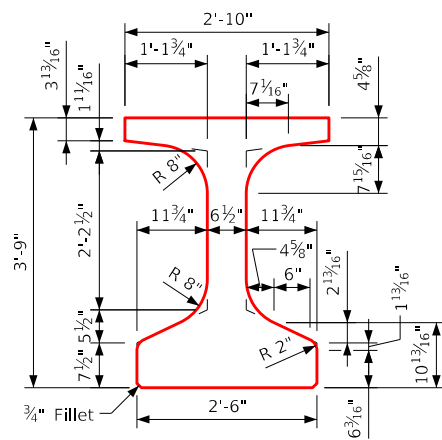
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

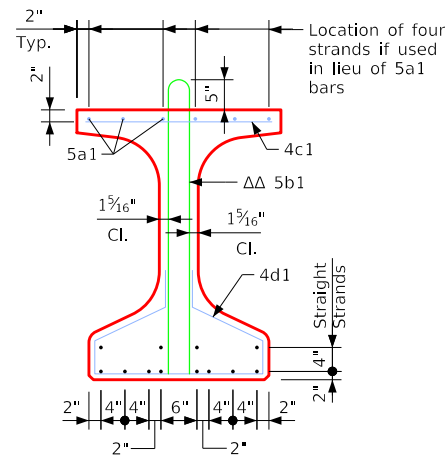
Beam Section Properties



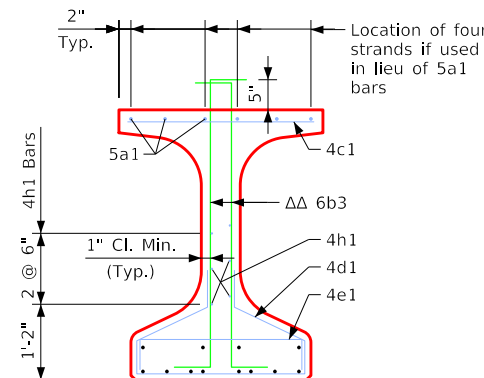
Top Flange Longitudinal Bar Layout



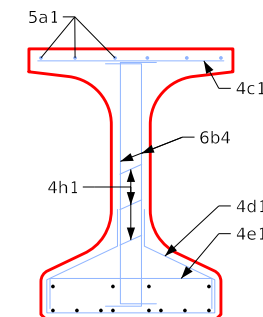
BTC Beam Cross Section



Section A-A



Section B-B



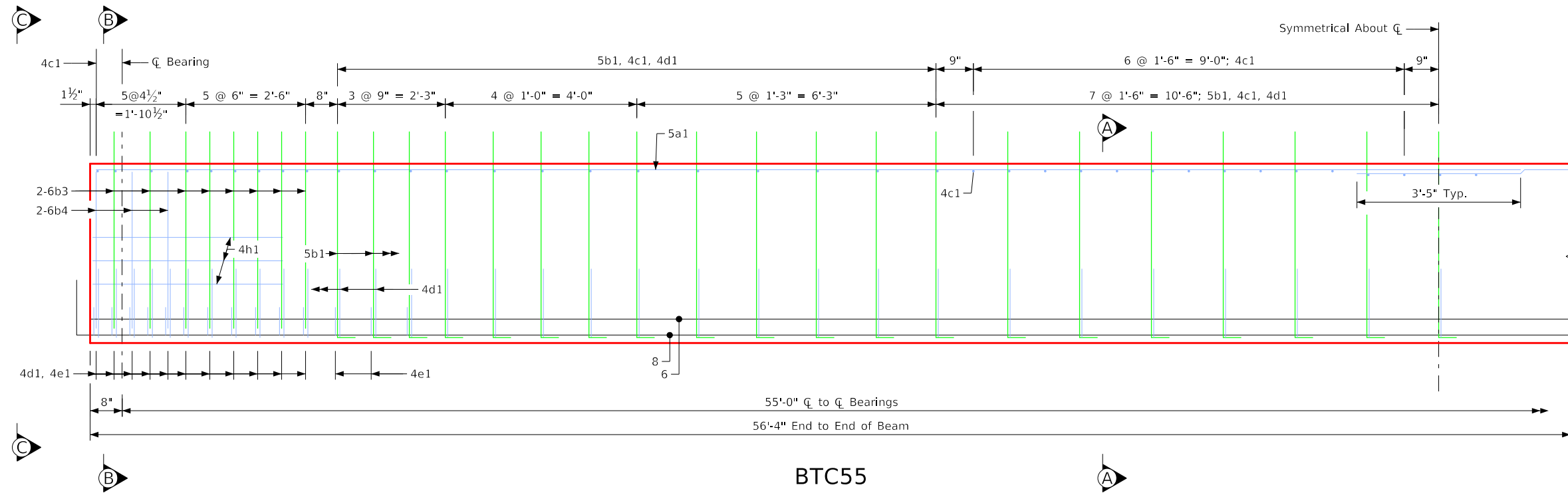
View C-C

Δ Epoxy Coated Bars

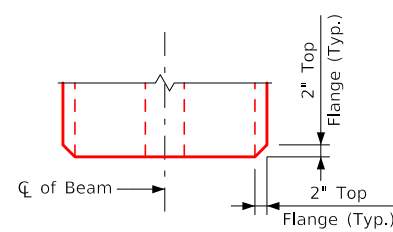
BTC50 Beam Details

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.

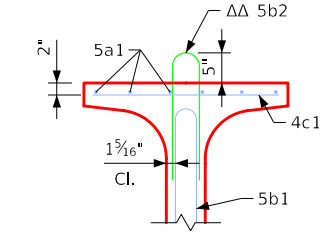
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 50'-0" Span	Standard Sheet 4705	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:19 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTC55



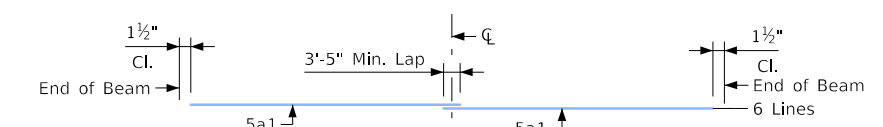
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



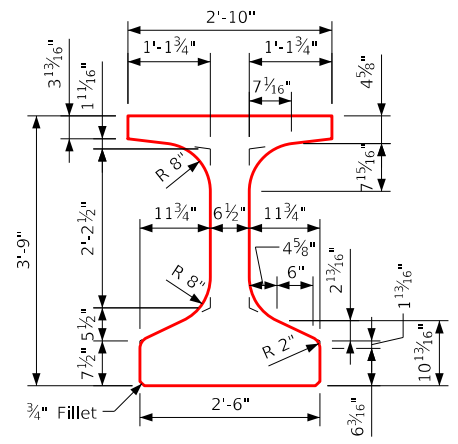
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

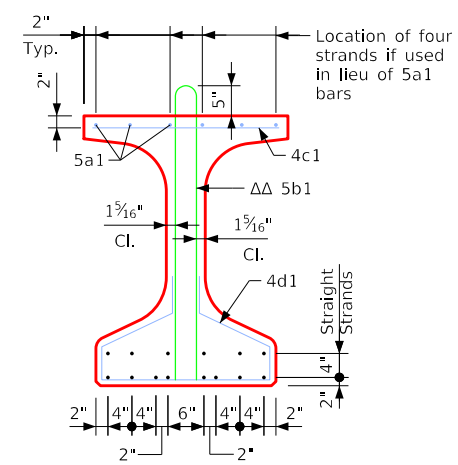
**Beam Section Properties**



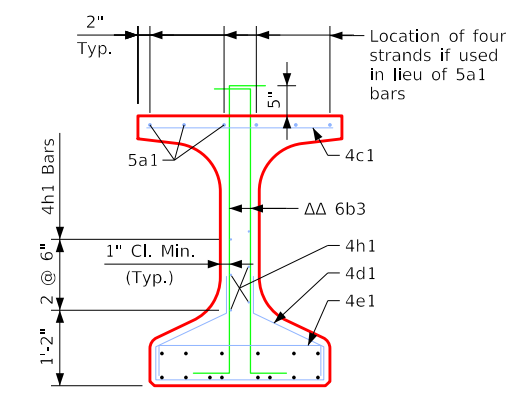
**Top Flange Longitudinal Bar Layout**



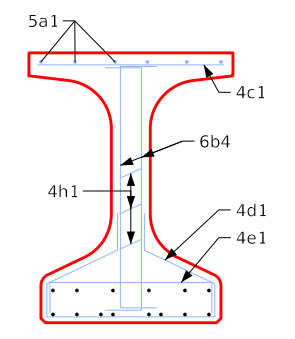
**BTC Beam Cross Section**



**Section A-A**



**Section B-B**



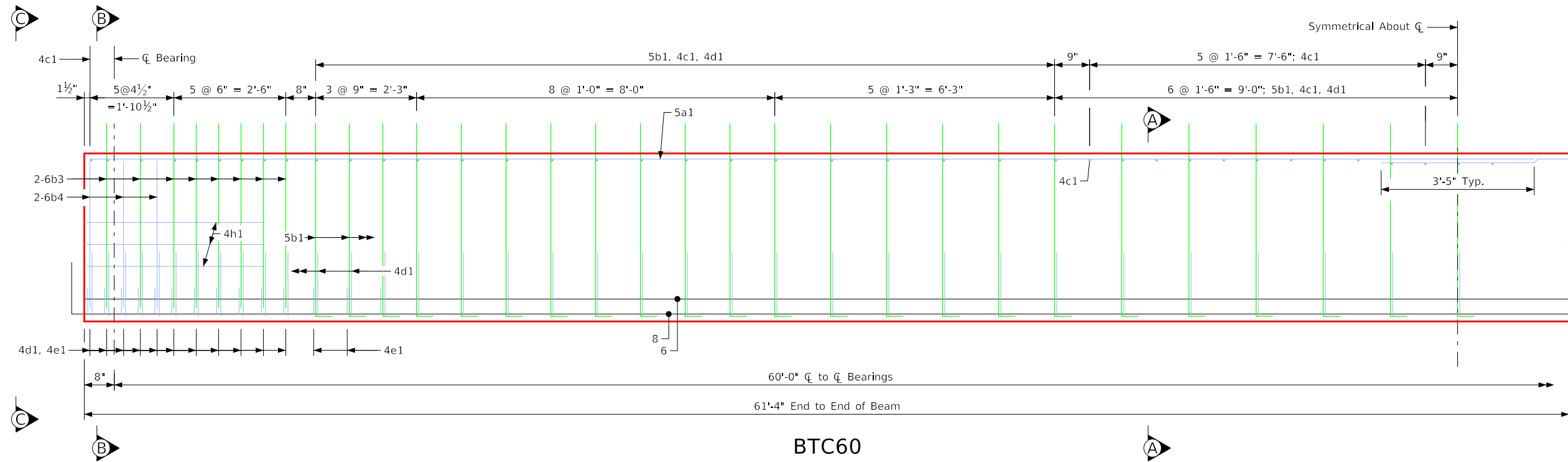
**View C-C**

Δ Epoxy Coated Bars

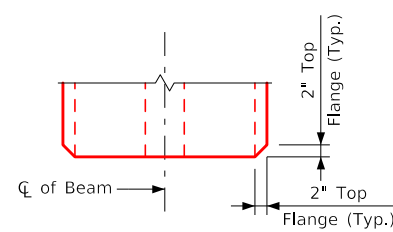
**BTC55 Beam Details**

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.

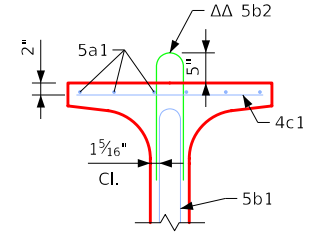
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 55'-0" Span	Standard Sheet 4706	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:20 PM	4/5/2026	bkloss	pw:\NTP\int1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTC60



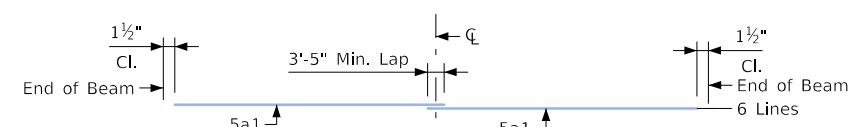
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



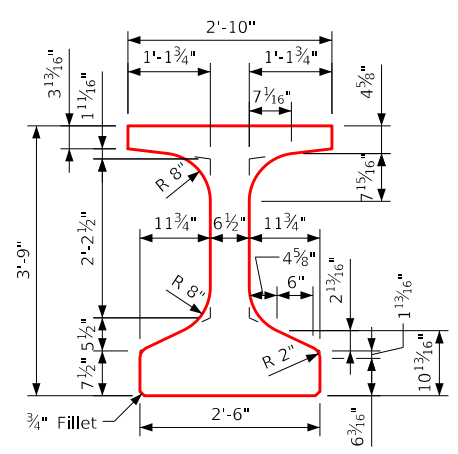
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

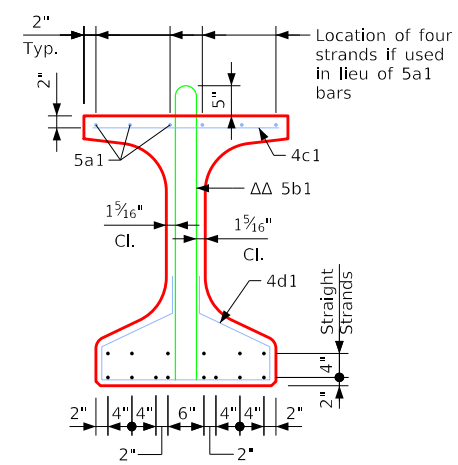
**Beam Section Properties**



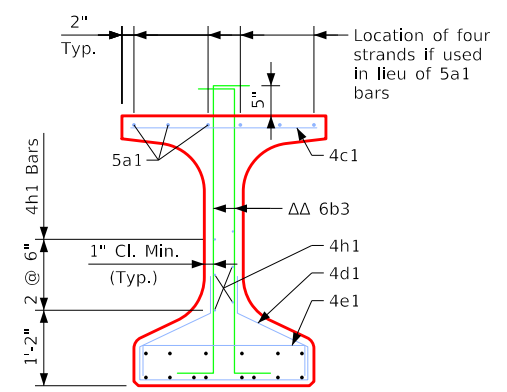
**Top Flange Longitudinal Bar Layout**



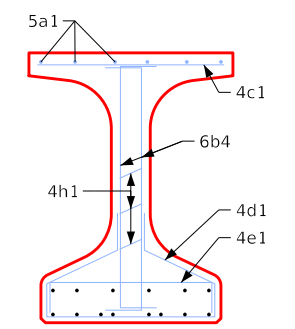
**BTC Beam Cross Section**



**Section A-A**

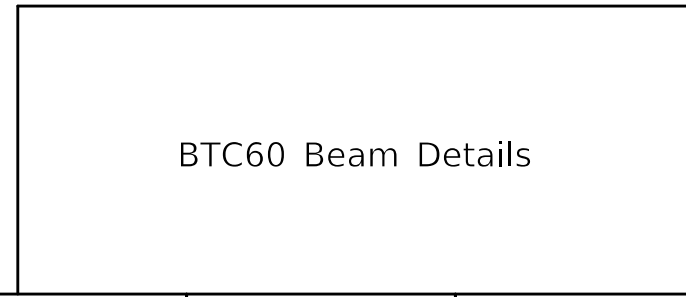


**Section B-B**



**View C-C**

Δ Epoxy Coated bars

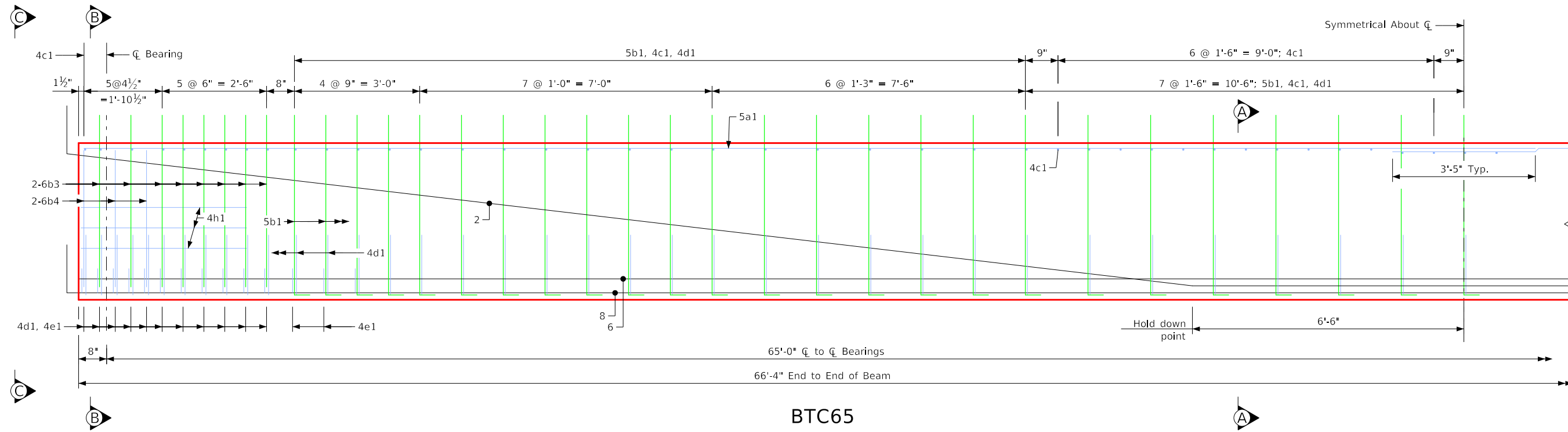


**BTC60 Beam Details**

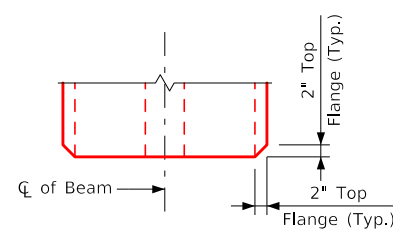
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added. Issued 05-04. Beams.dgn - 4707 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 60'-0" Span	Standard Sheet 4707	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:20 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

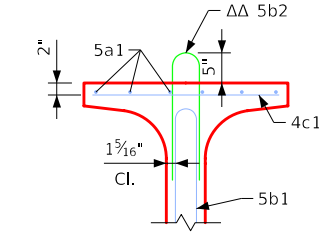
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added. Issued 05-04. Beams.dgn - 4708 - This Sheet Re-Issued 04-2024. Sheet Format Update.



**BTC65**



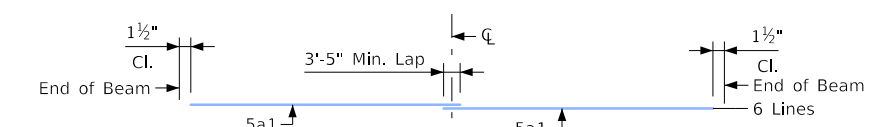
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



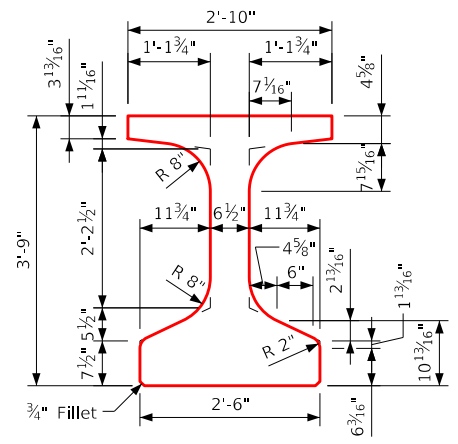
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

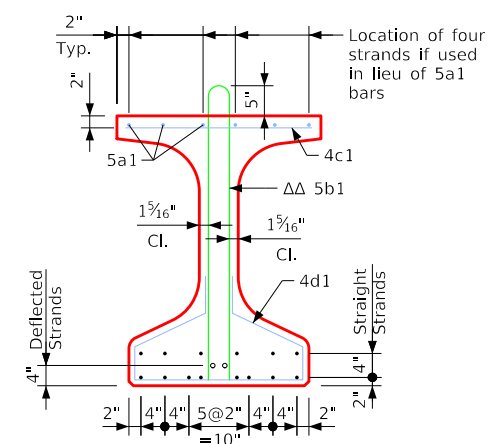
**Beam Section Properties**



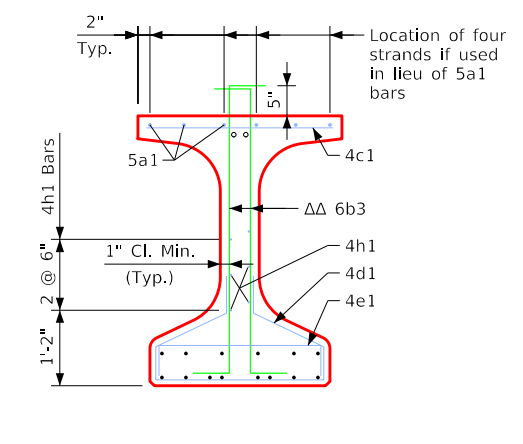
**Top Flange Longitudinal Bar Layout**



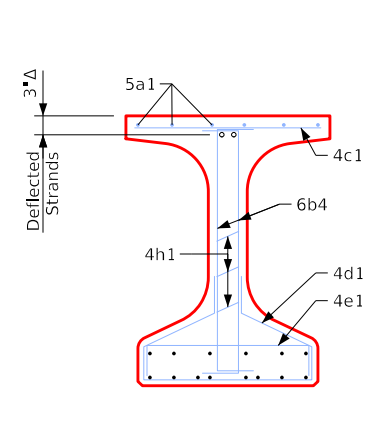
**BTC Beam Cross Section**



**Section A-A**



**Section B-B**



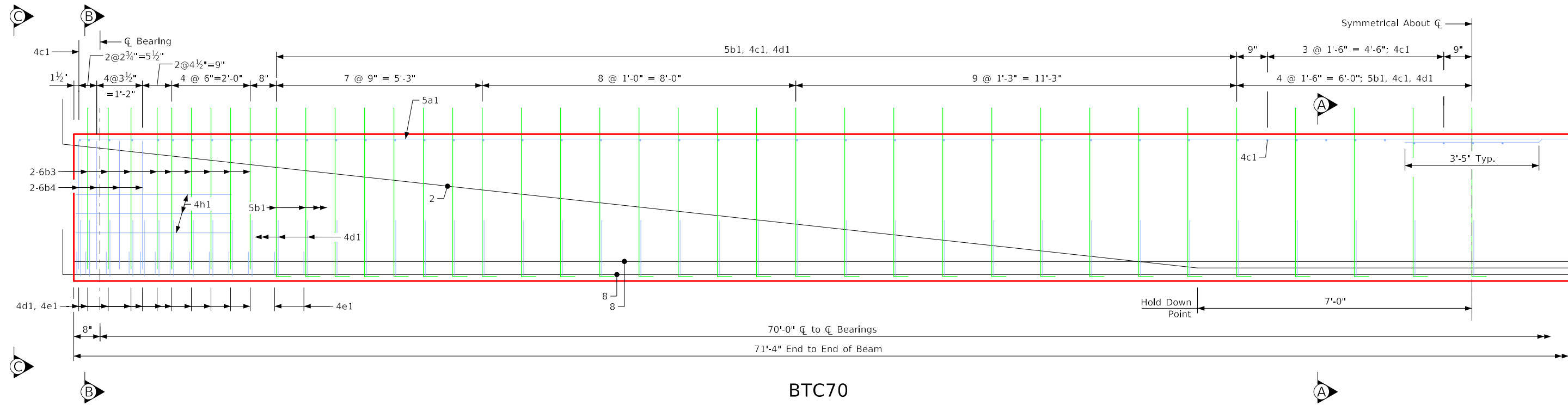
**View C-C**

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

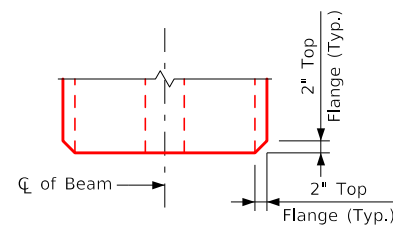
**BTC65 Beam Details**

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 65'-0" Span	Standard Sheet 4708	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:21 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

Revision 10-07: 5b2 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.

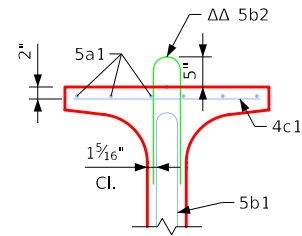


**BTC70**



**Top View**

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

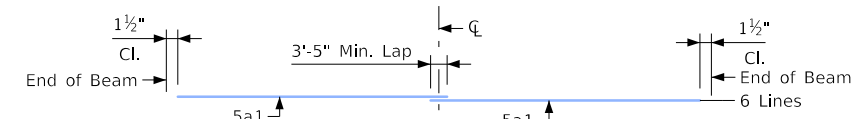


**Section A-A (Alternate)**

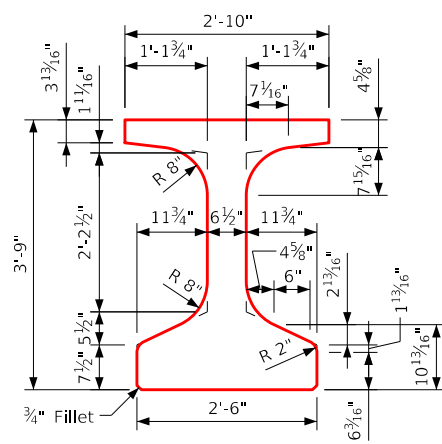
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

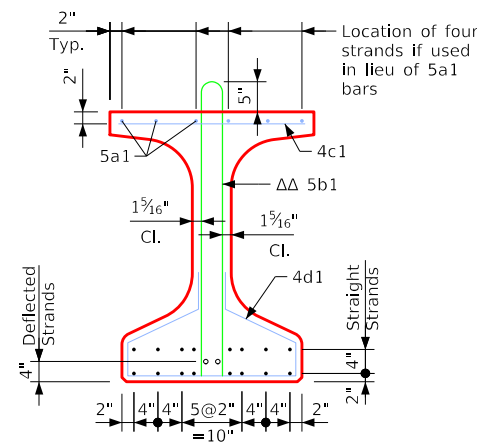
**Beam Section Properties**



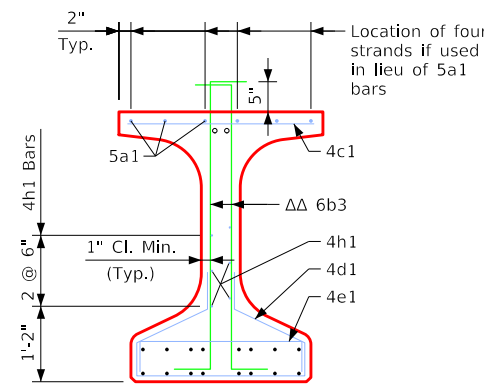
**Top Flange Longitudinal Bar Layout**



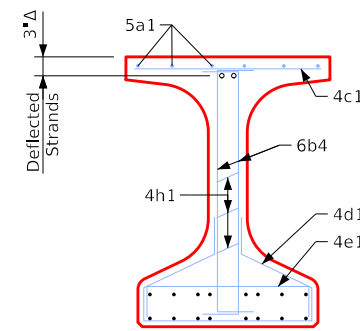
**BTC Beam Cross Section**



**Section A-A**



**Section B-B**

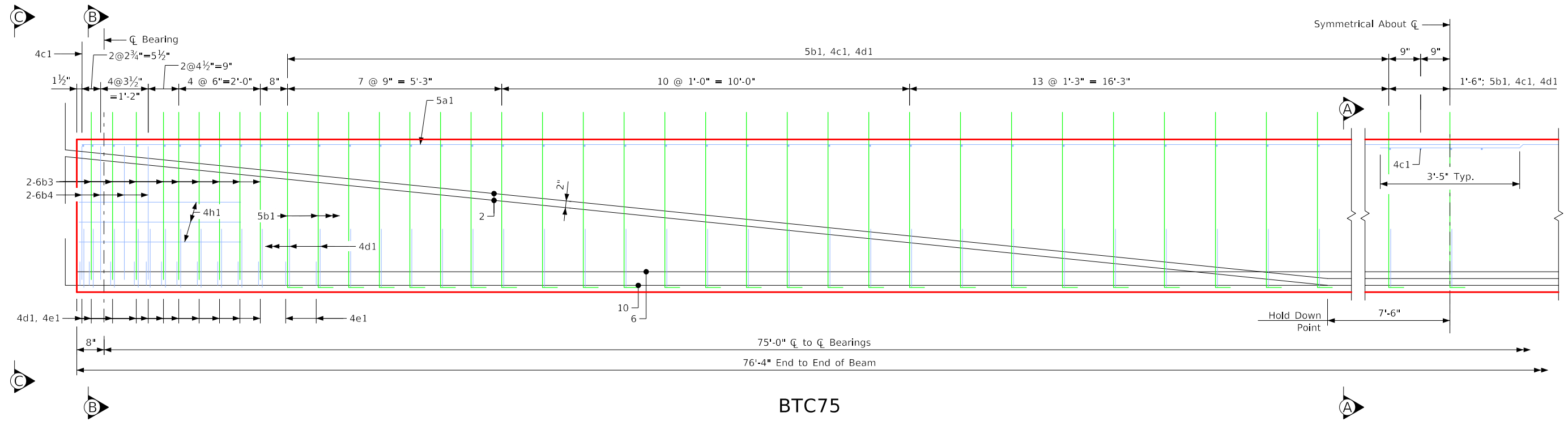


**View C-C**

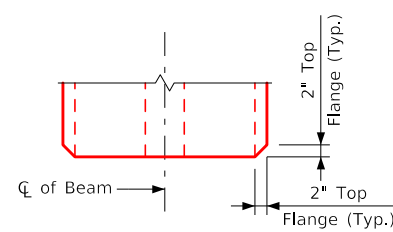
- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

**BTC70 Beam Details**

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 70'-0" Span	Standard Sheet 4709	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:22 PM	4/5/2026	bkloss	pw:\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

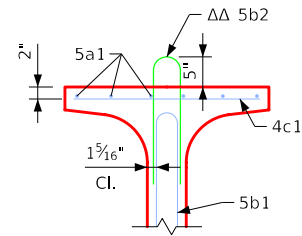


BTC75



Top View

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

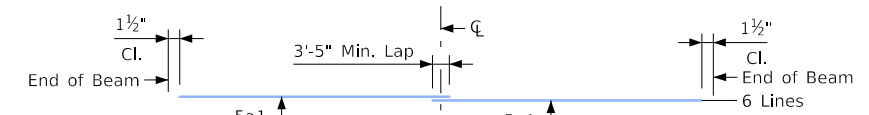


Section A-A (Alternate)

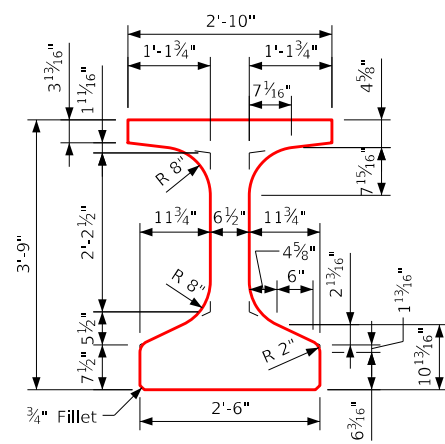
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

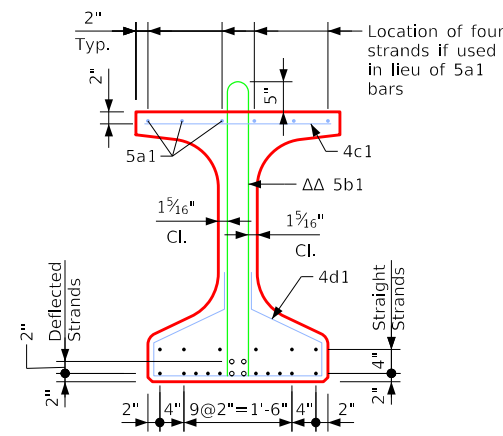
Beam Section Properties



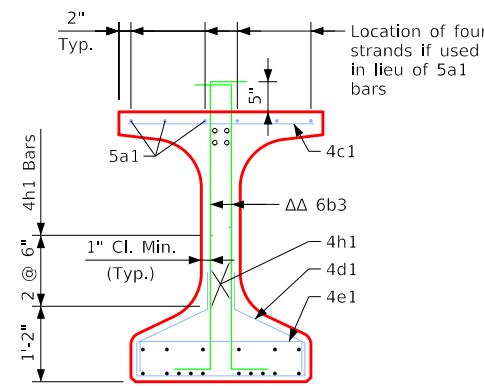
Top Flange Longitudinal Bar Layout



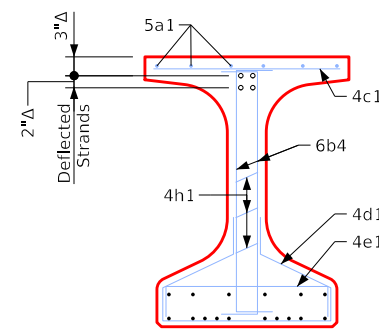
BTC Beam Cross Section



Section A-A



Section B-B



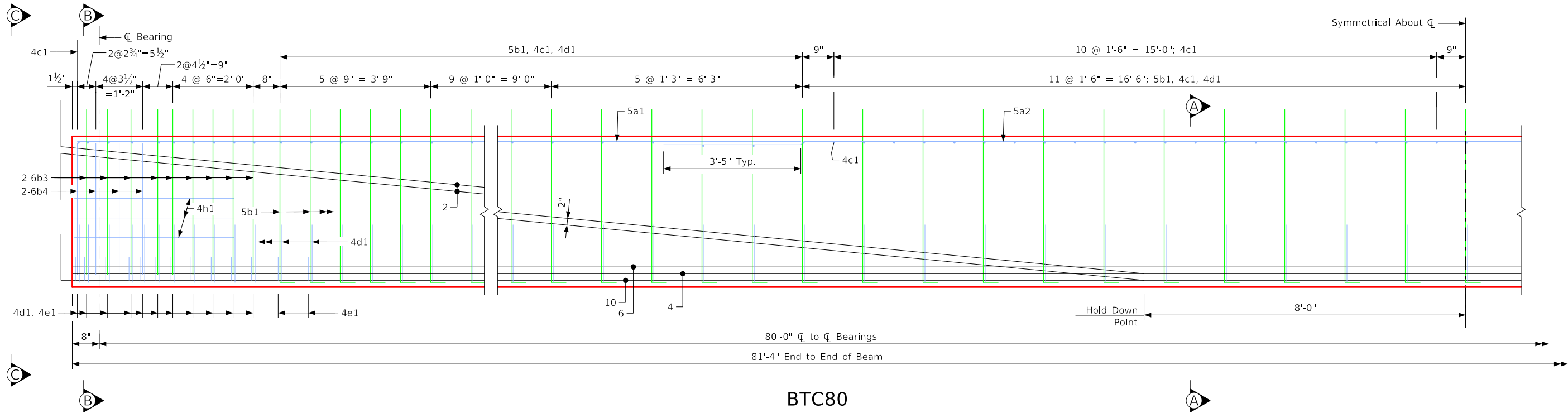
View C-C

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

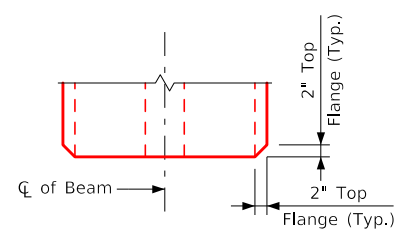
BTC75 Beam Details

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
3:49:23 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

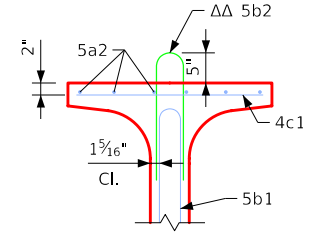


BTC80



Top View

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

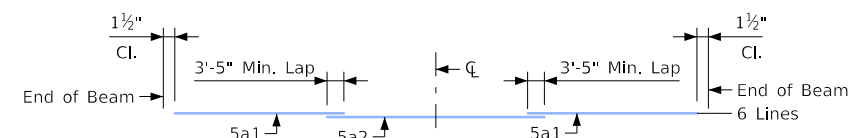


Section A-A (Alternate)

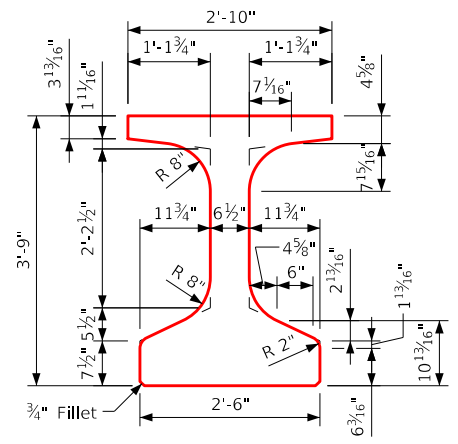
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

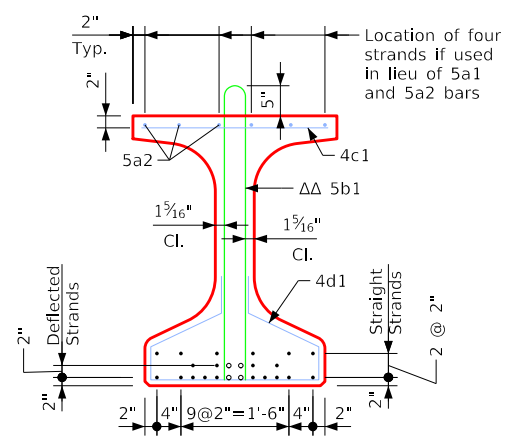
Beam Section Properties



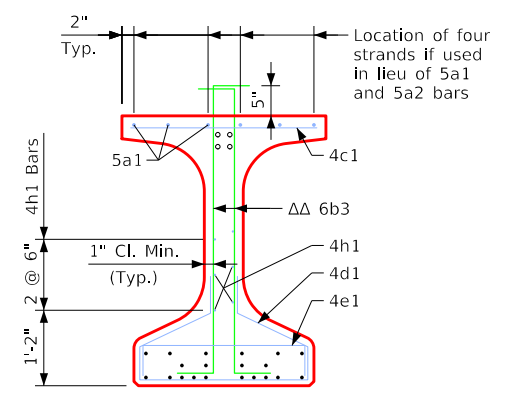
Top Flange Longitudinal Bar Layout



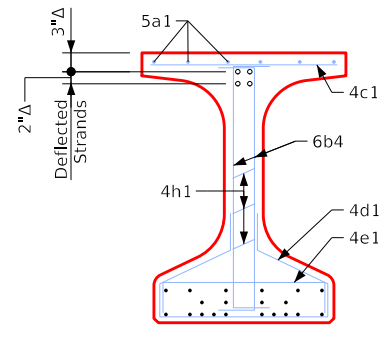
BTC Beam Cross Section



Section A-A



Section B-B



View C-C

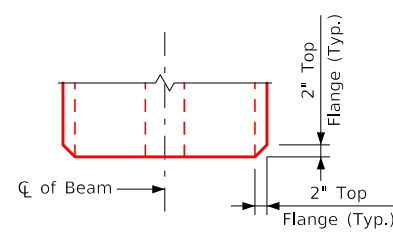
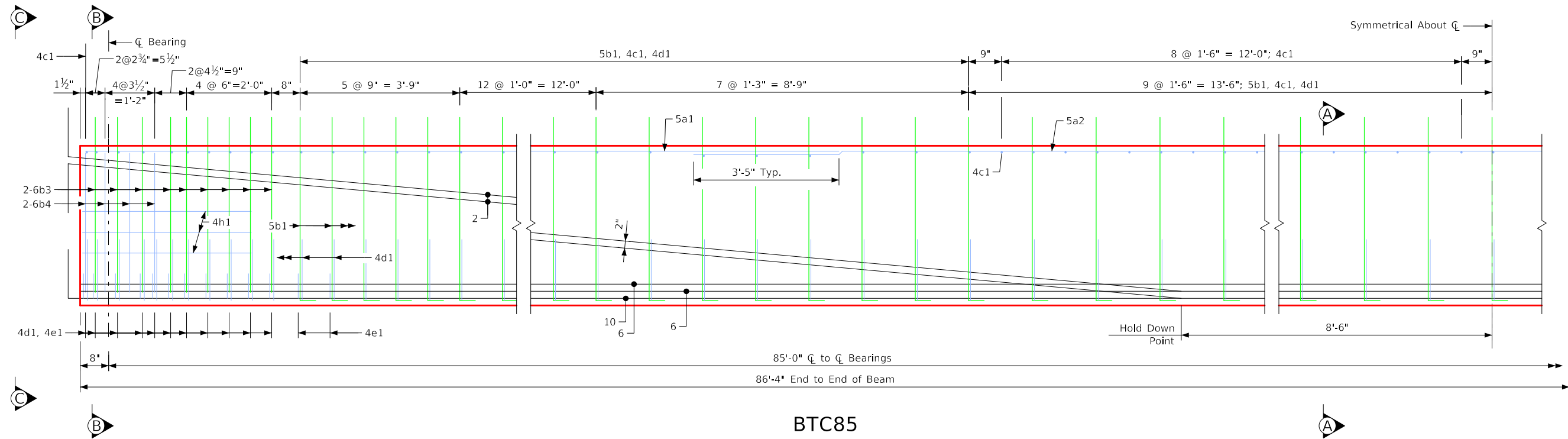
- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

BTC80 Beam Details

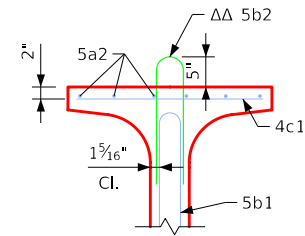
Revision 10-07: 5b2 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added. Issued 05-04. Beams.dgn - 4711 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 80'-0" Span	Standard Sheet 4711	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:24 PM	4/5/2026	bkloss	pw:\NTP\wint1.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.



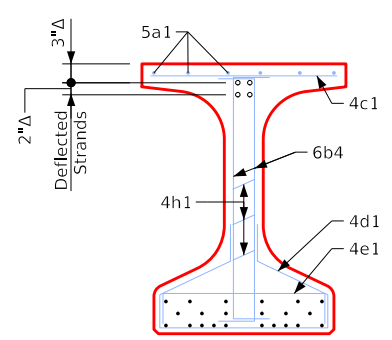
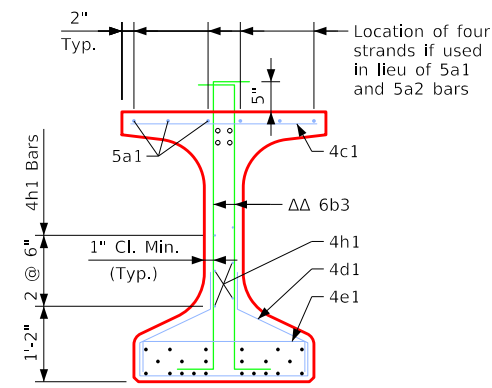
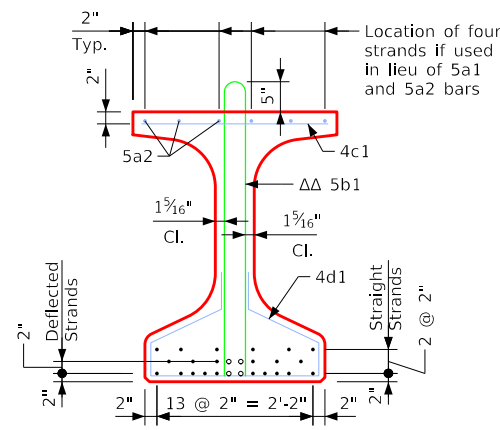
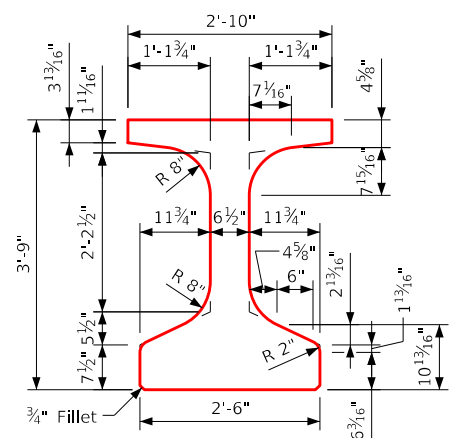
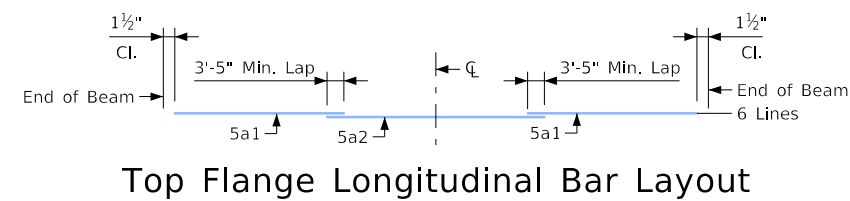
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



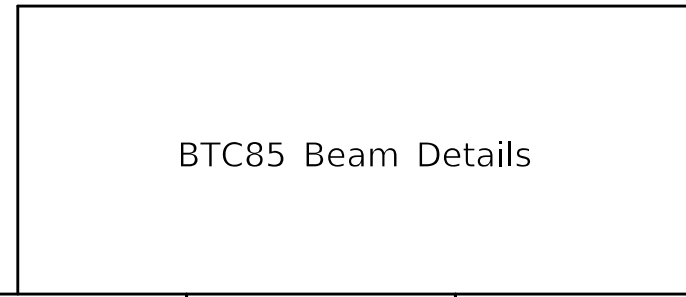
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

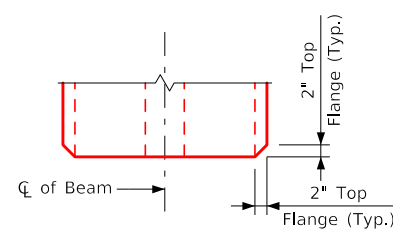
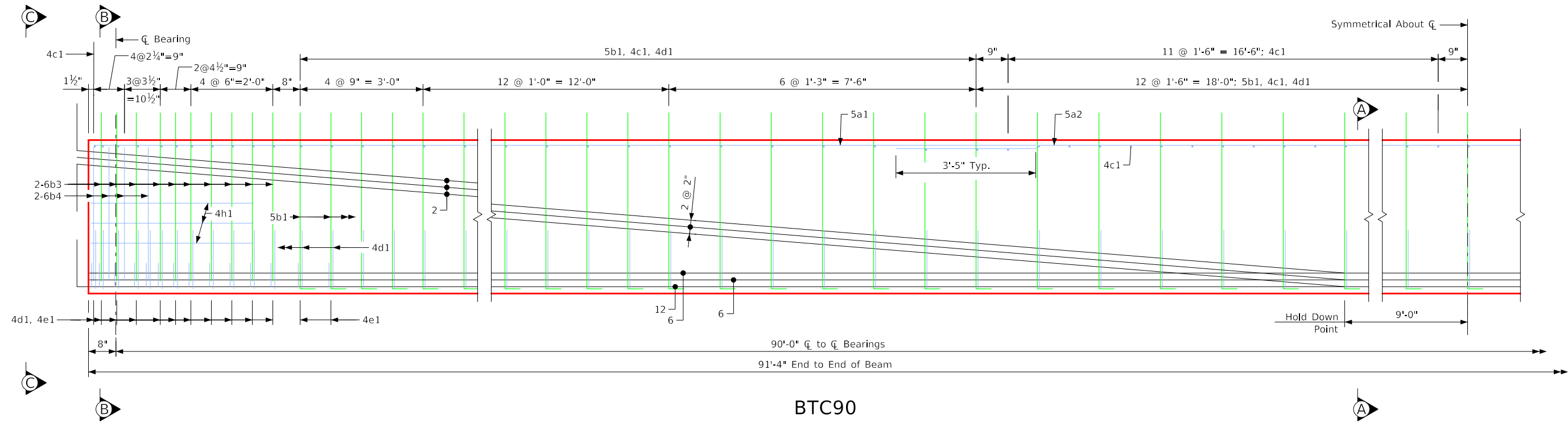
**Beam Section Properties**



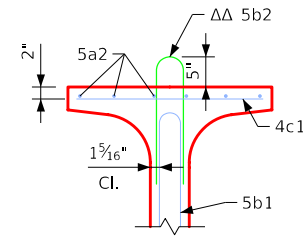
- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars



FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 85'-0" Span	Standard Sheet 4712	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:24 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



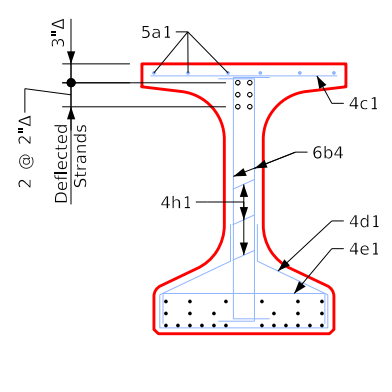
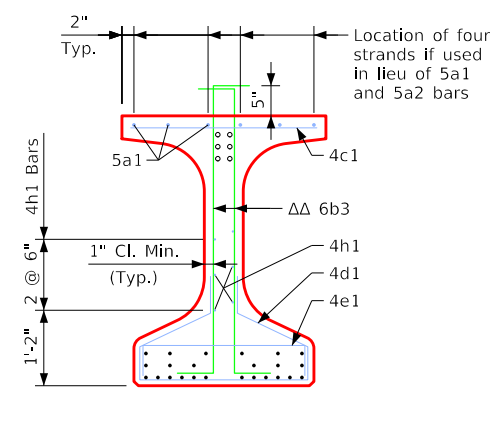
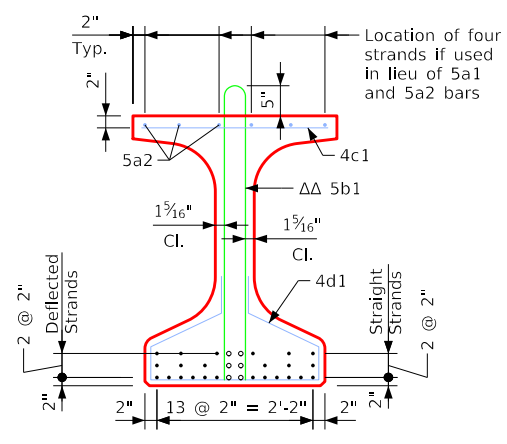
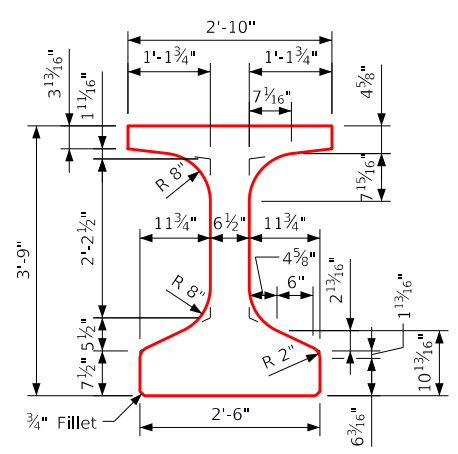
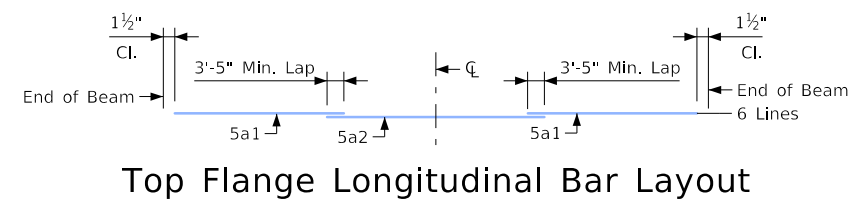
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



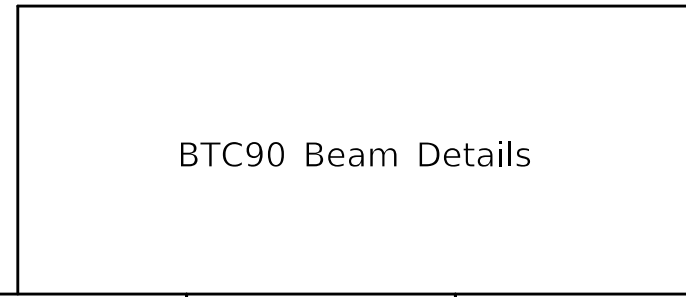
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

**Beam Section Properties**



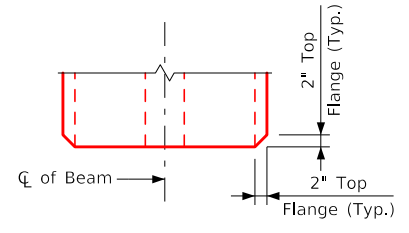
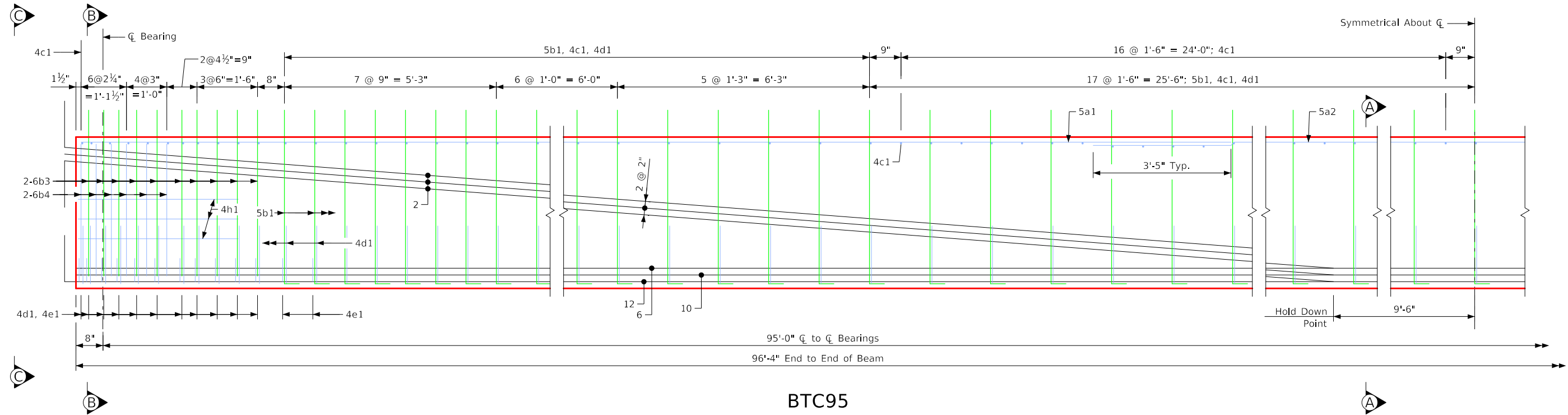
- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars



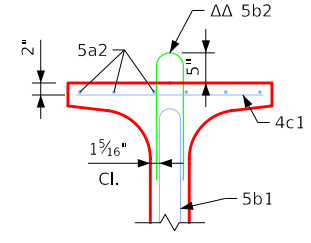
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added. Revised 10-2024: Added one set of 6b3, 4d1, and 4e1 to each beam end and revised rebar spacing. Issued 05-04. Beams.dgn - 4713 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 90'-0" Span	Standard Sheet 4713	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:25 PM	4/5/2026	bkloss	pw:\NTP\wint1.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.  
 Revised 10-2024: Added one set of 6b4 to each beam end and revised rebar spacing.  
 Issued 05-04.  
 Beams.dgn - 4714 - This Sheet Re-Issued 04-2024. Sheet Format Update.



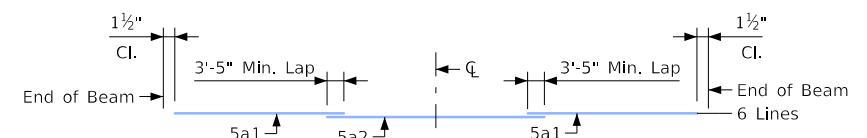
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



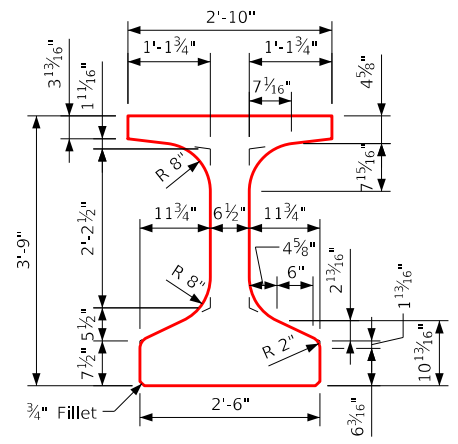
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

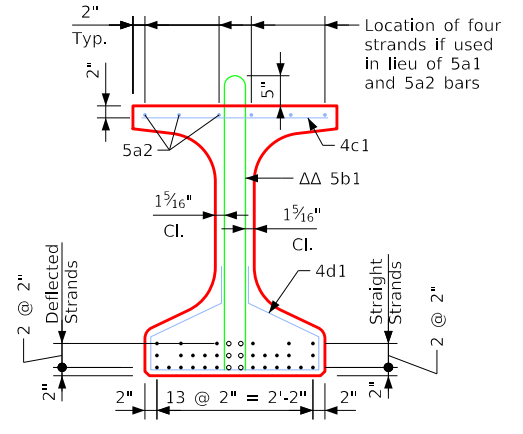
**Beam Section Properties**



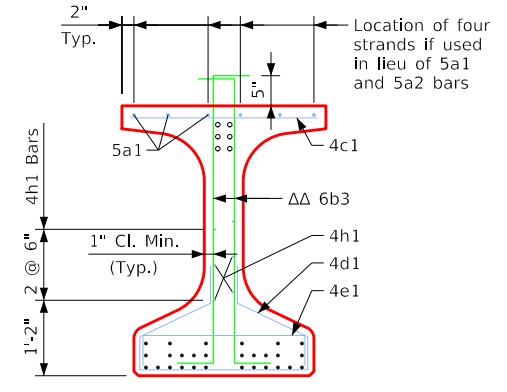
**Top Flange Longitudinal Bar Layout**



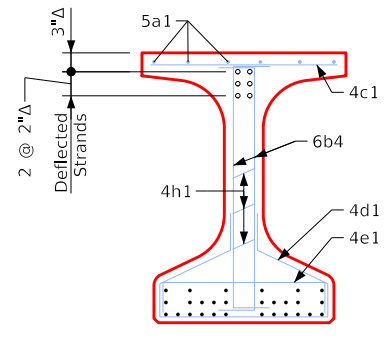
**BTC Beam Cross Section**



**Section A-A**



**Section B-B**



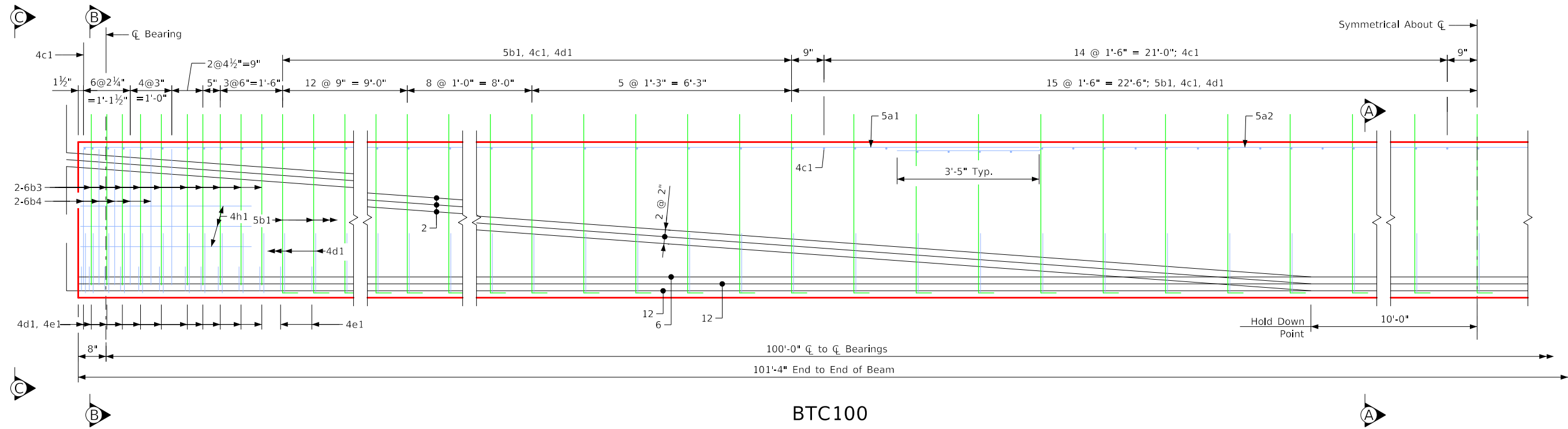
**View C-C**

- o Deflected Strands
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  Epoxy Coated Bars

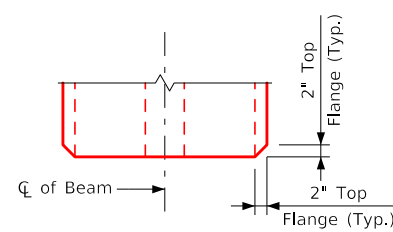
**BTC95 Beam Details**

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 95'-0" Span	Standard Sheet 4714	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:26 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

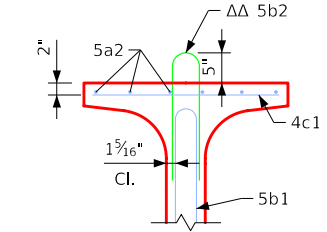
Revision 10-07: 5b2 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added. Issued 05-04. Beams.dgn - 4715 - This Sheet Re-Issued 04-2024. Sheet Format Update.



**BTC100**



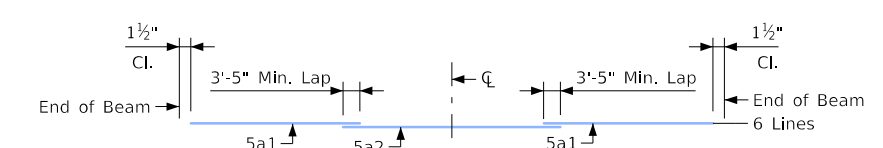
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



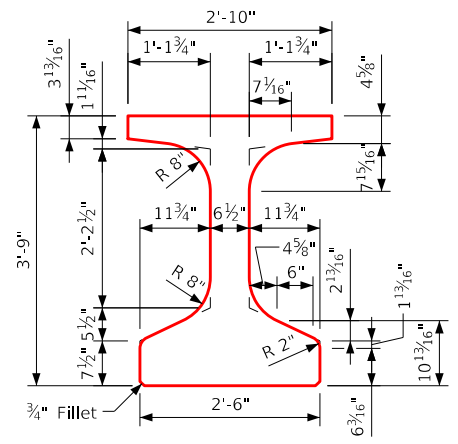
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

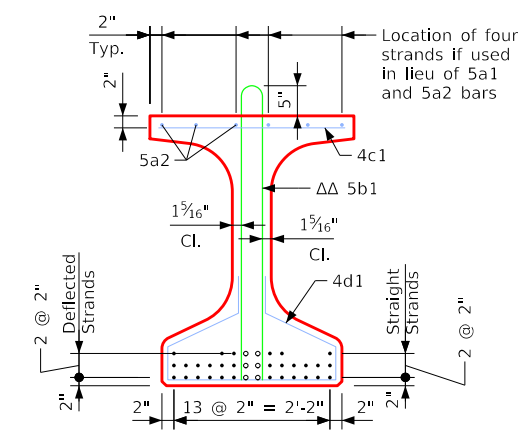
**Beam Section Properties**



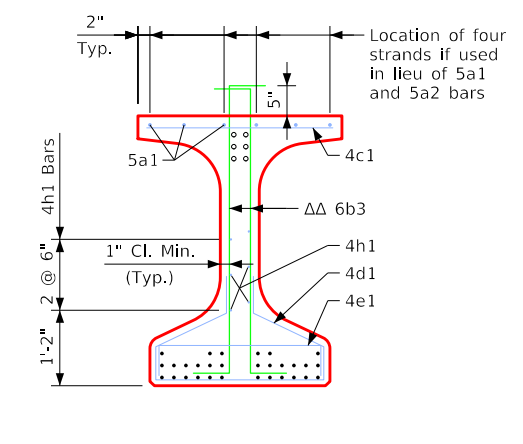
**Top Flange Longitudinal Bar Layout**



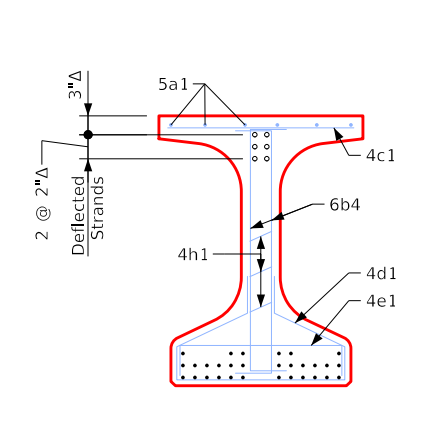
**BTC Beam Cross Section**



**Section A-A**



**Section B-B**

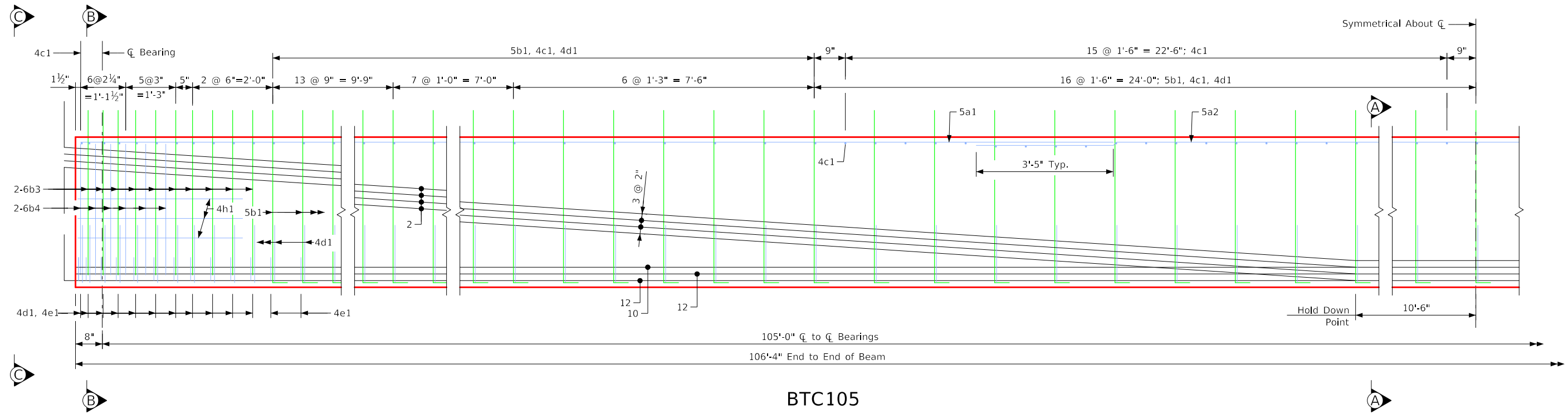


**View C-C**

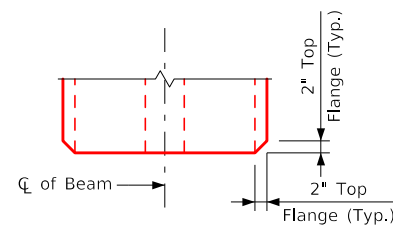
- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

**BTC100 Beam Details**

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 100'-0" Span	Standard Sheet 4715	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:27 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

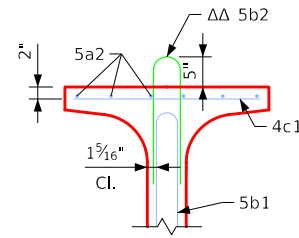


BTC105



Top View

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

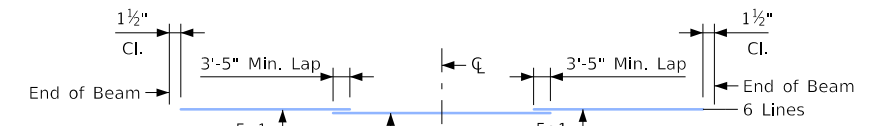


Section A-A (Alternate)

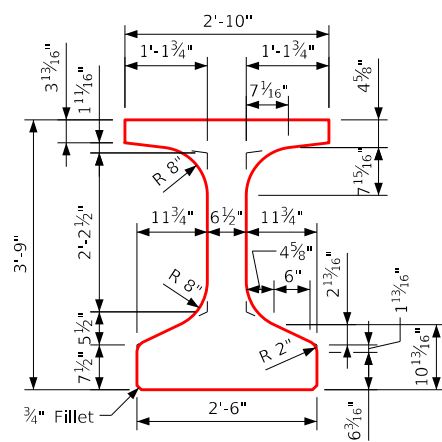
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

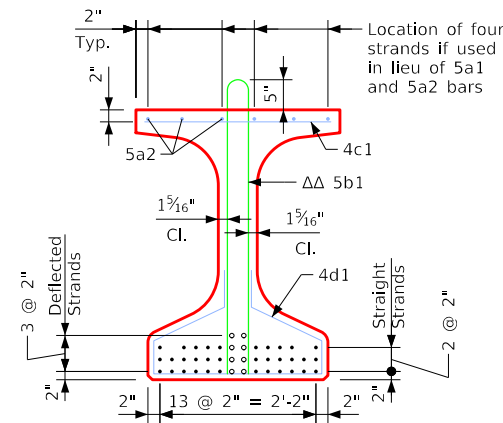
Beam Section Properties



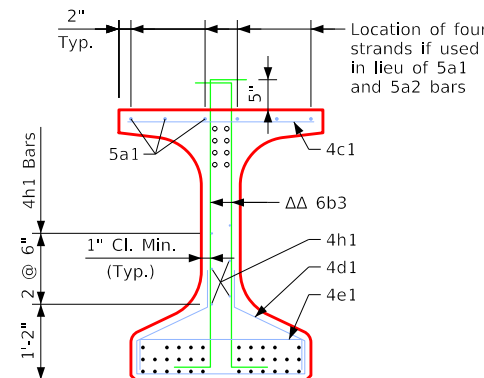
Top Flange Longitudinal Bar Layout



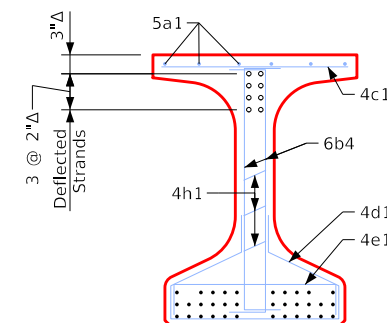
BTC Beam Cross Section



Section A-A



Section B-B



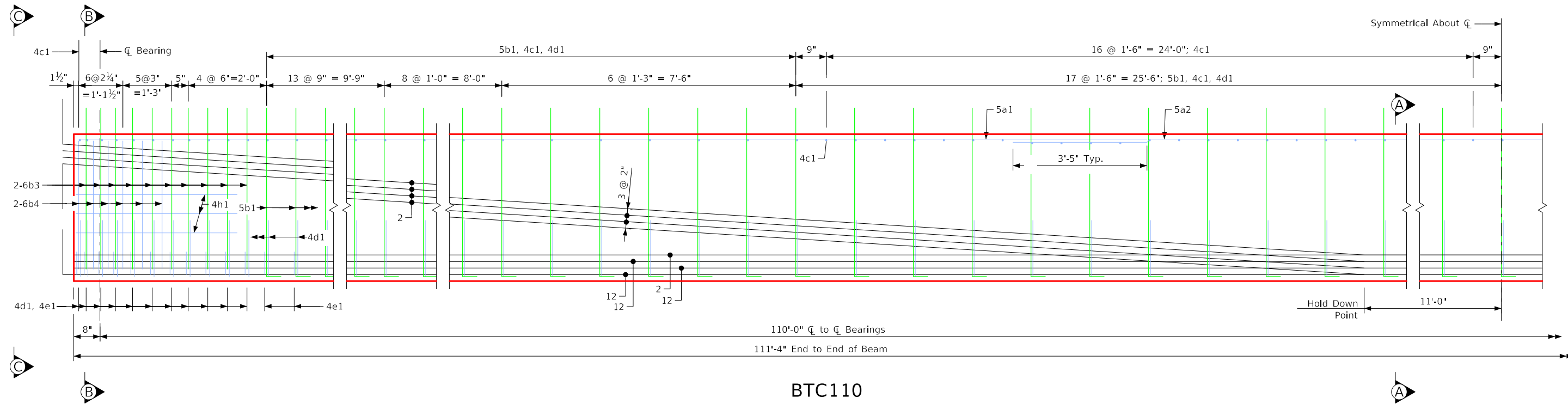
View C-C

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

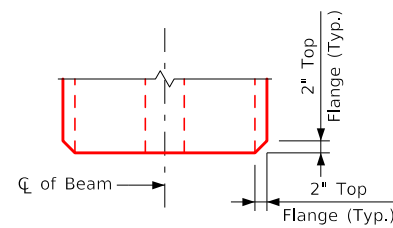
BTC105 Beam Details

Revision 10-07: 5b2 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
3:49:28 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

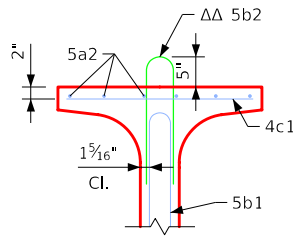


BTC110



Top View

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

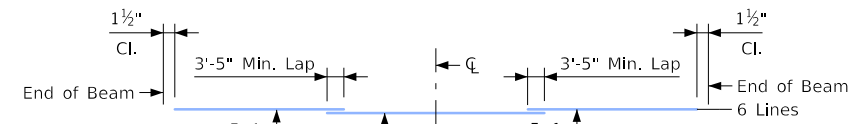


Section A-A (Alternate)

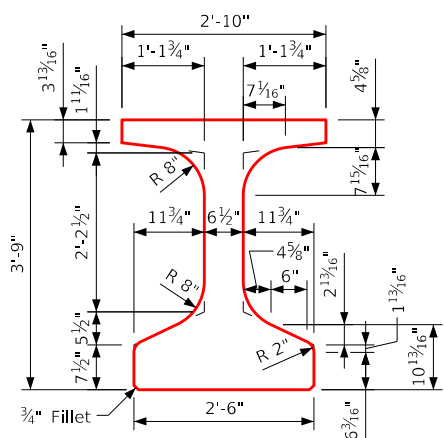
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

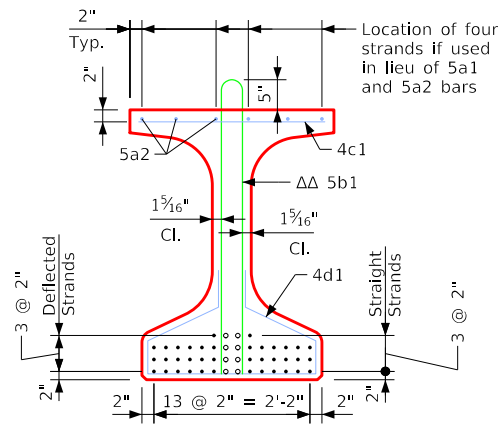
Beam Section Properties



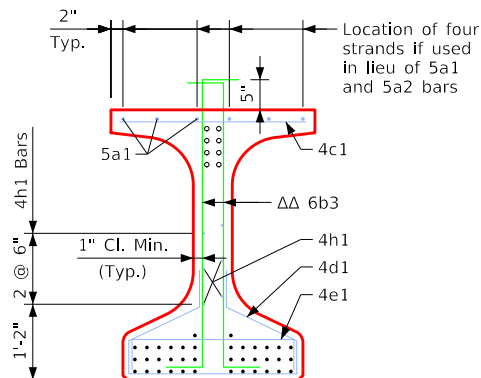
Top Flange Longitudinal Bar Layout



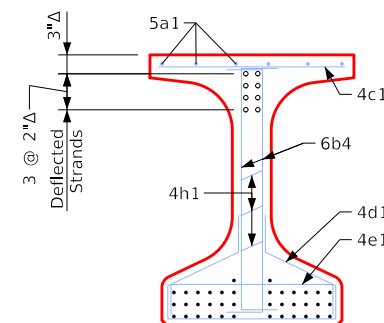
BTC Beam Cross Section



Section A-A



Section B-B



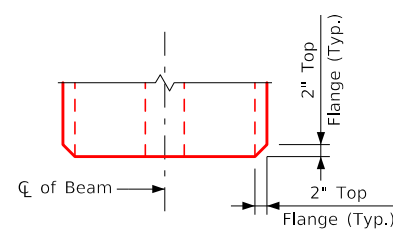
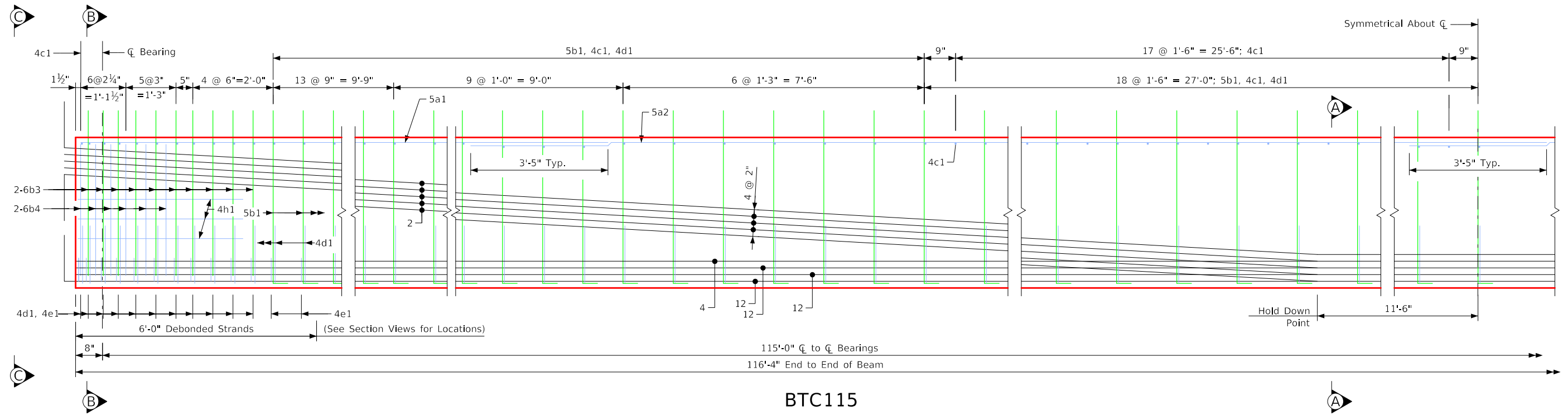
View C-C

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

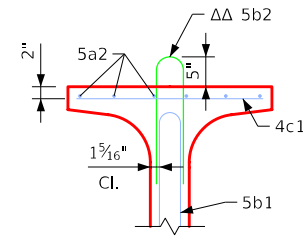
BTC110 Beam Details

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
3:49:29 PM	4/5/2026	bkloss	pw:\NTP\int1.dot.int.lan:PWMain\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				



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

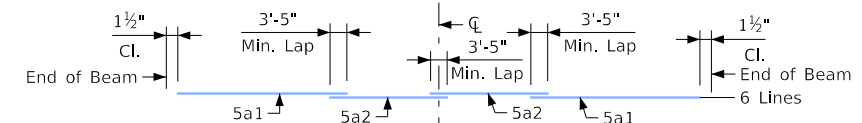


Section A-A (Alternate)

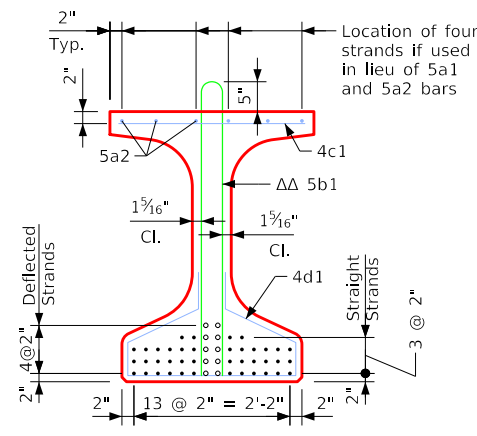
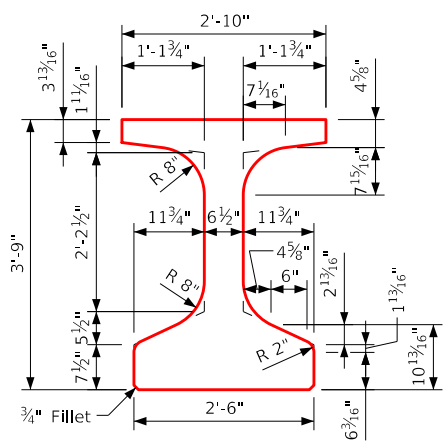
See Alternate Bar Note on Standard Sheet 4700.

Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>

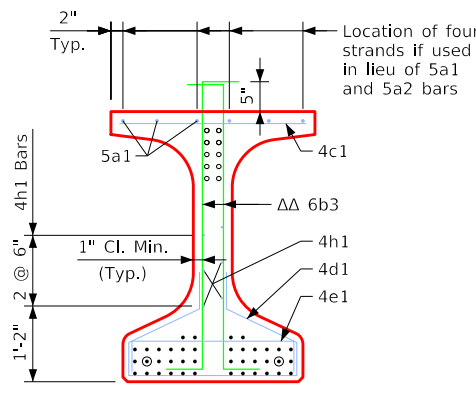
**Beam Section Properties**



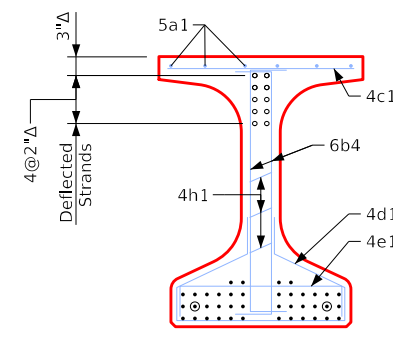
**Top Flange Longitudinal Bar Layout**



**Section A-A**



**Section B-B**



**View C-C**

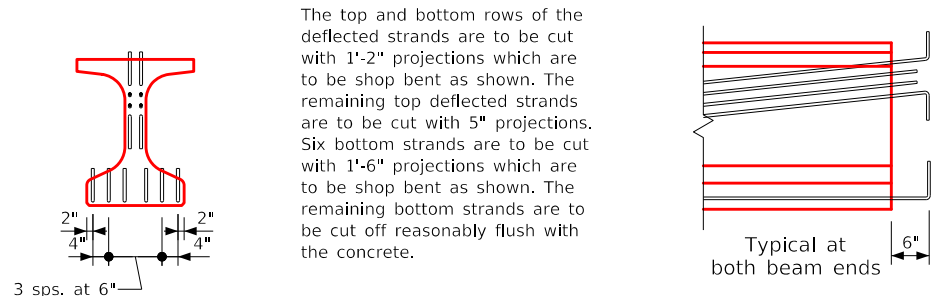
- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars
- ⊙ Strands Debonded 6'-0" from Beam Ends

**BTC115 Beam Details**

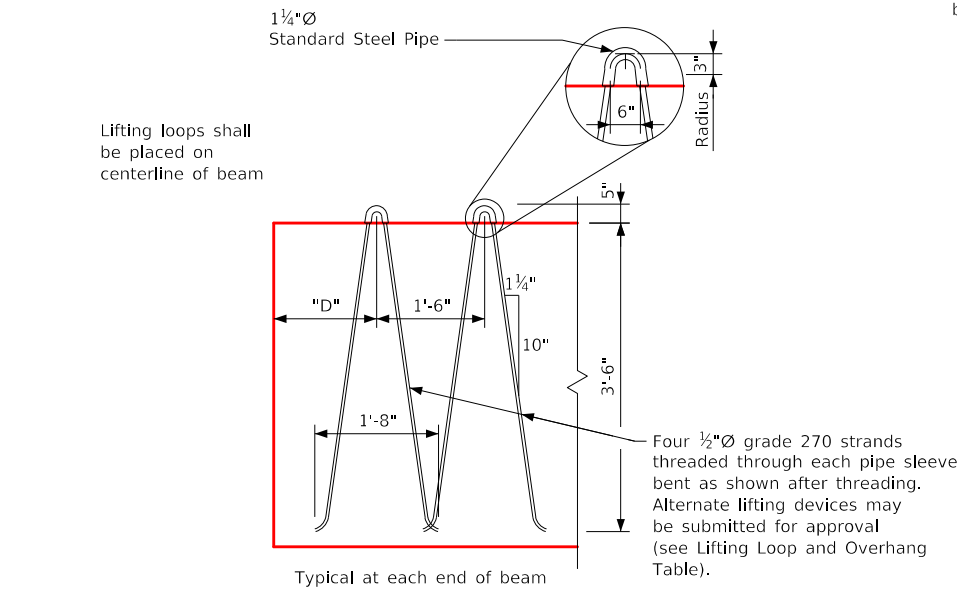
Revision 10-07: 5b2 Bar Lengthened to Extend 5 Inches Above Beam Top. Alternate Section A-A Added. Issued 05-04. Beams.dgn - 4718 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 115'-0" Span	Standard Sheet 4718	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:30 PM	4/5/2026	bkloss	pw:\NTP\wint1.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 1/4 inch. Revised 10-2024; Revised "At Release" and "After Losses" Camber Values. Issued 05-04. Beams.dgn - 4719s1 - This Sheet Re-Issued 04-2024. Sheet Format Update.



### Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms



### Lifting Loop Detail

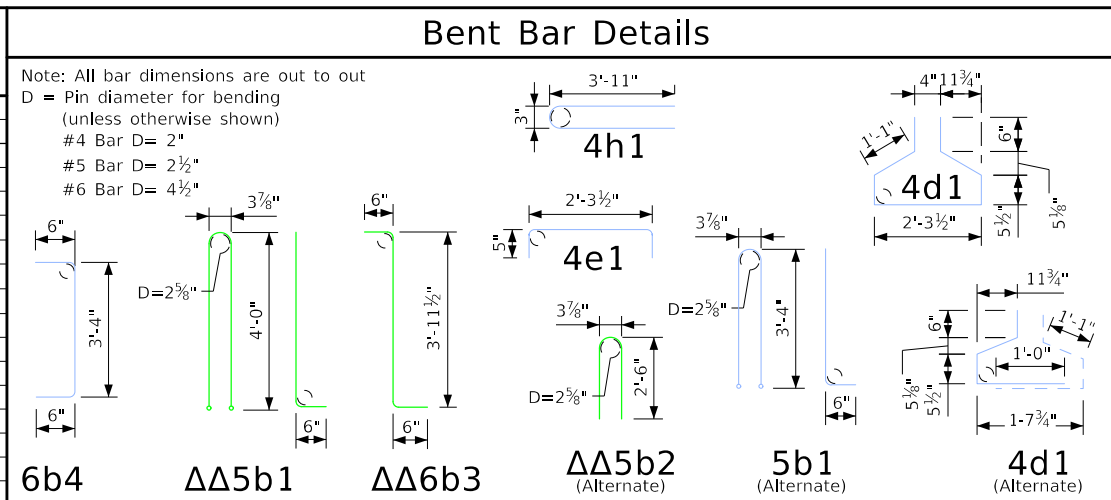
Beam	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
BTC120	2	4	8'-3"	14

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.

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"



### BTC120 Beam Data

BTC Beam	Span Length @ Bearing	Overall Beam Length (L)	Concrete Strength		Strand Size Dia. (in.)	No. of Strands		Total Initial Prestress (kips) ③	Hold Down Force (kips)	Camber (in.) ⑥		Deflection (in.) Δ <sub>D</sub>		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 <sub>i</sub>	Time ② (plastic) Δ <sub>T</sub>				
			Steel Diaphragm	Steel Diaphragm		HL-93 Loading	Steel Diaphragm										
BTC120	120'-0"	121'-4"	8.00	10.00	0.60"	44	10	2297	26.6	4.48"	7.17"	4.77"	1.19"	8'-6"	43.7	21.7	3074

- 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 C of span. For different deck and diaphragm weights, deflections will be directly proportional.
- Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck. Total beam deflections at C of span, Δ<sub>D</sub>, due to weight of slab and diaphragms for detailing purpose:
  - (A) Δ<sub>D</sub>=Δ<sub>i</sub> + Δ<sub>T</sub> for simple span.
  - (B) Δ<sub>D</sub>=Δ<sub>i</sub> + 3/4Δ<sub>T</sub> for end spans of continuous bridge.
  - (C) Δ<sub>D</sub>=Δ<sub>i</sub> + 1/2Δ<sub>T</sub> for interior spans of continuous bridge.
- Total initial prestress is based on 72.6% f's, f's= 270 ksi. and A<sub>s</sub>= 0.217 in.<sup>2</sup>.
- Requires a 4500 psi., 28 day compressive strength for cast-in-place deck concrete.
- Includes partial length debonded strands, see individual Beam Sheet for locations and details.
- 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.<sup>2</sup>) 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, 1, 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).

### 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.

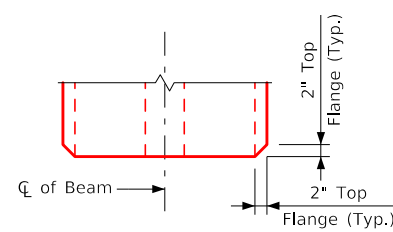
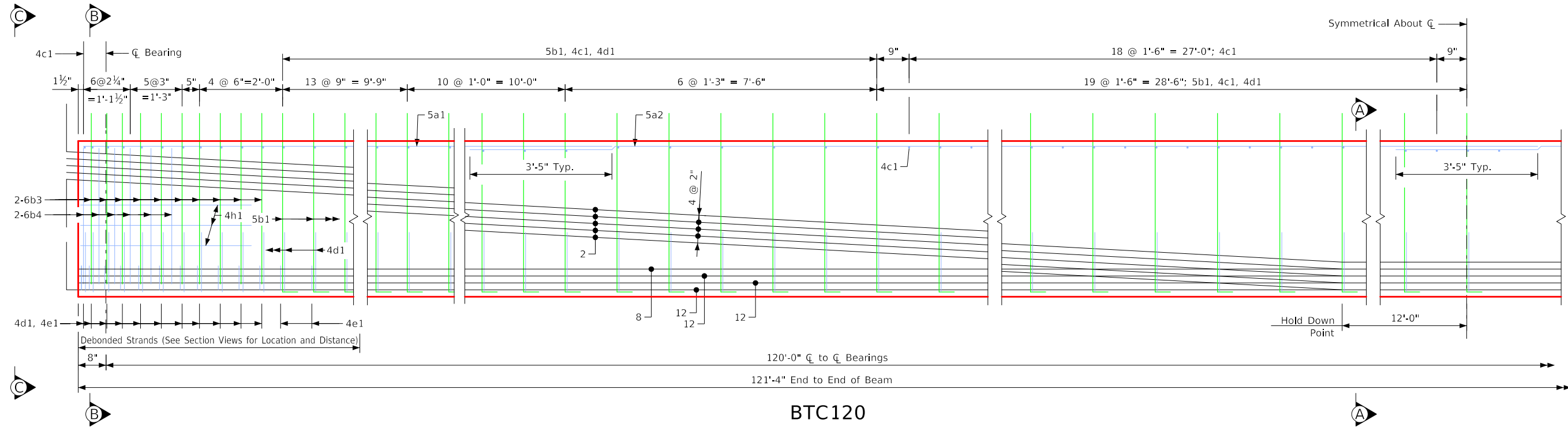
Design: AASHTO LRFD, Series of 2017 with minor modifications.

### Alternate Bar Notes:

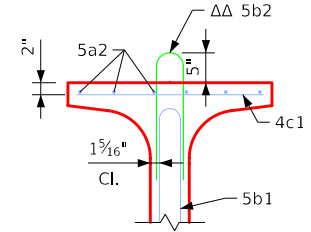
Alternate bars shown in Bent Bar Details may be used in lieu of reinforcing bars shown in bar list. No additional payment shall be made for use of alternate bars.

### BTC120 Beam - Data 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.

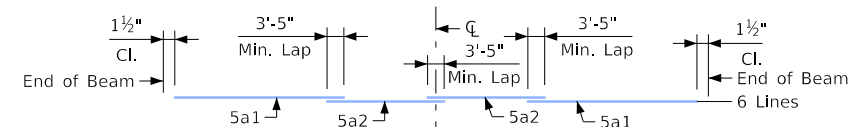


The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.

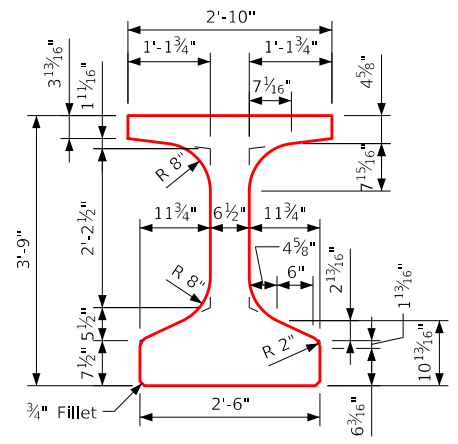


See Alternate Bar Note on Standard Sheet 4719 (sheet 1).

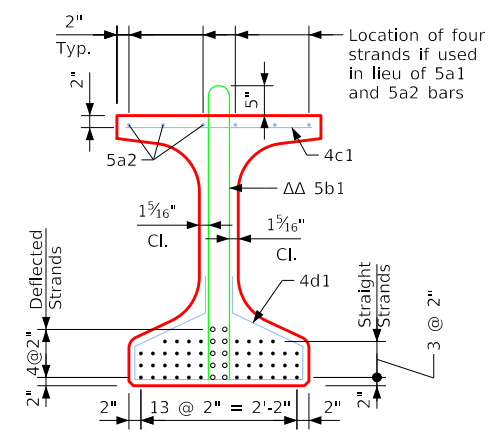
Area = 691.8 in.<sup>2</sup>  
 $\bar{y}_b = 20.74$  in.  
 $I = 178,971$  in.<sup>4</sup>



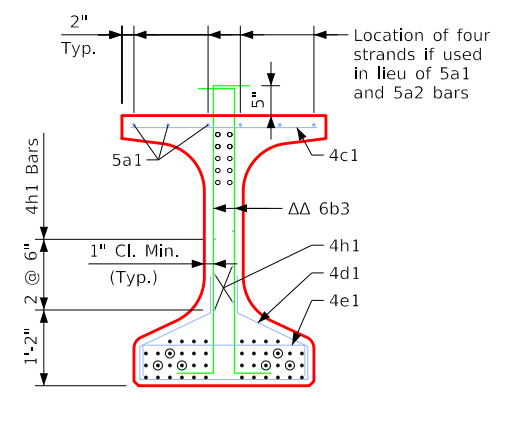
Top Flange Longitudinal Bar Layout



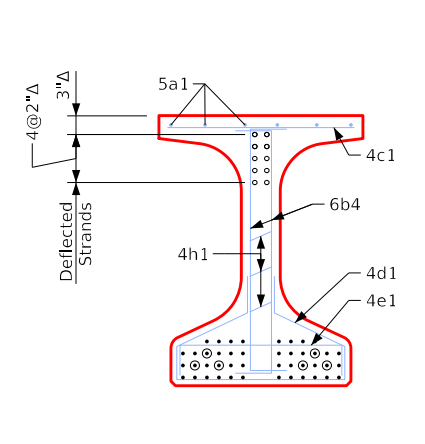
BTC Beam Cross Section



Section A-A



Section B-B

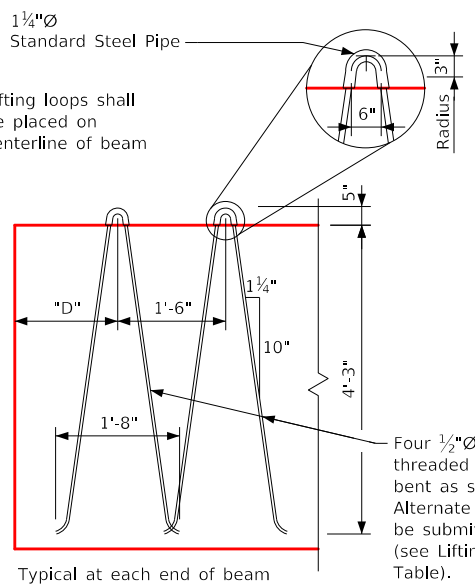


View C-C

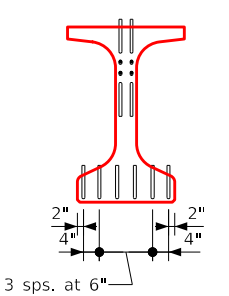
- Deflected Strands
- Δ Dimensions at End of Beam
- ΔΔ Epoxy Coated Bars
- ⊙ Strands Debonded
- 3'-0" from Beam Ends - 3rd Row from Bottom
- 6'-0" from Beam Ends - 2nd Row from Bottom

BTC120 Beam Details

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "C" Beam - 120'-0" Span (Sheet 2 of 2)	Standard Sheet 4719s2	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:32 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

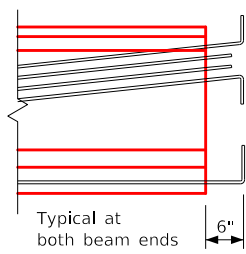


Lifting Loop Detail



Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms

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

Four 1/2 inch diameter 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).

BTD Beam Data

BTD Beam	Span Length $\ell_c$ - $\ell_b$ Bearing	Overall Beam Length (L)	Concrete Strength		Strand Size Dia. (in.)	Number of Strands		Total Initial Prestress (kips) <sup>③</sup>	Hold Down Force (kips)	Camber (in.) <sup>⑤</sup>		Deflection (in.) $\Delta_D$		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 <sup>①</sup> (elastic) $\Delta_1$	Time <sup>②</sup> (plastic) $\Delta_T$				
			HL-93 Loading														
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	0.37"	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	2.34"	3.74"	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	2.75"	4.40"	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	3.14"	5.03"	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	3.46"	5.53"	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	4.04"	6.46"	4.43"	1.11"	9'-3"	51.2	25.3	3543

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.

- 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  $\ell_c$  of span for BTD50 to BTD120, and two steel diaphragms (0.500 kips) placed 20'-0", on either side, of the beam  $\ell_c$  for BTD125 to BTD130. 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  $\ell_c$  of span,  $\Delta_D$ , due to weight of deck and diaphragms for detailing purpose: (A)  $\Delta_D = \Delta_1 + \Delta_T$  for simple span. (B)  $\Delta_D = \Delta_1 + \frac{3}{4}\Delta_T$  for end spans of continuous bridge. (C)  $\Delta_D = \Delta_1 + \frac{1}{2}\Delta_T$  for interior spans of continuous bridge.
- ③ Total initial prestress is based on 72.6%  $f'_s$ ,  $f'_s = 270$  ksi. and  $A_s = 0.217$  in.<sup>2</sup>.
- 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.<sup>2</sup>) 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)

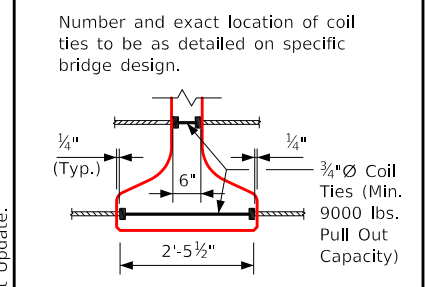
When expansion joints are used, concrete sealer shall be applied to the prestressed beam end sections. The sealing shall be in accordance with materials I.M.570 (Fabricator Application) and I.M.491.12 (Contractor Application). Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.

Lifting Loop And Overhang Table

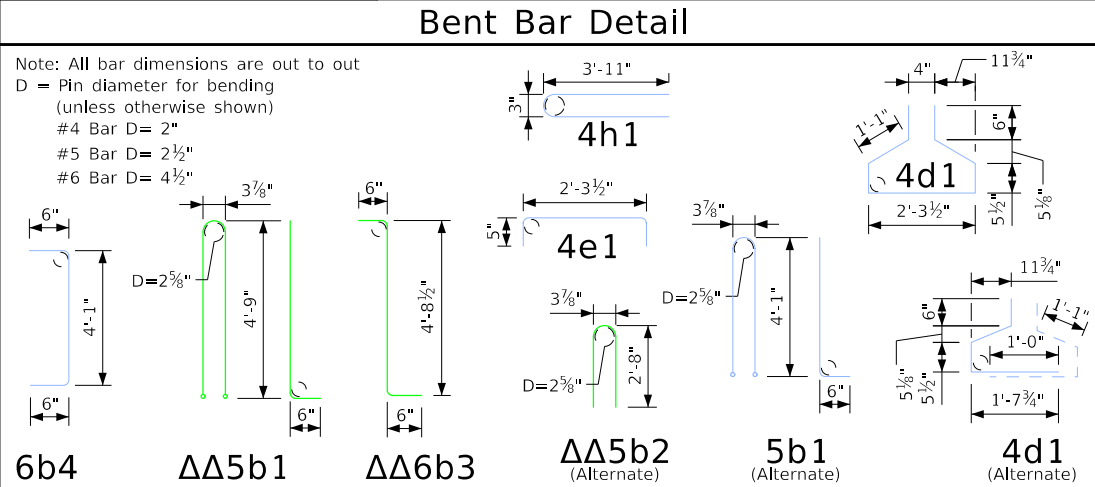
Beams	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
BTD50-BTD80	1	4	2'-0"	**
BTD85-BTD90	2	4	2'-0"	**
BTD95	2	4	2'-0"	10
BTD100	2	4	3'-9"	9
BTD105	2	4	6'-3"	11
BTD110	2	4	8'-2"	11
BTD115	2	4	8'-3"	11
BTD120	2	4	9'-3"	14
BTD125	2	4	9'-3"	14
BTD130	2	4	9'-3"	14

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

Lifting loops shall carry loads equally.



Coil Tie Detail



Bent Bar Detail

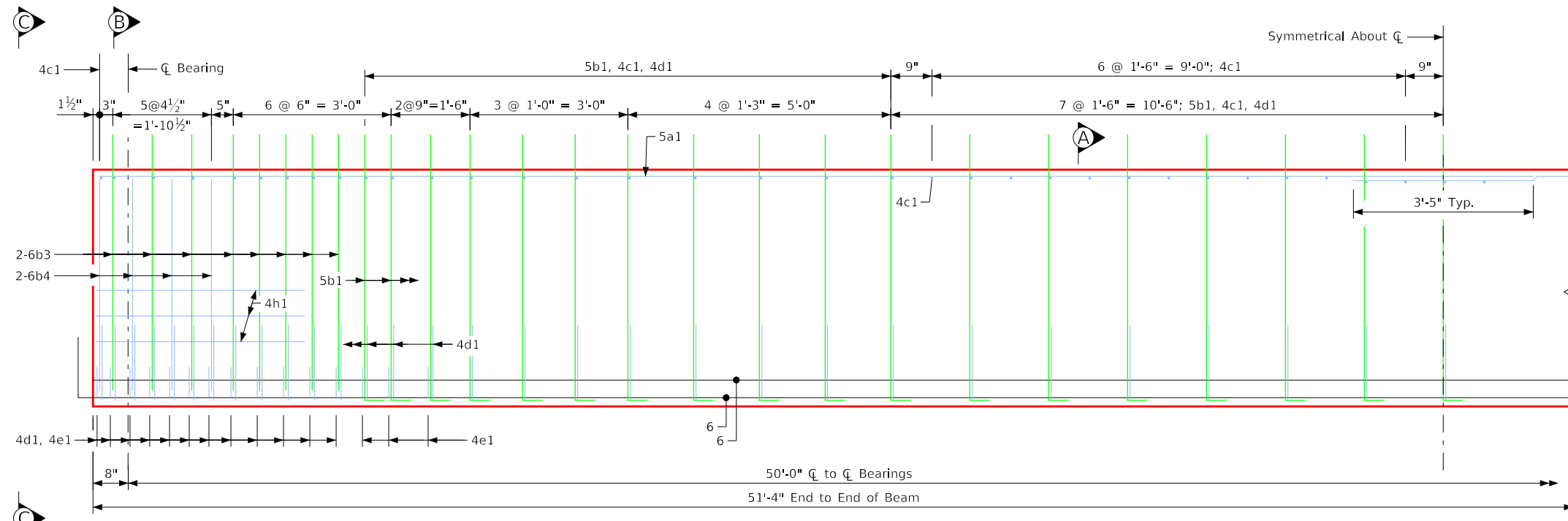
Note: All bar dimensions are out to out D = Pin diameter for bending (unless otherwise shown) #4 Bar D= 2" #5 Bar D= 2 1/2" #6 Bar D= 4 1/2"

Reinforcing Bar List

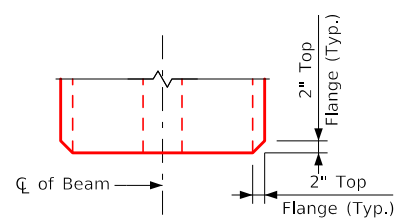
Beam	BTD50	BTD55	BTD60	BTD65	BTD70	BTD75	BTD80	BTD85	BTD90	BTD95	BTD100	BTD105	BTD110	BTD115	BTD120	BTD125	BTD130	Beam																						
Bar Shape	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	Bar																					
5a1	12	27'-3"	12	29'-9"	12	32'-3"	12	34'-9"	12	37'-3"	12	39'-9"	12	24'-0"	12	26'-6"	12	29'-0"	5a1																					
5a2	—	—	—	—	—	—	—	—	6	40'-0"	6	40'-0"	6	40'-0"	6	40'-0"	6	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"	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"	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"	20	5'-1"	20	5'-1"	20	5'-1"	20	5'-1"	24	5'-1"	24	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"	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"	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"	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

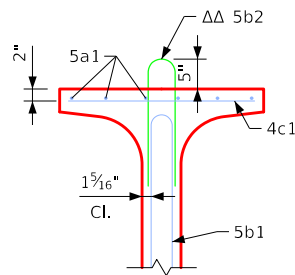


BTD50



Top View

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

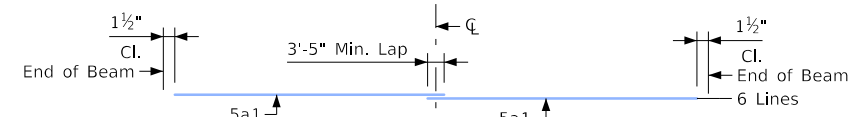


Section A-A (Alternate)

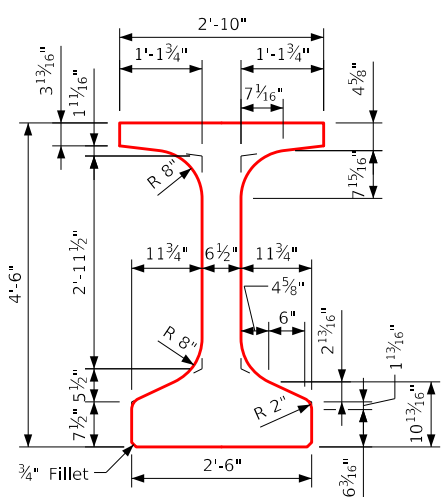
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

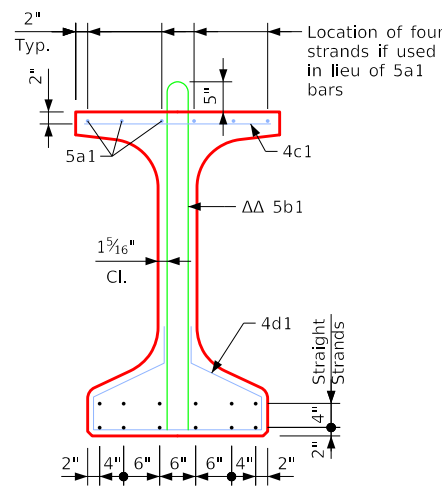
Beam Section Properties



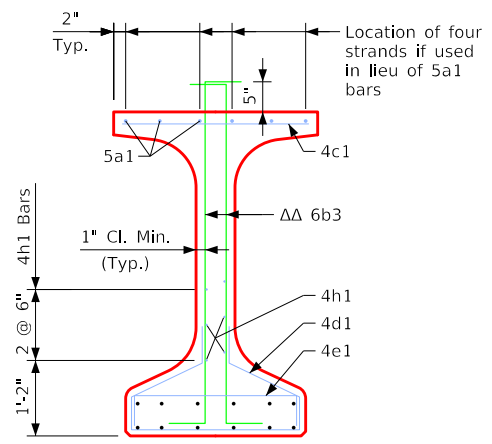
Top Flange Longitudinal Bar Layout



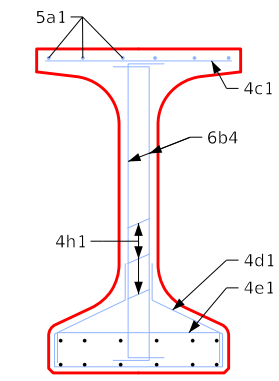
BTD Beam Cross Section



Section A-A



Section B-B



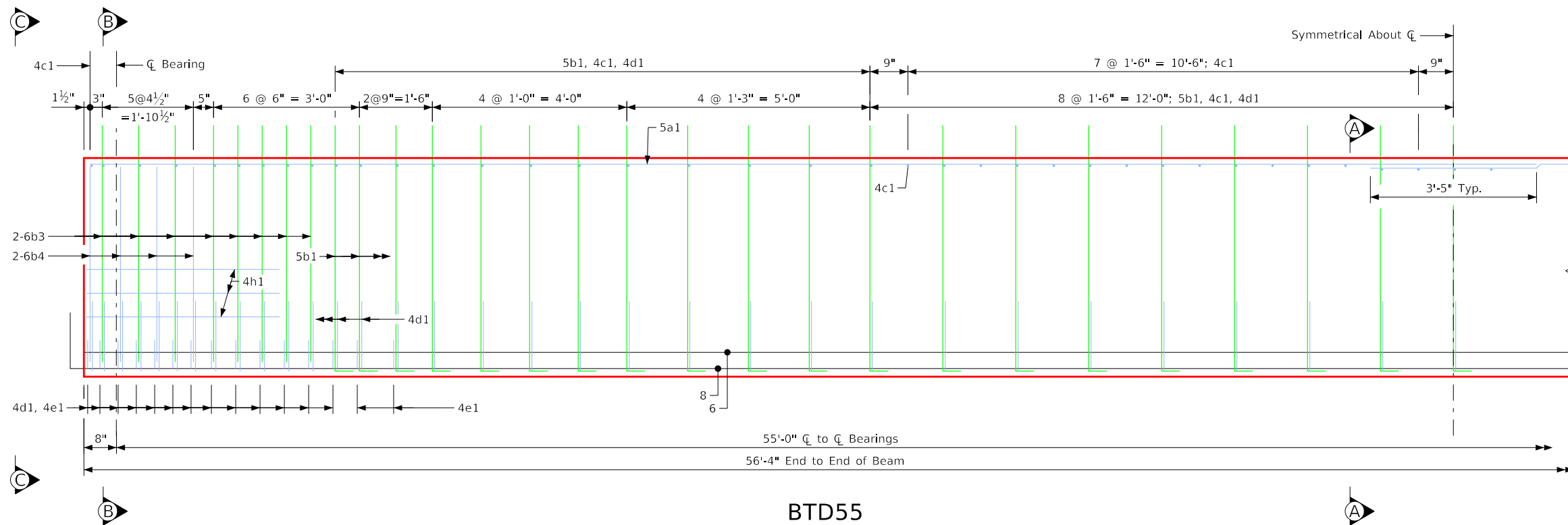
View C-C

Δ Epoxy Coated Bars

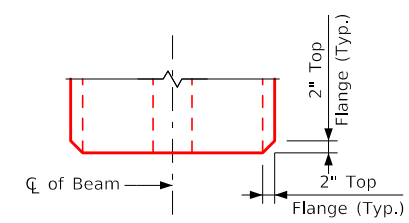
### BTD50 Beam Details

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.

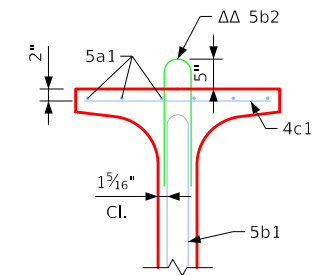
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 50'-0" Span	Standard Sheet 4731	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:34 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTD55



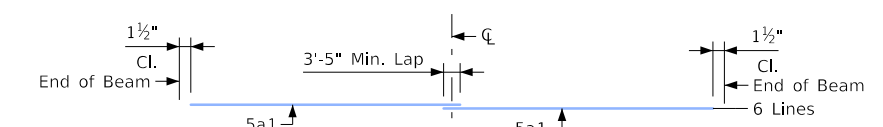
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



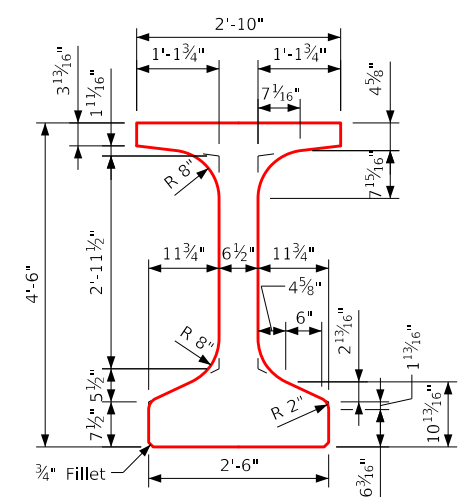
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

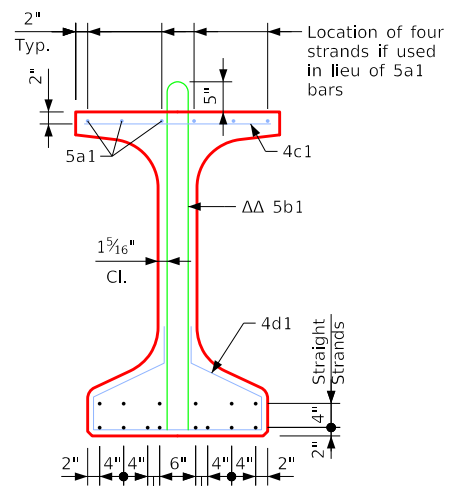
**Beam Section Properties**



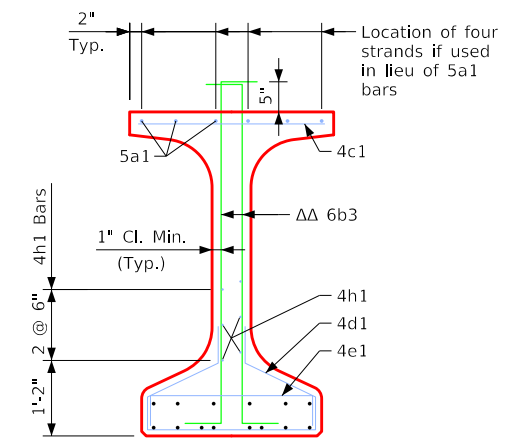
**Top Flange Longitudinal Bar Layout**



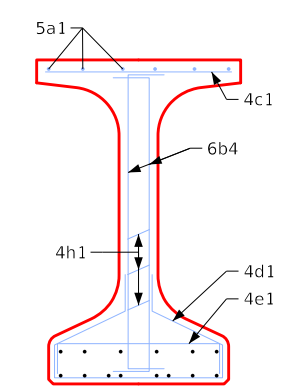
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**



**View C-C**

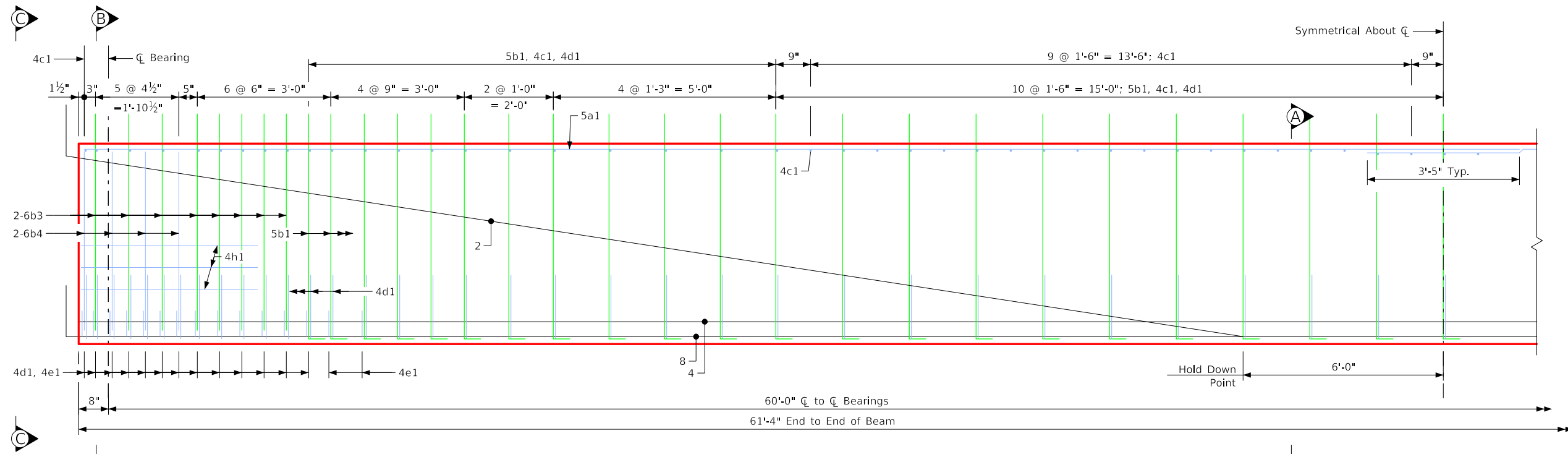
Δ Epoxy Coated Bars

**BTD55 Beam Details**

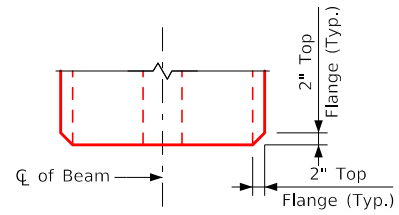
Revision 08-09: Added Strands to Sections A-A, B-B, & C-C. Issued 05-04. Beams.dgn - 4732 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 55'-0" Span	Standard Sheet 4732	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:35 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

Issued 05-04  
 Revision 08-09: Added Strands to Sections A-A, B-B, & C-C.  
 Revised 04-2026: Corrected detailing error showing 4th 6b4 bar from end of beam drawn extending through top of beam, as well as an additional 4c1 bar drawn next to this bar. Total 4c1 bar quantity is shown as 81 bars.  
 Beams.dgn - 4733 - This Sheet Re-Issued 04-2024. Sheet Format Update.

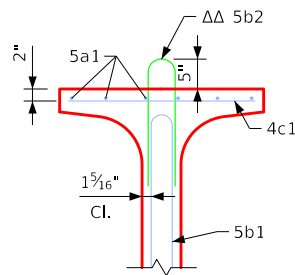


**BTD60**



**Top View**

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

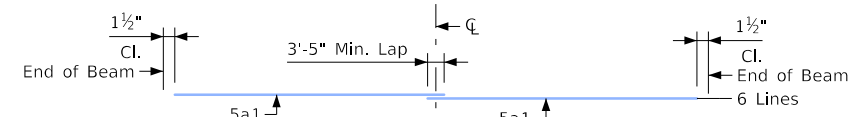


**Section A-A (Alternate)**

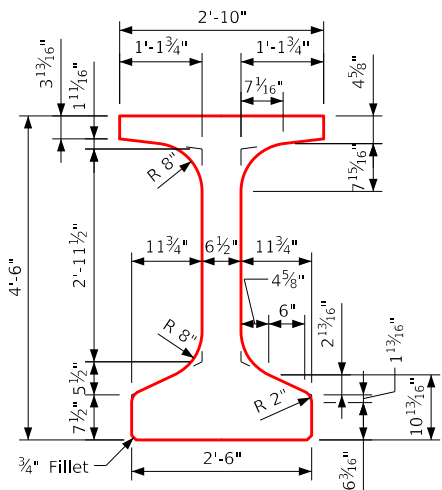
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

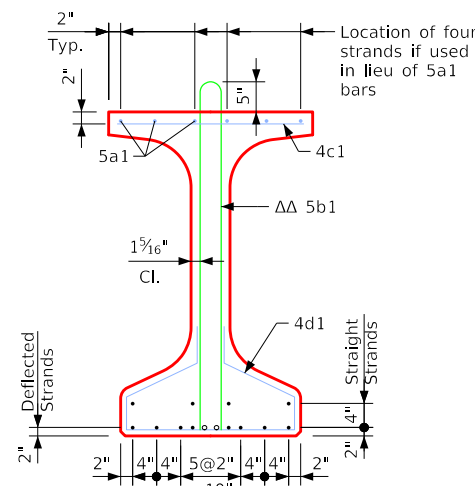
**Beam Section Properties**



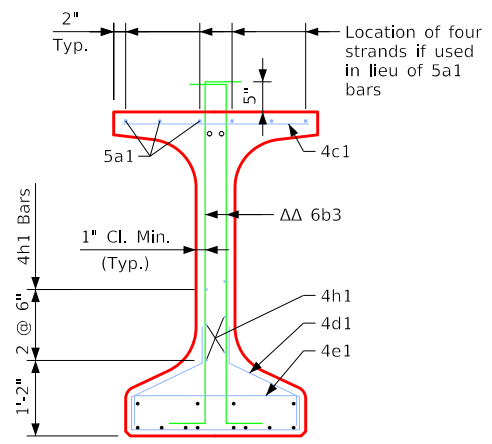
**Top Flange Longitudinal Bar Layout**



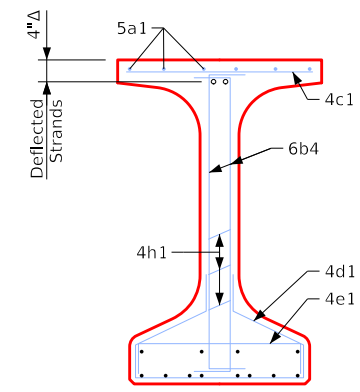
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**

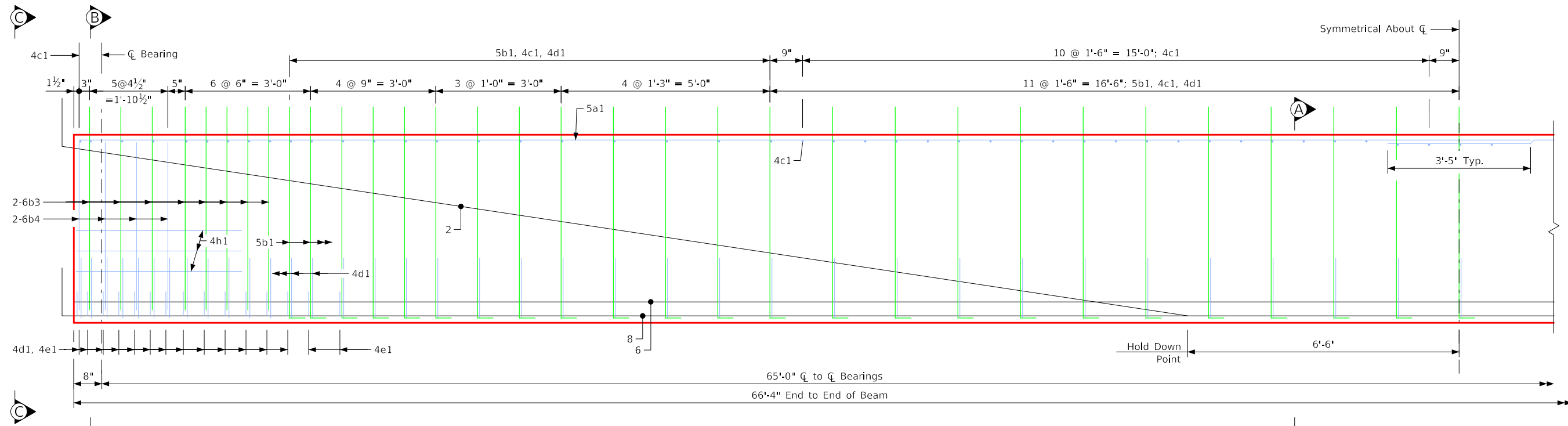


**View C-C**

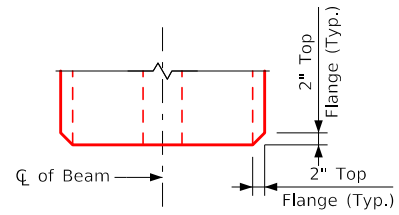
- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

**BTD60 Beam Details**

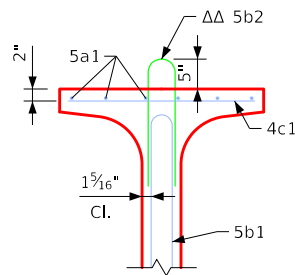
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 60'-0" Span	Standard Sheet 4733	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:35 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTD65



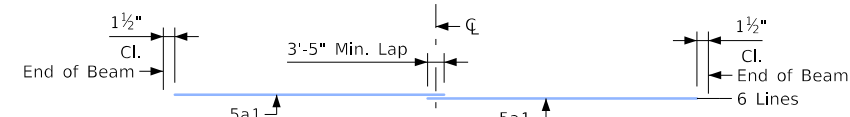
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



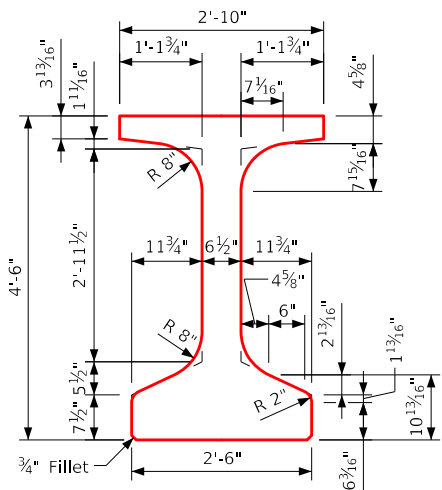
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

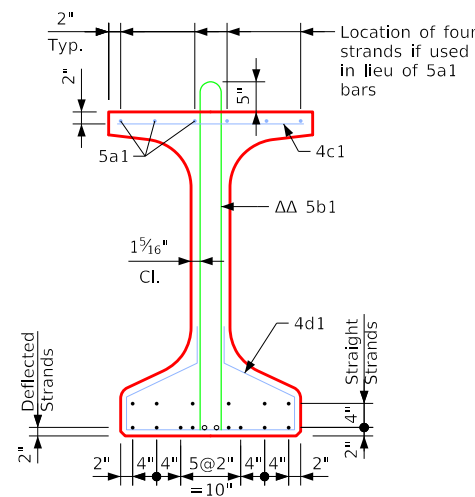
**Beam Section Properties**



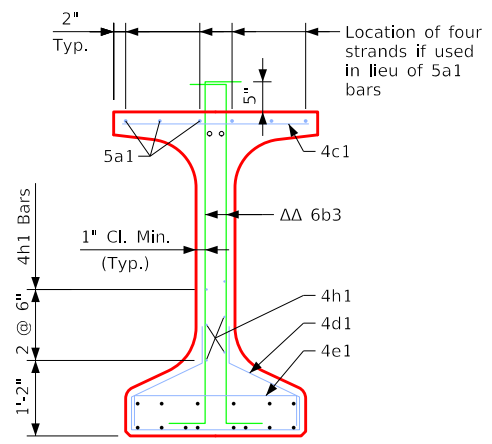
**Top Flange Longitudinal Bar Layout**



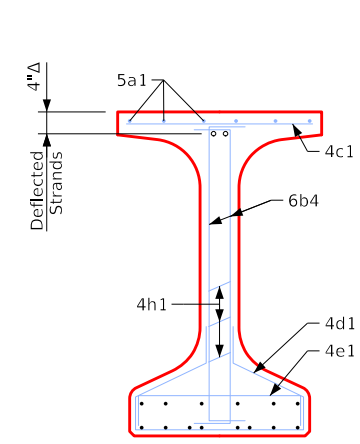
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**



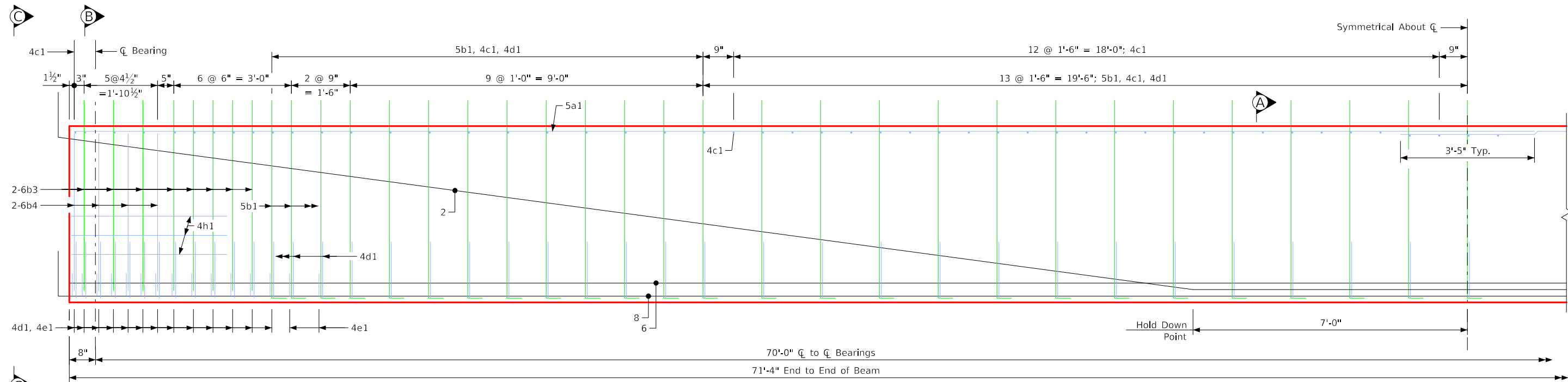
**View C-C**

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

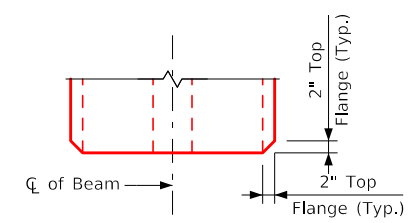
**BTD65 Beam Details**

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.

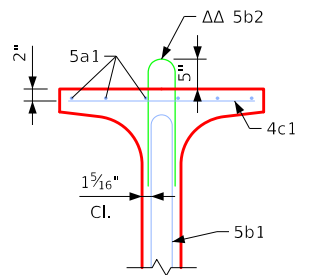
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 65'-0" Span	Standard Sheet 4734	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:36 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



**BTD70**



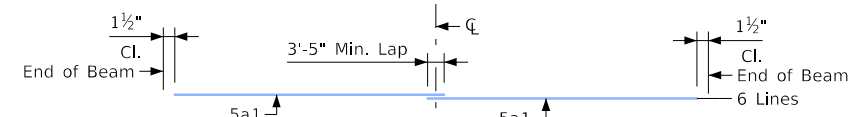
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



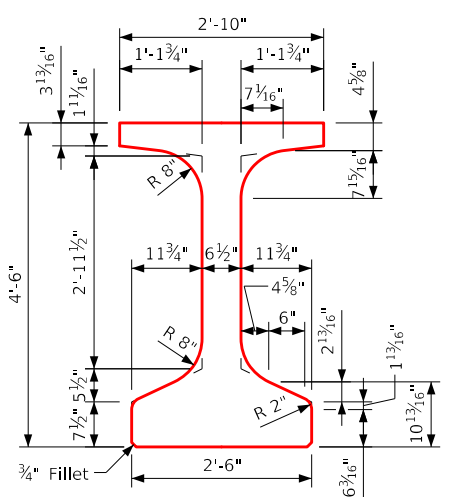
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

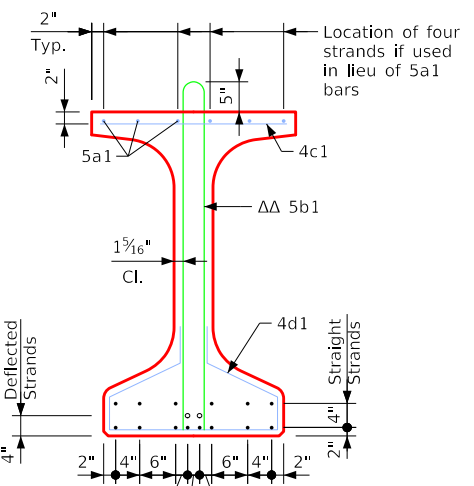
**Beam Section Properties**



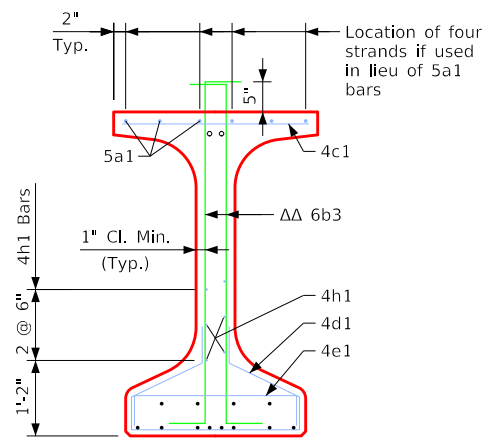
**Top Flange Longitudinal Bar Layout**



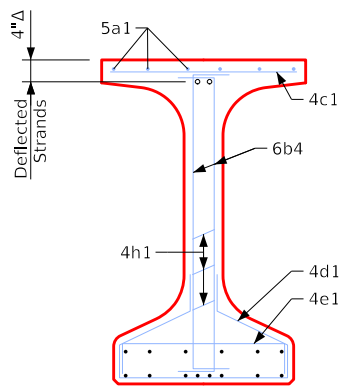
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**



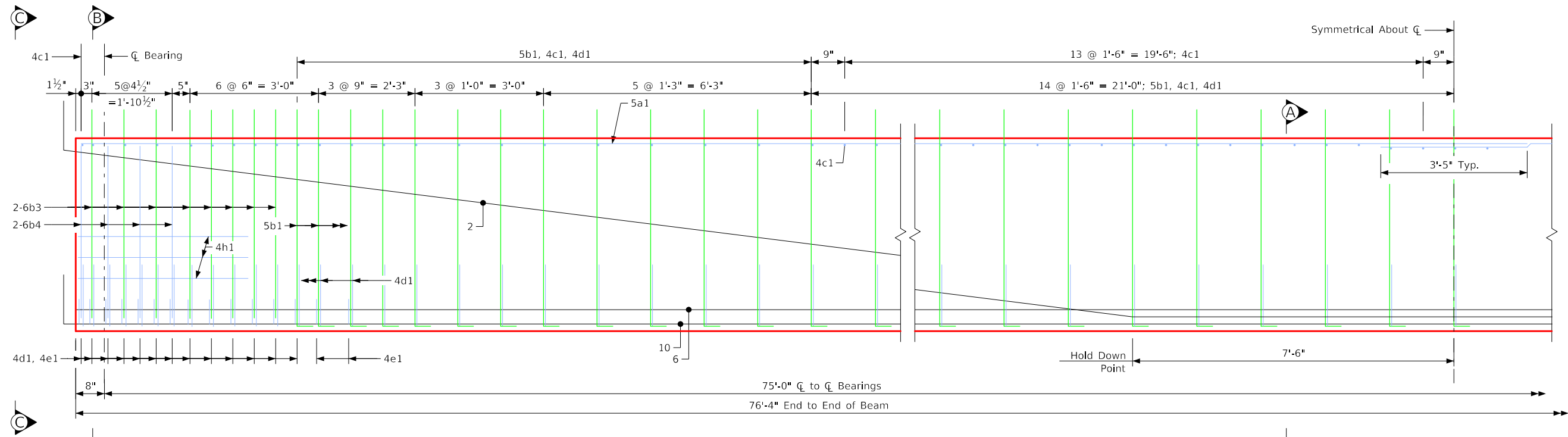
**View C-C**

- o Deflected Strands
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  Epoxy Coated Bars

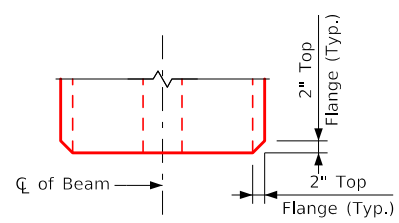
**BTD70 Beam Details**

Revision 10-07: 5b2 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.

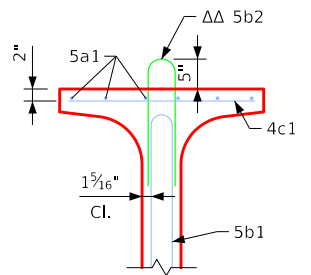
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 70'-0" Span	Standard Sheet 4735	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:37 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



**BTD75**



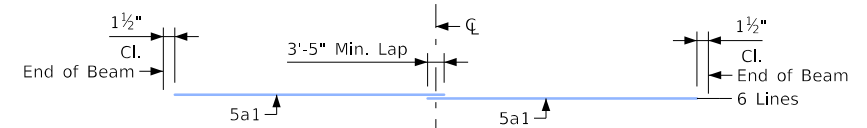
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



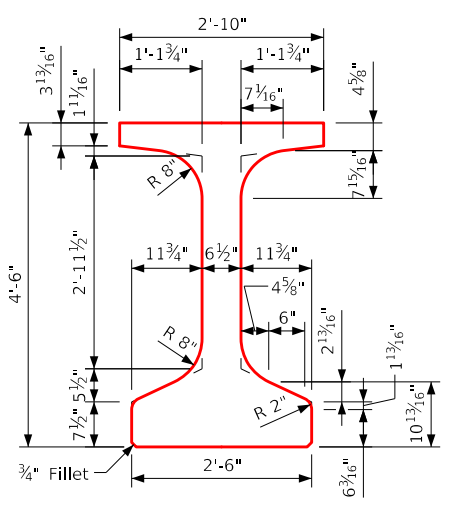
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

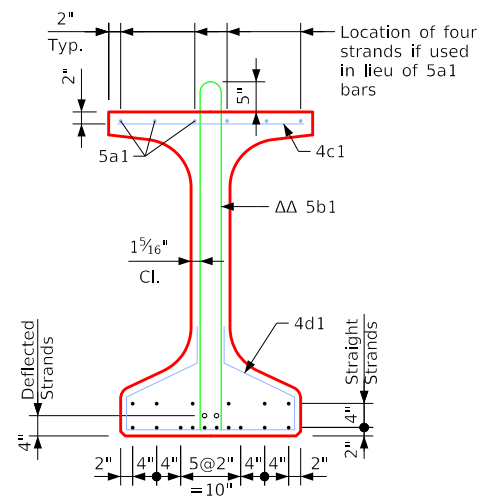
**Beam Section Properties**



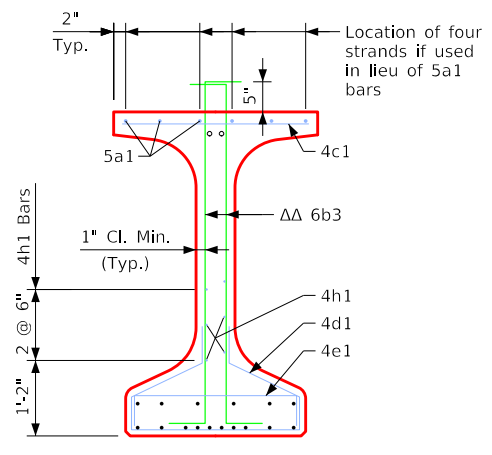
**Top Flange Longitudinal Bar Layout**



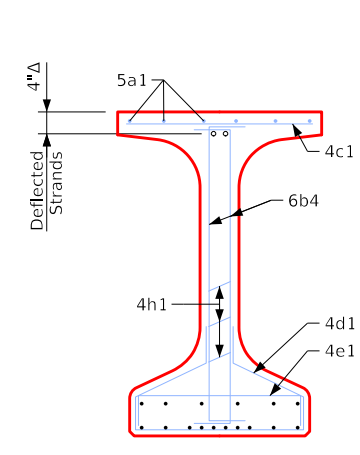
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**



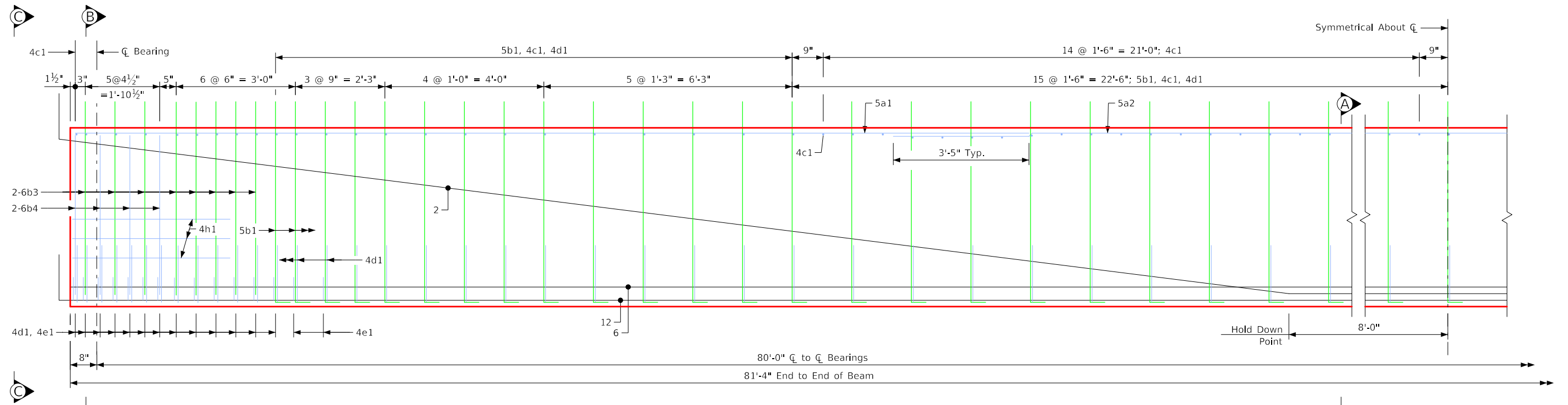
**View C-C**

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

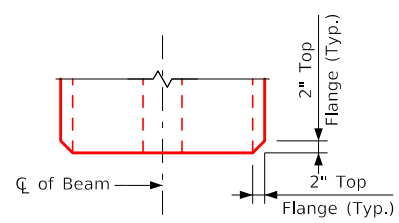
**BTD75 Beam Details**

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.

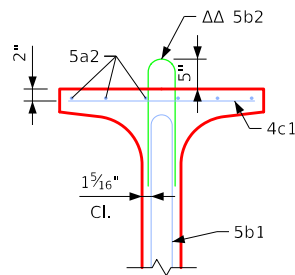
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 75'-0" Span	Standard Sheet 4736	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:38 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



**BTD80**



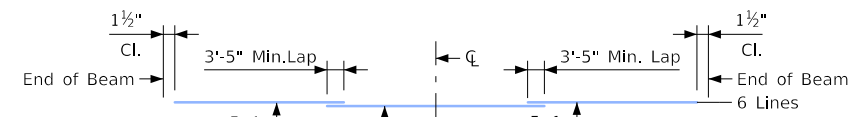
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



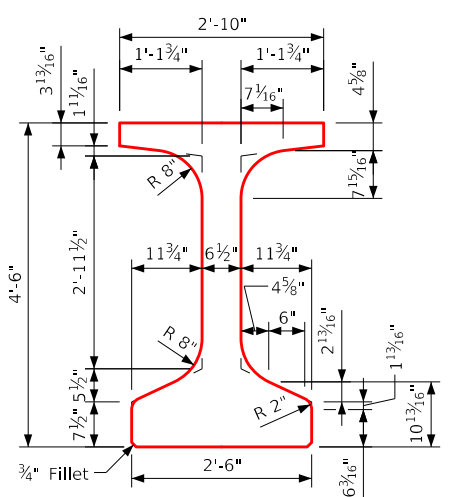
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b$  = 24.64 in.  
 $I$  = 285,860 in.<sup>4</sup>

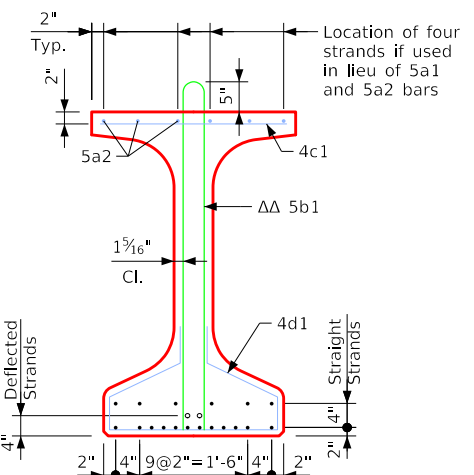
**Beam Section Properties**



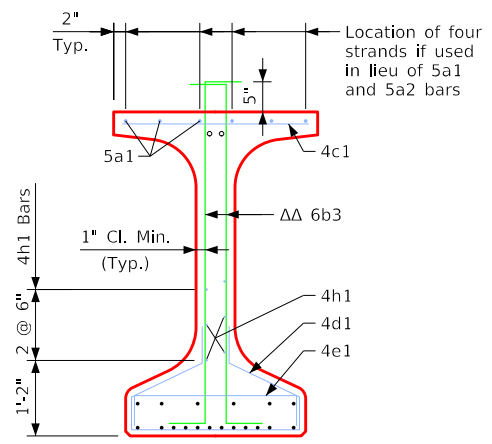
**Top Flange Longitudinal Bar Layout**



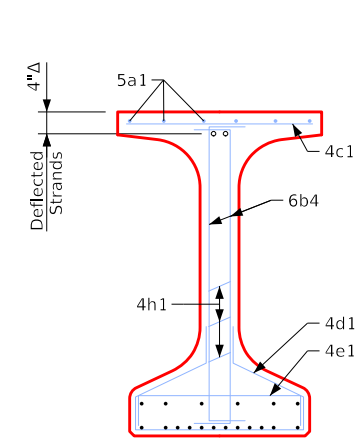
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**



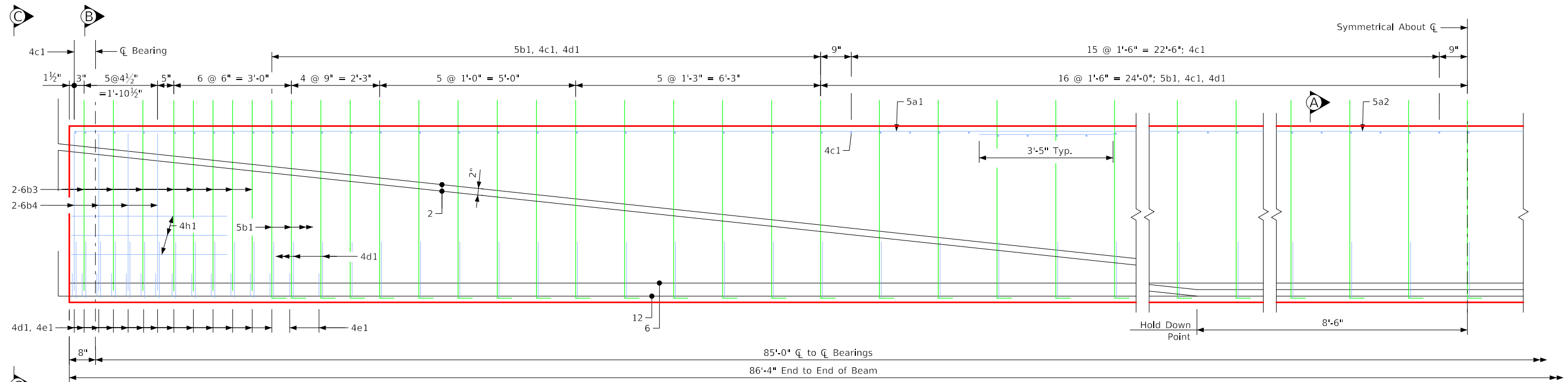
**View C-C**

- o Deflected Strands
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  Epoxy Coated Bars

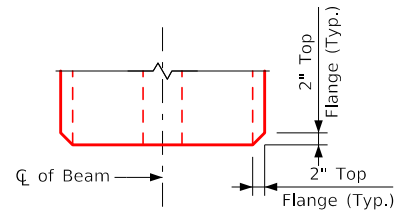
**BTD80 Beam Details**

Revision 10-07: 5b2 Bar Lengthened to Extend 5 Inches Above Beam Top. Issued 05-04. Beams.dgn - 4737 - This Sheet Re-issued 04-2024. Sheet Format Update.

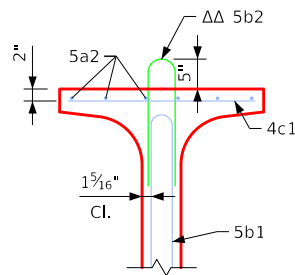
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 80'-0" Span	Standard Sheet 4737	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:39 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



**BTD85**



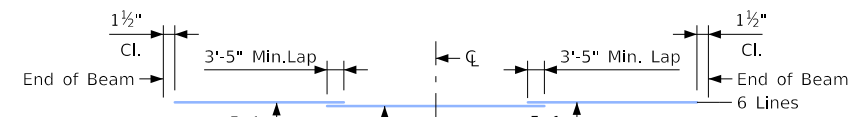
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



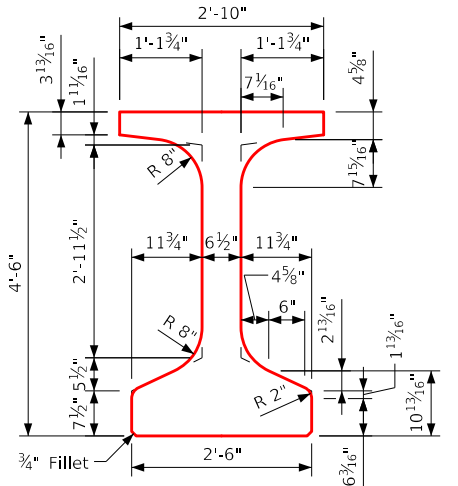
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

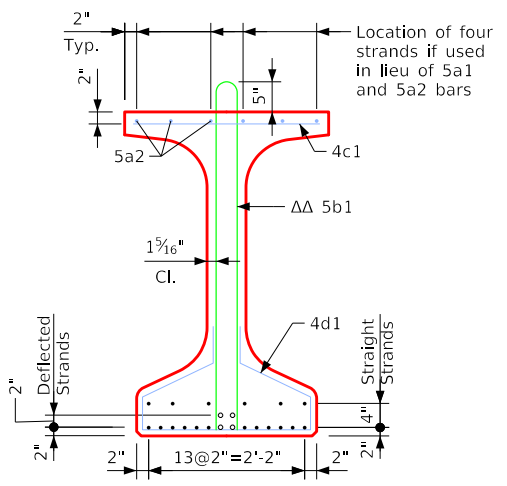
**Beam Section Properties**



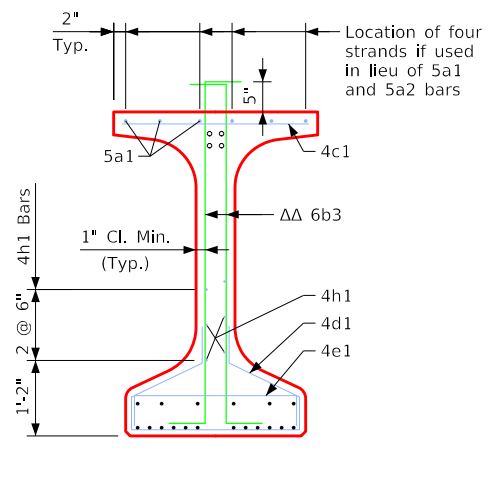
**Top Flange Longitudinal Bar Layout**



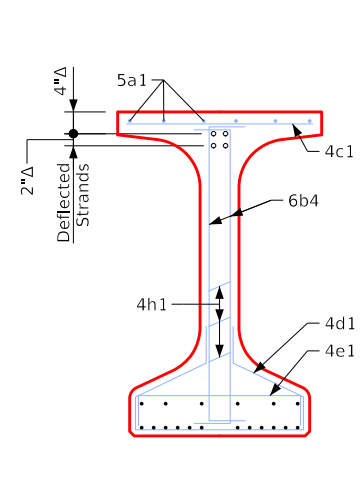
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**



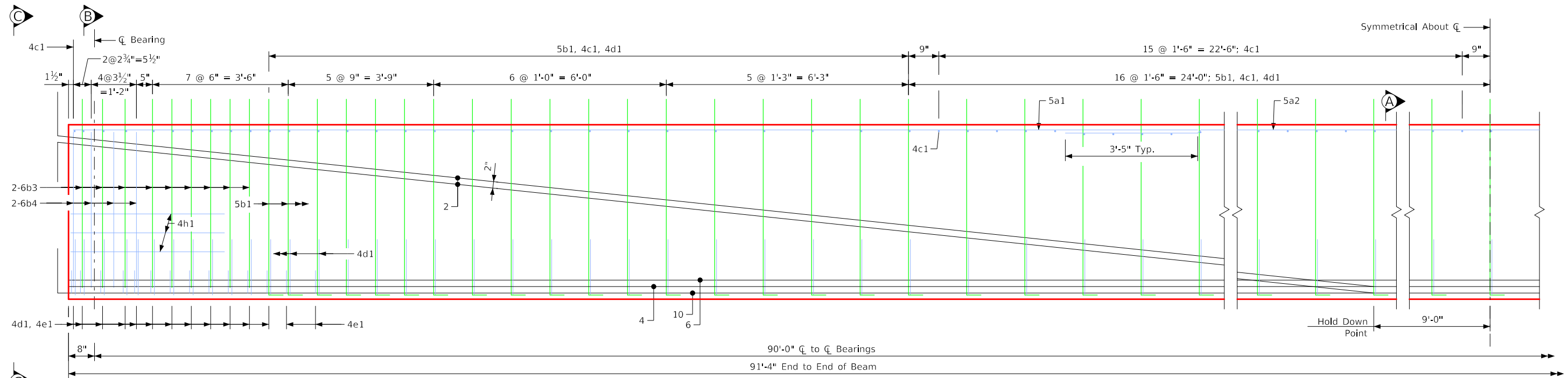
**View C-C**

- o Deflected Strands
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  Epoxy Coated Bars

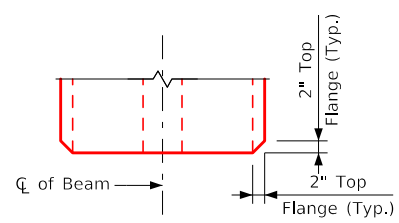
**BTD85 Beam Details**

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.

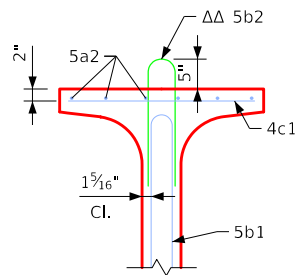
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 85'-0" Span	Standard Sheet 4738	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:40 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



**BTD90**



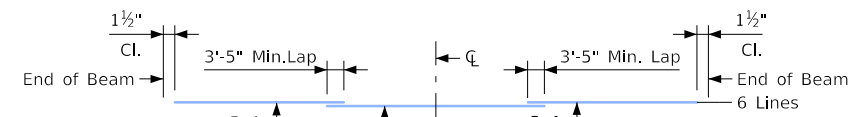
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



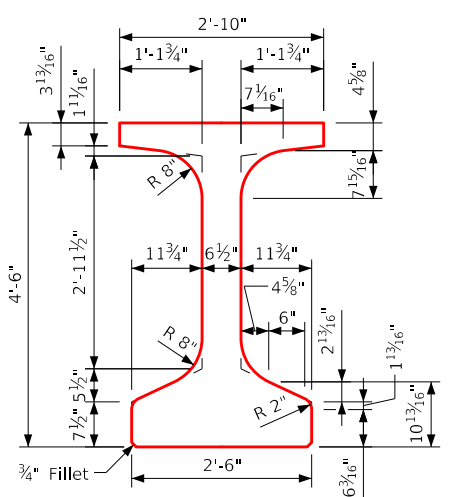
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

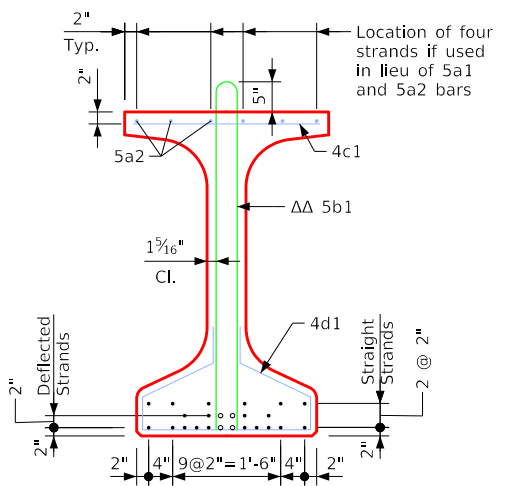
**Beam Section Properties**



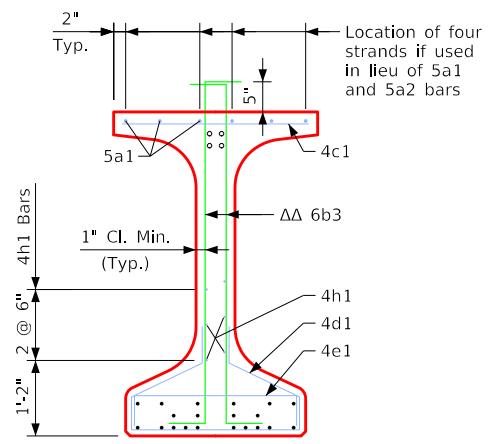
**Top Flange Longitudinal Bar Layout**



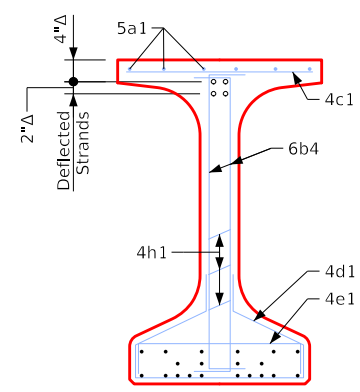
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**



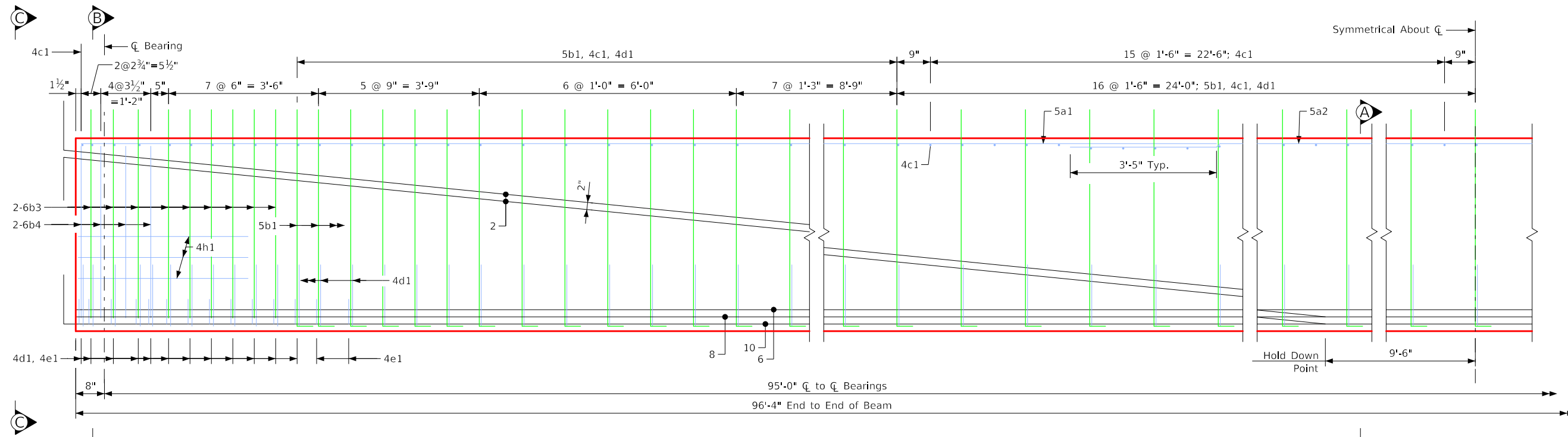
**View C-C**

- o Deflected Strands
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  Epoxy Coated Bars

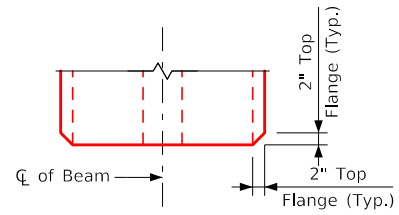
**BTD90 Beam Details**

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
3:49:41 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

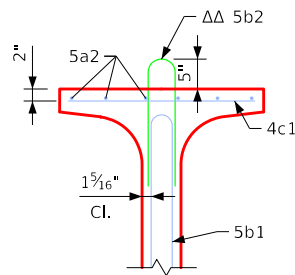


BTD95



Top View

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

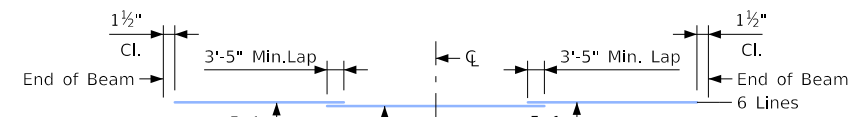


Section A-A (Alternate)

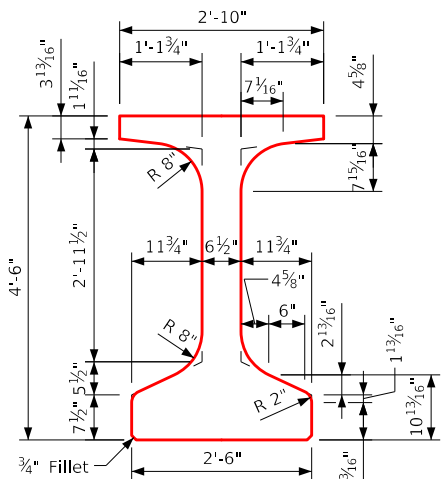
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

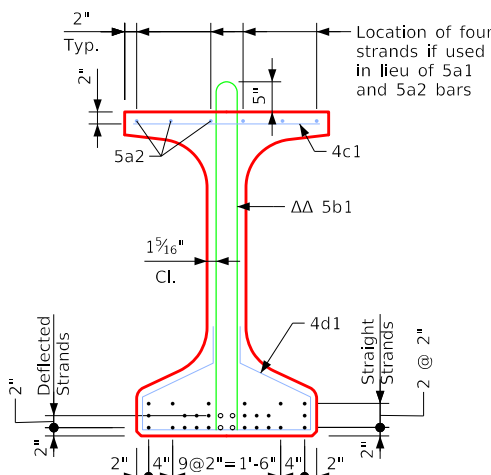
Beam Section Properties



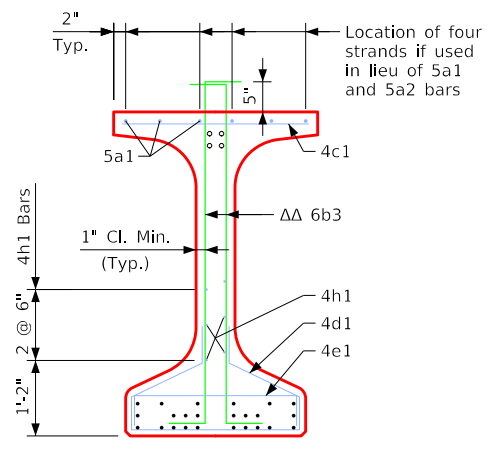
Top Flange Longitudinal Bar Layout



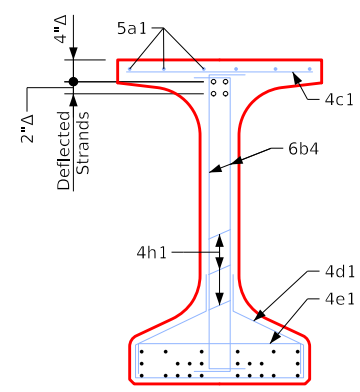
BTD Beam Cross Section



Section A-A



Section B-B



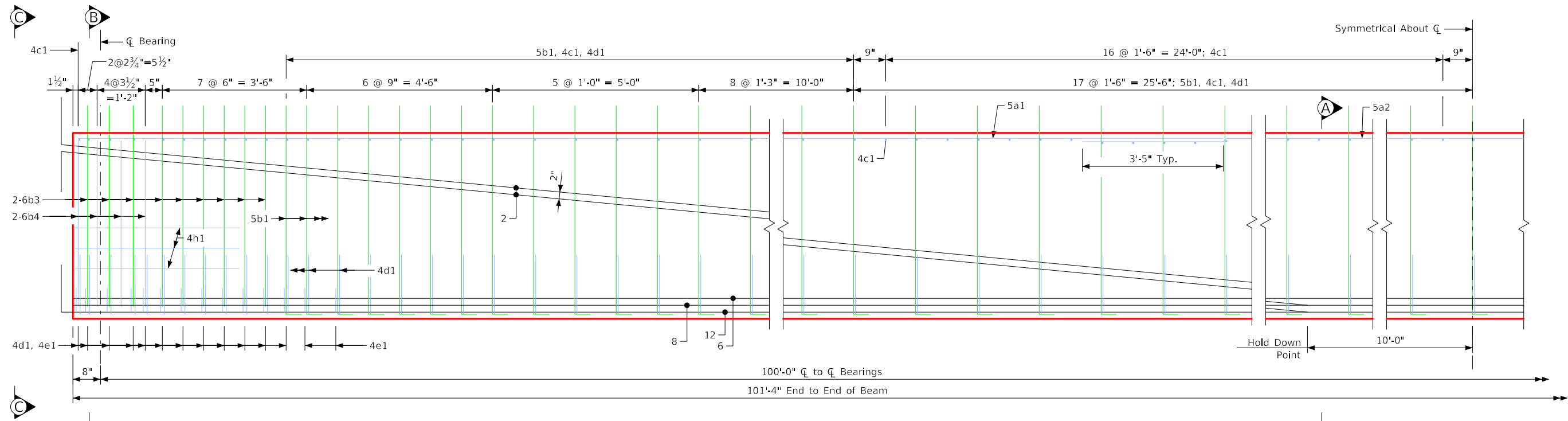
View C-C

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

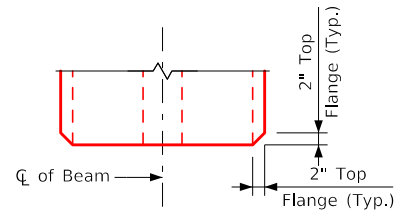
BTD95 Beam Details

Revision 10-07: 5b2 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
3:49:42 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

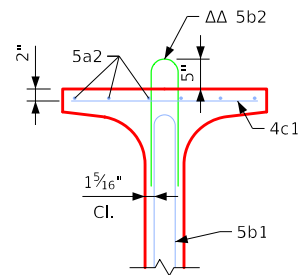


BTD100



Top View

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

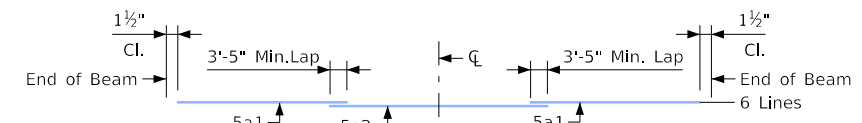


Section A-A (Alternate)

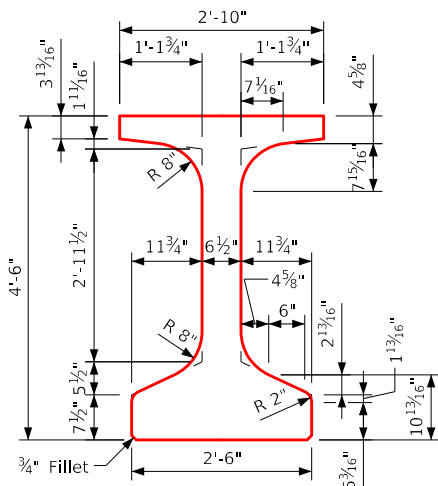
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

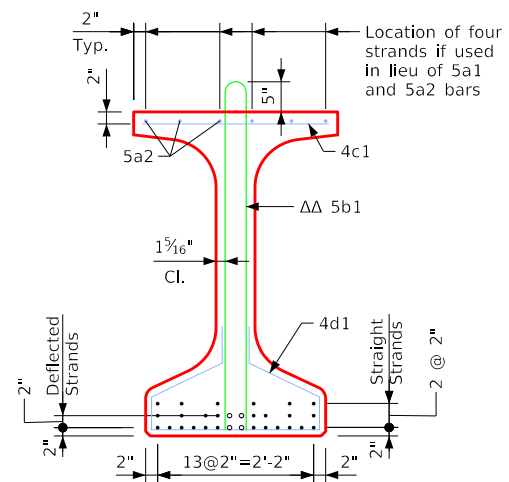
Beam Section Properties



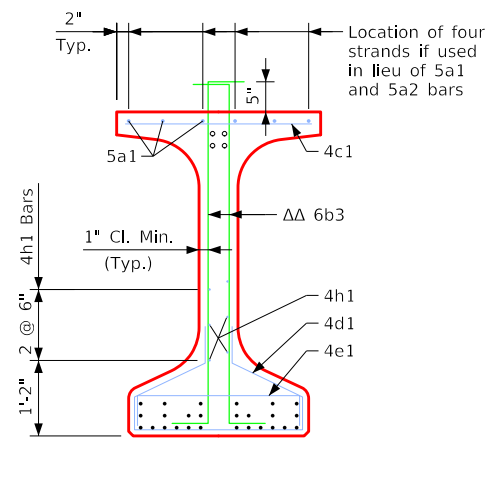
Top Flange Longitudinal Bar Layout



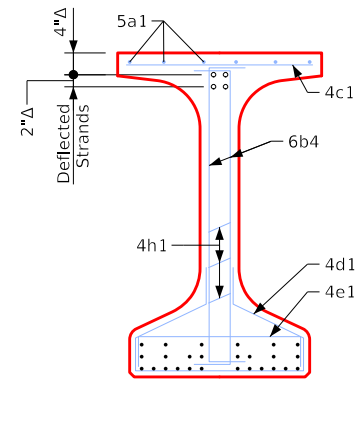
BTD Beam Cross Section



Section A-A



Section B-B



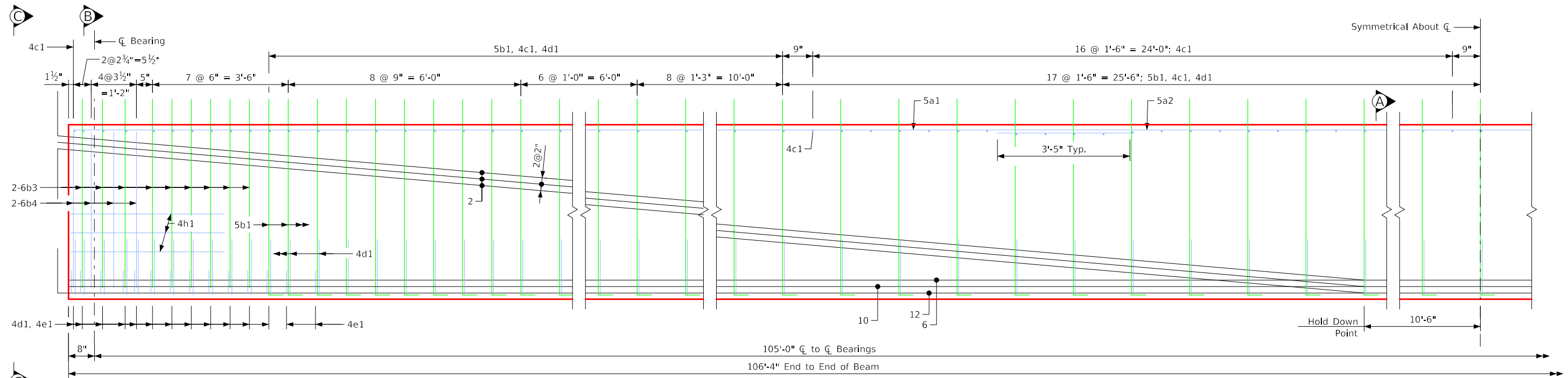
View C-C

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

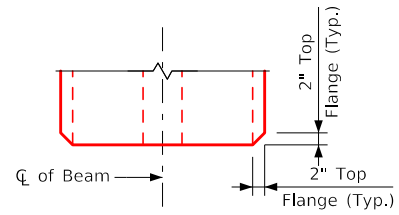
BTD100 Beam Details

Revision 10-07: 5b2 Bar Lengthened to Extend 5 Inches Above Beam Top. Issued 05-04. Beams.dgn - 4741 - This Sheet Re-Issued 04-2024. Sheet Format Update.

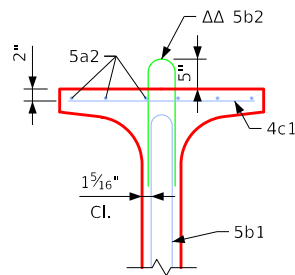
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 100'-0" Span	Standard Sheet 4741	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:43 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTD105



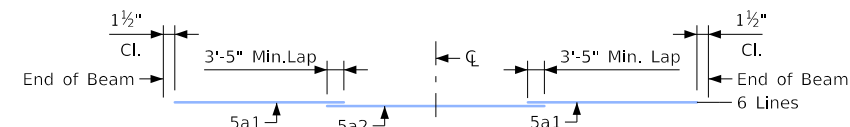
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



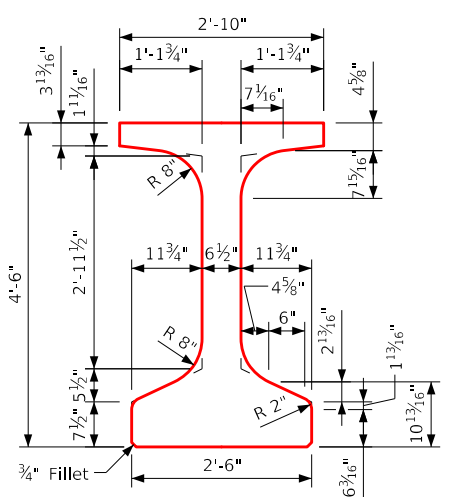
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

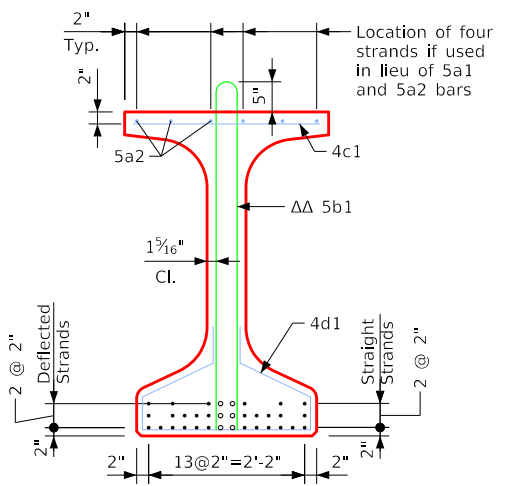
**Beam Section Properties**



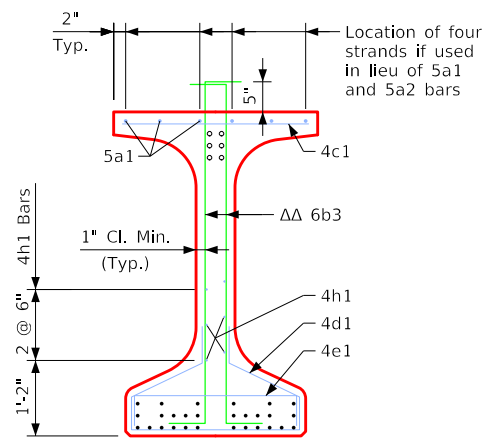
**Top Flange Longitudinal Bar Layout**



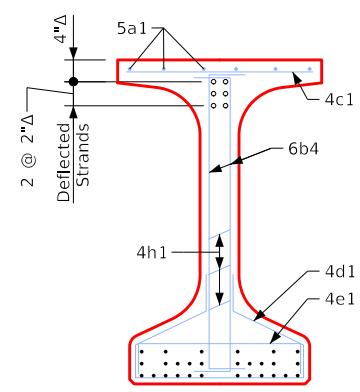
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**



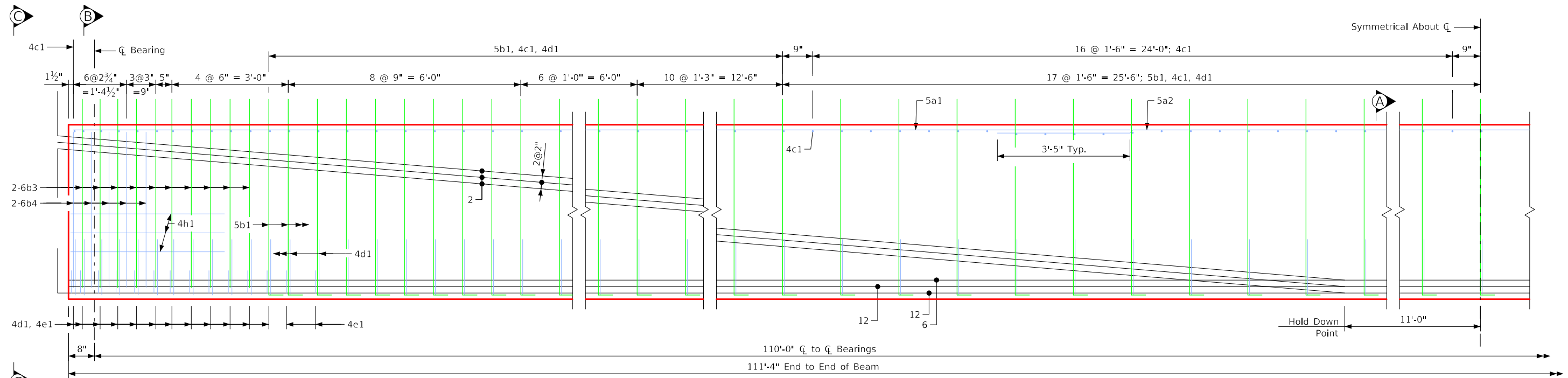
**View C-C**

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

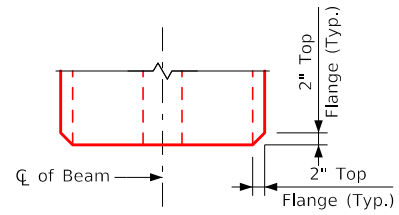
**BTD105 Beam Details**

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
3:49:43 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

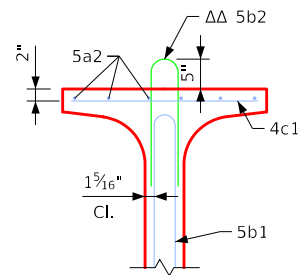


BTD110



Top View

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

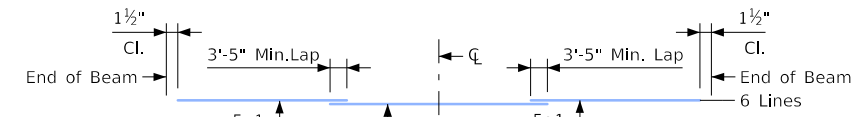


Section A-A (Alternate)

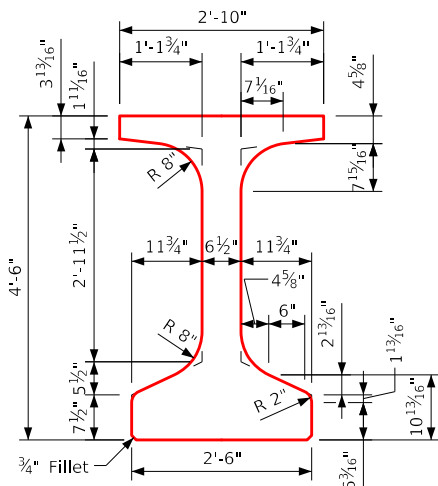
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

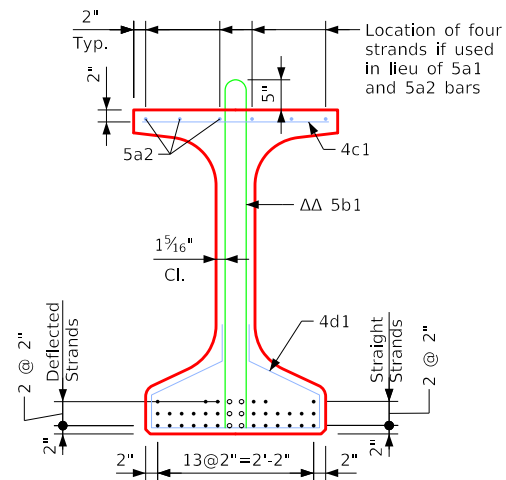
Beam Section Properties



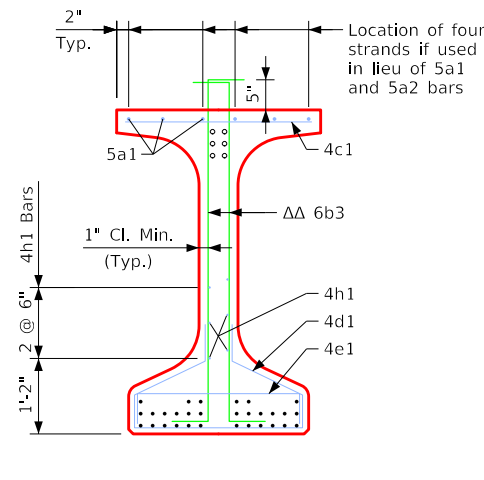
Top Flange Longitudinal Bar Layout



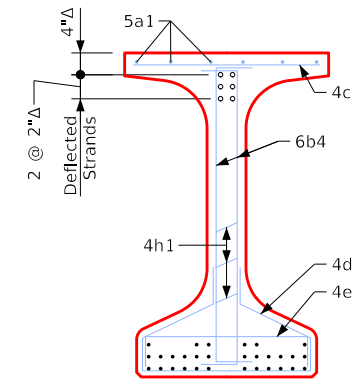
BTD Beam Cross Section



Section A-A



Section B-B



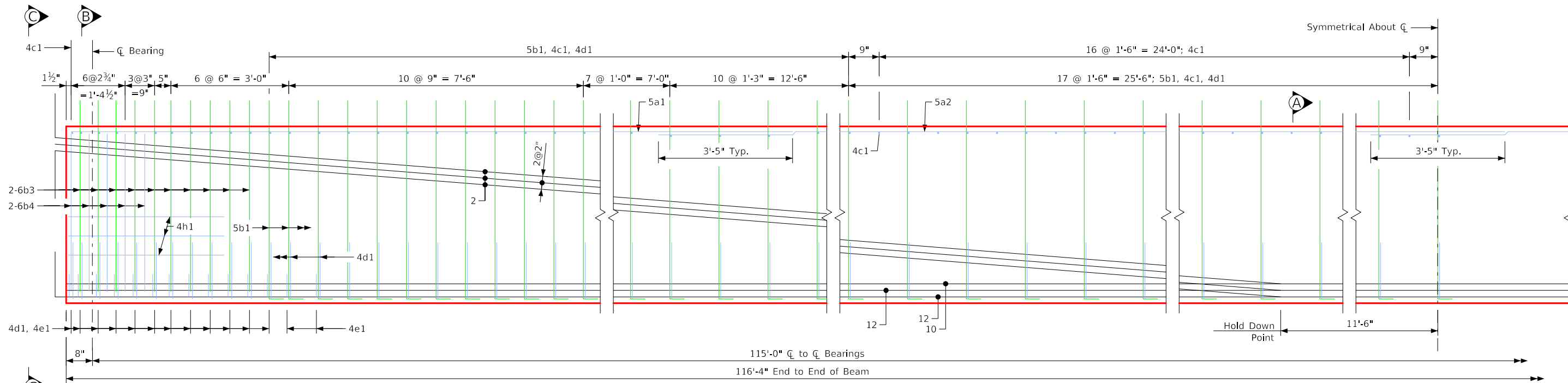
View C-C

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

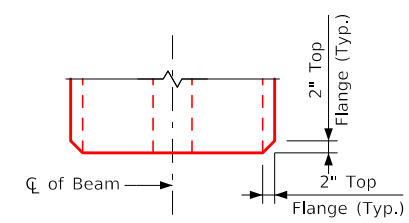
BTD110 Beam Details

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.

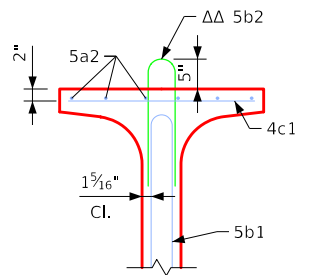
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 110'-0" Span	Standard Sheet 4743	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:44 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTD115



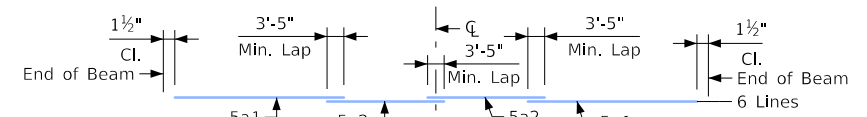
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



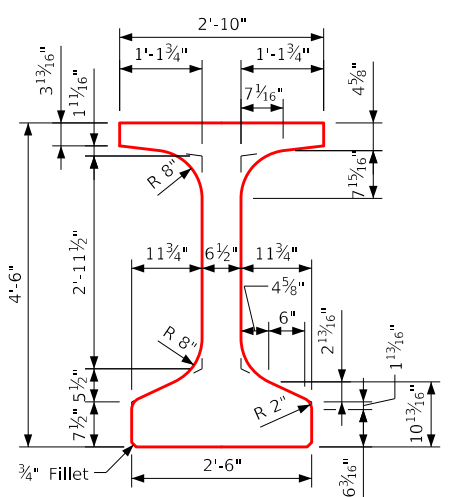
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

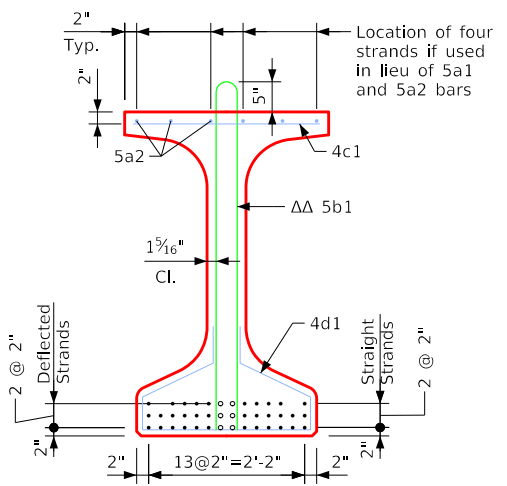
**Beam Section Properties**



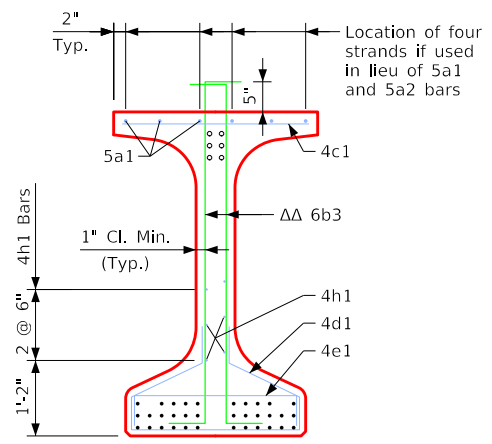
**Top Flange Longitudinal Bar Layout**



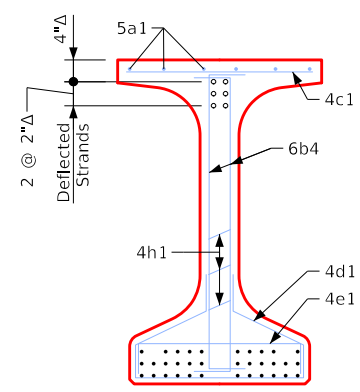
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**



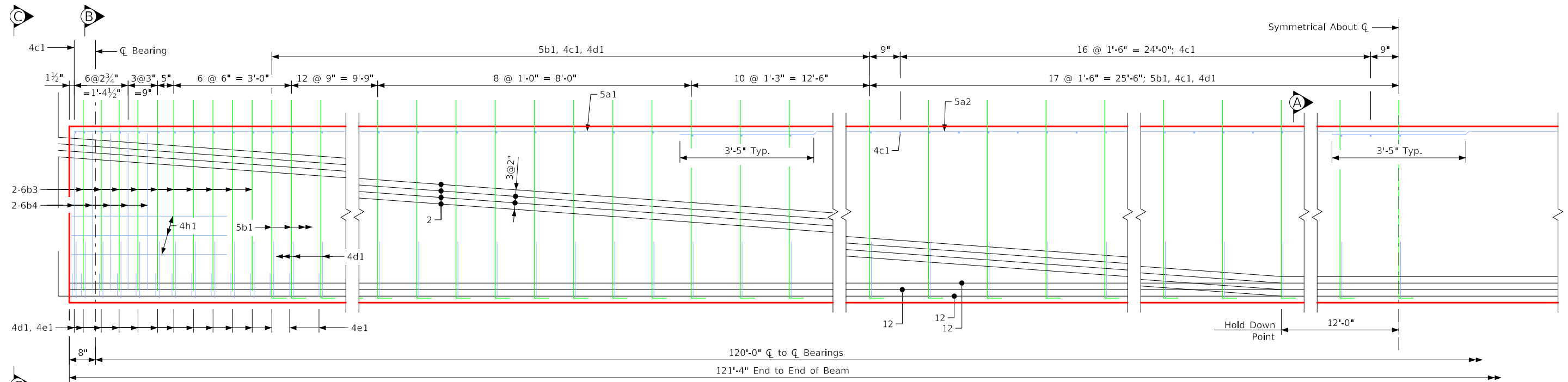
**View C-C**

- Deflected Strands
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  Epoxy Coated Bars

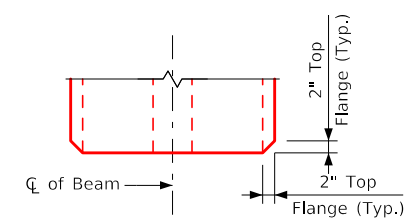
**BTD115 Beam Details**

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.

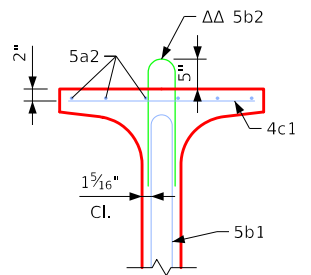
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 115'-0" Span	Standard Sheet 4744	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:45 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



**BTD120**



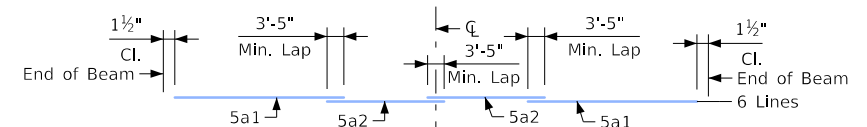
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



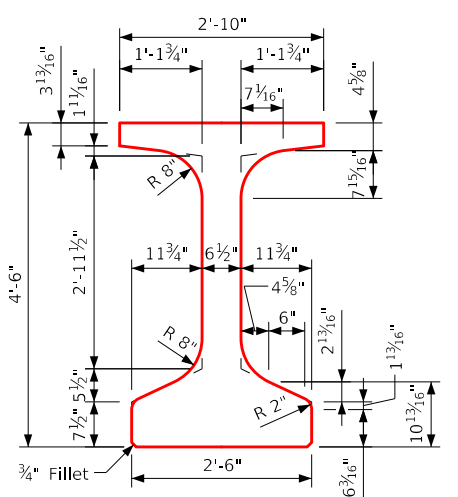
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b$  = 24.64 in.  
I = 285,860 in.<sup>4</sup>

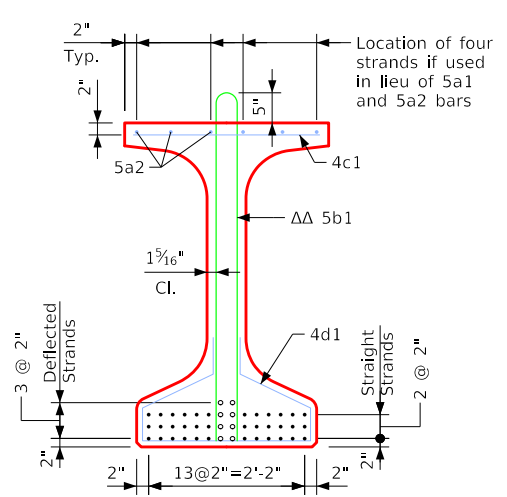
**Beam Section Properties**



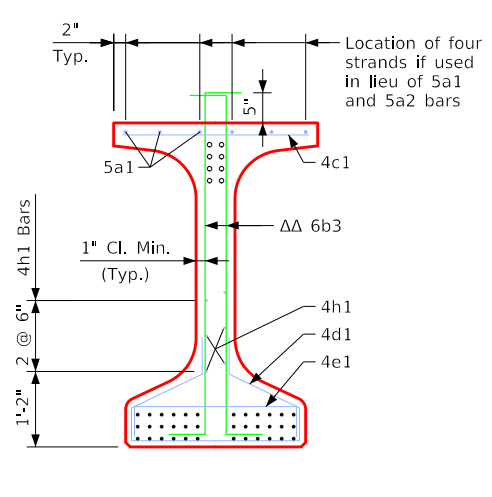
**Top Flange Longitudinal Bar Layout**



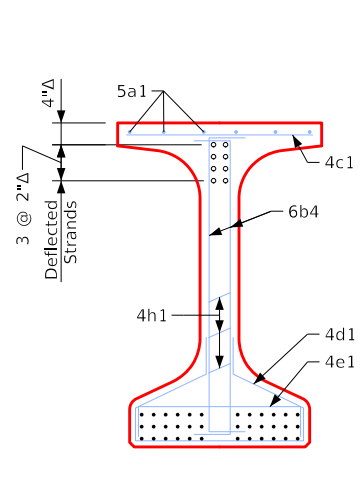
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**

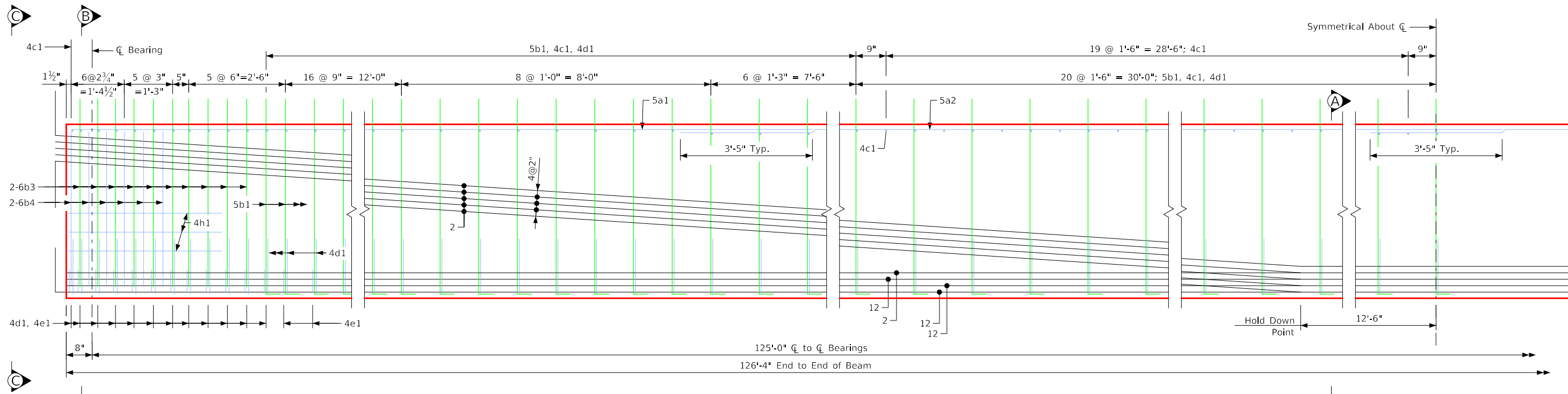


**View C-C**

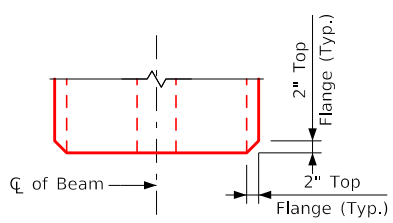
- Deflected Strands
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  Epoxy Coated Bars

<b>BTD120 Beam Details</b>			
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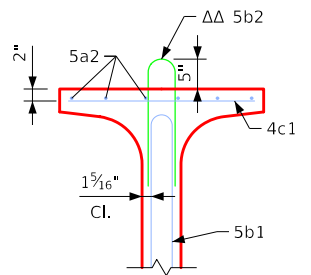
Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top. Issued 05-04. Beams.dgn - 4745 - This Sheet Re-Issued 04-2024. Sheet Format Update.



**BTD125**



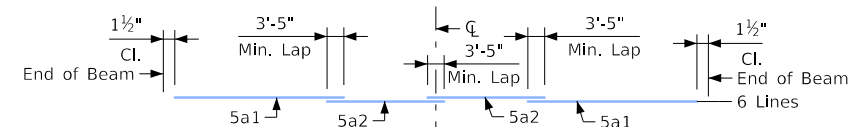
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



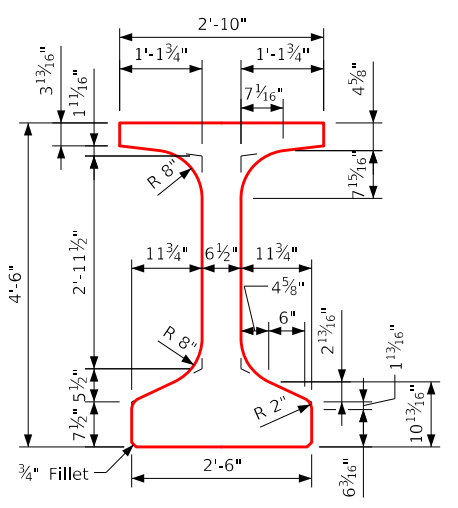
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b$  = 24.64 in.  
I = 285,860 in.<sup>4</sup>

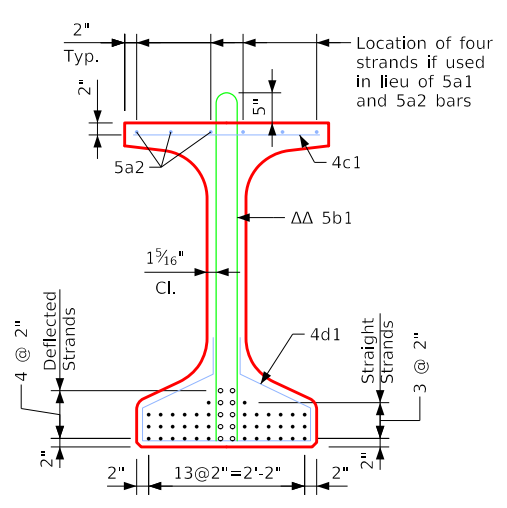
**Beam Section Properties**



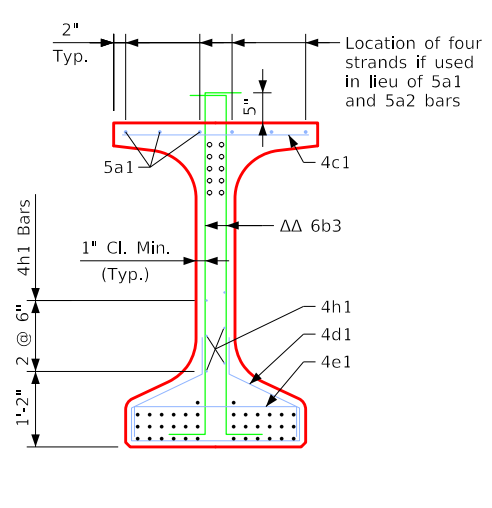
**Top Flange Longitudinal Bar Layout**



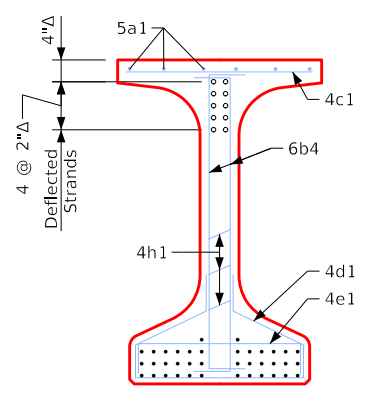
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**



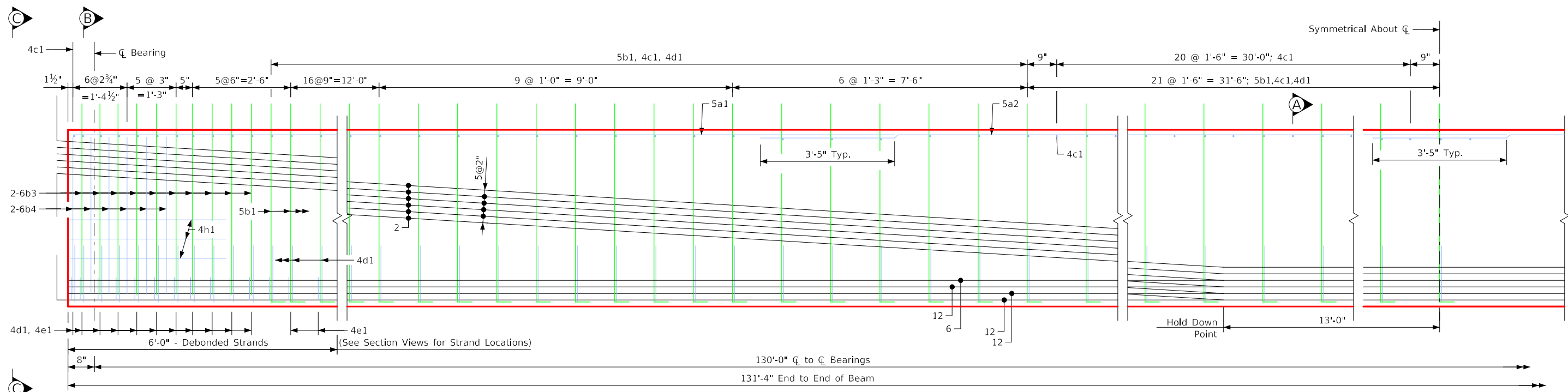
**View C-C**

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

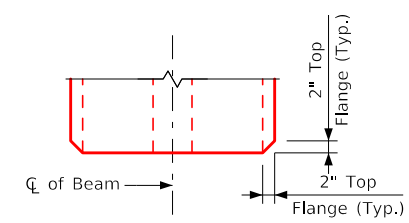
**BTD125 Beam Details**

Issued 05-04.  
 Revision 10-07: 5b2 Bar Lengthened to Extend 5 Inches Above Beam Top.  
 Revised 04-2026: Corrected vertical 5b1, 4c1, 4d1 bar spacing dimension in elevation view to 16@9"=12'-9".  
 Beams.dgn - 4746 - This Sheet Re-Issued 04-2024. Sheet Format Update.

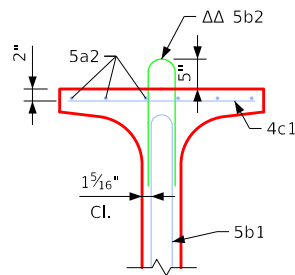
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 125'-0" Span	Standard Sheet 4746	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:47 PM	4/5/2026	bkloss	pw:\NTP\int1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



**BTD130**



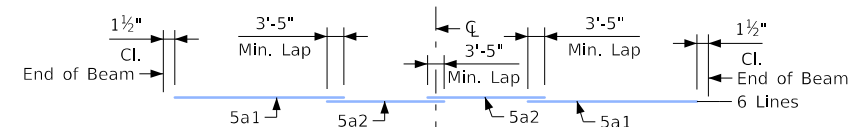
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



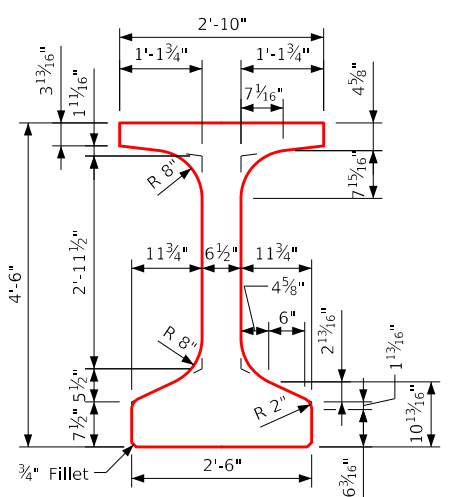
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4730.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

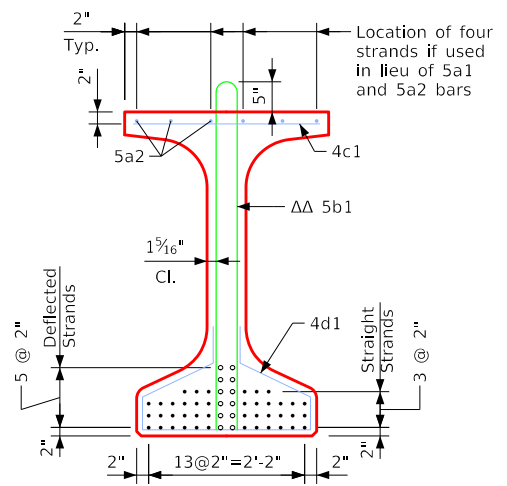
**Beam Section Properties**



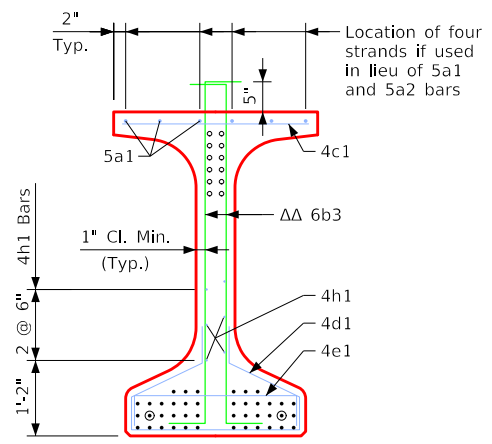
**Top Flange Longitudinal Bar Layout**



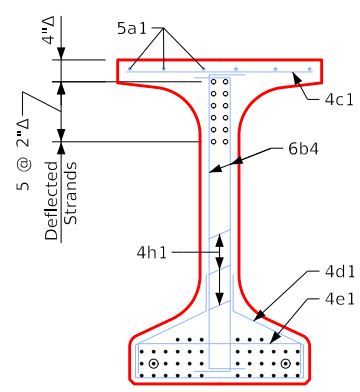
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**



**View C-C**

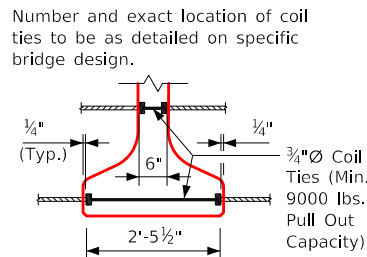
- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars
- ⊙ Strands Debonded 6'-0" from Beam Ends

**BTD130 Beam Details**

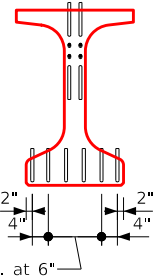
Revision 10-07: 5b2 Bar Lengthened to Extend 5 Inches Above Beam Top. Issued 05-04. Beams.dgn - 4747 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "D" Beam - 130'-0" Span	Standard Sheet 4747	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:48 PM	4/5/2026	bkloss	pw:\NTP\wint1.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. Revised 10-2024: Revised "At Release" and "After Losses" Camber Values, revised "Reinforcing Bar List" and "Reinforcing Steel Weight" in the "BTD135 Beam Data" Table due to changes in 6b4, 4d1, and 4e1 bar quantity. Issued 05-04. Beams.dgn - 4748s1 - This Sheet Re-issued 04-2024. Sheet Format Update.

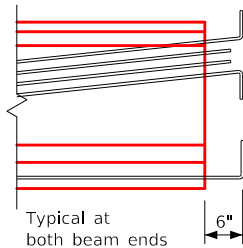


**Coil Tie Detail**

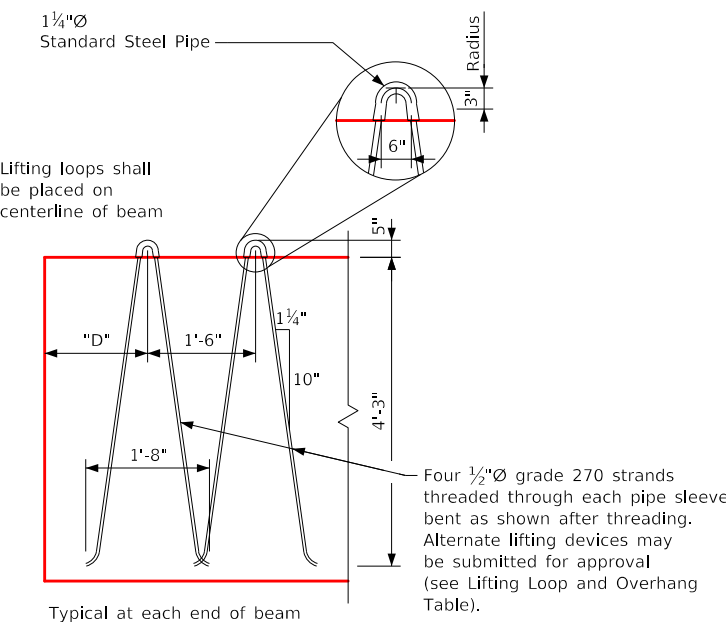


**Strand Projection at Beam Ends When Embedded in Concrete End Diaphragm**

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



**Lifting Loop Detail**

**Lifting Loop and Overhang Table**

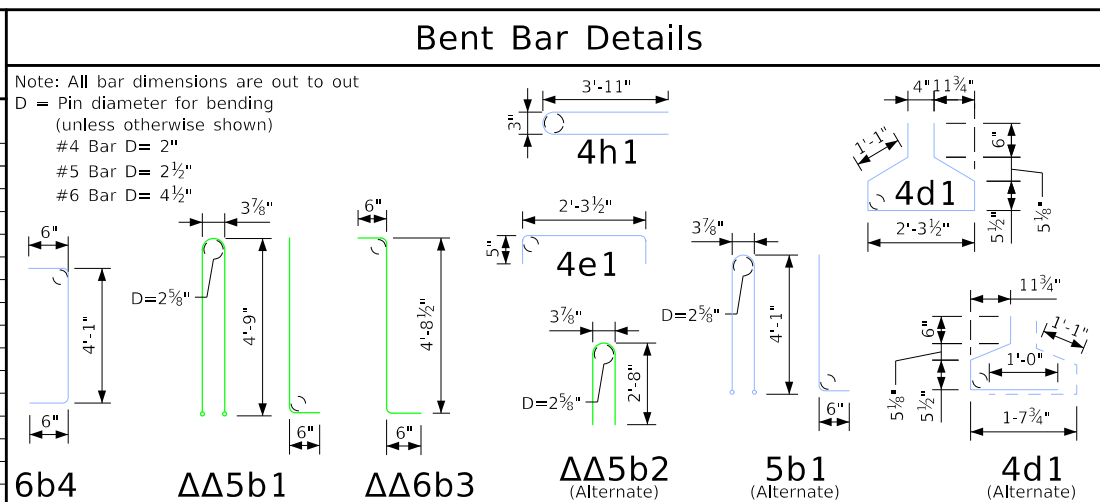
Beams	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
BTD135	2	4	9'-3"	16

Lifting loops shall carry loads equally.

- 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		BTD135	
Beam	Bar	Shape	No. Length
	5a1		12 33'-2"
	5a2		12 40'-0"
ΔΔ	5b1		111 10'-8"
ΔΔ*	6b3		40 5'-9"
*	6b4		24 5'-1"
	4c1		179 2'-7"
	4d1		132 6'-5"
	4e1		28 3'-2"
	4h1		6 8'-0"



BTD135 Beam Data																	
BTD Beam	Span Length $\bar{C}$ - $\bar{C}$ Bearing	Overall Beam Length (L)	Concrete Strength		Strand Size Dia. (in.)	Number of Strands		Total Initial Prestress (kips) $\oplus$	Hold Down Force (kips)	Camber (in.) $\ominus$		Deflection (in.) $\Delta_D$		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 $\Delta_1$ (elastic)	Time $\Delta_T$ (plastic)				
			HL-93 Loading			Steel Diaphragm	Steel Diaphragm										
⑤ BTD135	135'-0"	136'-4"	8.00	9.50	0.60"	46	12	2467	29.5	4.46"	7.14"	5.00"	1.25"	9'-0 1/2"	53.2	26.2	3645

- 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'-0 1/2" beam spacing and two steel diaphragms, (0.500 kips) placed 20'-0", on either side, of the beam  $\bar{C}$ . For different deck and diaphragm weights, deflections will be directly proportional.
- Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck. Total beam deflections at  $\bar{C}$  of span,  $\Delta_D$ , due to weight of deck and diaphragms for detailing purpose: (A)  $\Delta_D = \Delta_1 + \Delta_T$  for simple span. (B)  $\Delta_D = \Delta_1 + 3/4 \Delta_T$  for end spans of continuous bridge. (C)  $\Delta_D = \Delta_1 + 1/2 \Delta_T$  for interior spans of continuous bridge.
- Total initial prestress is based on 72.6% f's, f's = 270 ksi. and  $A_s = 0.217 \text{ in.}^2$ .
- Calculated design cambers are based on multipliers developed from research in Iowa.
- Includes partial length debonded strands, see Beam Sheet for locations and 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.<sup>2</sup>) 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).

**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:**

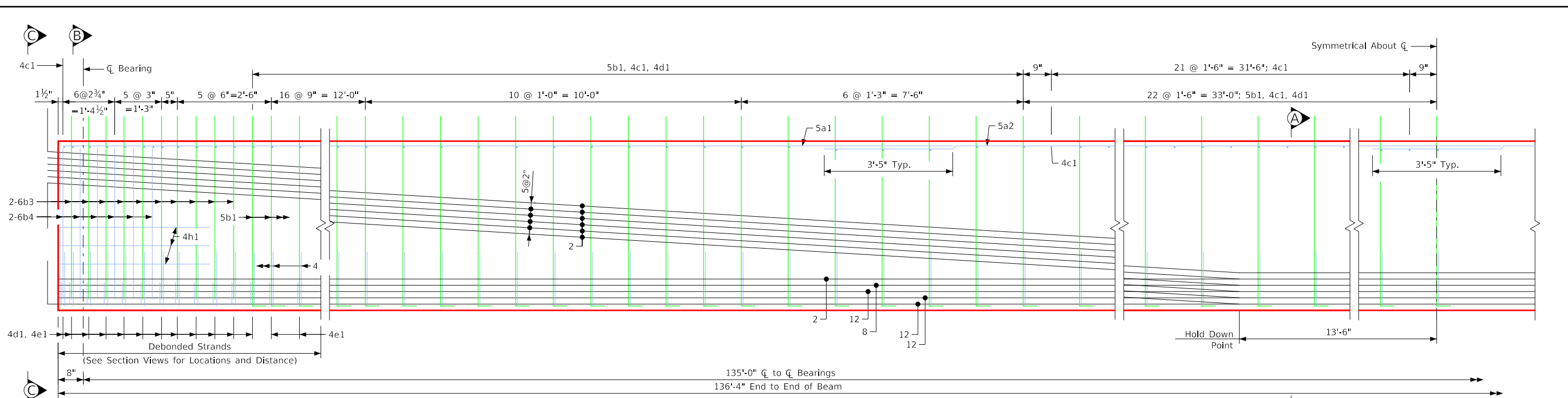
Construction: Standard Specifications of the Iowa Department of Transportation, current series, with current applicable special provisions and supplemental specifications. Design: AASHTO LRFD, Series of 2017 with minor modifications.

**Alternate Bar Notes:**

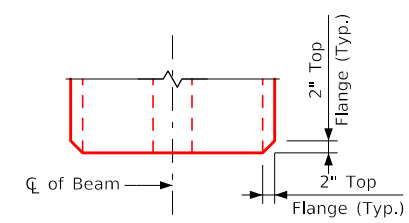
Alternate bars shown in Bent Bar Details may be used in lieu of reinforcing bars shown in bar list. No additional payment shall be made for use of alternate bars.

BTD135 Beam - Data Details
----------------------------

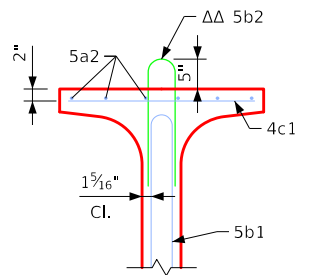
Issued 05-04.  
 Revision 10-07: 5b2 Bar Deleted. 5b1 Bar Lengthened to Extend 5 Inches Above Beam Top.  
 Revised 10-2024: Revised strand pattern moving 2 straight strands from row 4 up to row 5 from the bottom of the beam. Added 4 debonded strands to row 3 for a total of 6 debonded strands. Removed one set of 6b4, 4d1, and 4e1 bars from each end and revised spacing.  
 Revised 04-2026: Corrected detailing error of leader arrow locations on 6b3 and 6b4 bars at beam end in elevation view.  
 Beams.dgn - 4748s2 - This Sheet Re-issued 04-2024. Sheet Format Update.



**BTD135**



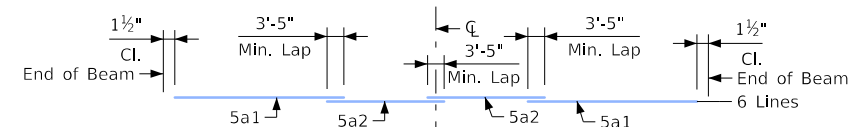
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



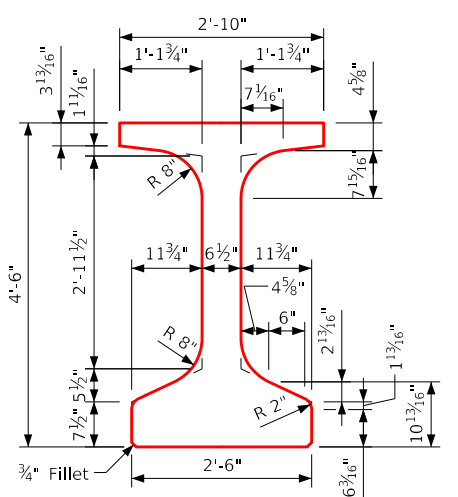
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4748s1.

Area = 748.8 in.<sup>2</sup>  
 $\bar{y}_b = 24.64$  in.  
 $I = 285,860$  in.<sup>4</sup>

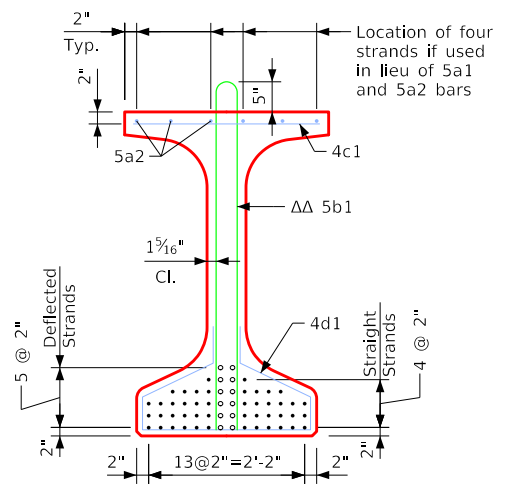
**Beam Section Properties**



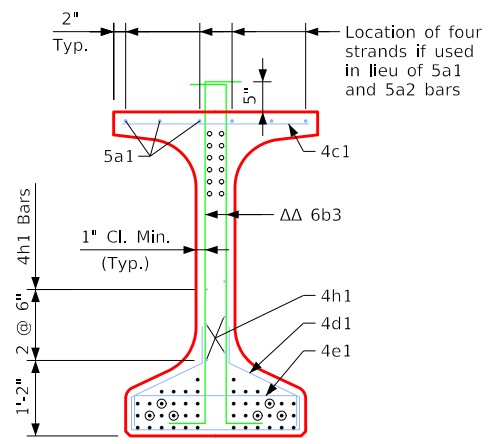
**Top Flange Longitudinal Bar Layout**



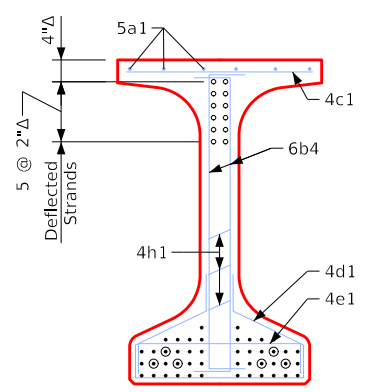
**BTD Beam Cross Section**



**Section A-A**



**Section B-B**

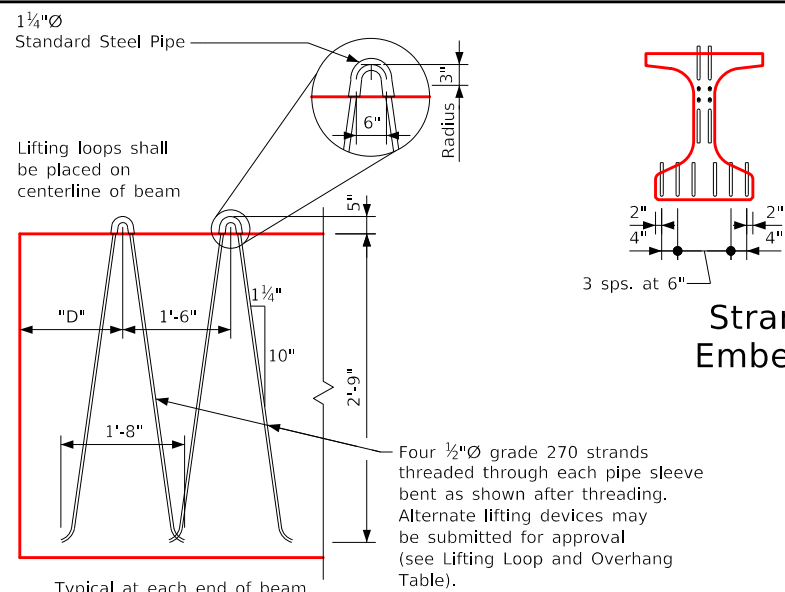


**View C-C**

- Deflected Strands
- Δ Dimensions at End of Beam
- △ Epoxy Coated Bars
- ⊙ Strands Debonded: 3'-0" from Beam Ends - 3rd Row from Bottom 6'-0" from Beam Ends - 2nd Row from Bottom

BTD135 Beam Details

Correction 12-13: Coil Tie Detail was changed to Reflect the Distance Between Coil Tie Anchors Embedded 1/4 inch. Revised 10-2024: Revised "At Release" and "After Losses" Camber Values for BTB85 to BTB95. Revised Reinforcing Bar List and BTB75 beams, due to changes of 6b3, 6b4, 4c1, and 4e1 bars. Issued 05-04. Beams.dgn - 4750 - This Sheet Re-Issued 04-2024. Sheet Format Update.



### 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:

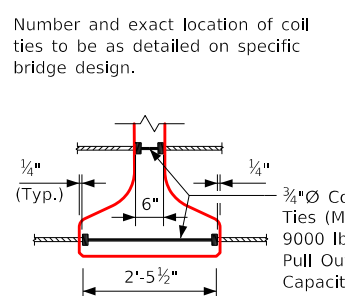
Alternate bars shown in Bent Bar Details may be used in lieu of reinforcing bars shown in bar list. No additional payment shall be made for use of alternate bars.

#### Lifting Loop Detail

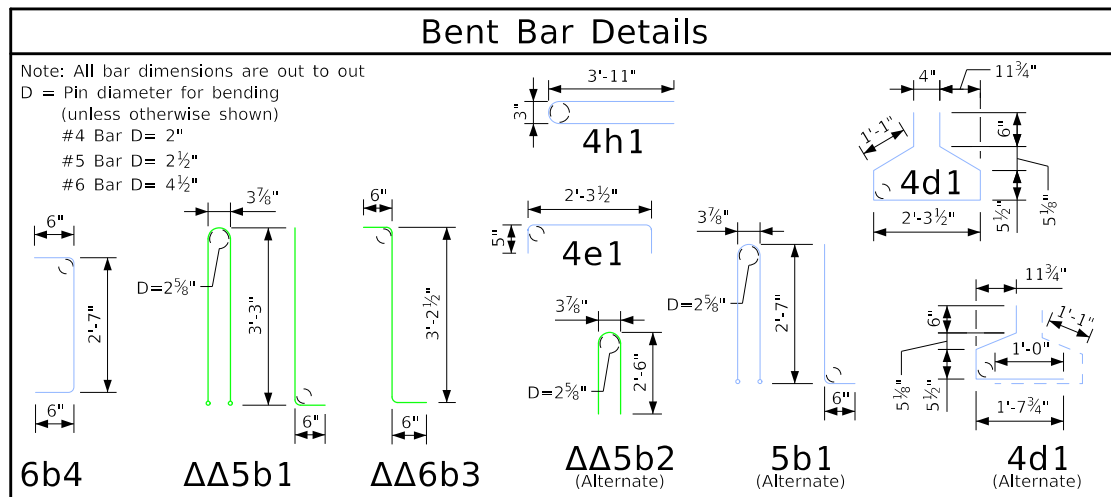
Beams	Lifting Loops Each End	# of Strands Per Loop	D	Beam Overhang (ft.)
BTB30-BTB75	1	4	2'-0"	**
BTB80-BTB85	2	4	2'-0"	7
BTB90	2	4	2'-6"	8.5
BTB95	2	4	2'-6"	11

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

Lifting loops shall carry loads equally.



#### Coil Tie Detail



#### Reinforcing Bar List

Beam	BTB30	BTB35	BTB40	BTB45	BTB50	BTB55	BTB60	BTB65	BTB70	BTB75	BTB80	BTB85	BTB90	BTB95	Beam
5a1	6	6	6	12	12	12	12	12	12	12	12	12	12	12	5a1
5a2	---	---	---	---	---	---	---	---	---	---	6	6	6	6	5a2
ΔΔ 5b1	17	21	25	29	37	43	47	55	59	63	67	71	75	83	5b1
ΔΔ* 6b3	36	36	36	36	36	36	40	36	36	32	32	32	32	32	6b3
* 6b4	4	4	4	4	4	8	8	8	8	8	16	16	16	16	6b4
4c1	45	53	57	63	69	73	77	81	87	93	97	107	111	117	4c1
4d1	37	41	45	49	57	65	69	77	79	83	89	93	97	105	4d1
4e1	24	24	24	24	24	26	26	24	24	26	26	26	26	26	4e1
4h1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4h1

### BTB Beam Data

BTB Beam	Span Length $\ell_c$ Bearing	Overall Beam Length (L)	Concrete Strength		Strand Size Dia. (in.)	Number of Strands		Total Initial Prestress (kips)	Hold Down Force (kips)	Camber (in.) <sup>5</sup>		Deflection (in.) $\Delta_D$		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 <sup>1</sup> (elastic) $\Delta_i$	Time <sup>2</sup> (plastic) $\Delta_T$				
			Steel Diaphragm	Steel Diaphragm		Steel Diaphragm	Steel Diaphragm										
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	1470
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	1557
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	1719
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	1771
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	1863
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	2.76"	4.42"	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	3.07"	4.91"	2.90"	0.73"	9'-3"	30.0	14.8	2187
BTB95	95'-0"	96'-4"	8.00	9.50	0.60"	34	10	1871	20.1	3.68"	5.88"	3.47"	0.87"	9'-3"	31.7	15.7	2327

<sup>1</sup> 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  $\ell_c$  of span. For different deck and diaphragm weights, deflections will be directly proportional.

<sup>2</sup> Deflections due to the combined effect of creep due to weight of deck and shrinkage of deck.  
 Total beam deflections at  $\ell_c$  of span,  $\Delta_D$ , due to weight of deck and diaphragms for detailing purpose:

- (A)  $\Delta_D = \Delta_i + \Delta_T$  for simple span.
- (B)  $\Delta_D = \Delta_i + 3/4 \Delta_T$  for end spans of continuous bridge.
- (C)  $\Delta_D = \Delta_i + 1/2 \Delta_T$  for interior spans of continuous bridge.

<sup>3</sup> Total initial prestress is based on 72.6% f's, f's = 270 ksi. and  $A_s = 0.217 \text{ in.}^2$ .

<sup>4</sup> Includes partial length debonded strands, see individual Beam Sheets for location and details.

<sup>5</sup> 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.

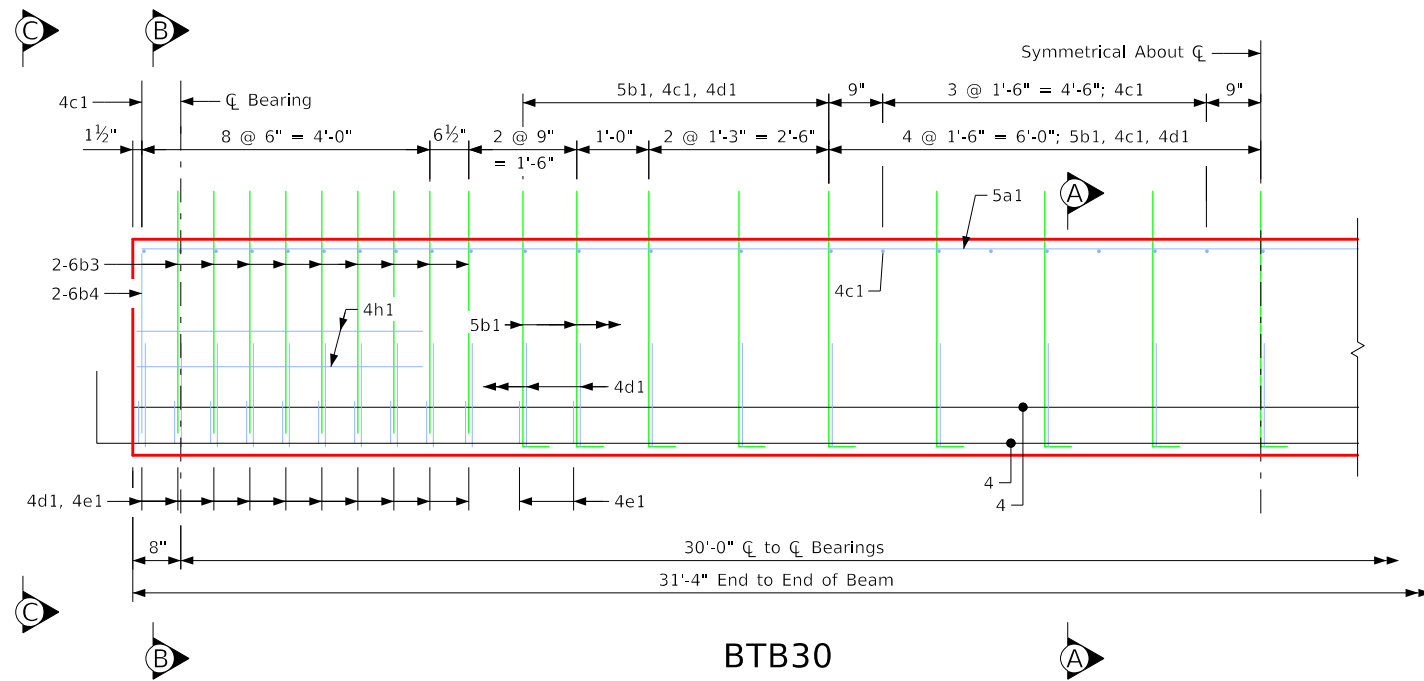
ΔΔ 5b1 and 6b3 bars to be epoxy coated

\* 6b3 and 6b4 bars to be used in pairs

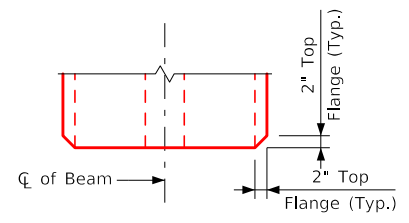
#### Beam Notes:

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.<sup>2</sup>) 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).

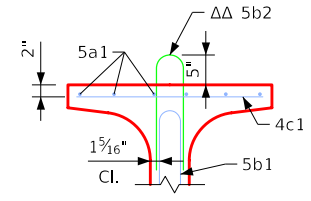
## BTB Beam - Data Details



BTB30



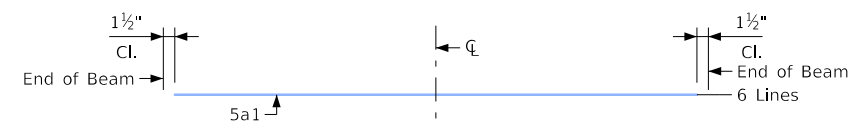
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



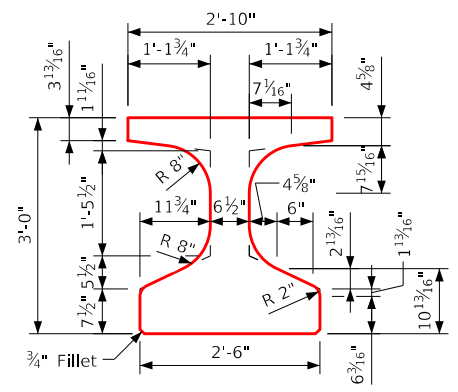
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 I = 99,980 in.<sup>4</sup>

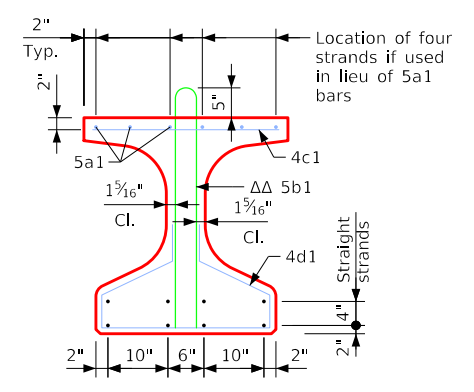
**Beam Section Properties**



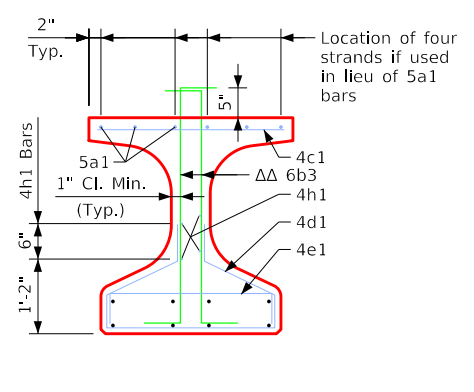
**Top Flange Longitudinal Bar Layout**



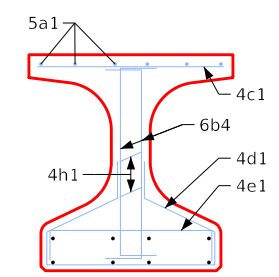
**BTB Beam Cross Section**



**Section A-A**

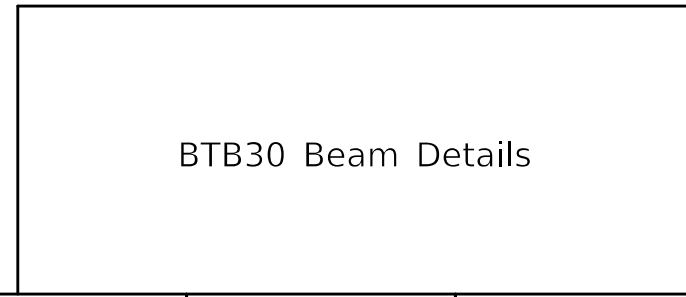


**Section B-B**



**View C-C**

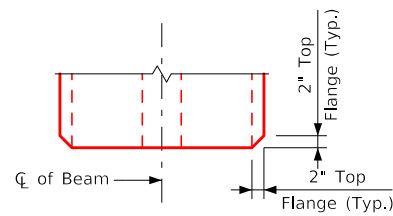
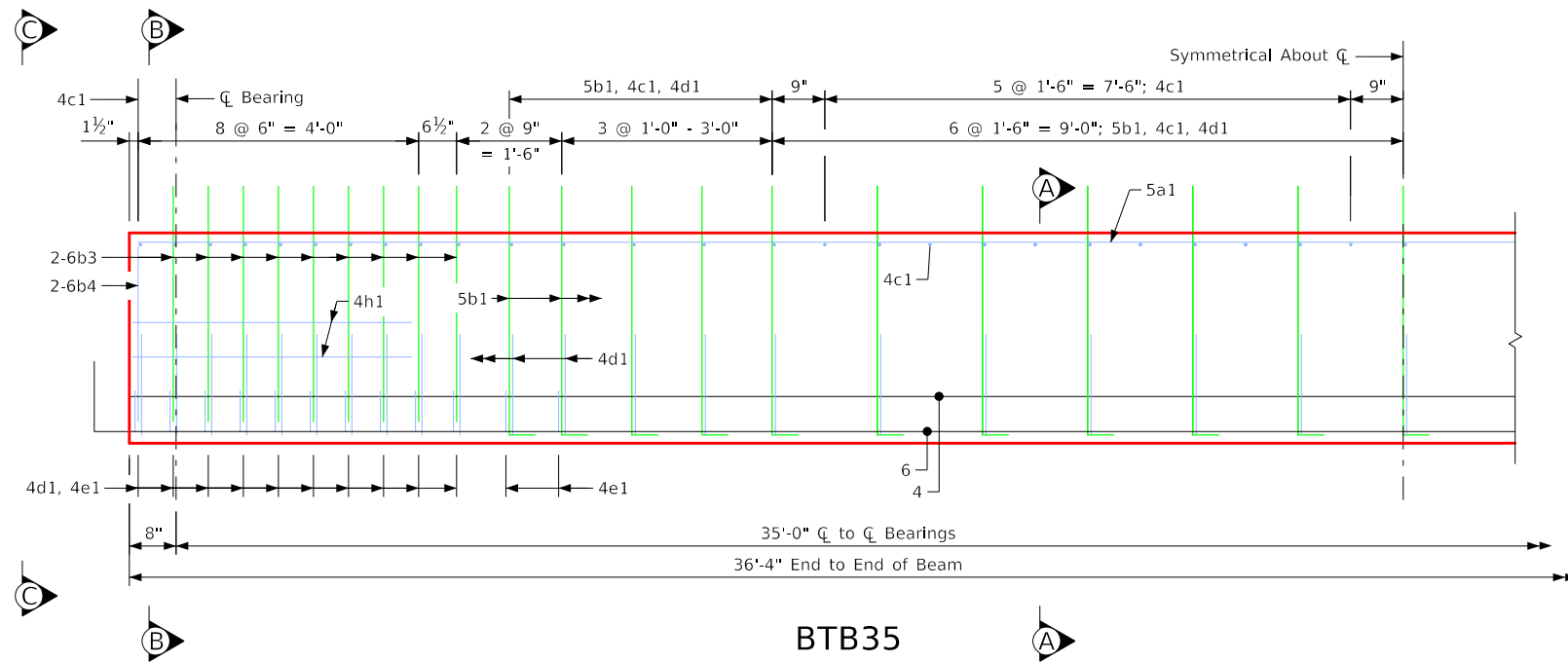
Δ Epoxy Coated Bars



**BTB30 Beam Details**

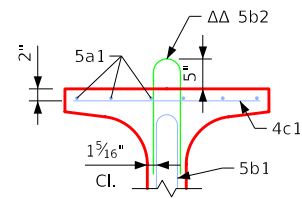
Issued 02-08. Beams.dgn - 4751 - This Sheet Re-issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 30'-0" Span	Standard Sheet 4751	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:52 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				



Top View

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

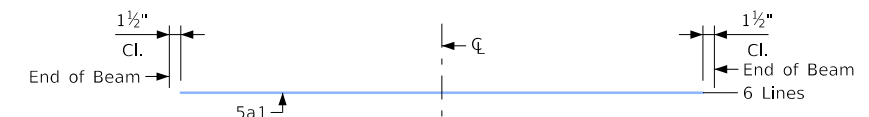


Section A-A (Alternate)

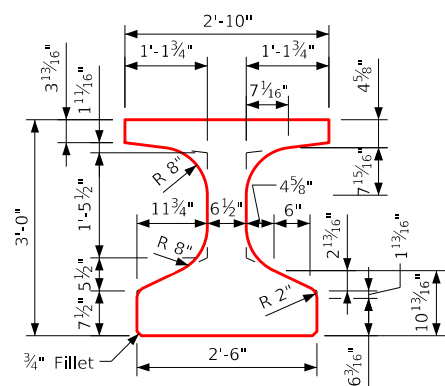
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

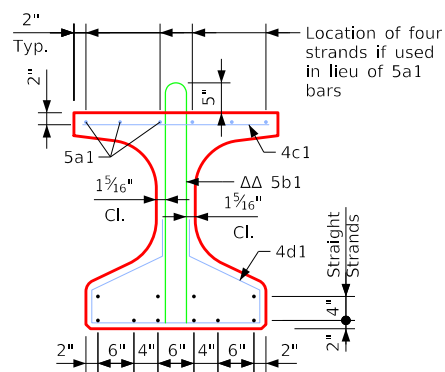
Beam Section Properties



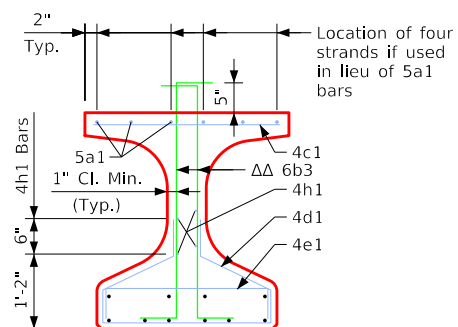
Top Flange Longitudinal Bar Layout



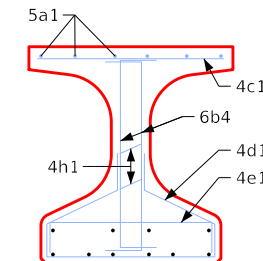
BTB Beam Cross Section



Section A-A



Section B-B



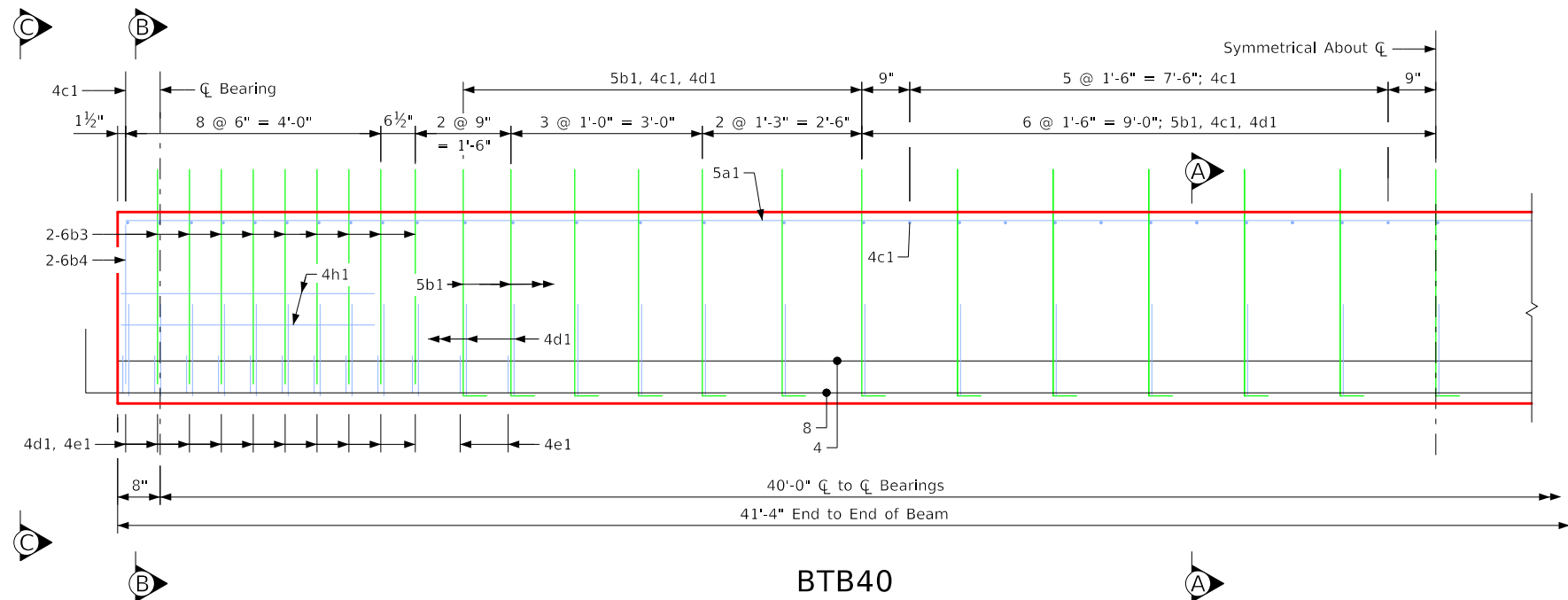
View C-C

△△ Epoxy Coated Bars

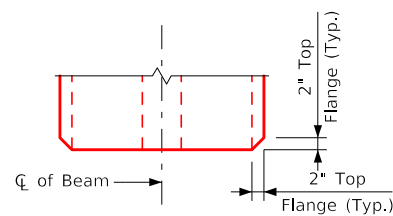
BTB35 Beam Details

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
3:49:53 PM	4/5/2026	bkloss	pw:\NTP\int1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

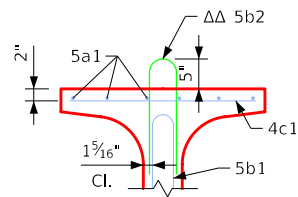


BTB40



Top View

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



Section A-A (Alternate)

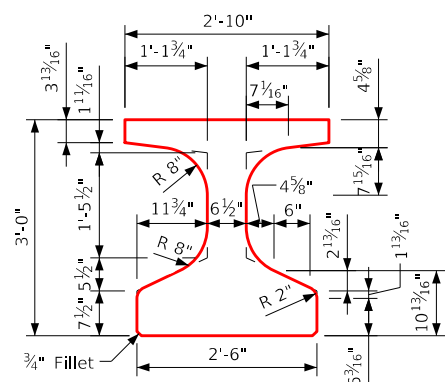
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

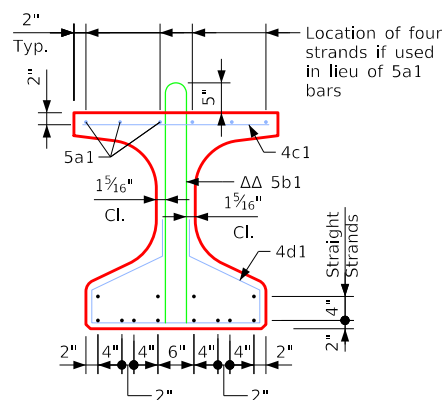
Beam Section Properties



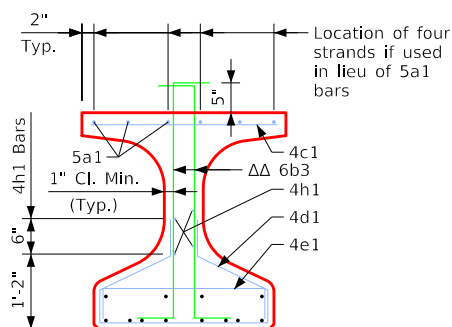
Top Flange Longitudinal Bar Layout



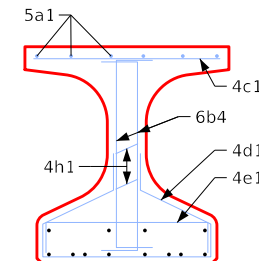
BTB Beam Cross Section



Section A-A



Section B-B



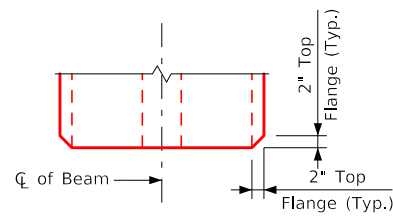
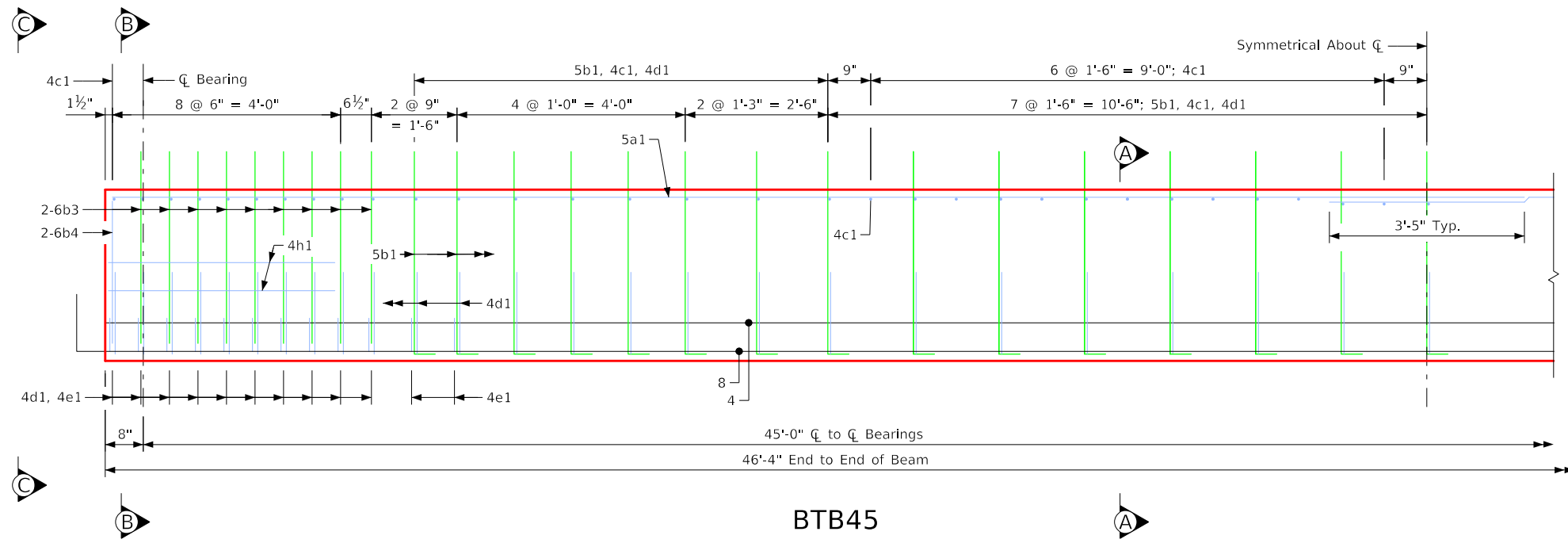
View C-C

△△ Epoxy Coated Bars

BTB40 Beam Details

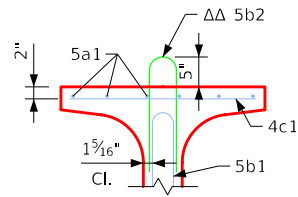
Revision 08-09: Added Strands to Sections A-A, B-B, & C-C. Issued 02-08. Beams.dgn - 4753 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 40'-0" Span	Standard Sheet 4753	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:54 PM	4/5/2026	bkloss	pw:\NTP\int1.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.

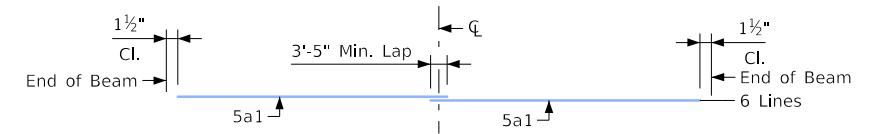


**Section A-A (Alternate)**

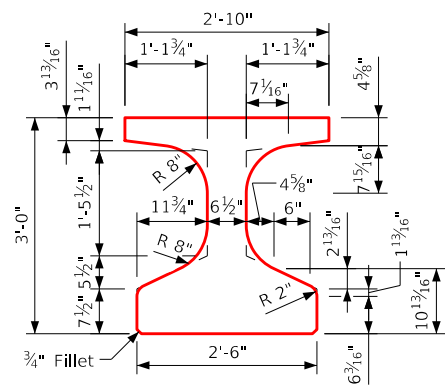
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

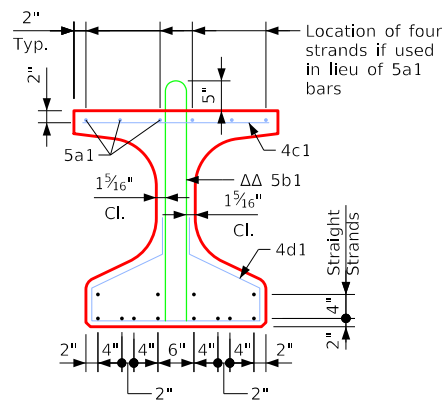
**Beam Section Properties**



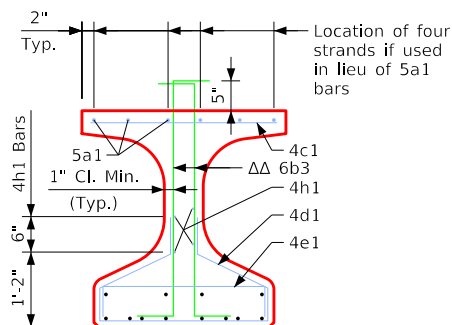
**Top Flange Longitudinal Bar Layout**



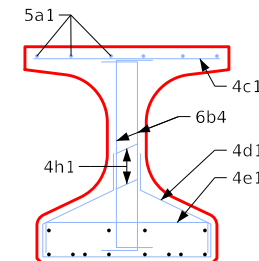
**BTB Beam Cross Section**



**Section A-A**



**Section B-B**



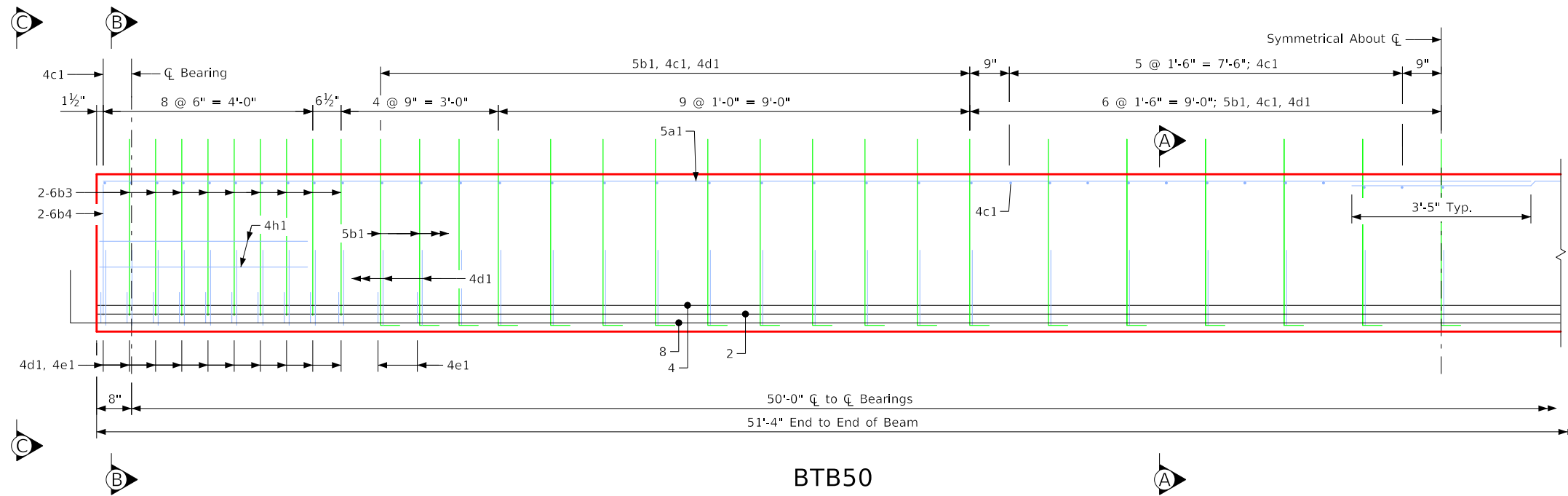
**View C-C**

ΔΔ Epoxy Coated Bars

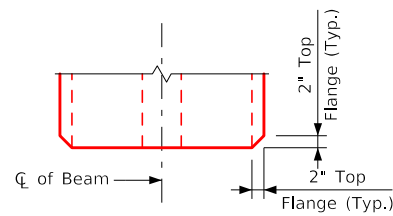
**BTB45 Beam Details**

Issued 02-08. Beams.dgn - 4754 - This Sheet Re-issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 45'-0" Span	Standard Sheet 4754	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:54 PM	4/5/2026	bkloss	pw:\NTP\int1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

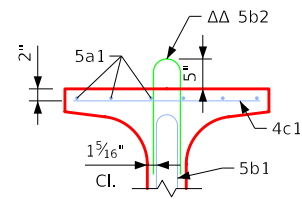


BTB50



Top View

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

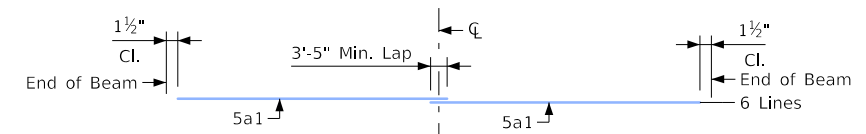


Section A-A (Alternate)

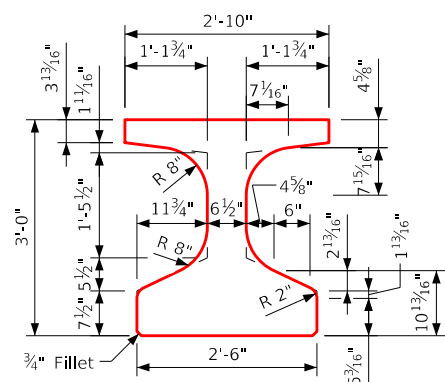
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

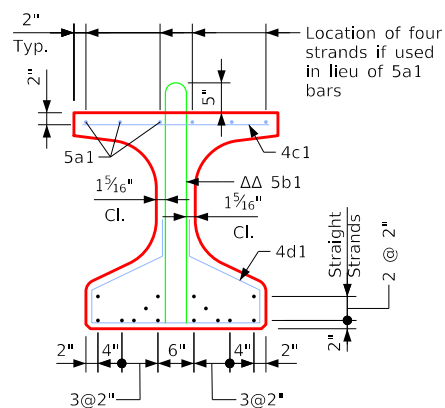
Beam Section Properties



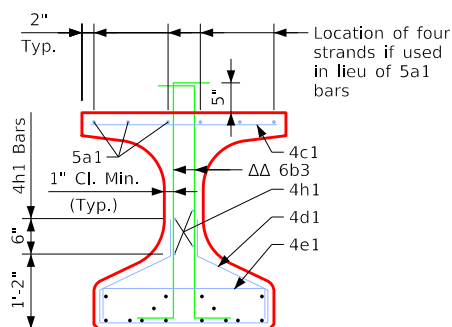
Top Flange Longitudinal Bar Layout



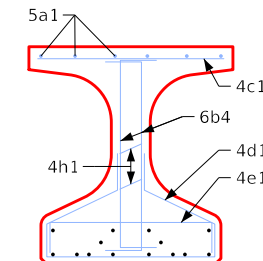
BTB Beam Cross Section



Section A-A



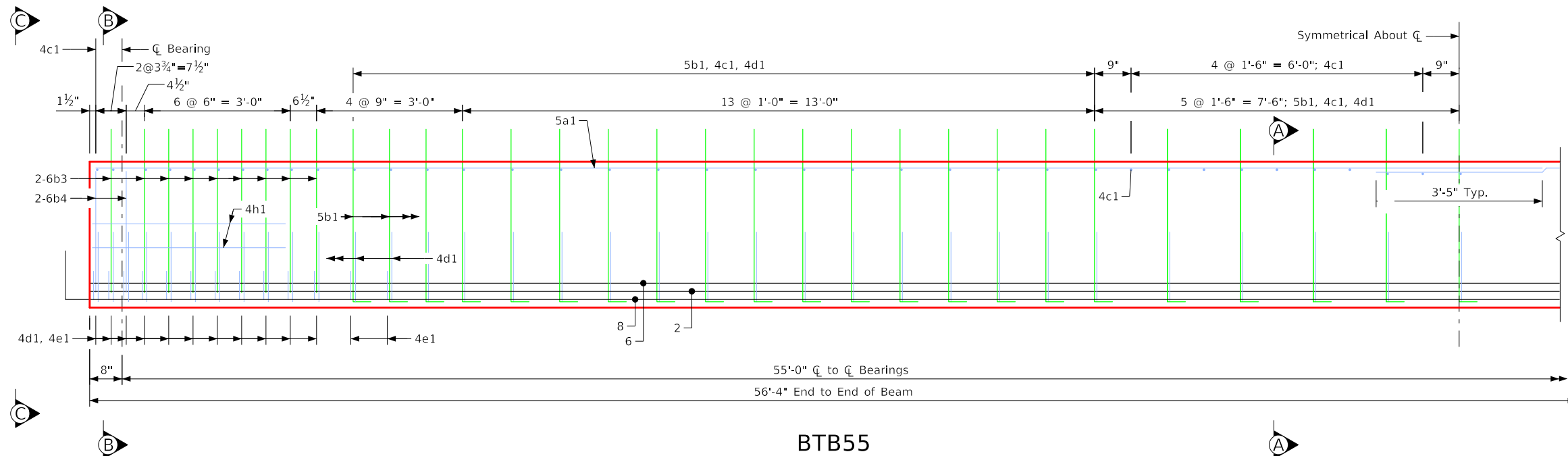
Section B-B



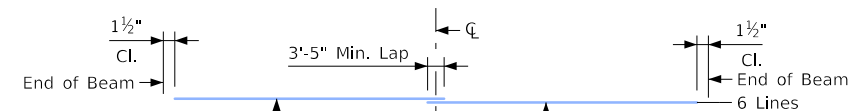
View C-C

Δ Epoxy Coated Bars

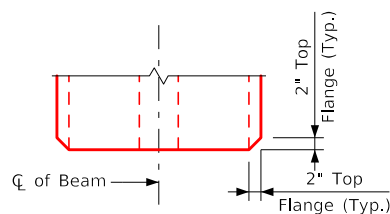
BTB50 Beam Details



BTB55

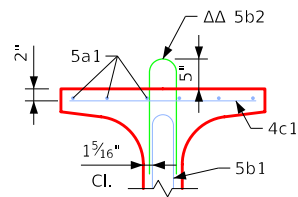


Top Flange Longitudinal Bar Layout



Top View

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

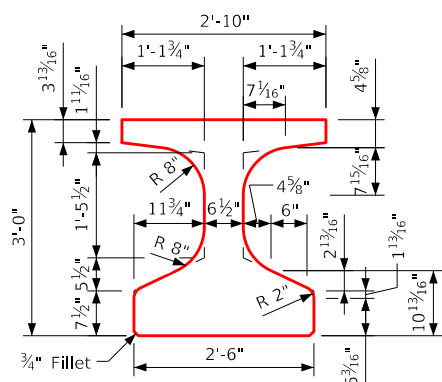


Section A-A (Alternate)

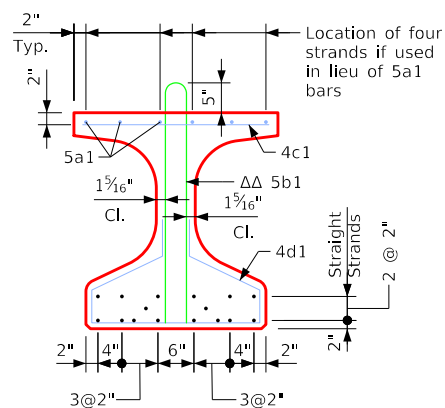
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

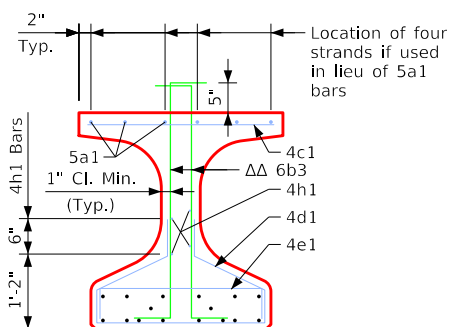
Beam Section Properties



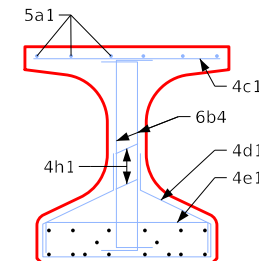
BTB Beam Cross Section



Section A-A



Section B-B



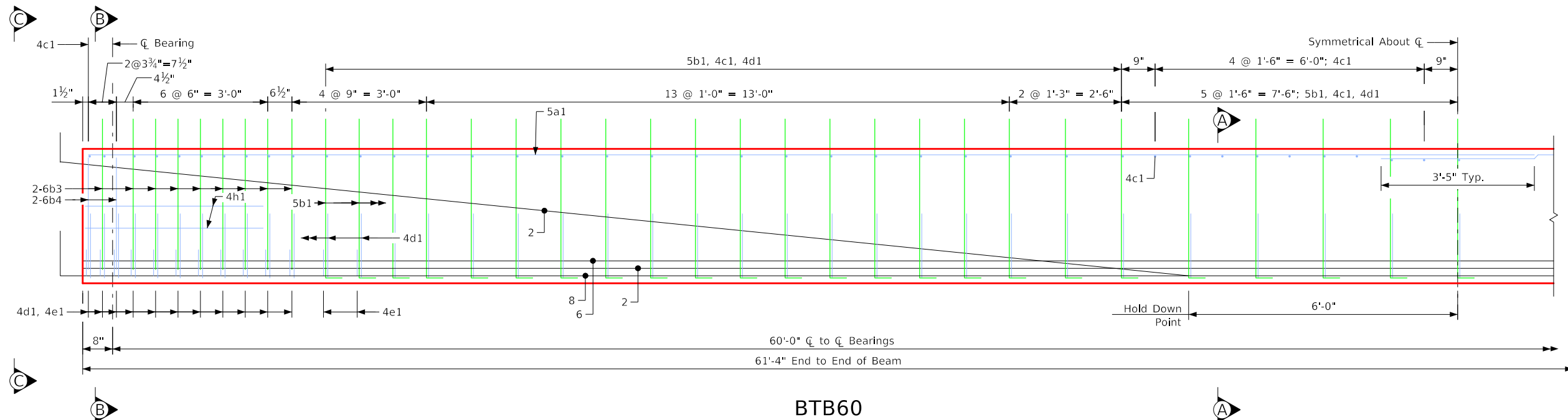
View C-C

△△ Epoxy Coated Bars

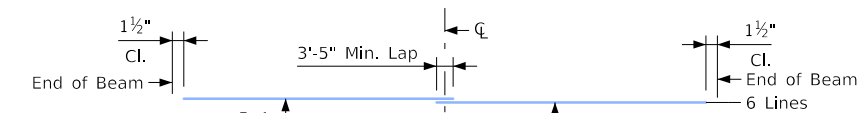
BTB55 Beam Details

Revised 10-2024: Added one set of 6b4, 4d1, and 4e1 to each beam end and revised rebar spacing. Issued 02-08. Beams.dgn - 4756 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 55'-0" Span	Standard Sheet 4756	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:56 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



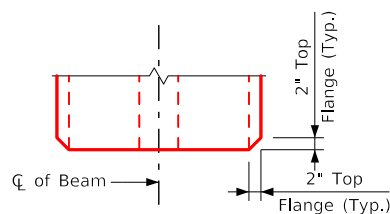
BTB60



Top Flange Longitudinal Bar Layout

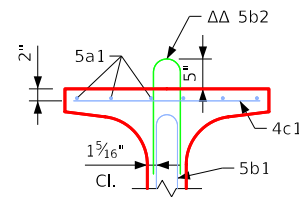
Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

Beam Section Properties



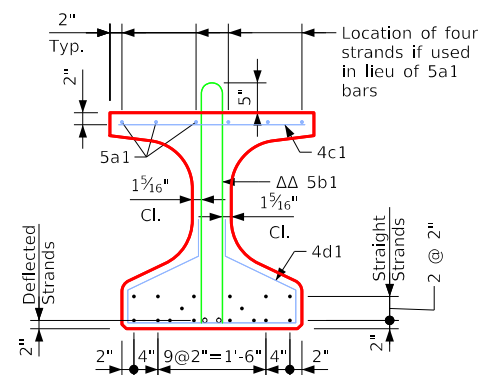
Top View

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

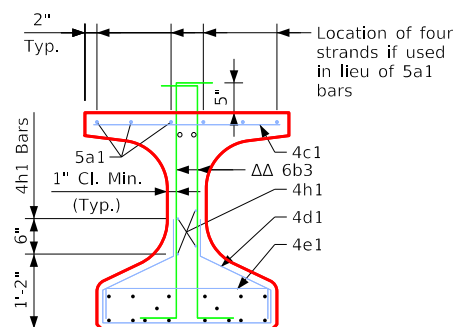


Section A-A (Alternate)

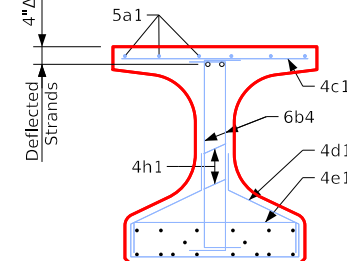
See Alternate Bar Note on Standard Sheet 4750.



Section A-A

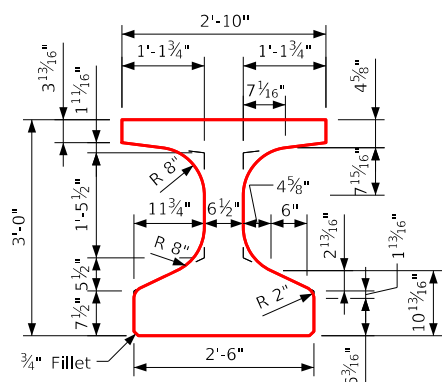


Section B-B



View C-C

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars



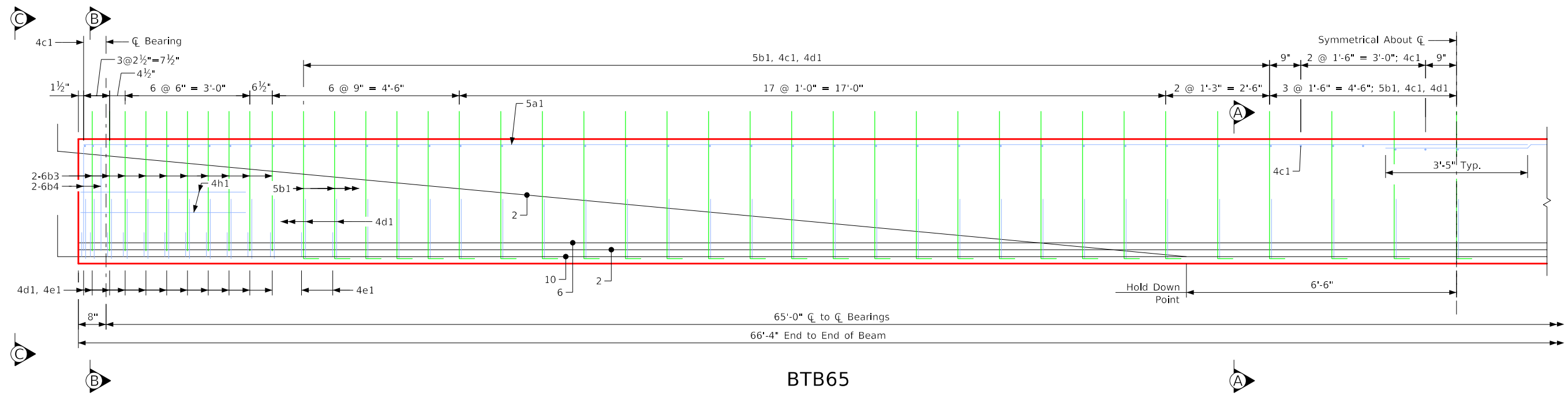
BTB Beam Cross Section

BTB60 Beam Details

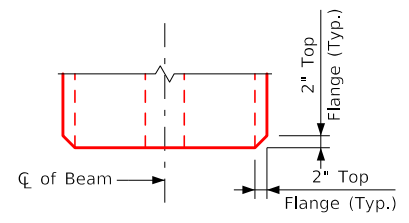
Issued 02-08. Revised 10-2024: Added one set of 6b4 to each beam end and revised rebar spacing. Revised 04-2026: Corrected detailing error, deleted dimension shown not associated to any linear elements at beam end. Beams.dgn - 4757 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 60'-0" Span	Standard Sheet 4757	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:57 PM	4/5/2026	bkloss	pw:\NTP\pint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

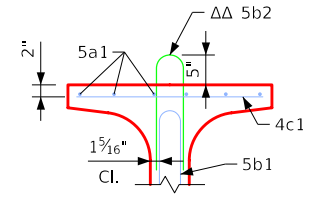
Revised 10-2024: Added one set of 6b3, 4d1, 4e1 and one set of 6b4 to each beam end and revised rebar spacing.  
 Issued 02-08.  
 Beams.dgn - 4758 - This Sheet Re-Issued 04-2024. Sheet Format Update.



**BTB65**



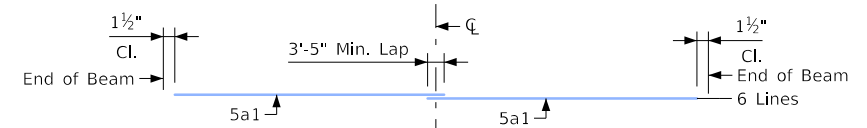
**Top View**  
 The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



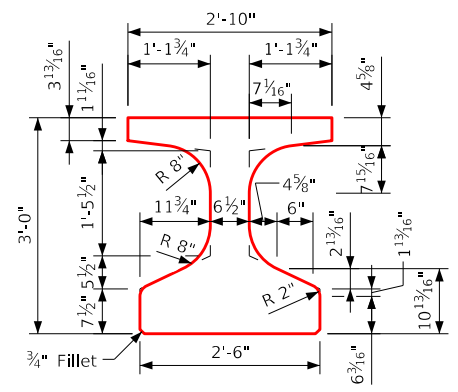
**Section A-A (Alternate)**  
 See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 I = 99,980 in.<sup>4</sup>

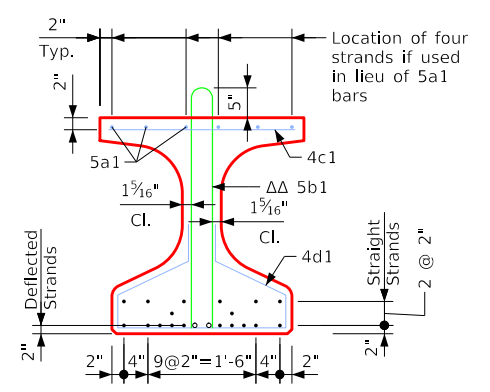
**Beam Section Properties**



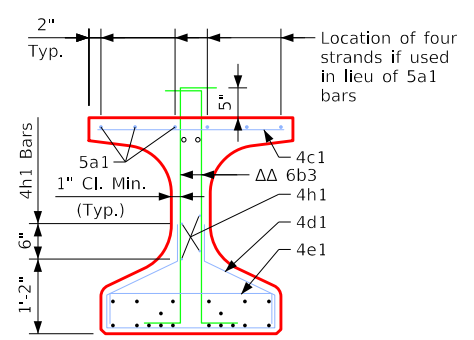
**Top Flange Longitudinal Bar Layout**



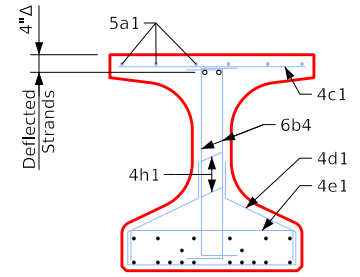
**BTB Beam Cross Section**



**Section A-A**



**Section B-B**

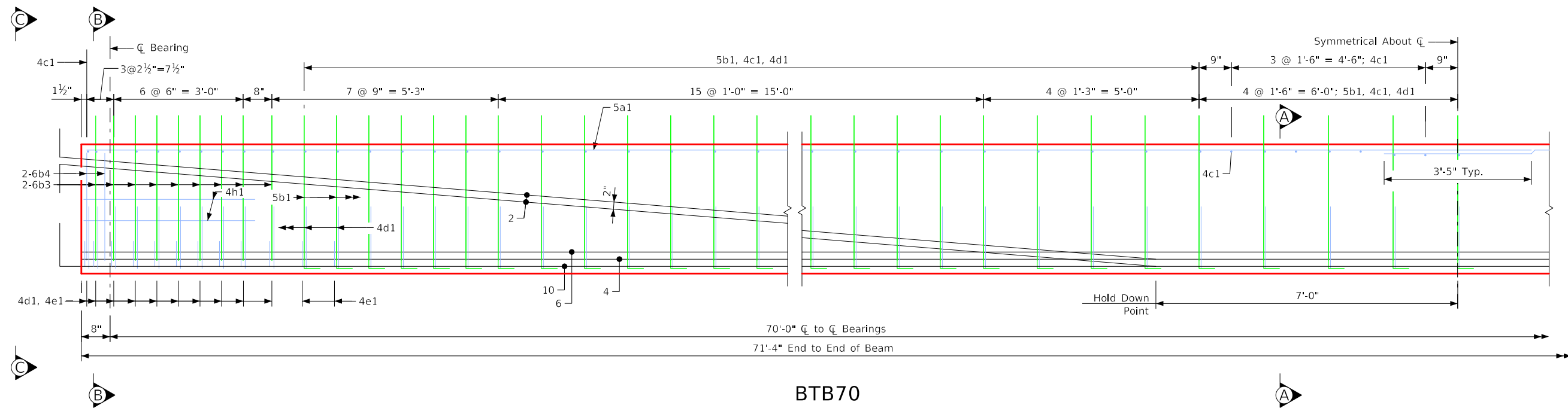


**View C-C**

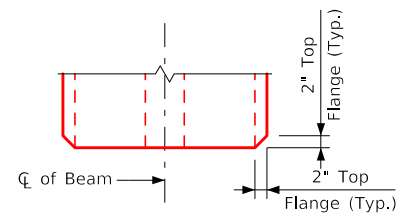
- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

**BTB65 Beam Details**

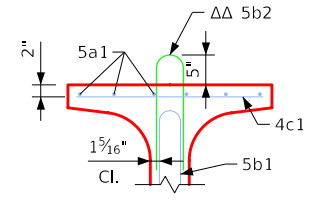
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 65'-0" Span	Standard Sheet 4758	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:58 PM	4/5/2026	bkloss	p:\NTP\int1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTB70



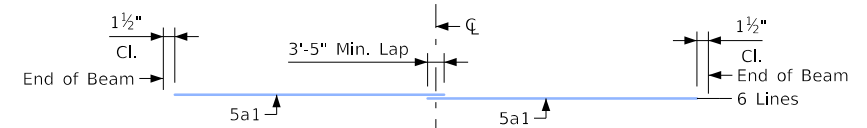
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



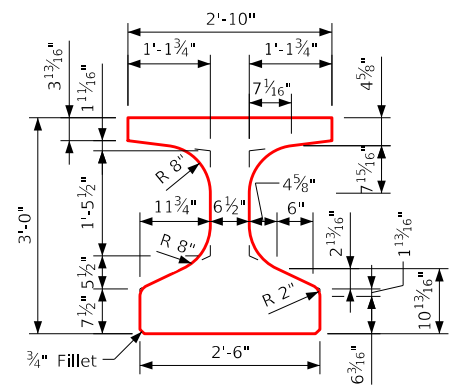
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

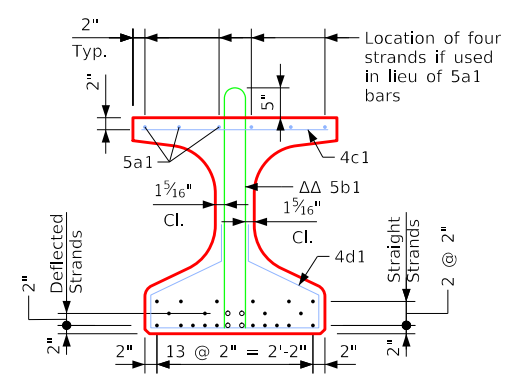
**Beam Section Properties**



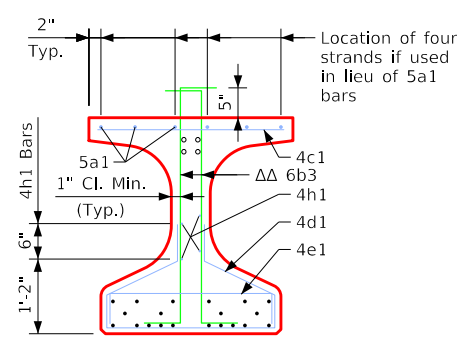
**Top Flange Longitudinal Bar Layout**



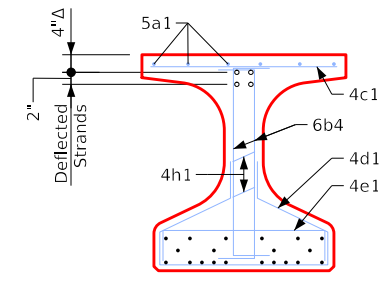
**BTB Beam Cross Section**



**Section A-A**



**Section B-B**



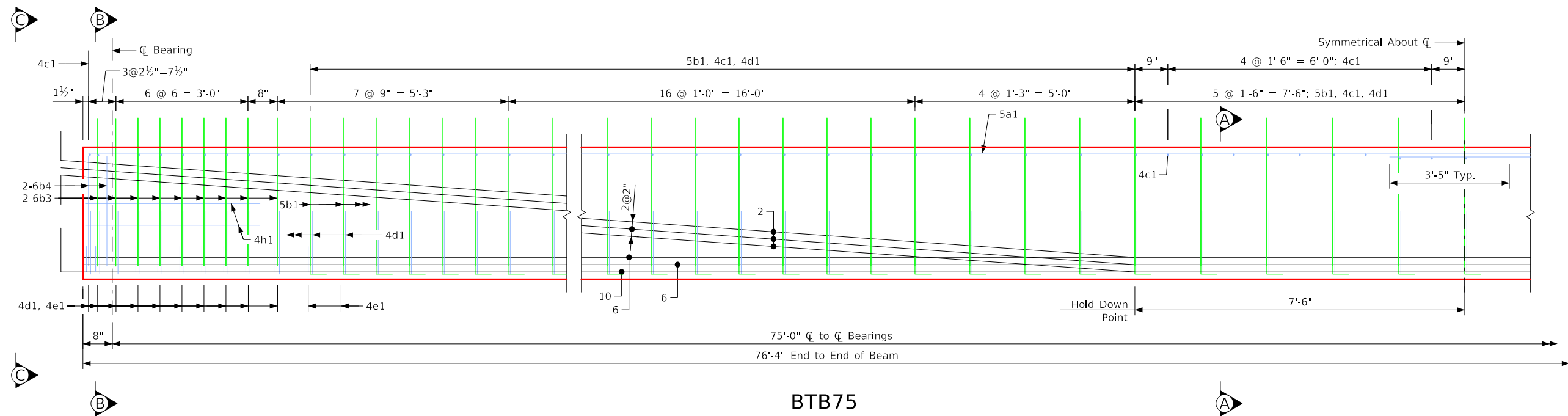
**View C-C**

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

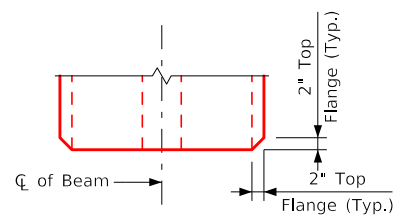
**BTB70 Beam Details**

Revised 10-2024: Added one set of 6b3, 4d1, 4e1 to each beam end and revised rebar spacing. Issued 02-08. Beams.dgn - 4759 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 70'-0" Span	Standard Sheet 4759	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:49:59 PM	4/5/2026	bkloss	pw:\NTP\int1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

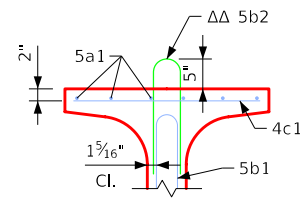


BTB75



Top View

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

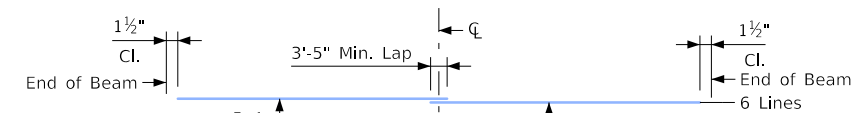


Section A-A (Alternate)

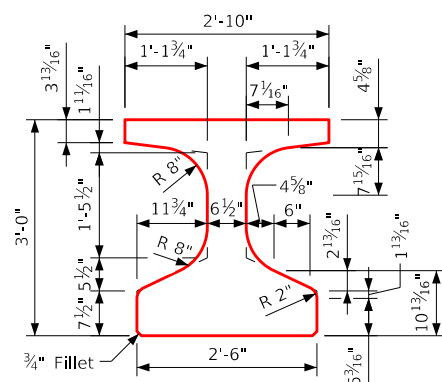
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

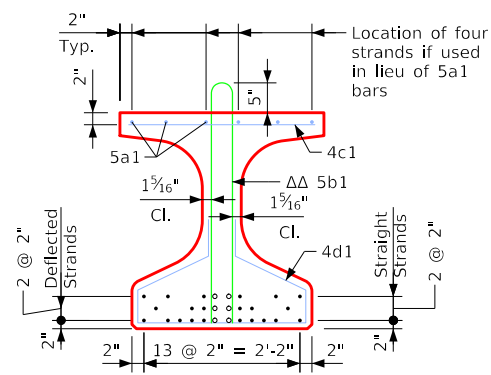
Beam Section Properties



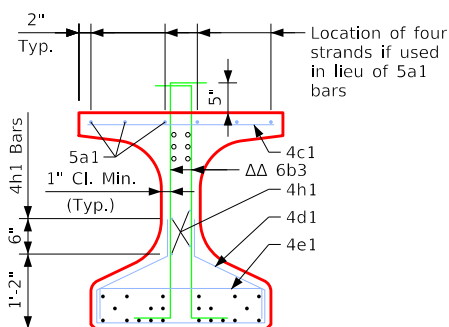
Top Flange Longitudinal Bar Layout



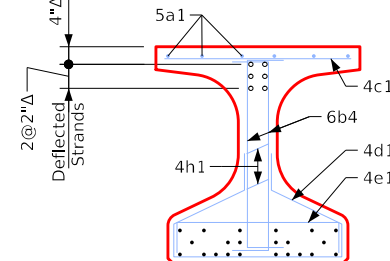
BTB Beam Cross Section



Section A-A



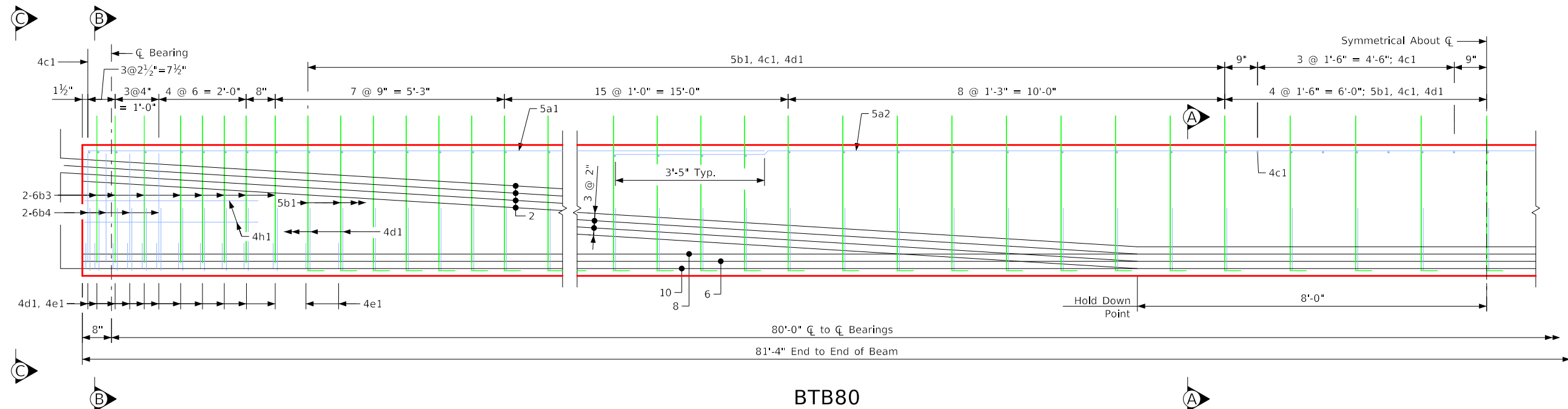
Section B-B



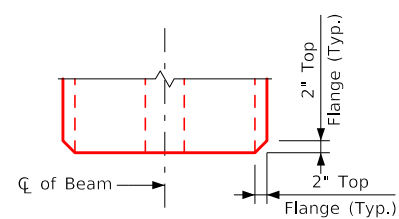
View C-C

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

BTB75 Beam Details

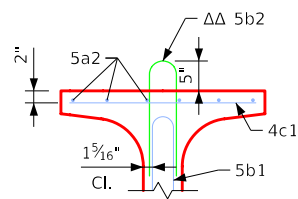


BTB80



Top View

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

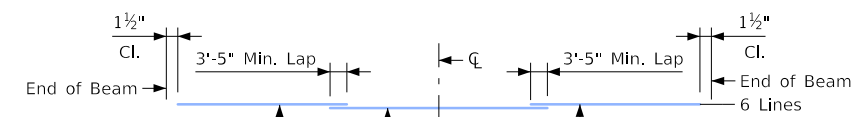


Section A-A (Alternate)

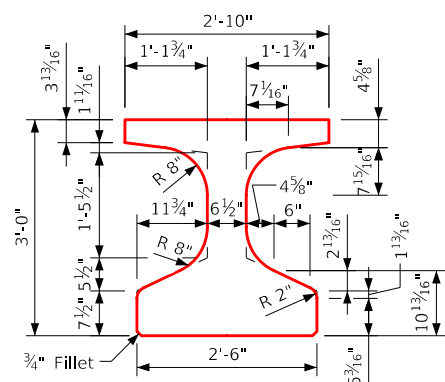
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

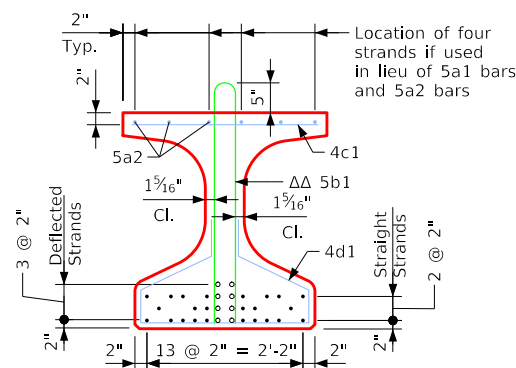
Beam Section Properties



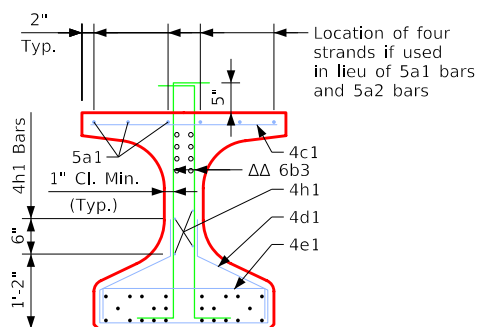
Top Flange Longitudinal Bar Layout



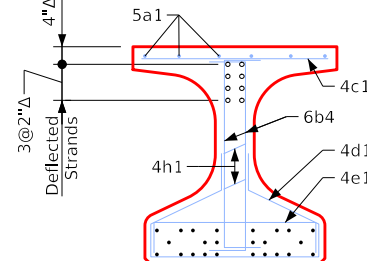
BTB Beam Cross Section



Section A-A



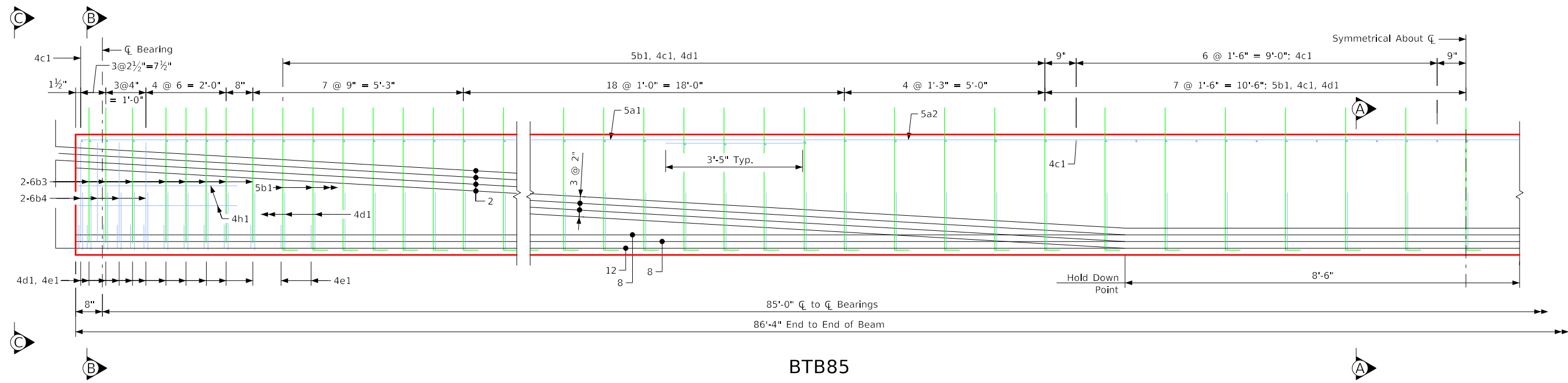
Section B-B



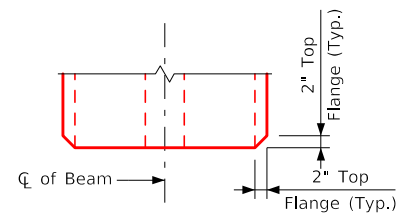
View C-C

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

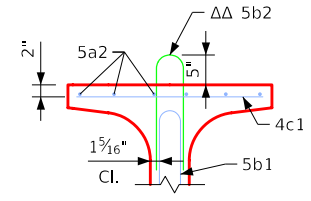
BTB80 Beam Details



BTB85



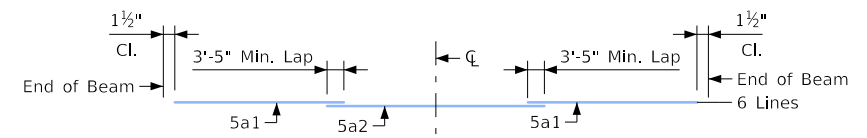
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



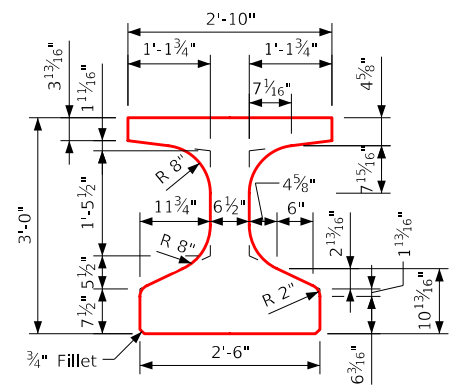
**Section A-A (Alternate)**  
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

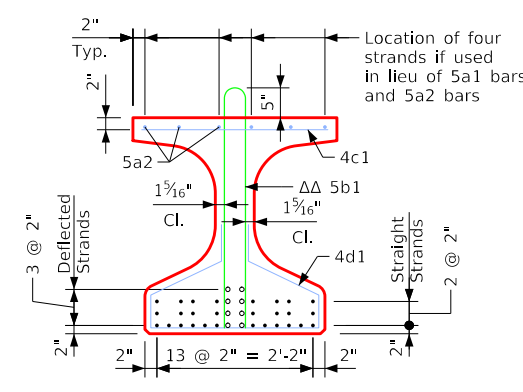
**Beam Section Properties**



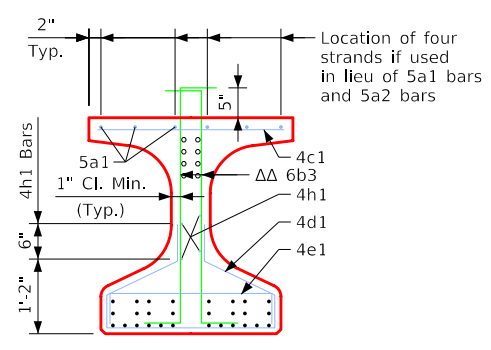
**Top Flange Longitudinal Bar Layout**



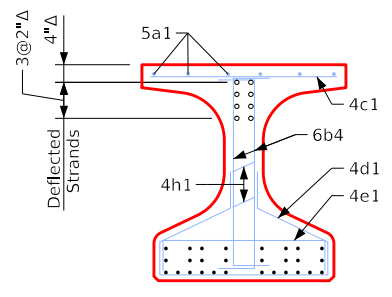
**BTB Beam Cross Section**



**Section A-A**



**Section B-B**



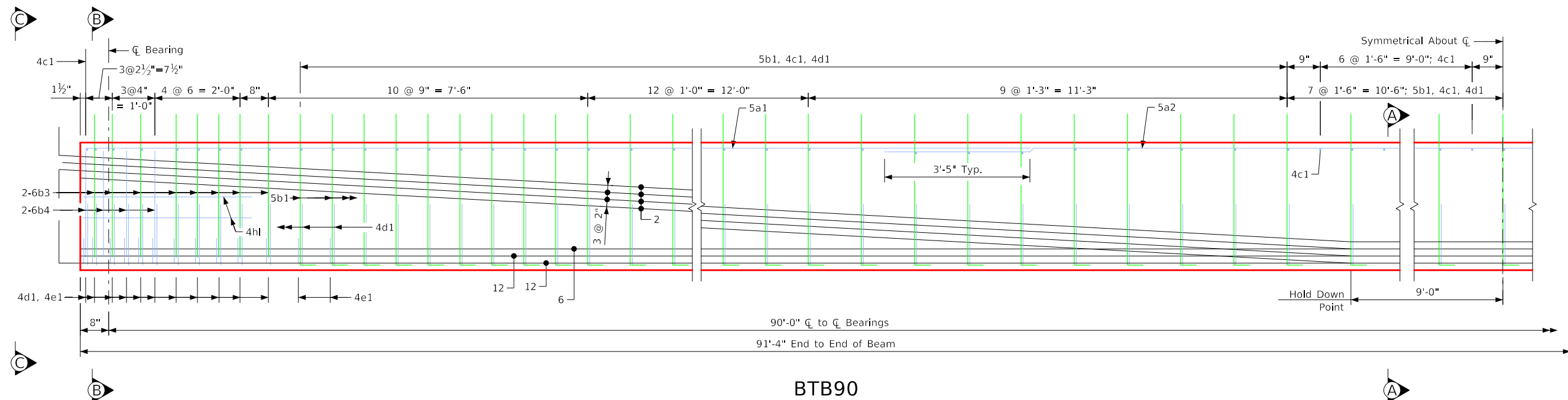
**View C-C**

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

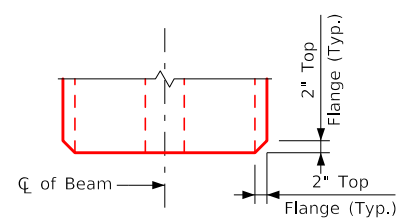
**BTB85 Beam Details**

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
3:50:01 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

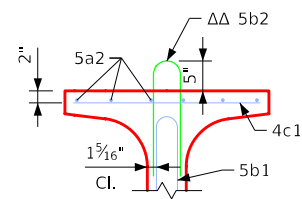


BTB90



Top View

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

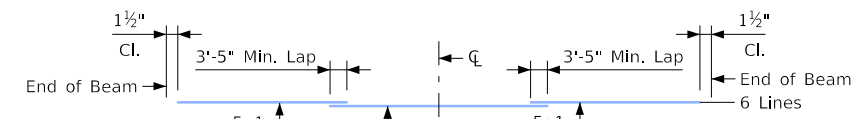


Section A-A (Alternate)

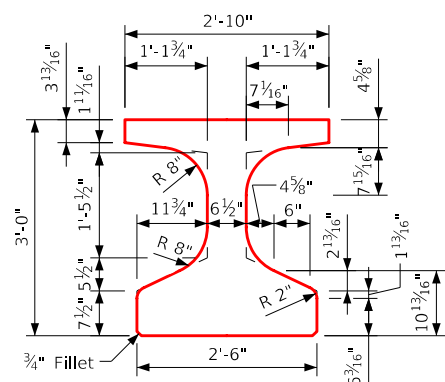
See Alternate Bar Note on Standard Sheet 4750.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

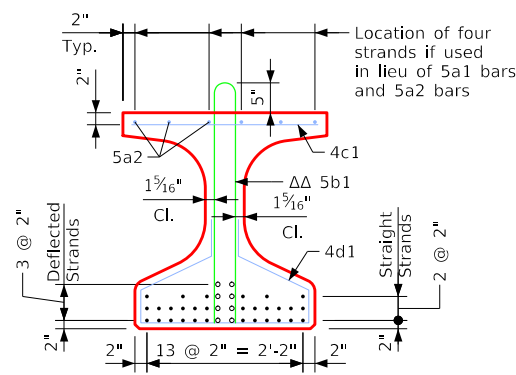
Beam Section Properties



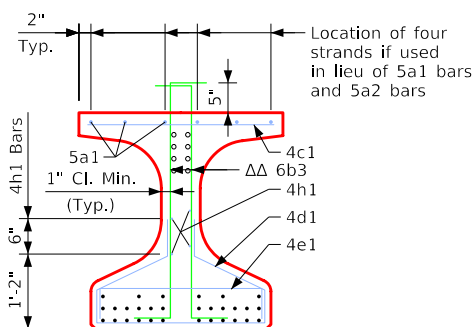
Top Flange Longitudinal Bar Layout



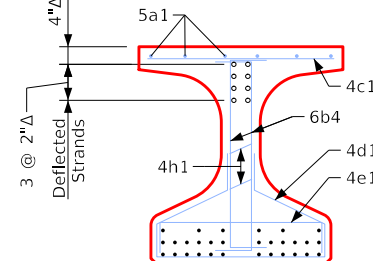
BTB Beam Cross Section



Section A-A



Section B-B



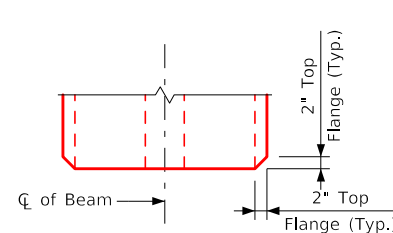
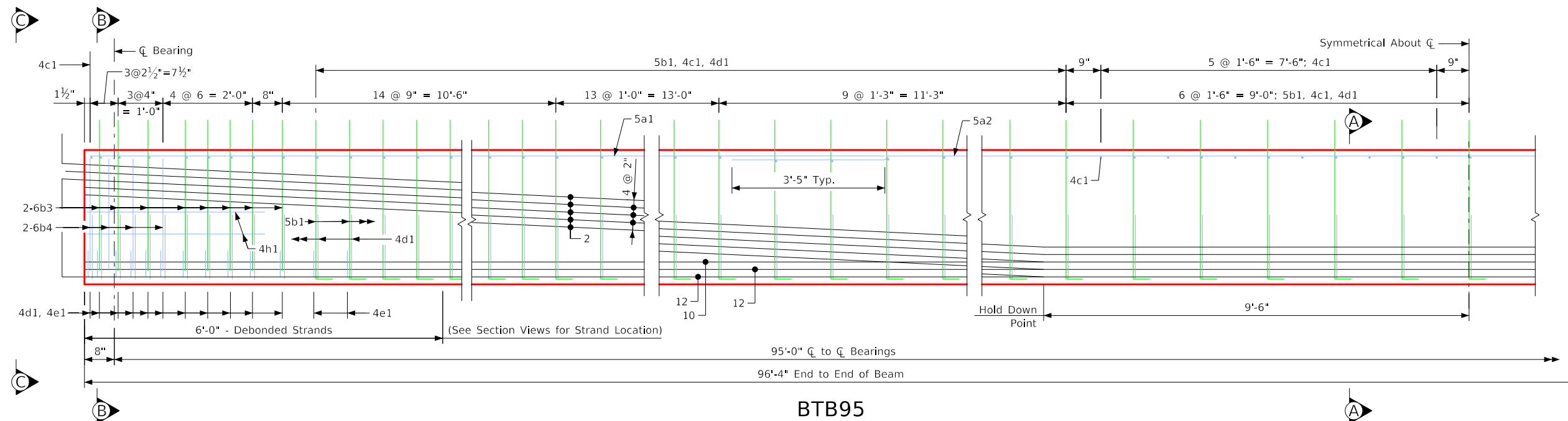
View C-C

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

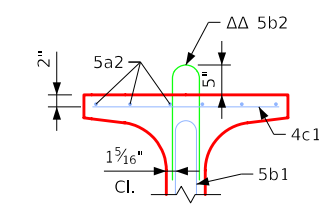
BTB90 Beam Details

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.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 90'-0" Span	Standard Sheet 4763	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:50:02 PM	4/5/2026	bkloss	pw:\NTP\int1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

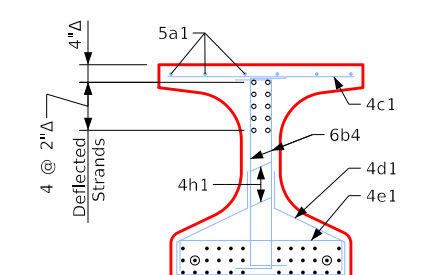
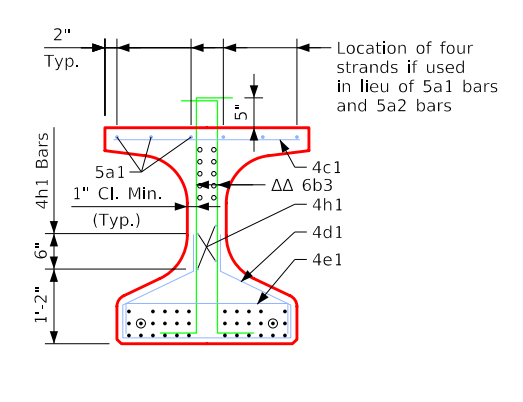
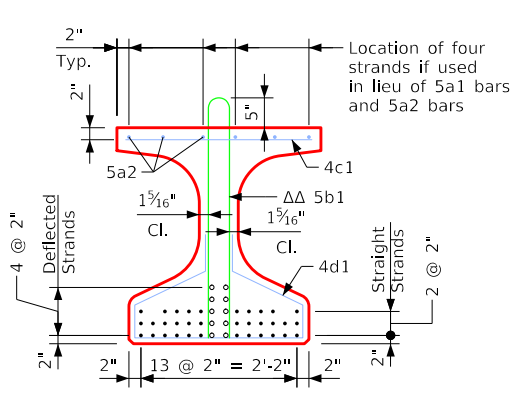
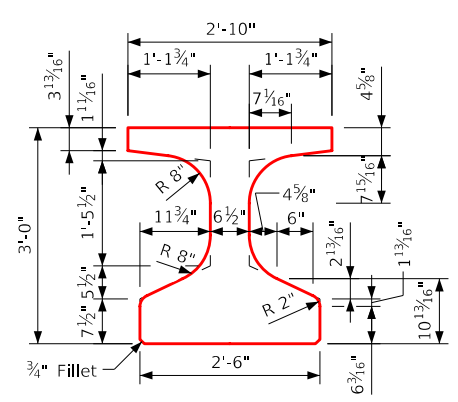
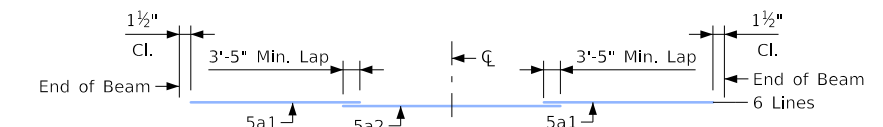


The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

Beam Section Properties



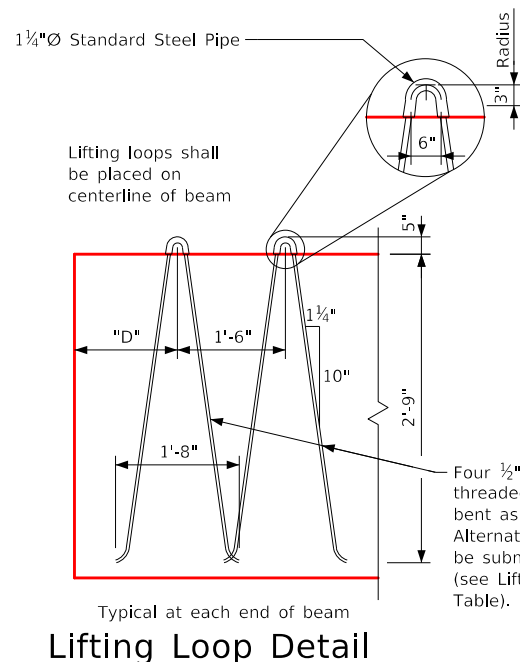
- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars
- ⊙ Strands Debonded 6'-0" from Beam Ends

BTB95 Beam Details

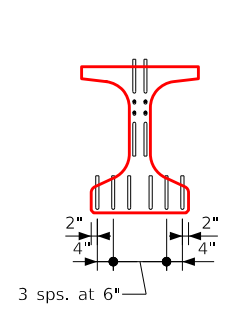
Revision 05-11: Added the Bend to the 3rd Deflected Strand at the Top to be Bent Down at the Beam End. Issued 02-08. Beams.dgn - 4764 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 95'-0" Span	Standard Sheet 4764	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:50:03 PM	4/5/2026	bkloss	pw:\NTP\int1.dot.int.lan:PWMain\Documents\Highway\Bridges\Standards\Bridges\Beams.dgn				

Correction 12-13: Coil Tie Detail was changed to Reflect the Distance Between Coil Tie Anchors Embedded 1/4 inch. Removed Article 2407.13 Spec. Note Under Lifting Loop Table. Revised 10-2024: Revised "At Release" and "After Losses" Camber Values for BTB100 and BTB105. Issued 02-08. Beams.dgn - 4765 - This Sheet Re-Issued 04-2024. Sheet Format Update.

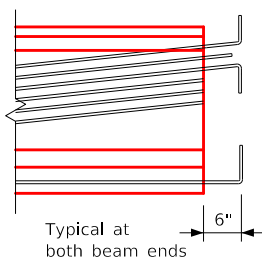


Typical at each end of beam  
**Lifting Loop Detail**



**Strand Projection at Beam Ends When Embedded in Concrete End Diaphragms**

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

**BTB Beam Data**

BTB Beam	Span Length @ Bearing	Overall Beam Length (L)	Concrete Strength		Strand Size Dia. (in.)	Number of Strands		Total Initial Prestress (kips) ③	Hold Down Force (kips)	Camber (in.) ⑤		Deflection (in.) Δ <sub>D</sub>		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 <sub>I</sub>	Time ② (plastic) Δ <sub>T</sub>				
			Steel Diaphragm			Steel Diaphragm				Steel Diaphragm							
④ BTB100	100'-0"	101'-4"	8.00	10.00	0.60"	38	8	1956	19.2	4.17"	6.67"	3.94"	0.98"	8'-0 3/8"	33.3	16.5	2410
④ BTB105	105'-0"	106'-4"	8.50	10.00	0.60"	38	12	2127	22.8	4.42"	7.06"	4.51"	1.13"	7'-4"	35.0	17.3	2428

**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.<sup>2</sup>) 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).

- 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'-0 3/8" beam spacing  
0.832 kip/ft. for 7'-4" beam spacing  
and one steel diaphragm (0.500 kips) at C 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 C of span, Δ<sub>D</sub>, due to weight of deck and diaphragms for detailing purpose:  
(A) Δ<sub>D</sub>=Δ<sub>I</sub> + Δ<sub>T</sub> for simple span.  
(B) Δ<sub>D</sub>=Δ<sub>I</sub> + 3/4Δ<sub>T</sub> for end spans of continuous bridge.  
(C) Δ<sub>D</sub>=Δ<sub>I</sub> + 1/2Δ<sub>T</sub> for interior spans of continuous bridge.
- ③ Total initial prestress is based on 72.6% f's, f's= 270 ksi. and A<sub>s</sub>= 0.217 in.<sup>2</sup>.
- 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.

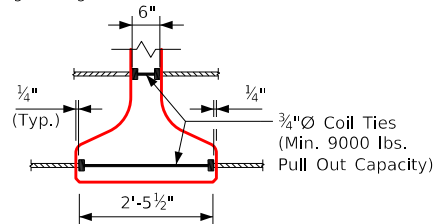
Note: All mild reinforcing steel can be epoxy coated at Contractor's option without modification to bar length or details at no additional cost to the State.

**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:**

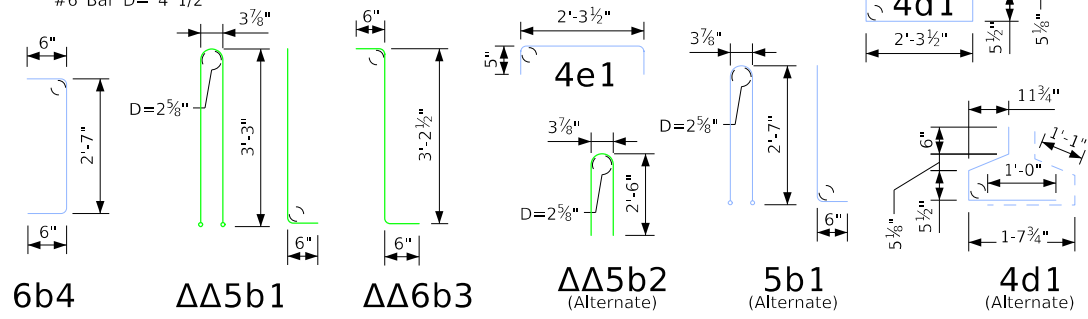
Alternate bars shown in Bent Bar Details may be used in lieu of reinforcing bars shown in Bar List. No additional payment shall be made for use of alternate bars.

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

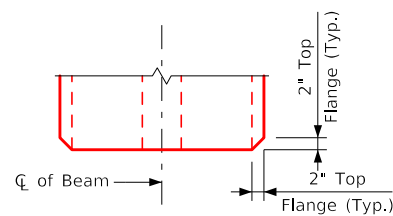
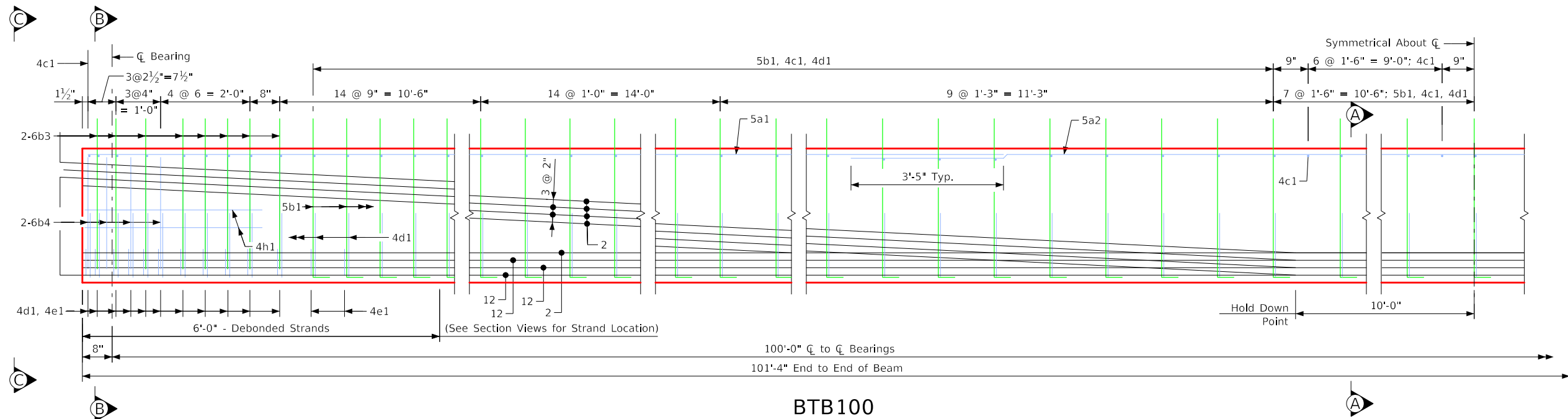
Beam	BTB100	BTB105	Beam
Bar	No.	Length	No. Length Bar
5a1	12	34'-0"	12 36'-6" 5a1
5a2	6	40'-0"	6 40'-0" 5a2
ΔΔ 5b1	87	7'-8"	85 7'-8" 5b1
ΔΔ★ 6b3	32	4'-3"	32 4'-3" 6b3
★ 6b4	16	3'-7"	16 3'-7" 6b4
4c1	119	2'-7"	125 2'-7" 4c1
4d1	109	6'-5"	107 6'-5" 4d1
4e1	26	3'-2"	26 3'-2" 4e1
4h1	4	8'-0"	4 8'-0" 4h1

**Bent Bar Detail**

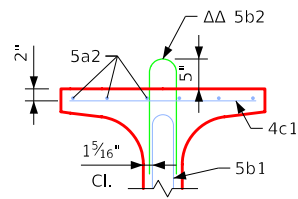
Note: All bar dimensions are out to out  
D = Pin diameter for bending (unless otherwise shown)  
#4 Bar D = 2"  
#5 Bar D = 2 1/2"  
#6 Bar D = 4 1/2"



BTB100 & BTB105 Beam-Data Dtls.



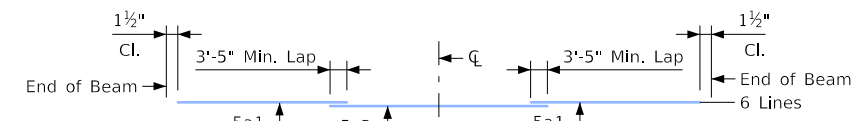
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



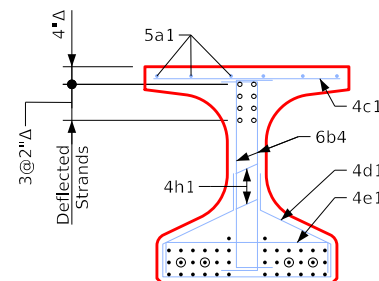
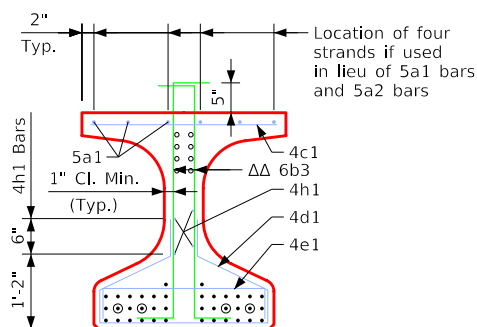
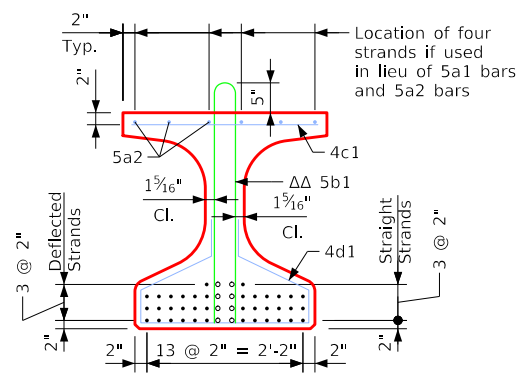
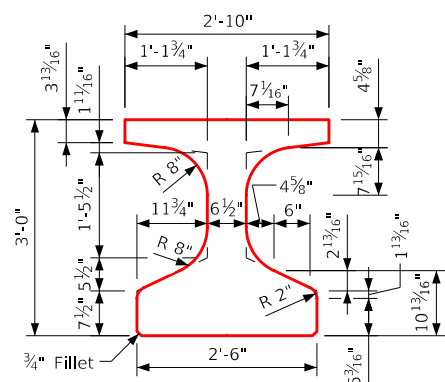
See Alternate Bar Note on Standard Sheet 4765.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

Beam Section Properties

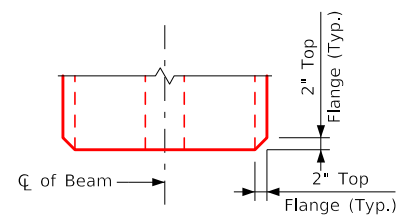
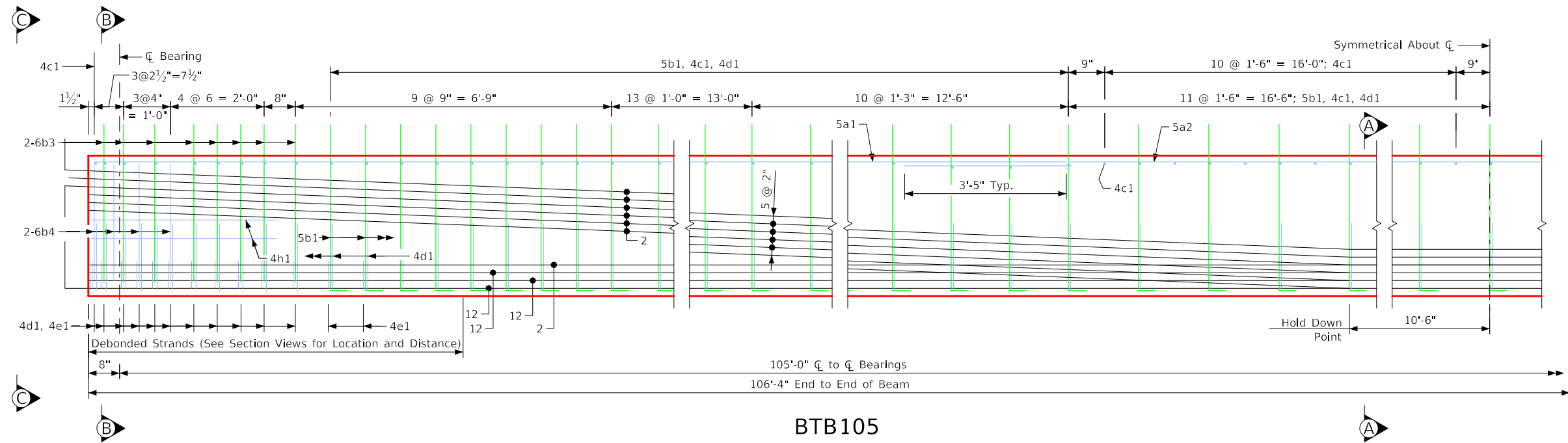


Top Flange Longitudinal Bar Layout



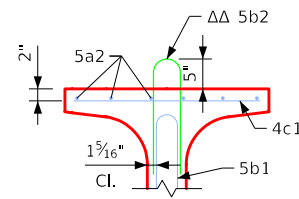
- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars
- ⊙ Strands Debonded 6'-0" from Beam Ends

BTB100 Beam Details



**Top View**

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

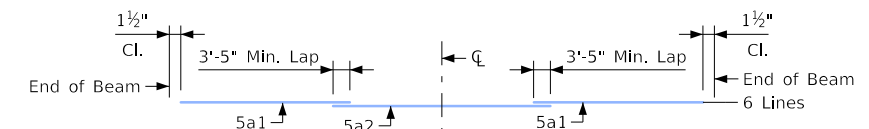


**Section A-A (Alternate)**

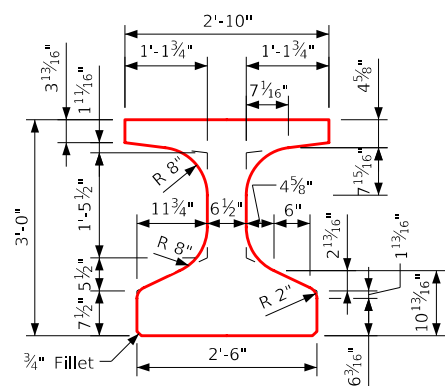
See Alternate Bar Note on Standard Sheet 4765.

Area = 631.7 in.<sup>2</sup>  
 $\bar{y}_b = 17.14$  in.  
 $I = 99,980$  in.<sup>4</sup>

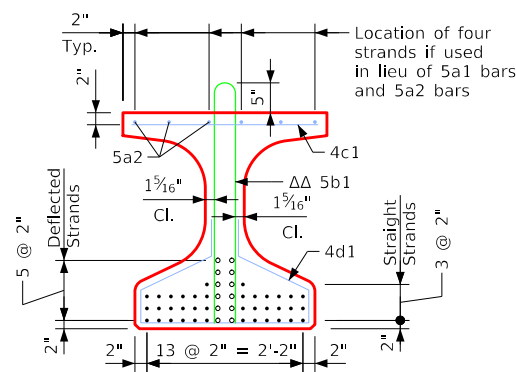
**Beam Section Properties**



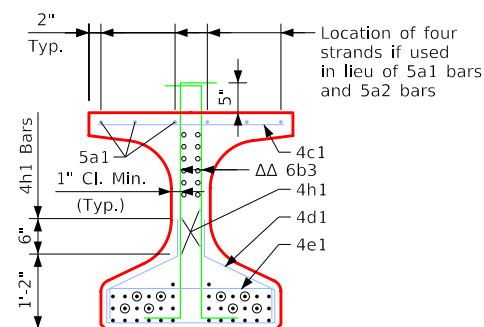
**Top Flange Longitudinal Bar Layout**



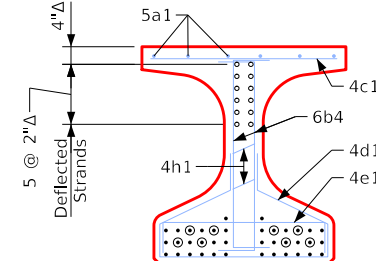
**BTB Beam Cross Section**



**Section A-A**



**Section B-B**



**View C-C**

- Deflected Strands
- △ Dimensions at End of Beam
- △△ 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**

Issued 02-08. Beams.dgn - 4767 - This Sheet Re-issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "B" Beam - 105'-0" Span	Standard Sheet 4767	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:50:06 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

## 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.<sup>2</sup>) 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	Overall Beam Length (L)	Concrete Strength		Strand Size Dia (in.)	Number of Strands		Total Initial Prestress (kips) ③	Hold Down Force (kips)	Camber (in.) ⑥		Deflection (in.) Δ <sub>D</sub>		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 <sub>I</sub>	Time ② (plastic) Δ <sub>T</sub>				
			HL-93 Loading			Steel Diaphragm											
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	2.48"	3.97"	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	2.95"	4.72"	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	3.34"	5.35"	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	3.65"	5.84"	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	4.02"	6.43"	4.66"	1.17"	9'-3"	61.5	30.4	4107
BTE150	150'-0"	151'-4"	7.50	9.50	0.60"	48	12	2553	33.7	4.48"	7.17"	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 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<sub>D</sub>, due to weight of deck and diaphragms for detailing purpose:  
 (A) Δ<sub>D</sub>=Δ<sub>I</sub> +Δ<sub>T</sub> for simple span.  
 (B) Δ<sub>D</sub>=Δ<sub>I</sub> +¾Δ<sub>T</sub> for end spans of continuous bridge.  
 (C) Δ<sub>D</sub>=Δ<sub>I</sub> +½Δ<sub>T</sub> for interior spans of continuous bridge.

③ Total initial prestress is based on 72.6% f's, f's= 270 ksi. and A<sub>s</sub>= 0.217 in.<sup>2</sup>.

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

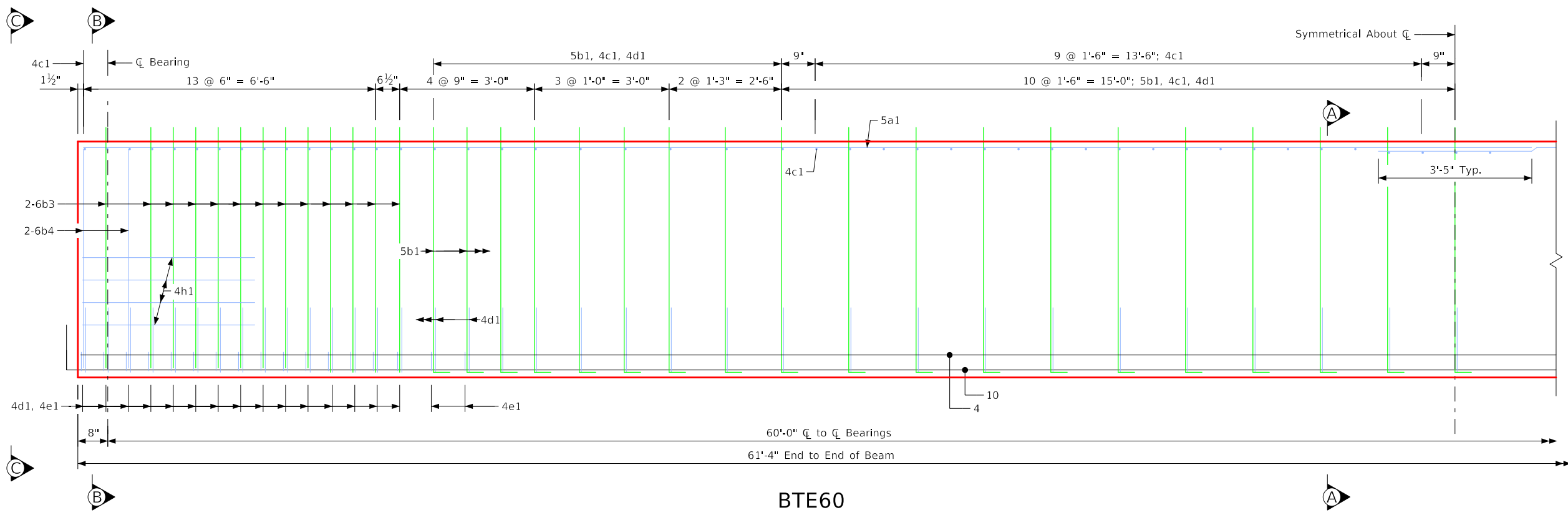
⑤ Includes partial length debonded strands, see individual Beam Sheet for locations and details.

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

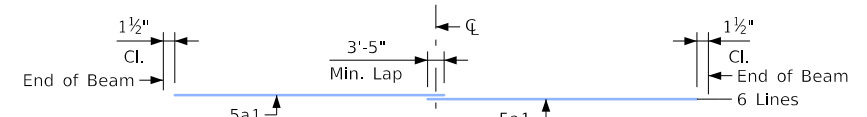
BTE Beam - Data Details

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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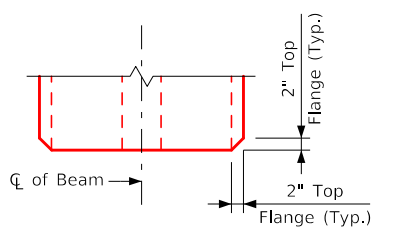




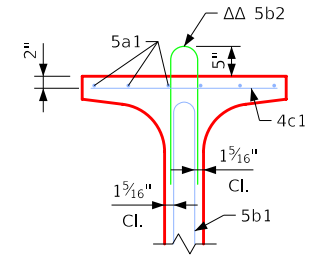
BTE60



Top Flange Longitudinal Bar Layout



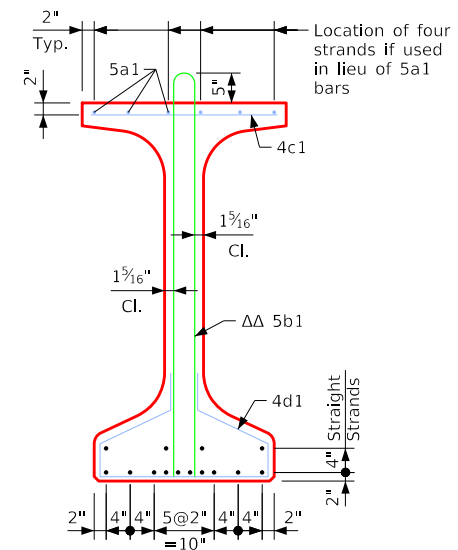
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



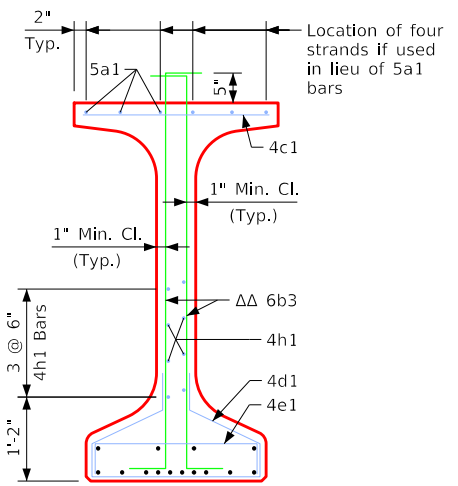
**Section A-A (Alternate)** See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

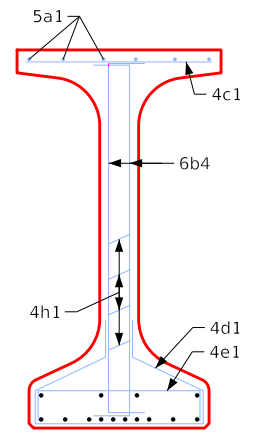
**Beam Section Properties**



**Section A-A**



**Section B-B**



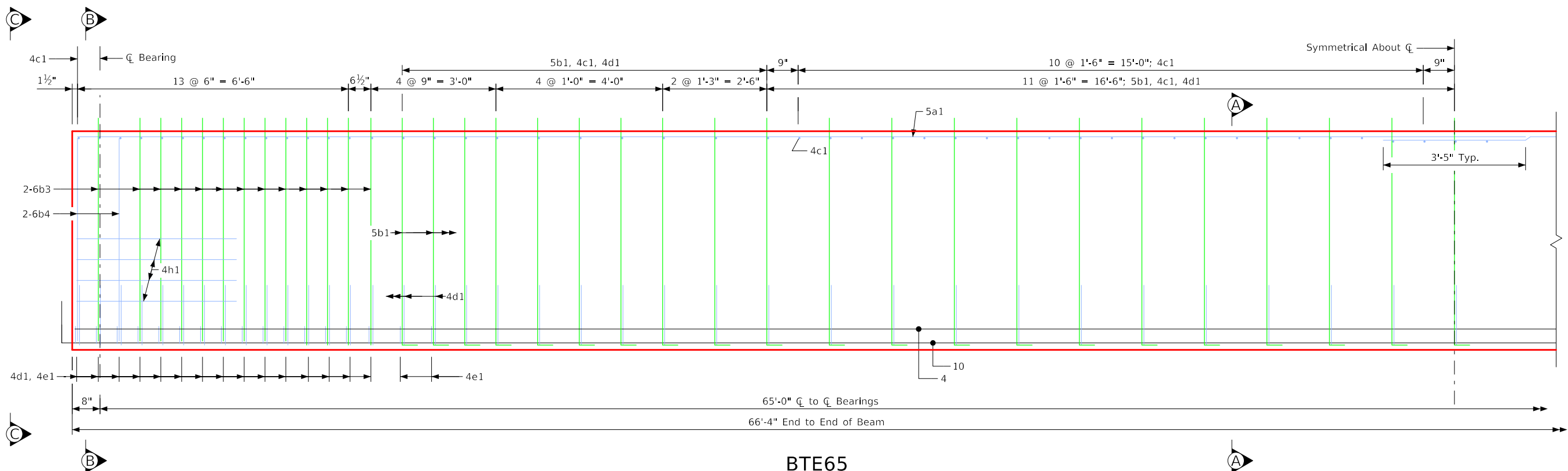
**View C-C**

△△ Epoxy Coated Bars

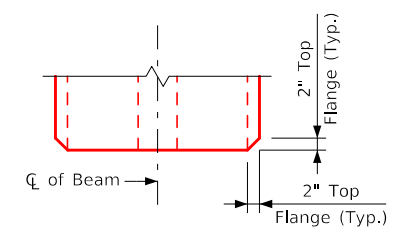
**BTE60 Beam Details**

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.

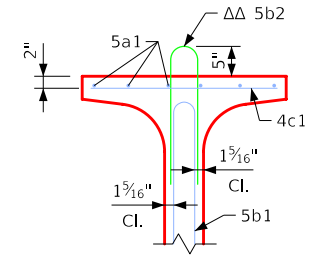
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 60'-0" Span	Standard Sheet 4771	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:50:09 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTE65



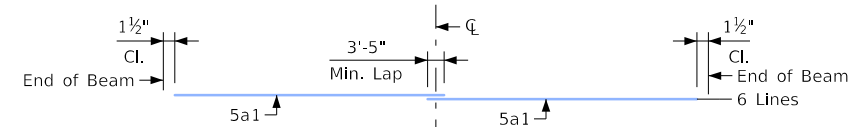
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



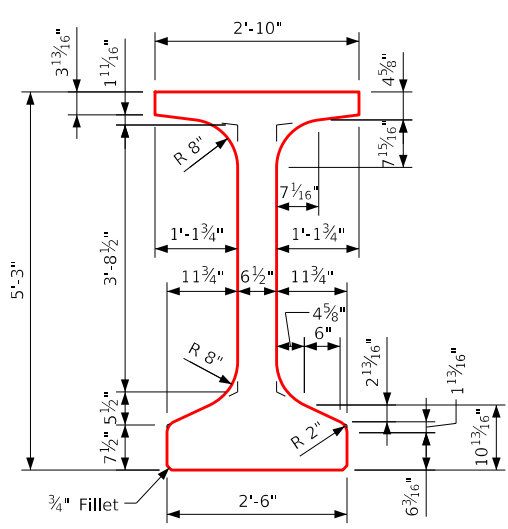
**Section A-A (Alternate)**  
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

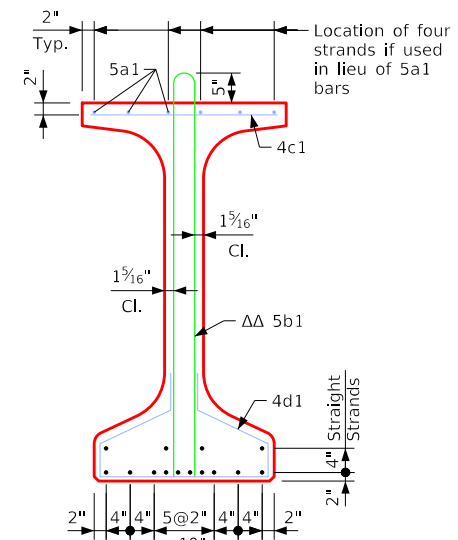
**Beam Section Properties**



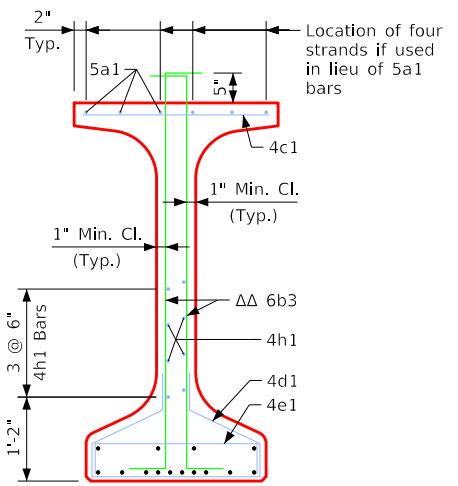
**Top Flange Longitudinal Bar Layout**



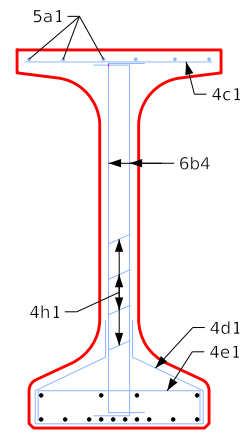
**BTE Beam Cross Section**



**Section A-A**



**Section B-B**



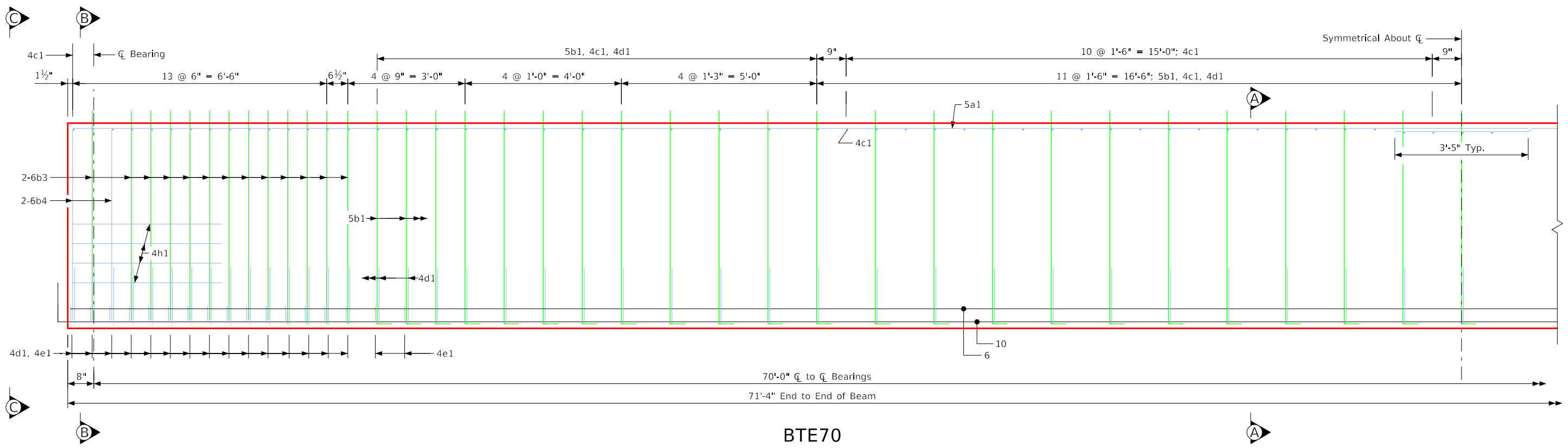
**View C-C**

ΔΔ Epoxy Coated Bars

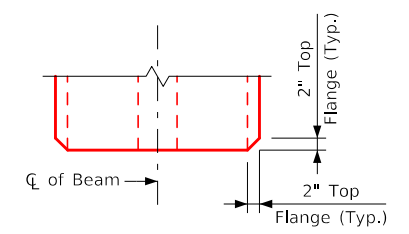
**BTE65 Beam Details**

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.

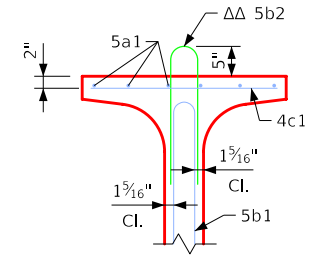
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 65'-0" Span	Standard Sheet 4772	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:50:10 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTE70



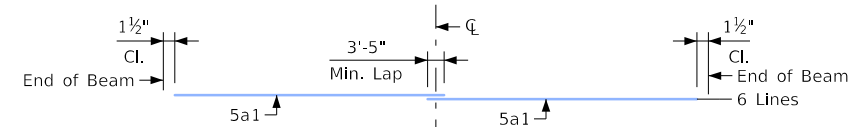
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



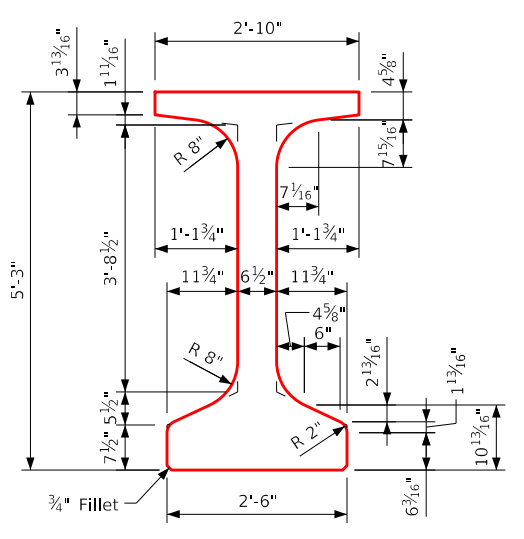
**Section A-A (Alternate)** See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

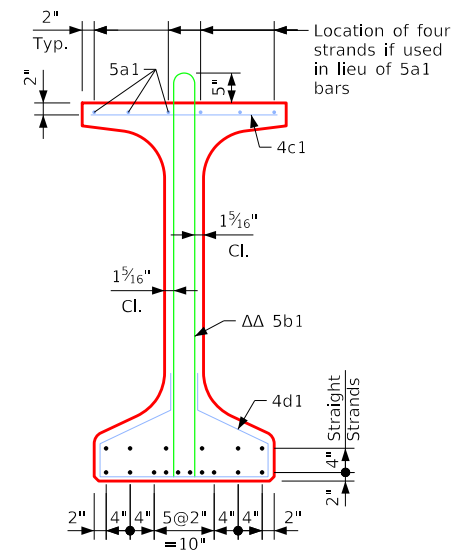
**Beam Section Properties**



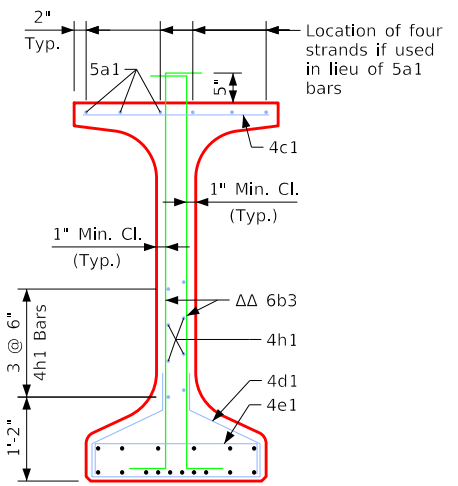
**Top Flange Longitudinal Bar Layout**



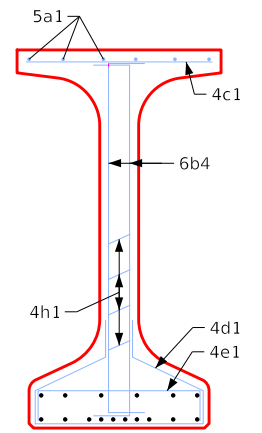
**BTE Beam Cross Section**



**Section A-A**



**Section B-B**



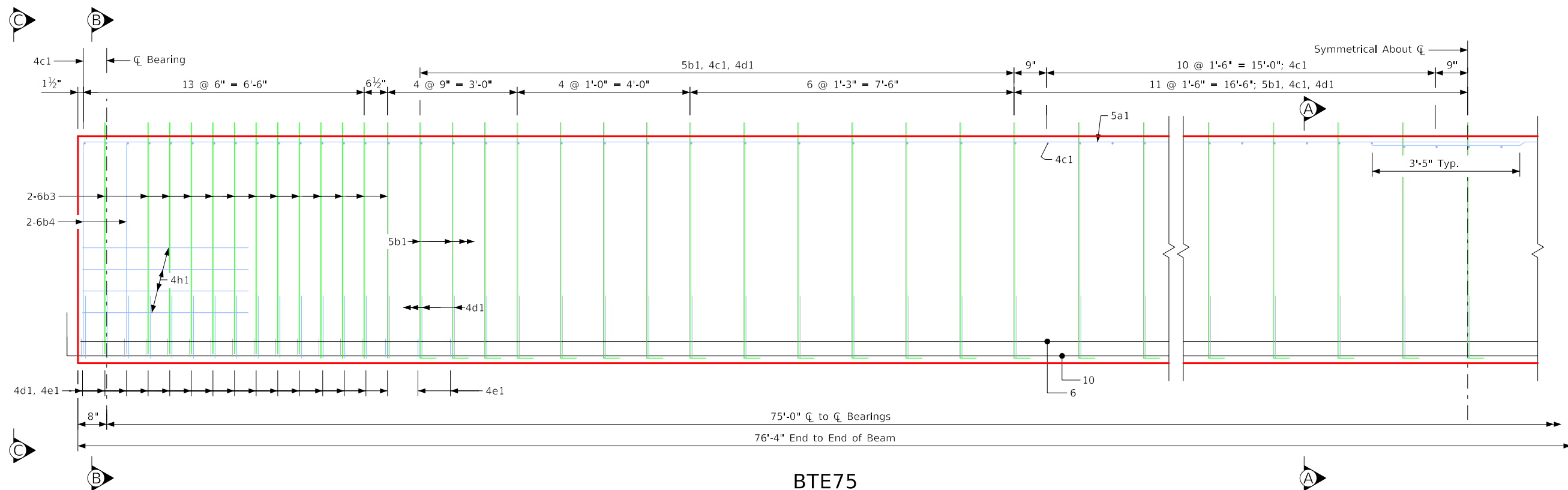
**View C-C**

△△ Epoxy Coated Bars

**BTE70 Beam Details**

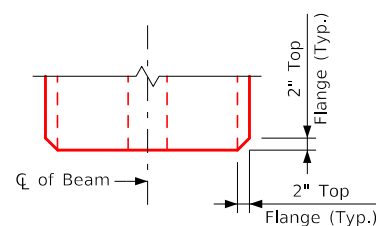
Revision 08-09: Added Strands to Sections A-A, B-B, & C-C. Issued 02-08. Beams.dgn - 4773 - This Sheet Re-Issued 04-2024. Sheet Format Update.

FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 70'-0" Span	Standard Sheet 4773	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:50:10 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



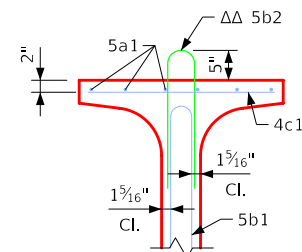
BTE75

A



Top View

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

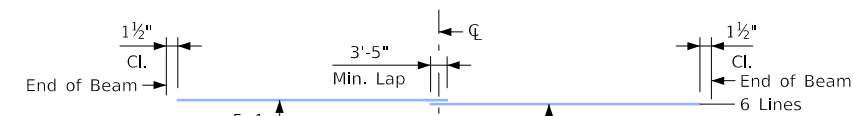


Section A-A (Alternate)

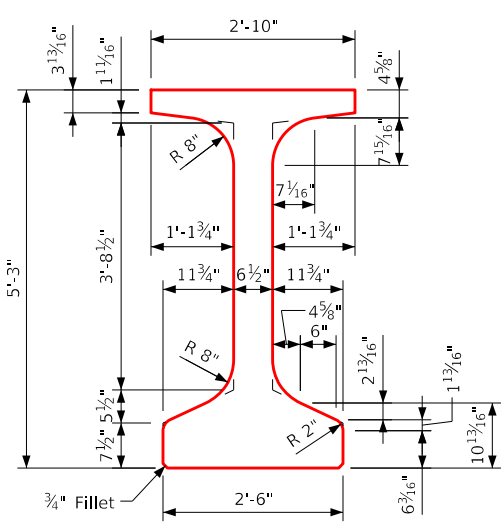
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

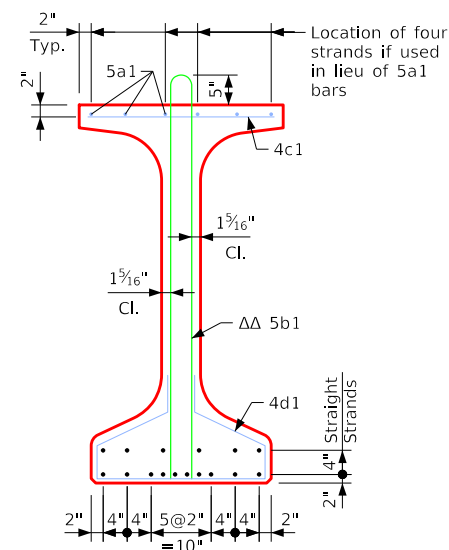
Beam Section Properties



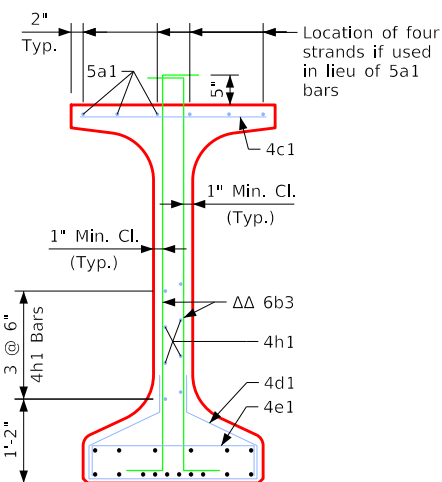
Top Flange Longitudinal Bar Layout



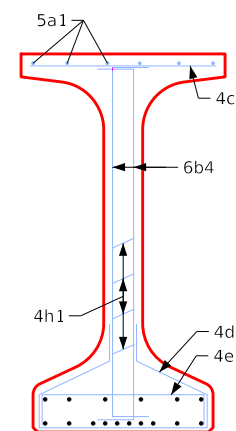
BTE Beam Cross Section



Section A-A



Section B-B



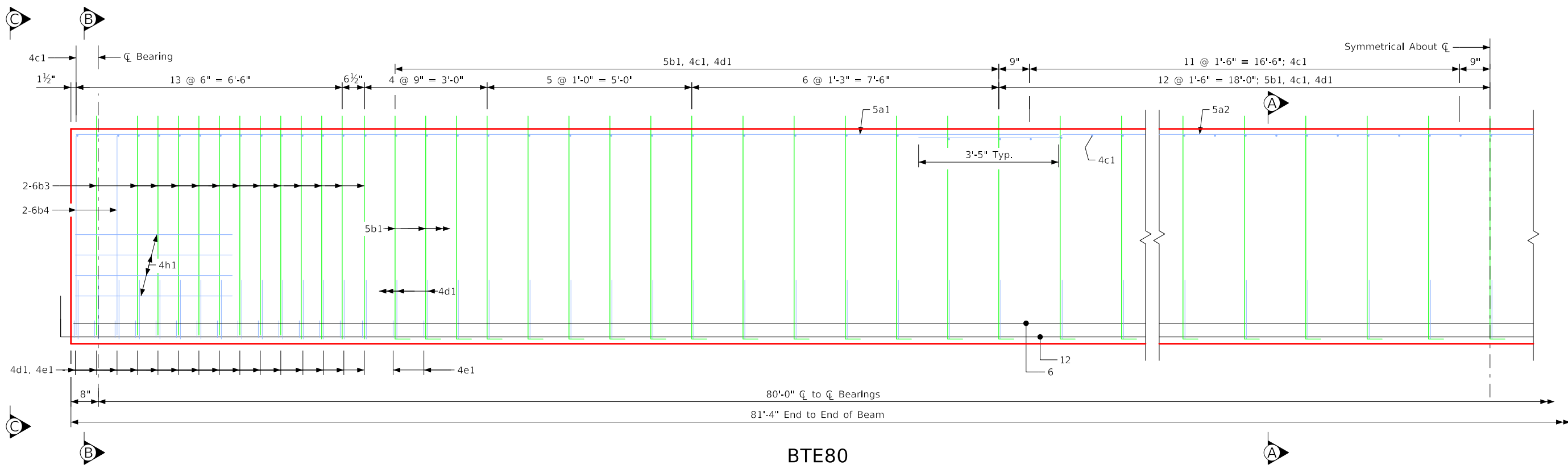
View C-C

ΔΔ Epoxy Coated Bars

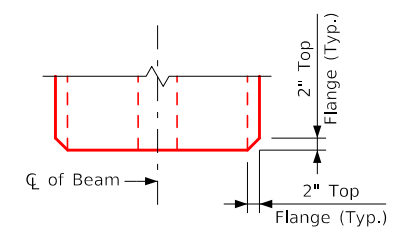
BTE75 Beam Details

Issued 02-08, Beams.dgn - 4774 - This Sheet Re-Issued 04+2024. Sheet Format Update.

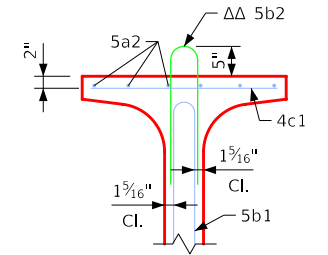
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 75'-0" Span	Standard Sheet 4774	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:50:11 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTE80



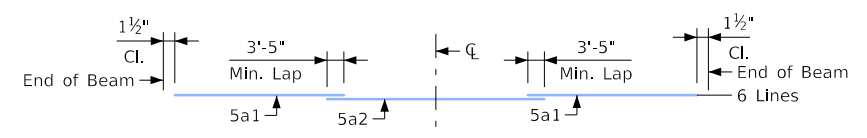
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



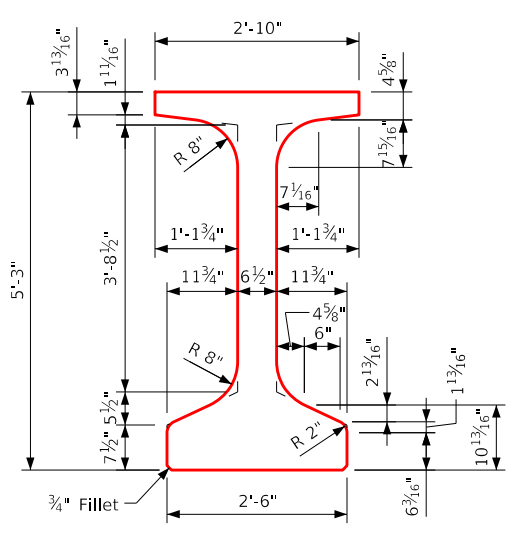
**Section A-A (Alternate)**  
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

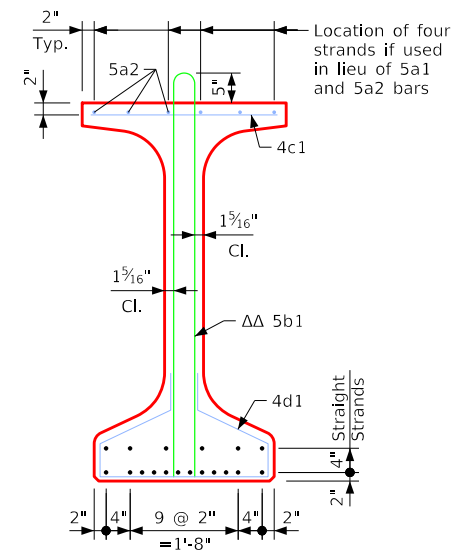
**Beam Section Properties**



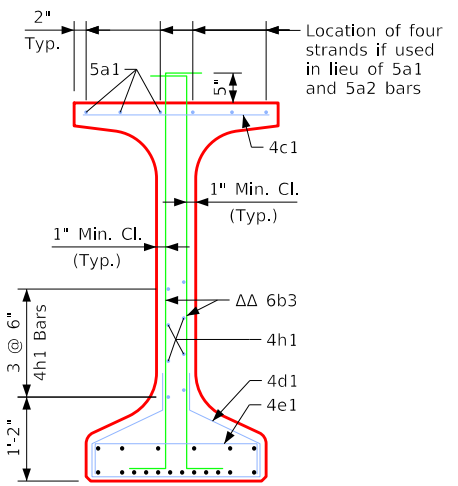
**Top Flange Longitudinal Bar Layout**



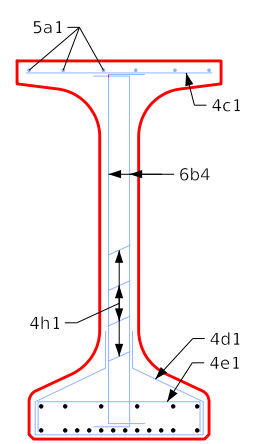
**BTE Beam Cross Section**



**Section A-A**

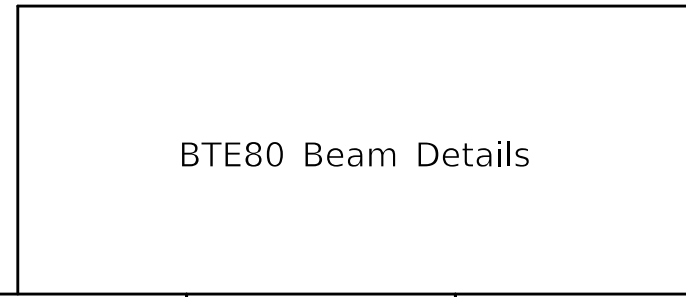


**Section B-B**



**View C-C**

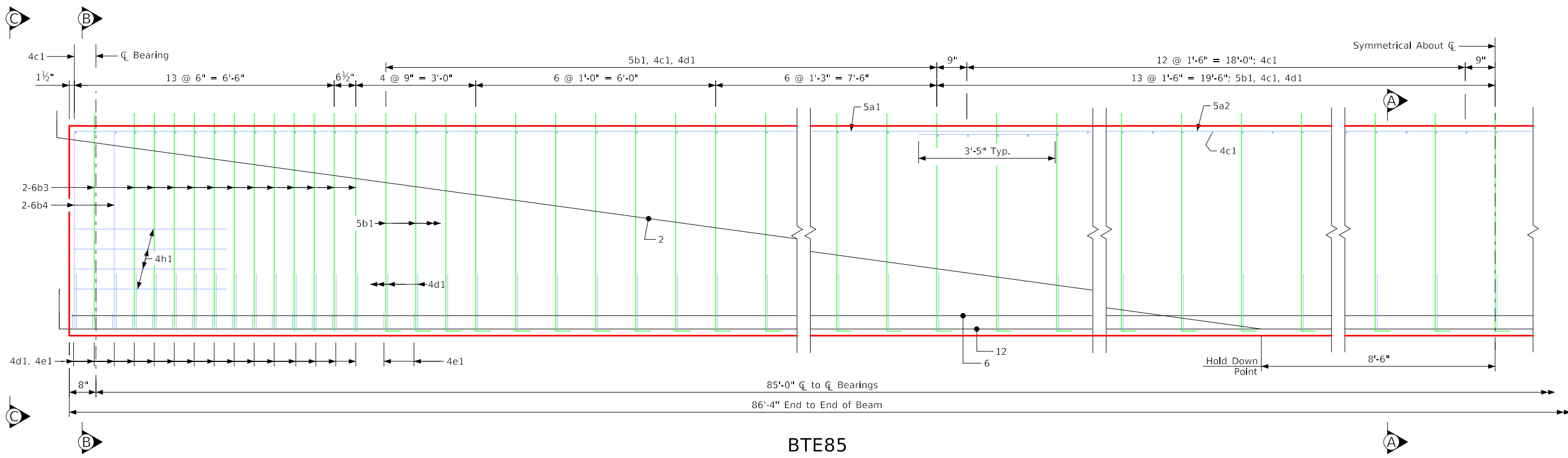
ΔΔ Epoxy Coated Bars



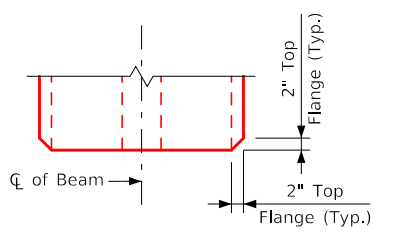
**BTE80 Beam Details**

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.

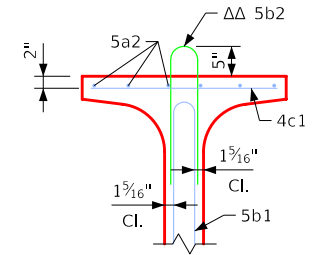
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 80'-0" Span	Standard Sheet 4775	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:50:12 PM	4/5/2026	bkloss	pw:\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTE85



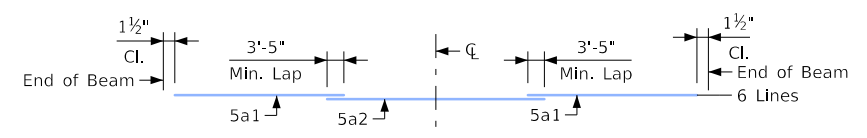
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



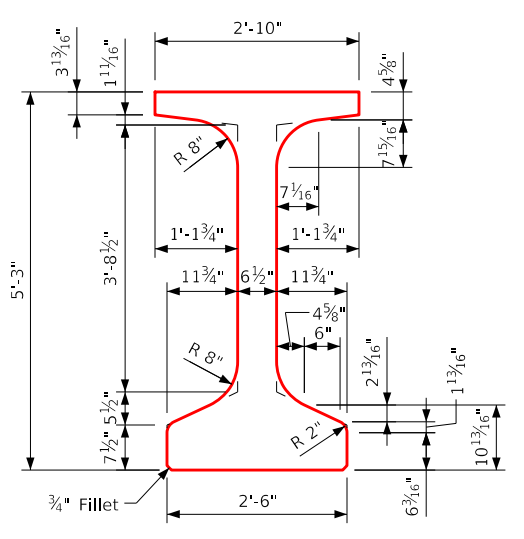
**Section A-A (Alternate)** See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

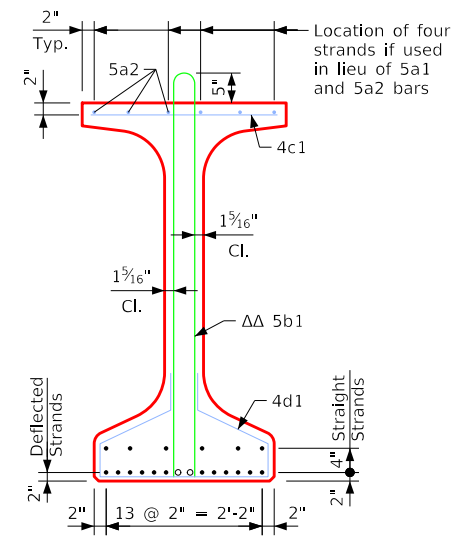
**Beam Section Properties**



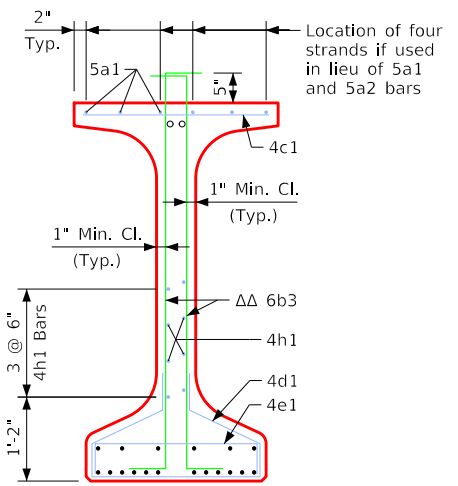
**Top Flange Longitudinal Bar Layout**



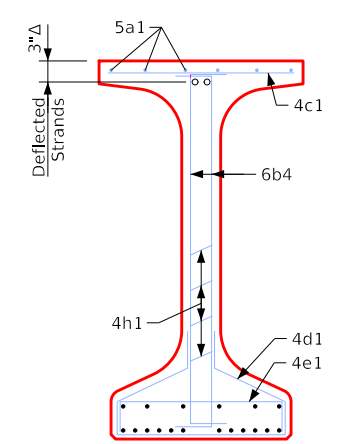
**BTE Beam Cross Section**



**Section A-A**



**Section B-B**



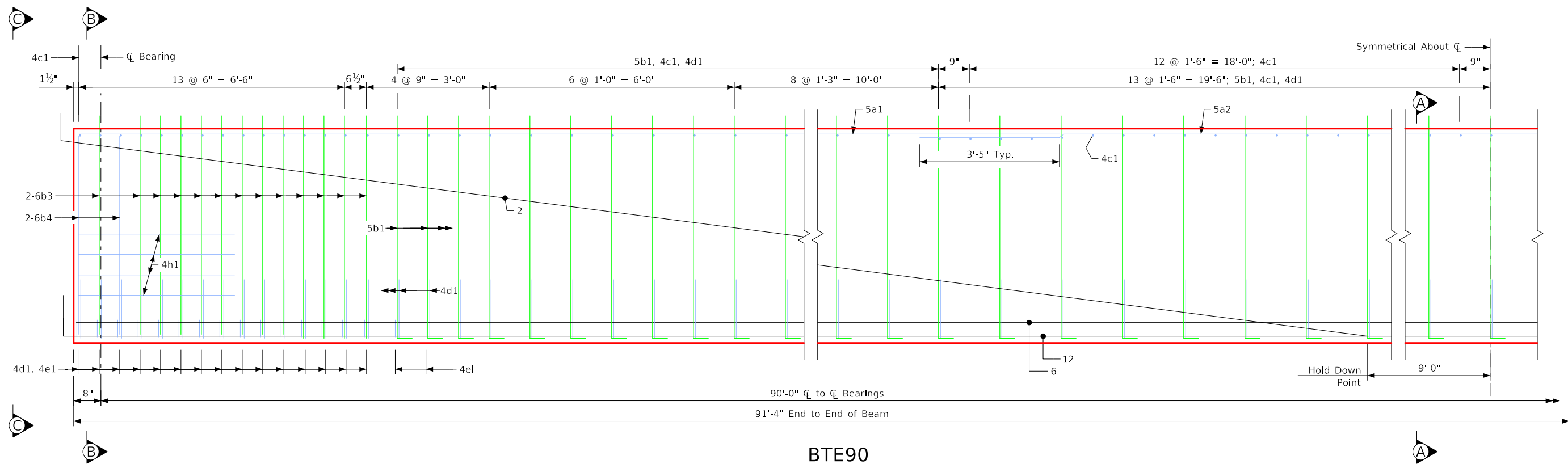
**View C-C**

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

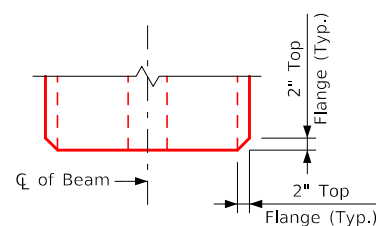
BTE85 Beam Details

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
3:50:13 PM	4/5/2026	bkloss	p:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

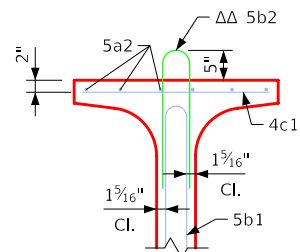


BTE90



Top View

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

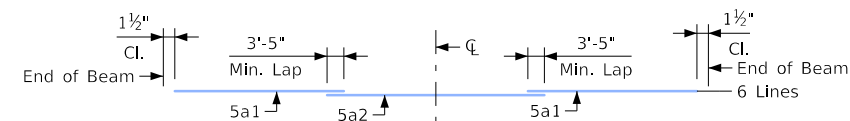


Section A-A (Alternate)

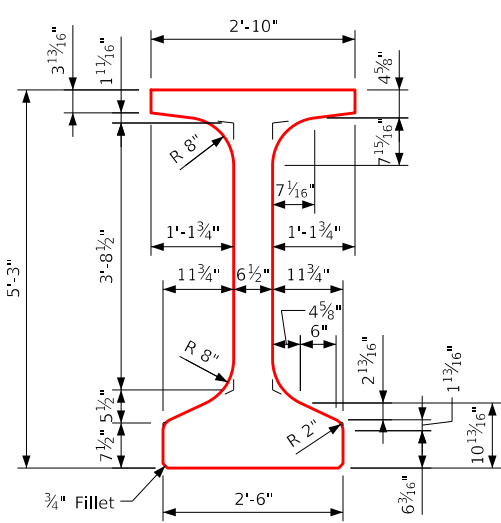
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

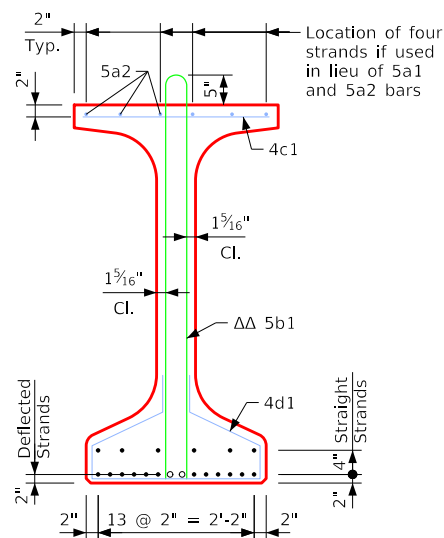
Beam Section Properties



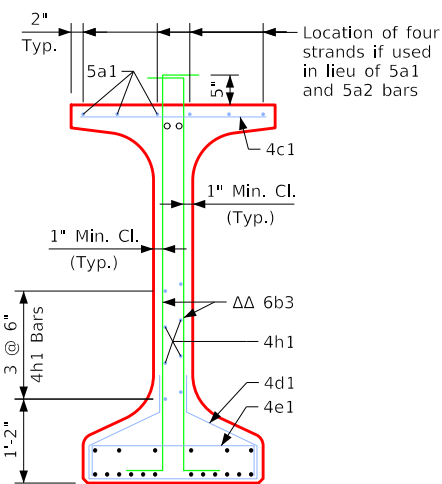
Top Flange Longitudinal Bar Layout



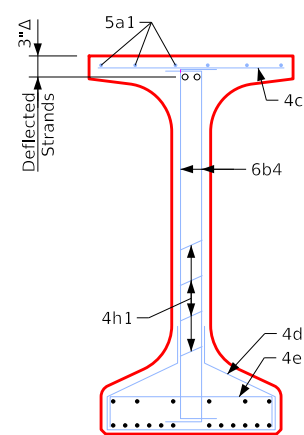
BTE Beam Cross Section



Section A-A



Section B-B



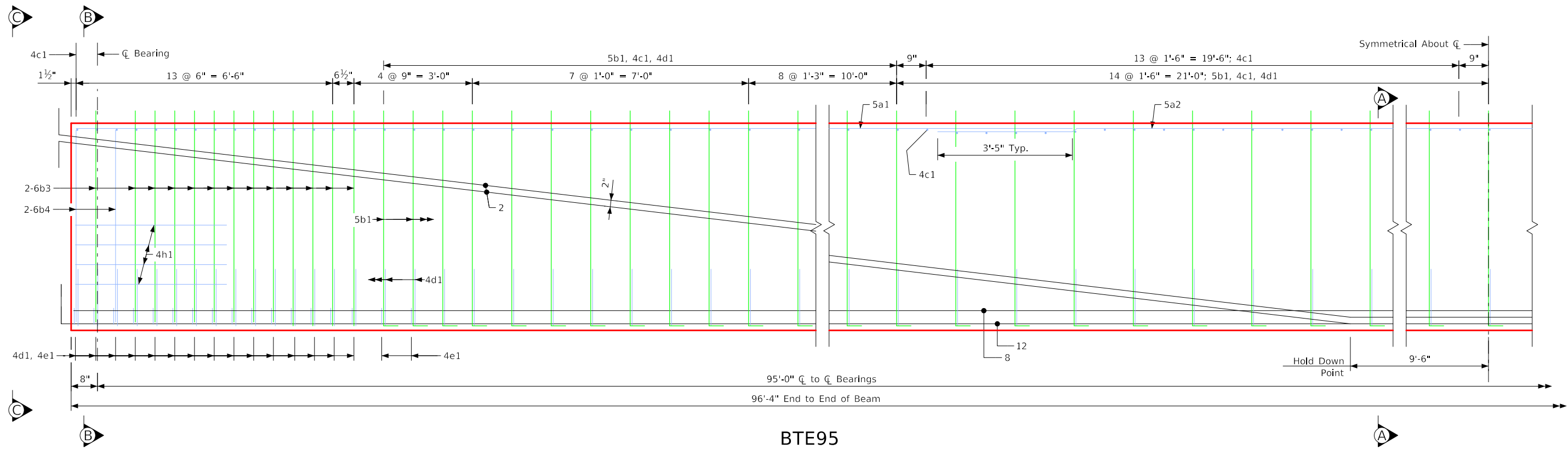
View C-C

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

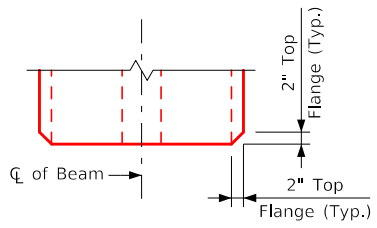
BTE90 Beam Details

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.

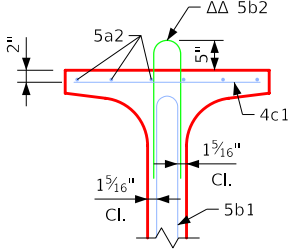
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 90'-0" Span	Standard Sheet 4777	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:50:14 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTE95



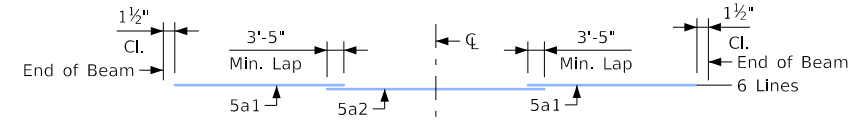
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



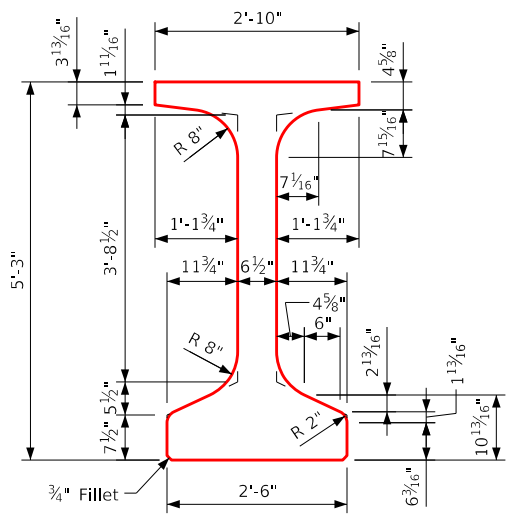
**Section A-A (Alternate)** See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

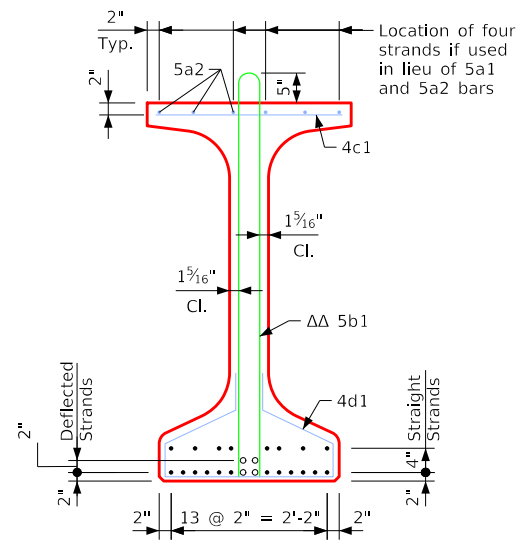
**Beam Section Properties**



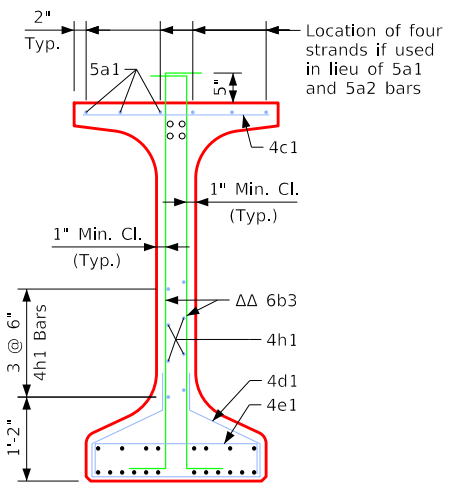
**Top Flange Longitudinal Bar Layout**



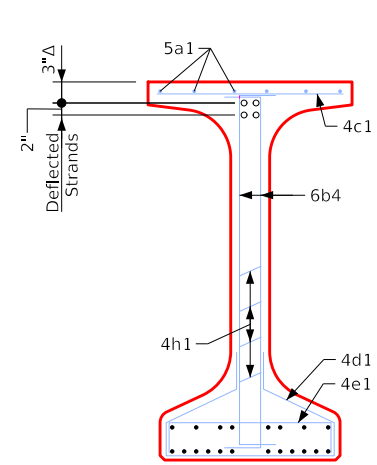
**BTE Beam Cross Section**



**Section A-A**



**Section B-B**



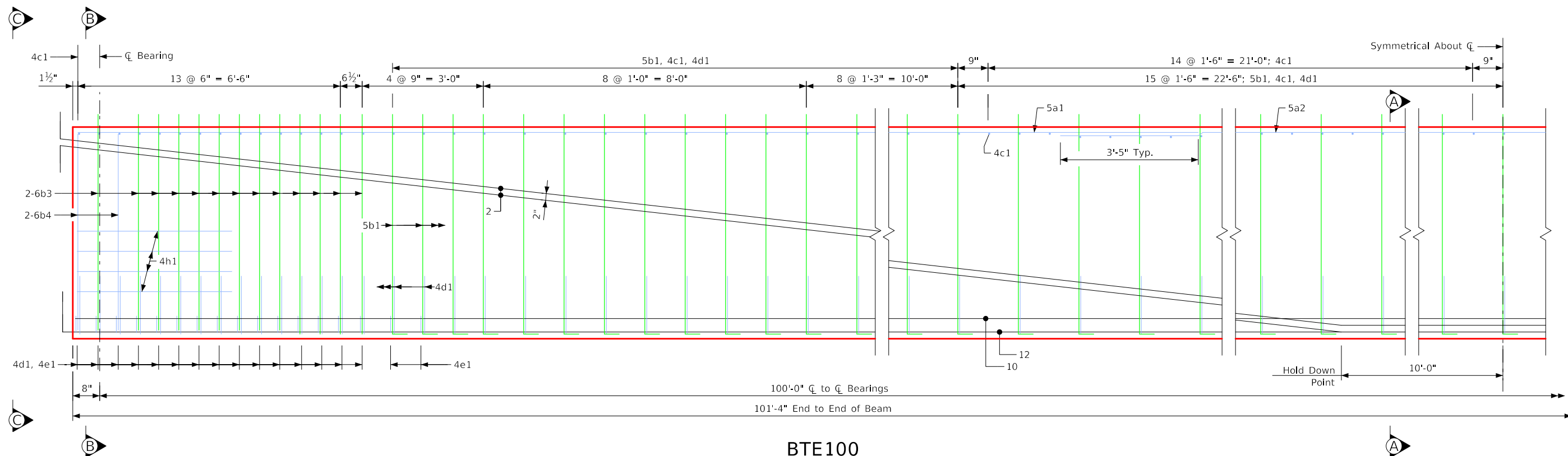
**View C-C**

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

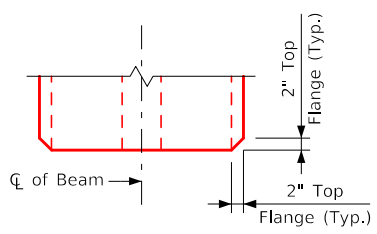
BTE95 Beam Details

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.

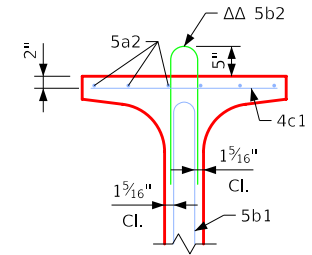
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 95'-0" Span	Standard Sheet 4778	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:50:15 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTE100



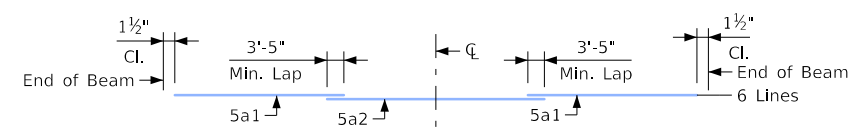
**Top View**  
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



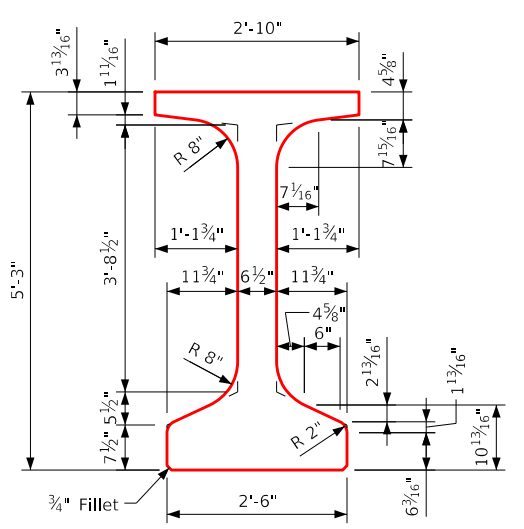
**Section A-A (Alternate)**  
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b$  = 28.75 in.  
I = 422.790 in.<sup>4</sup>

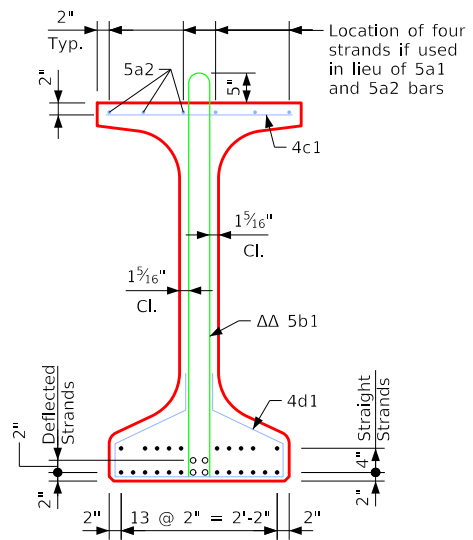
**Beam Section Properties**



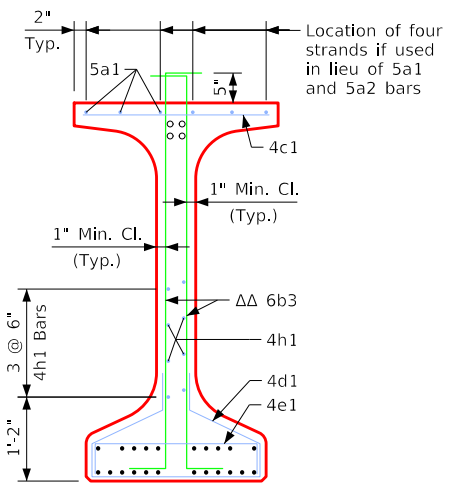
**Top Flange Longitudinal Bar Layout**



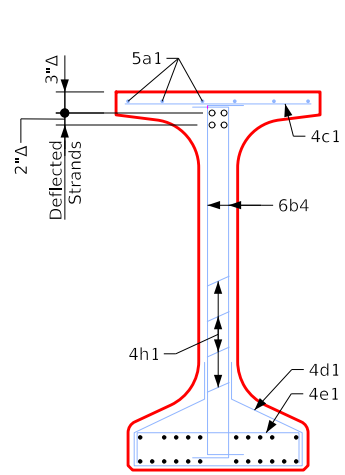
**BTE Beam Cross Section**



**Section A-A**



**Section B-B**



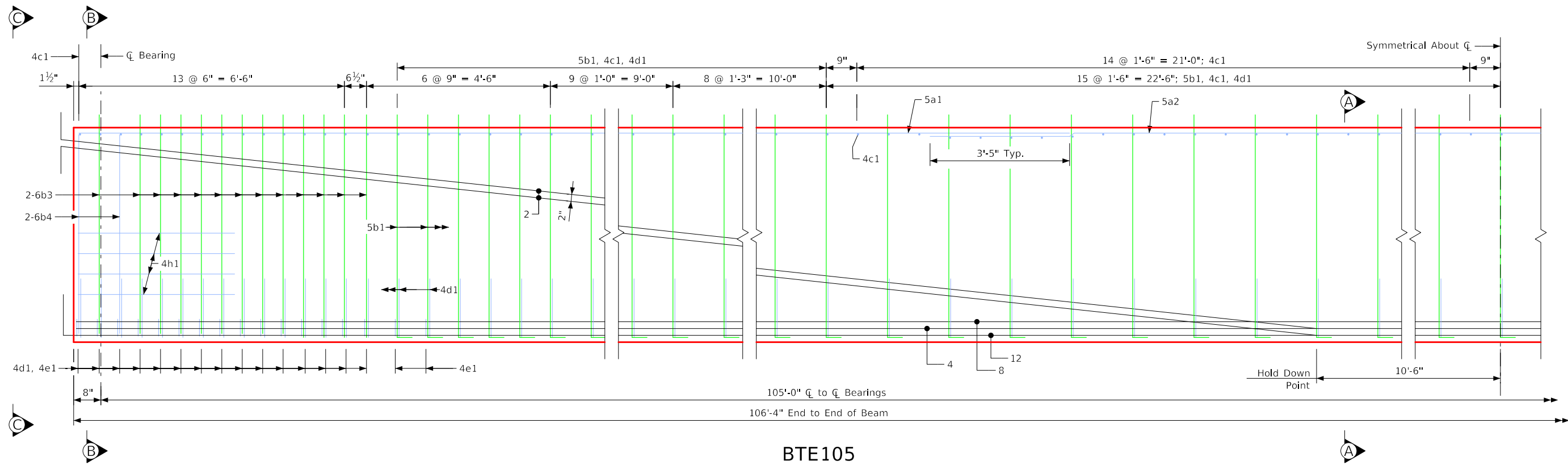
**View C-C**

- o Deflected Strands
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  Epoxy Coated Bars

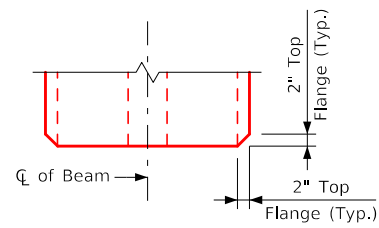
BTE100 Beam Details

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.

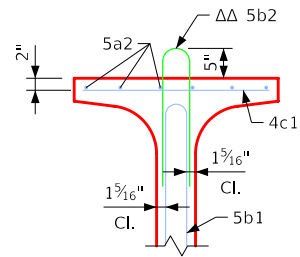
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 100'-0" Span	Standard Sheet 4779	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:50:16 PM	4/5/2026	bkloss	pw:\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTE105



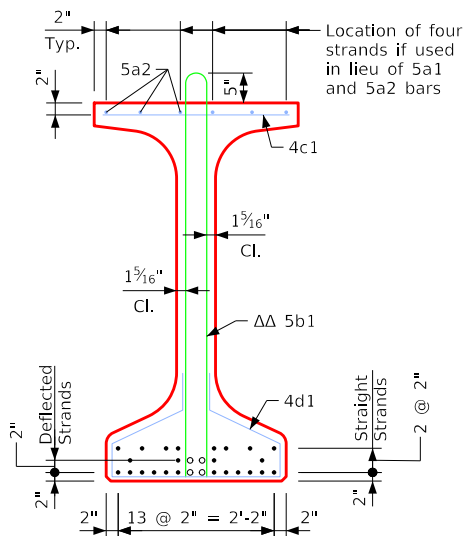
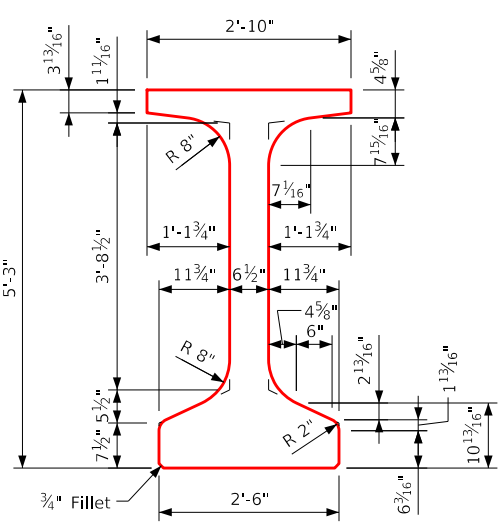
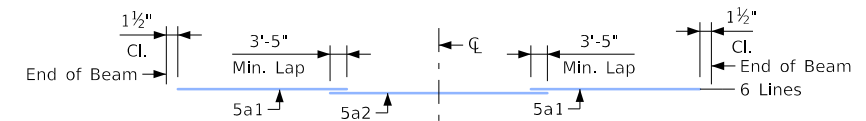
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



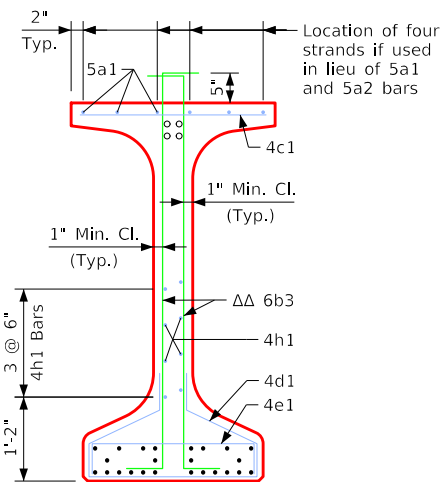
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

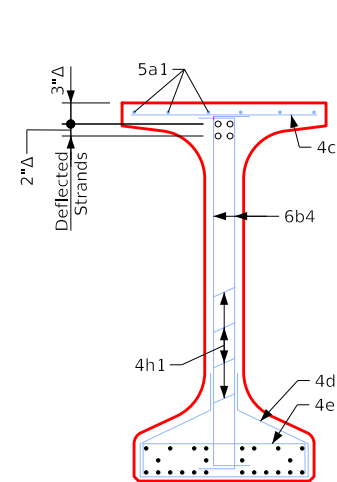
Beam Section Properties



Section A-A



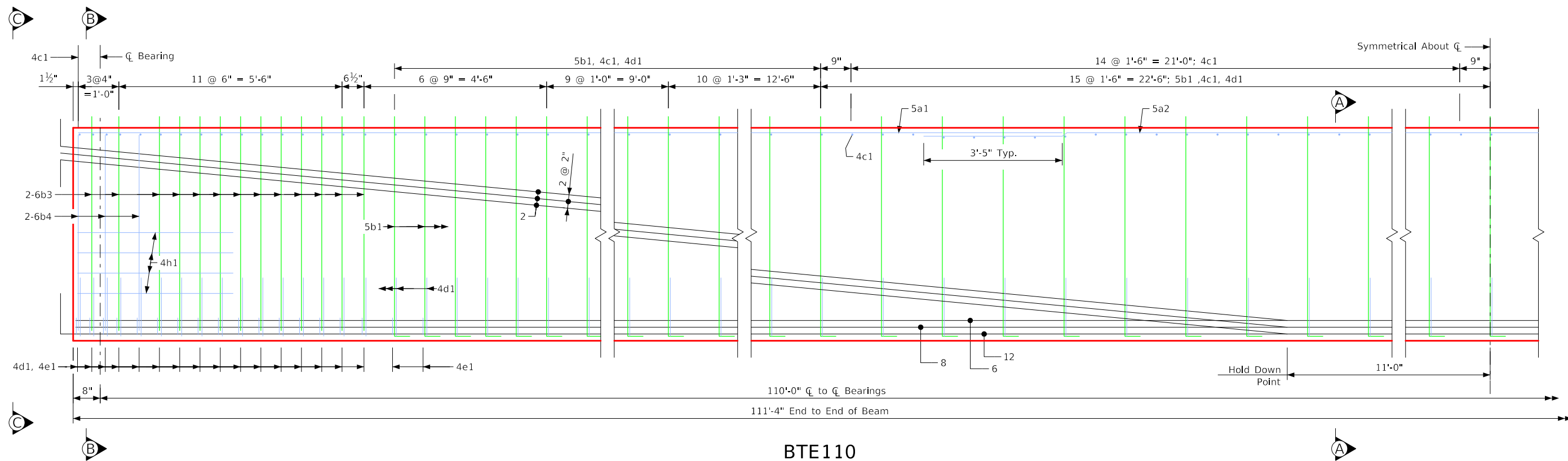
Section B-B



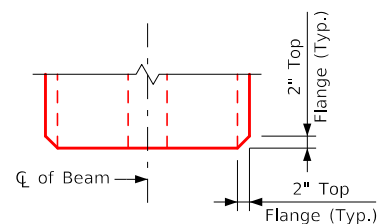
View C-C

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

BTE105 Beam Details

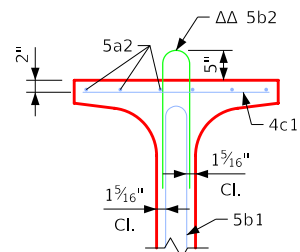


BTE110



Top View

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

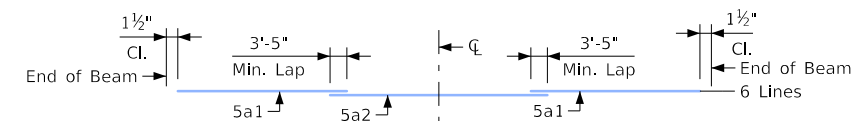


Section A-A (Alternate)

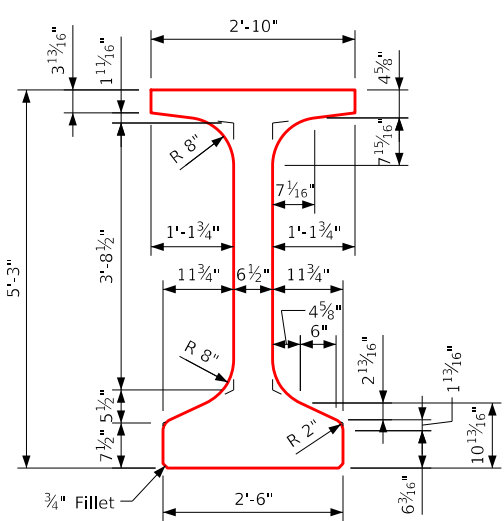
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
I = 422.790 in.<sup>4</sup>

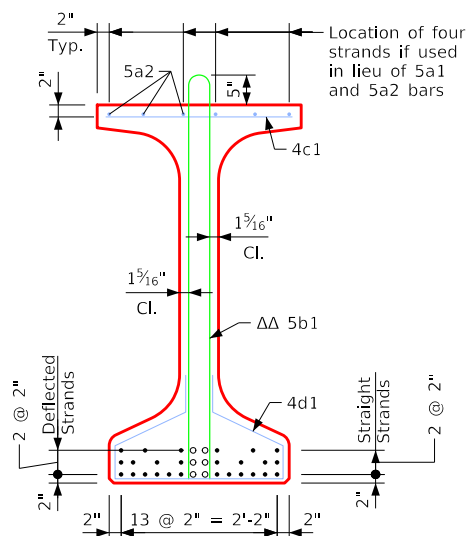
Beam Section Properties



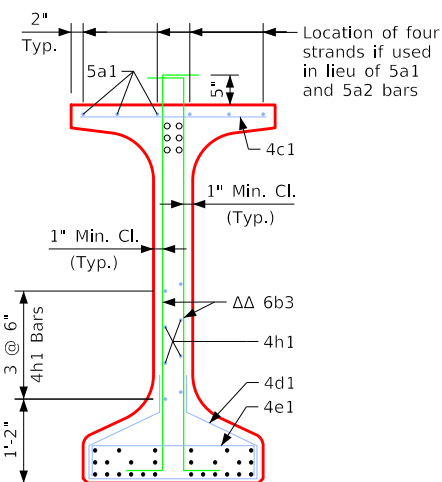
Top Flange Longitudinal Bar Layout



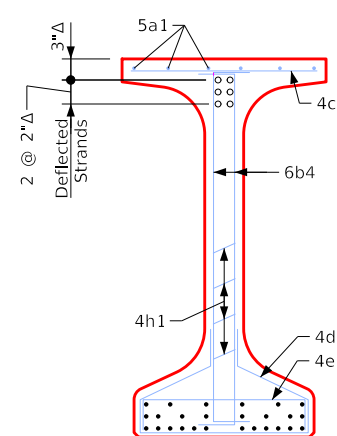
BTE Beam Cross Section



Section A-A



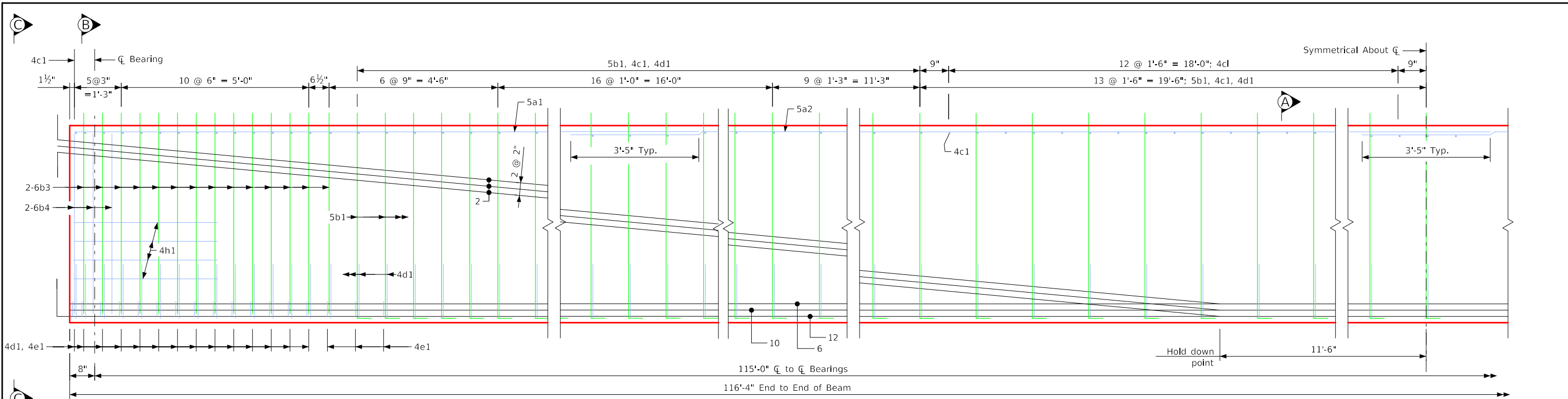
Section B-B



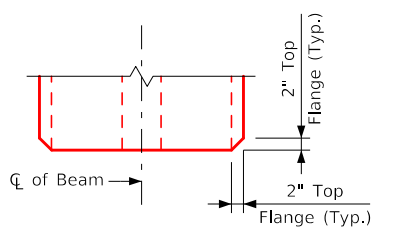
View C-C

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

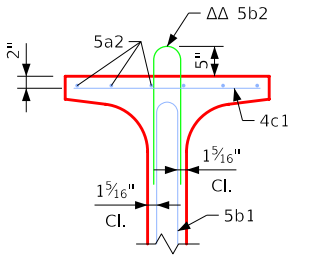
BTE110 Beam Details



BTE115



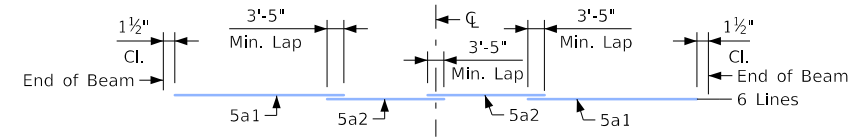
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



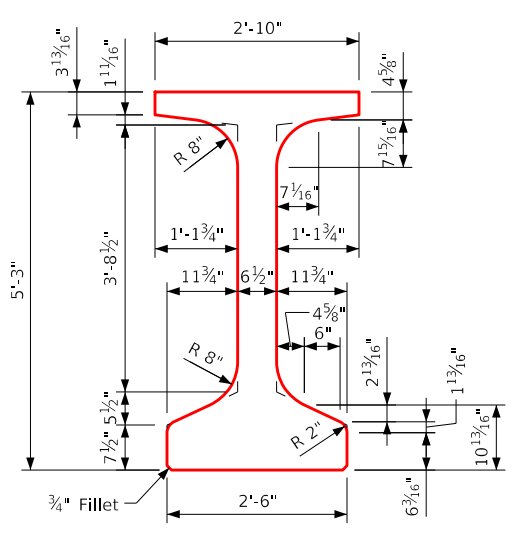
**Section A-A (Alternate)** See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b$  = 28.75 in.  
I = 422.790 in.<sup>4</sup>

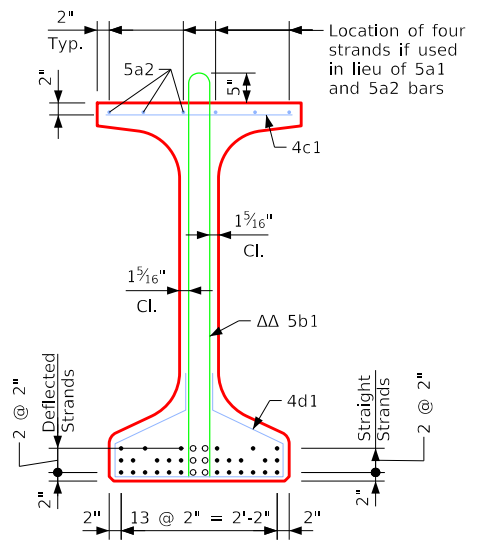
**Beam Section Properties**



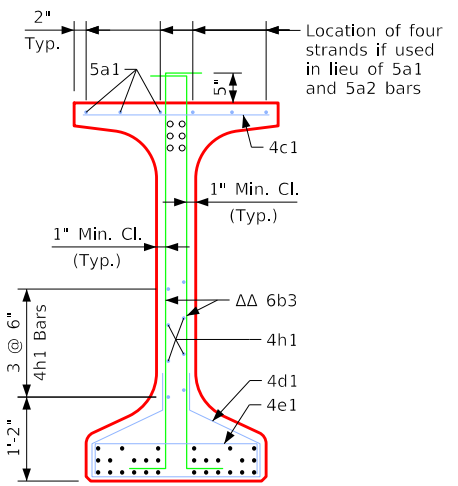
**Top Flange Longitudinal Bar Layout**



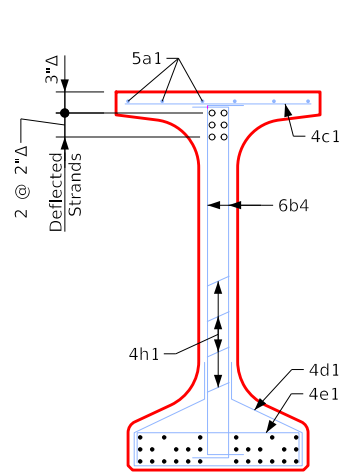
**BTE Beam Cross Section**



**Section A-A**



**Section B-B**



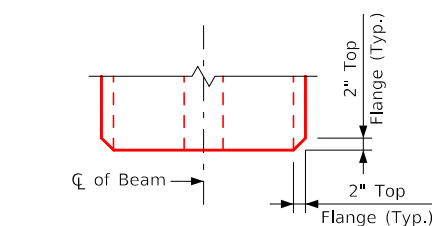
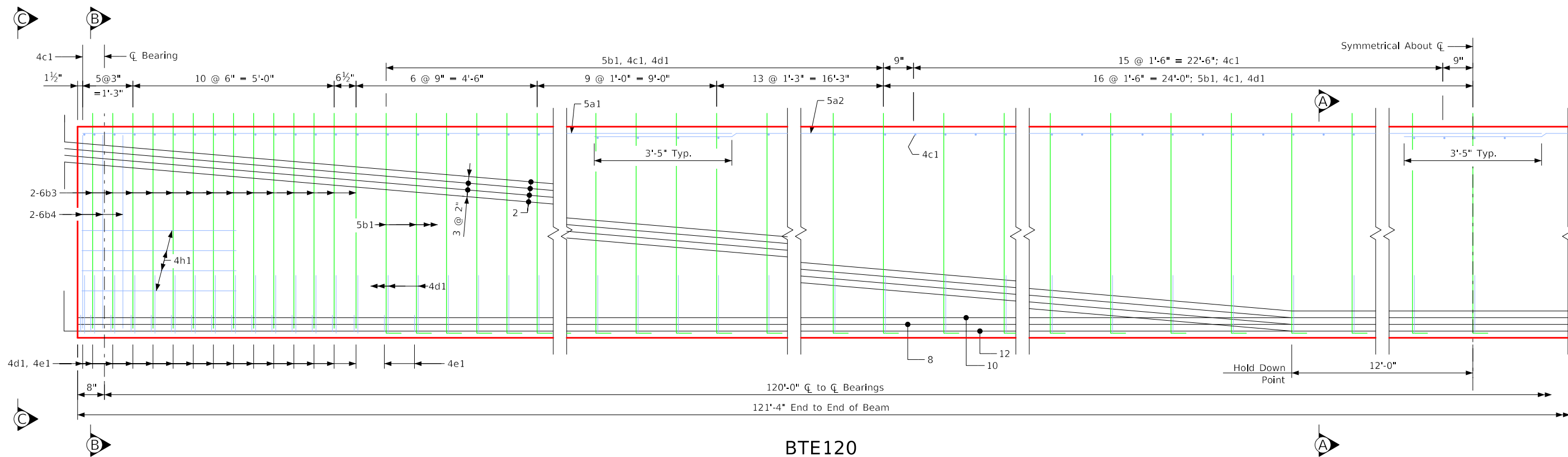
**View C-C**

- o Deflected Strands
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  Epoxy Coated Bars

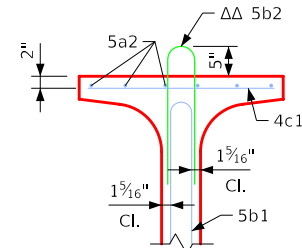
**BTE115 Beam Details**

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
3:50:19 PM	4/5/2026	bkloss	pw:\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



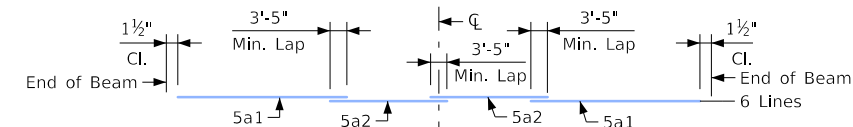
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



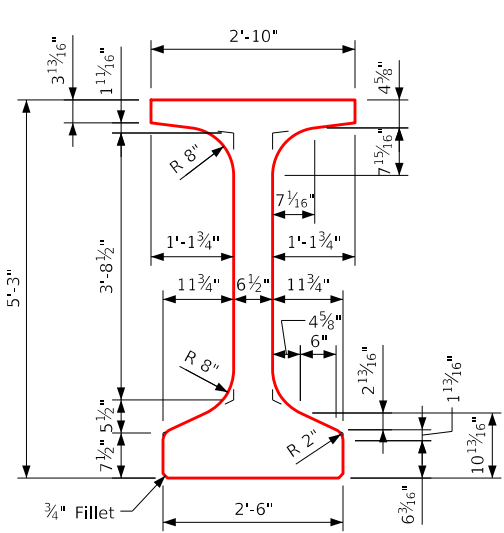
**Section A-A (Alternate)** See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b$  = 28.75 in.  
I = 422.790 in.<sup>4</sup>

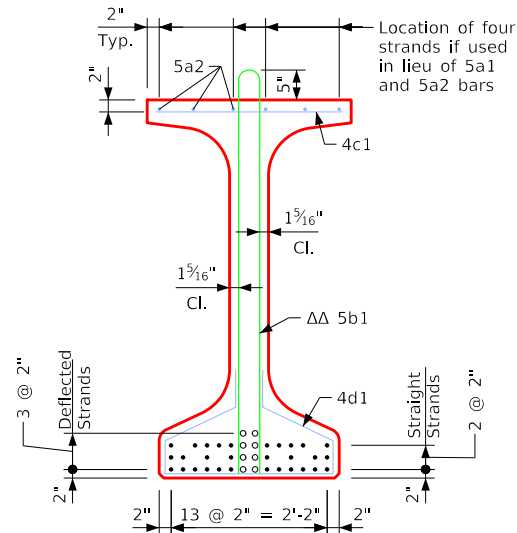
**Beam Section Properties**



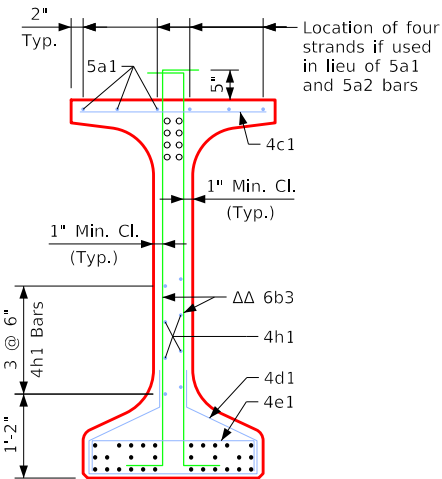
**Top Flange Longitudinal Bar Layout**



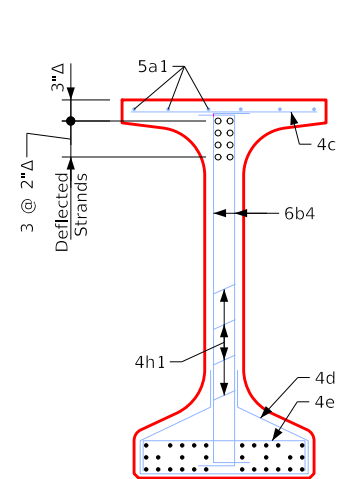
**BTE Beam Cross Section**



**Section A-A**



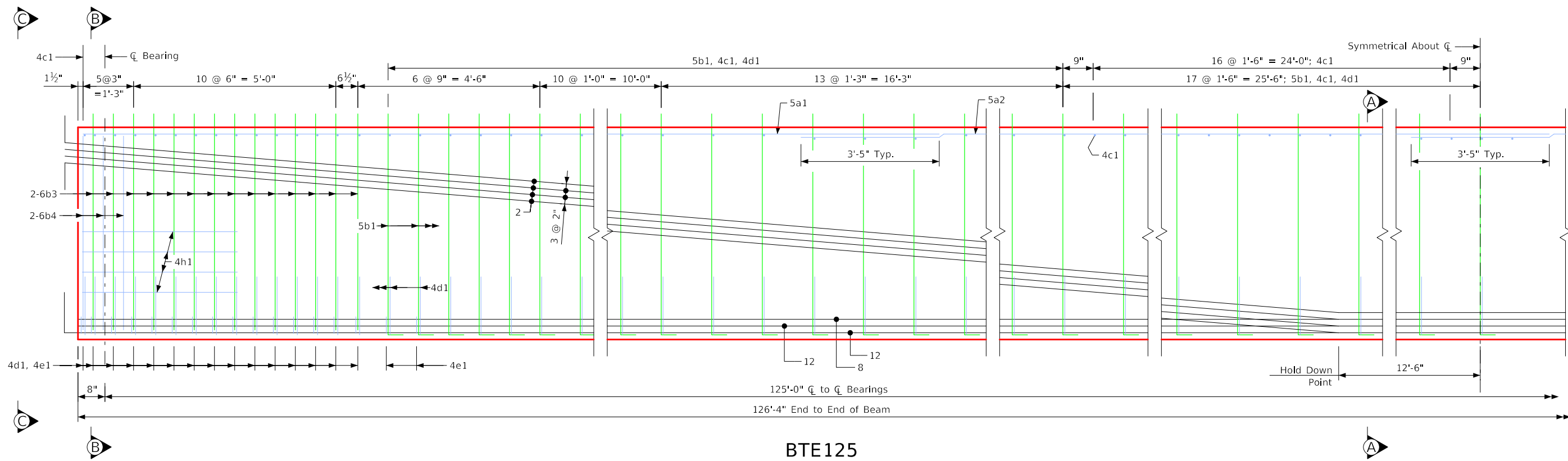
**Section B-B**



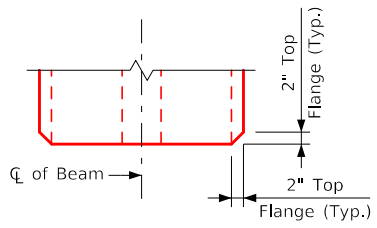
**View C-C**

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

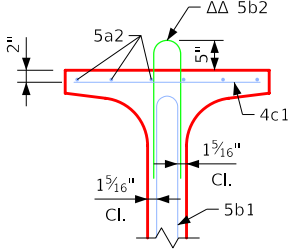
**BTE120 Beam Details**



BTE125



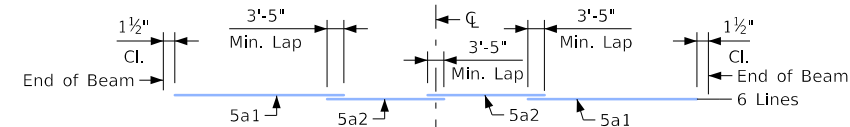
**Top View** The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



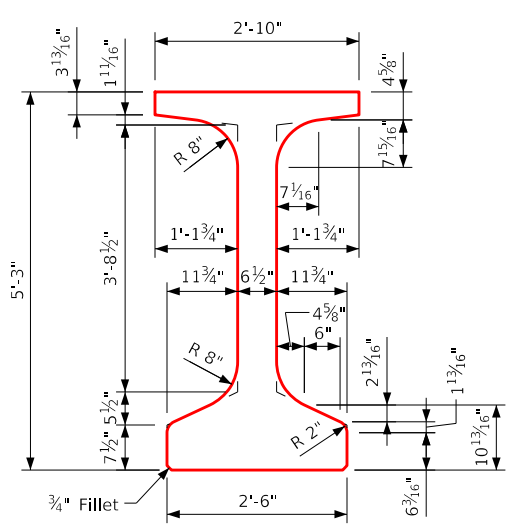
**Section A-A (Alternate)** See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

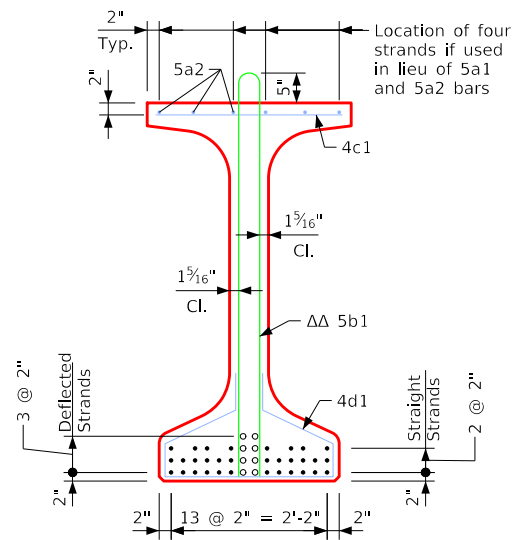
**Beam Section Properties**



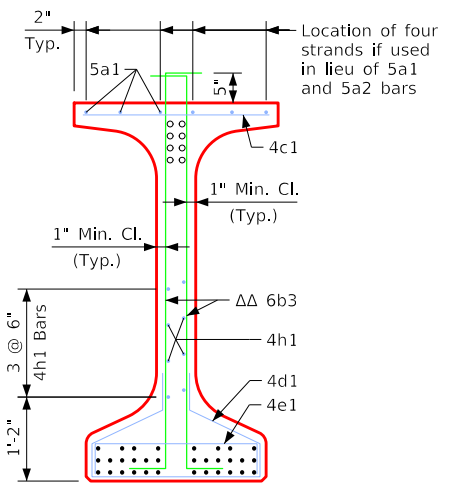
**Top Flange Longitudinal Bar Layout**



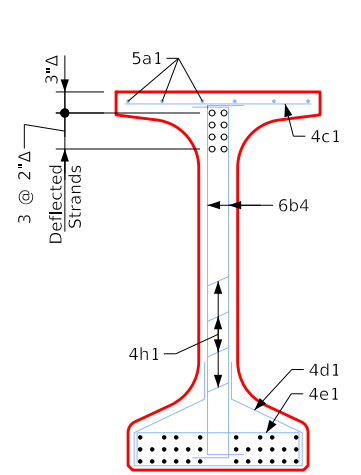
**BTE Beam Cross Section**



**Section A-A**



**Section B-B**



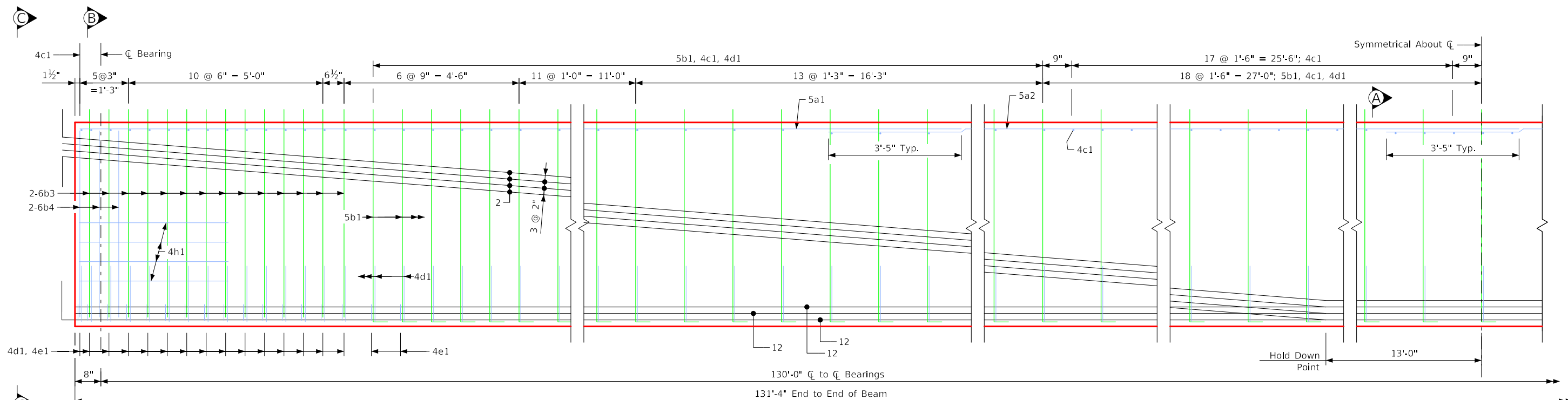
**View C-C**

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

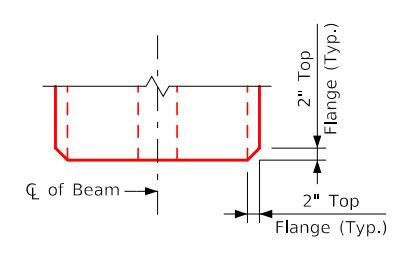
BTE125 Beam Details

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.

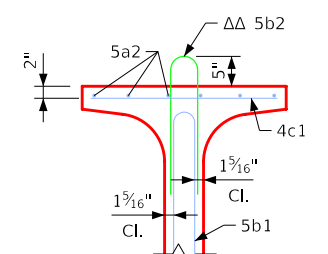
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 125'-0" Span	Standard Sheet 4784	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:50:21 PM	4/5/2026	bkloss	p:\NTP\wint1.dot.int.lan:P\WMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



**BTE130**



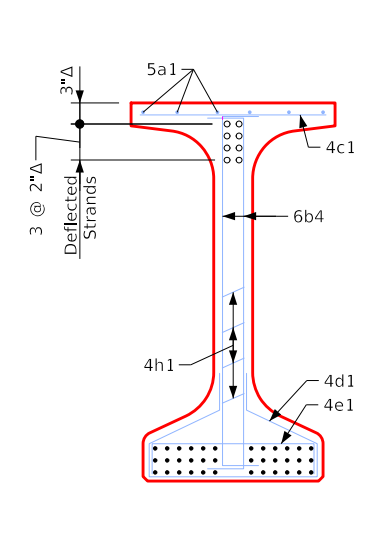
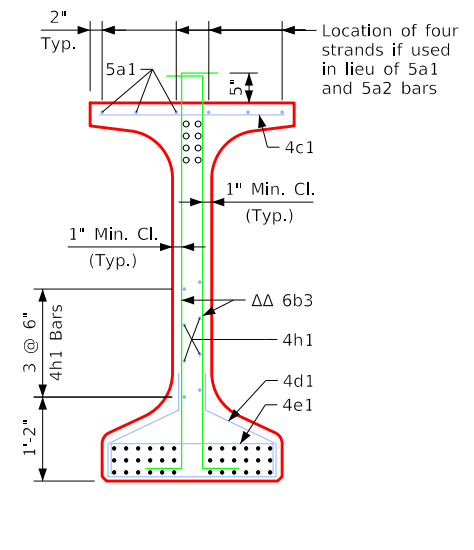
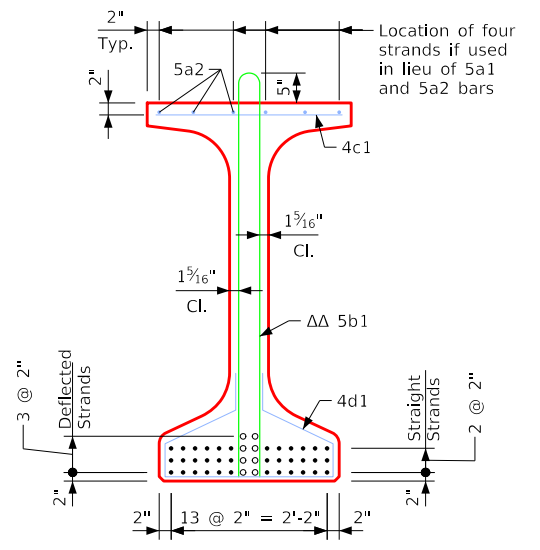
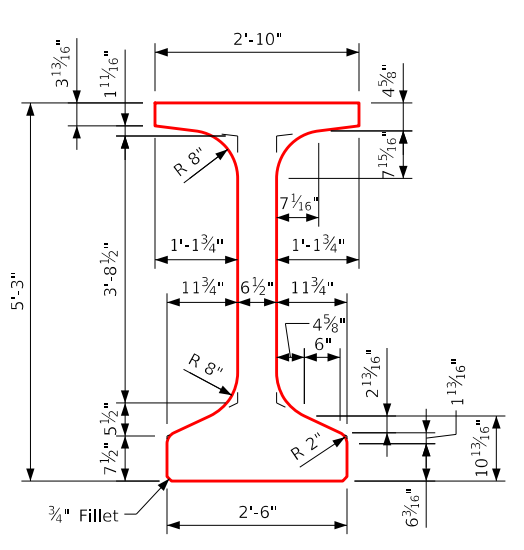
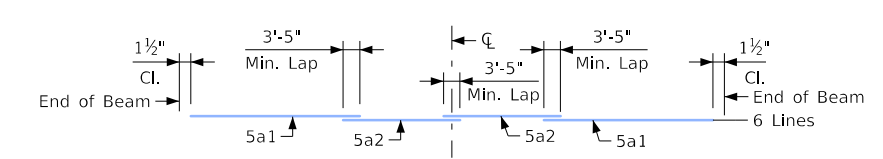
The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

**Beam Section Properties**

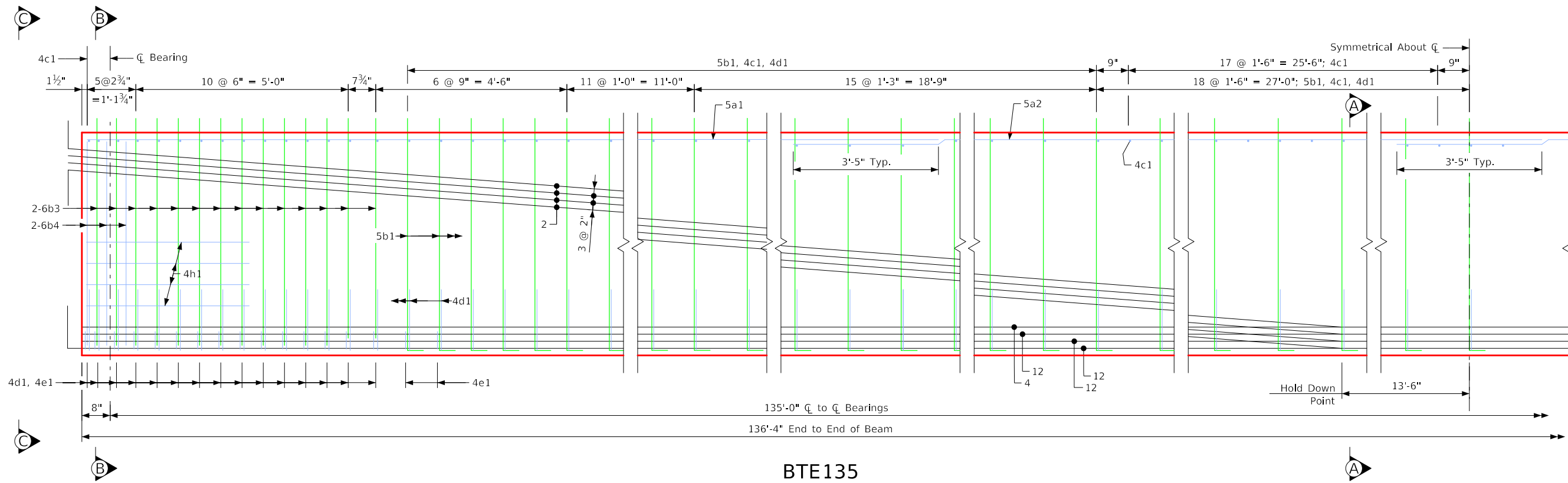


- Deflected Strands
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  Epoxy Coated Bars

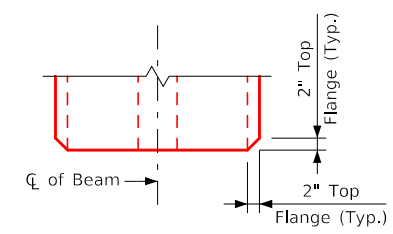
**BTE130 Beam Details**

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
3:50:21 PM	4/5/2026	bkloss	pw:\NTPwint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

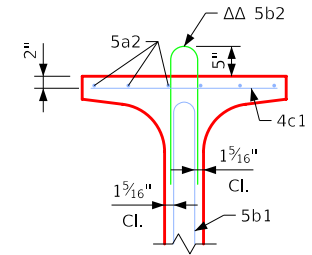


BTE135



Top View

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

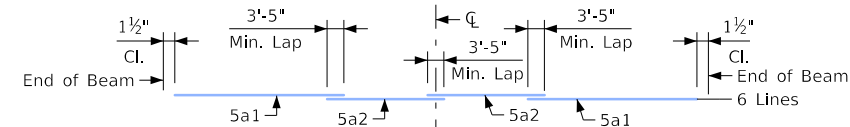


Section A-A (Alternate)

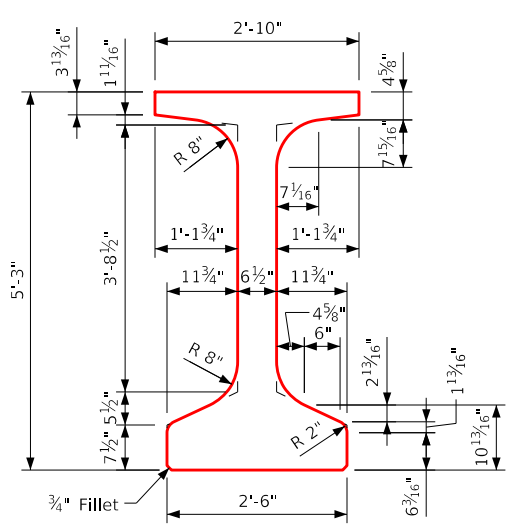
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

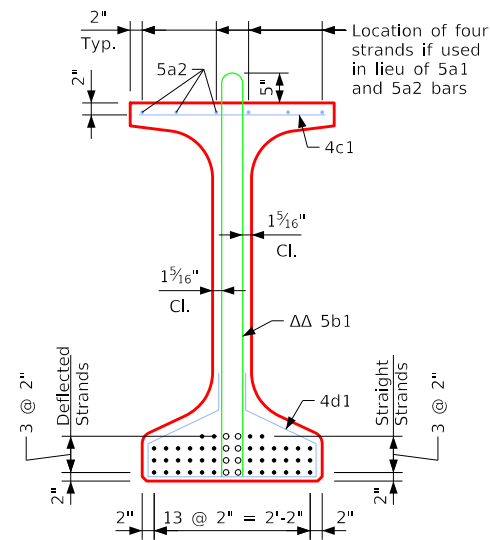
Beam Section Properties



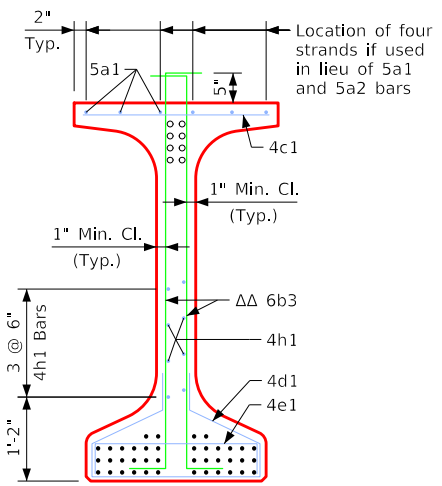
Top Flange Longitudinal Bar Layout



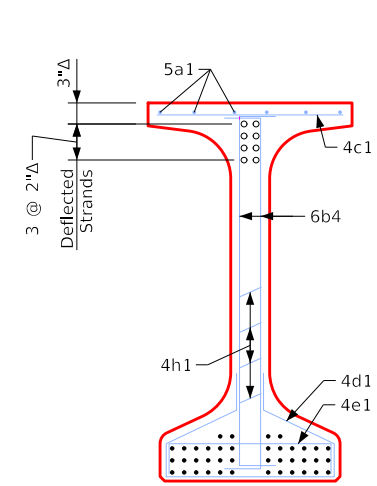
BTE Beam Cross Section



Section A-A



Section B-B



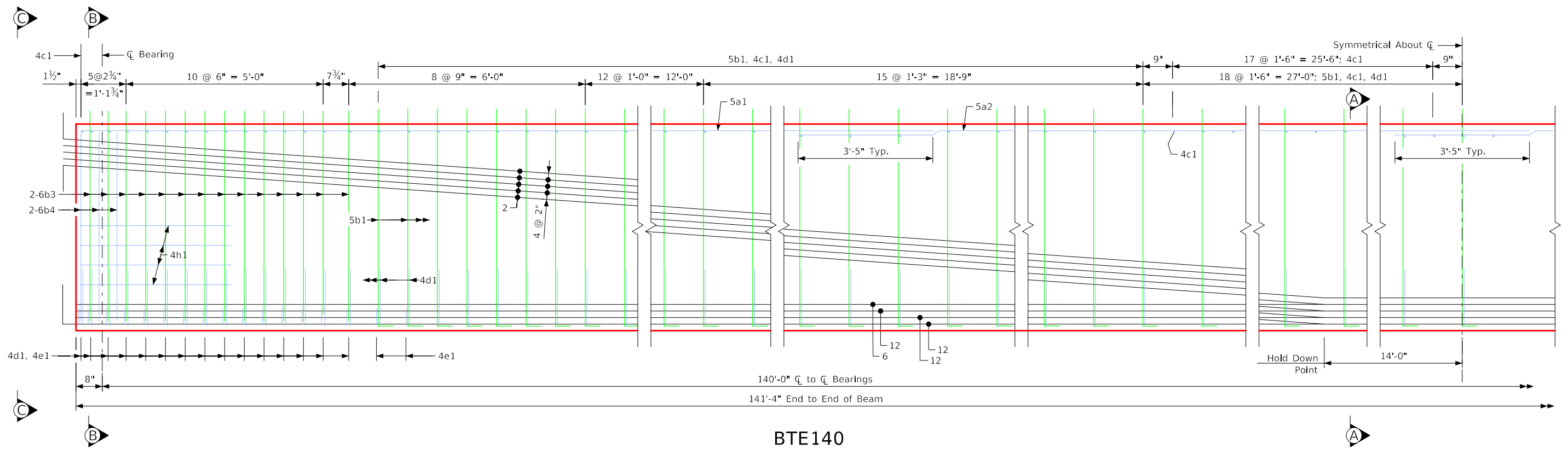
View C-C

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

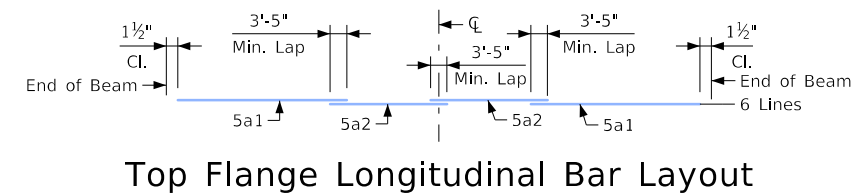
BTE135 Beam Details

Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.  
Revised 10-2024: Revised beam end spacing to 5 @ 2 3/4" = 1'-1 3/4" and 6 1/2" to 7 3/4" spacing at each beam end.  
Issued 02-08.  
Beams.dgn - 4786 - This Sheet Re-Issued 04-2024. Sheet Format Update.

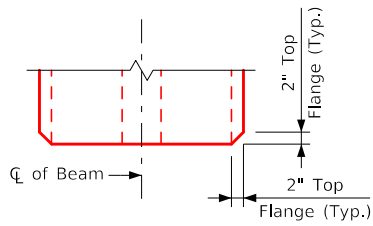
FILE NO.	ENGLISH	DESIGN TEAM	Bulb Tee "E" Beam - 135'-0" Span	Standard Sheet 4786	COUNTY	PROJECT NUMBER	SHEET NUMBER
3:50:22 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				



BTE140

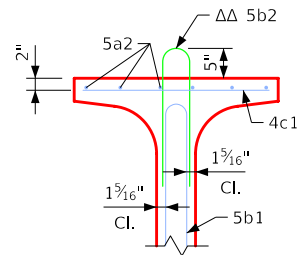


Top Flange Longitudinal Bar Layout



Top View

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

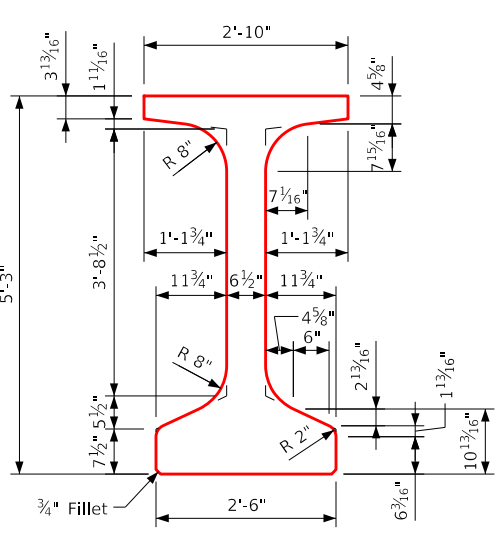


Section A-A (Alternate)

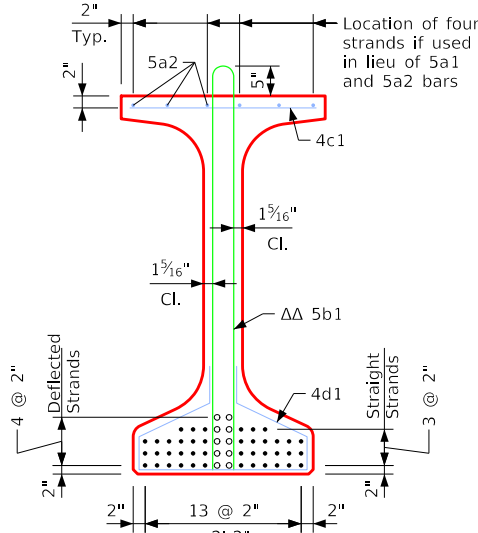
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

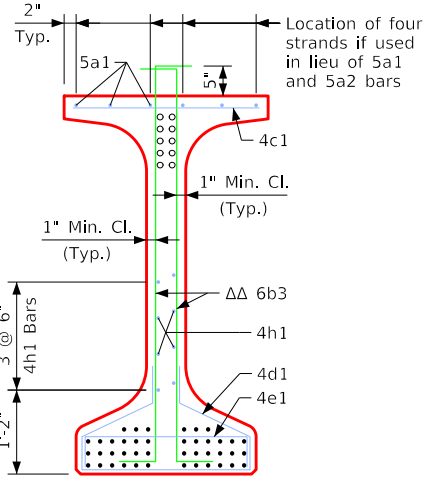
Beam Section Properties



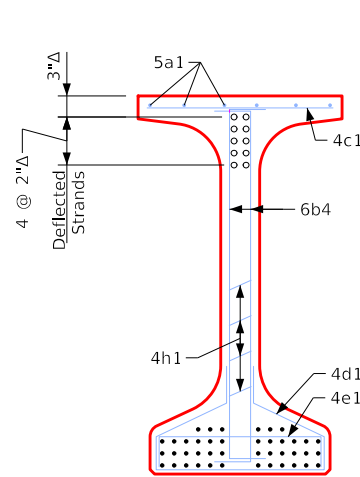
BTE Beam Cross Section



Section A-A



Section B-B



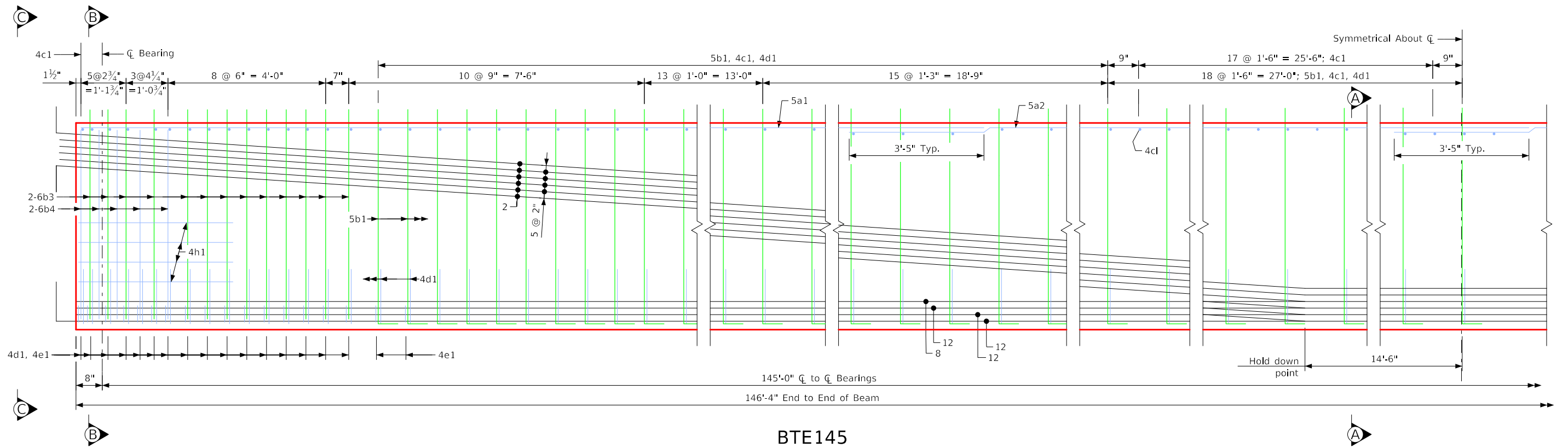
View C-C

- Deflected Strands
- △ Dimensions at End of Beam
- △△ Epoxy Coated Bars

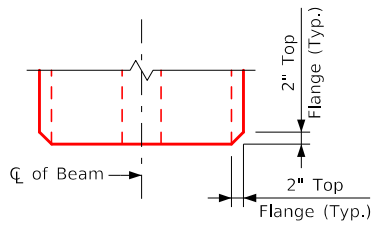
BTE140 Beam Details

Issued 02-08.  
 Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.  
 Revised 10-2024: Revised beam end spacing to 5@2 1/4" = 1'-1 3/8" and 6 1/2" to 7 3/4" spacing at each beam end.  
 Revised 04-2026: Corrected Dimension of End to End of Beam to 141'-4" (was incorrectly shown as 136'-4").  
 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
3:50:23 PM	4/5/2026	bkloss	p:\NTP\int1.dot.int.lan:P\Main\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

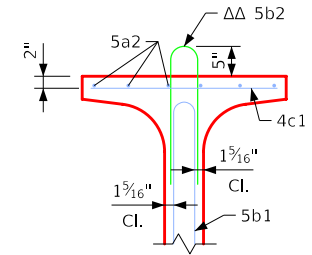


BTE145



Top View

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

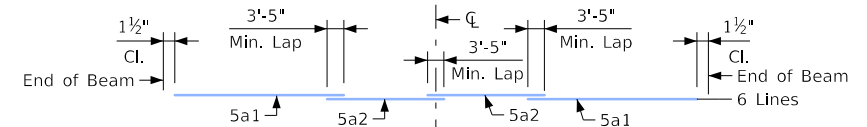


Section A-A (Alternate)

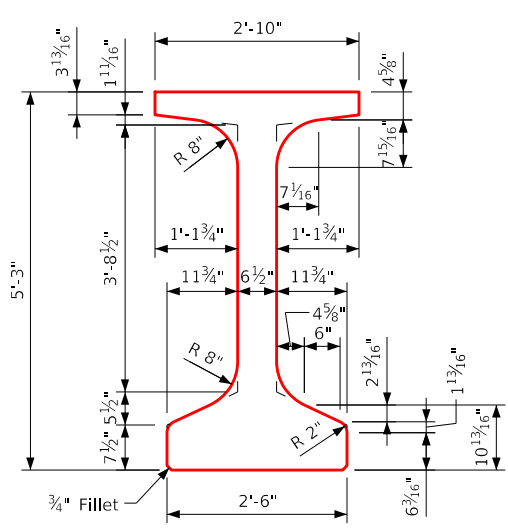
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 $I = 422.790$  in.<sup>4</sup>

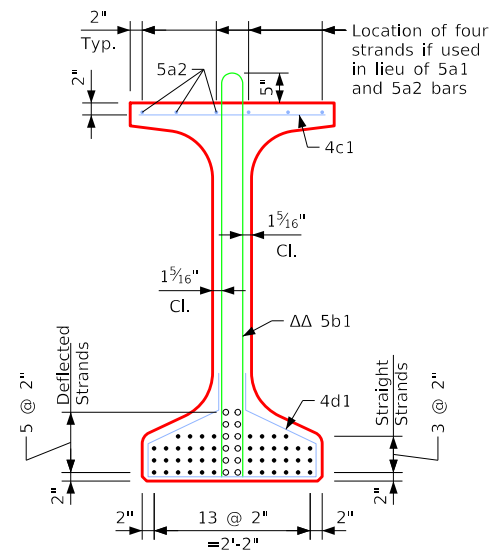
Beam Section Properties



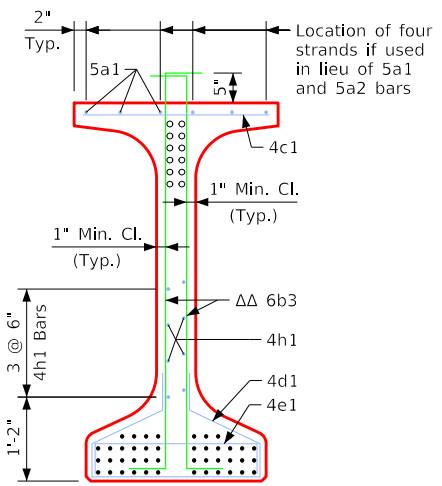
Top Flange Longitudinal Bar Layout



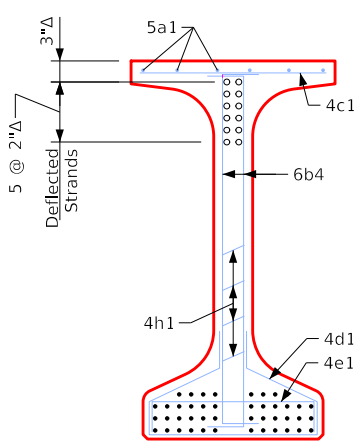
BTE Beam Cross Section



Section A-A



Section B-B



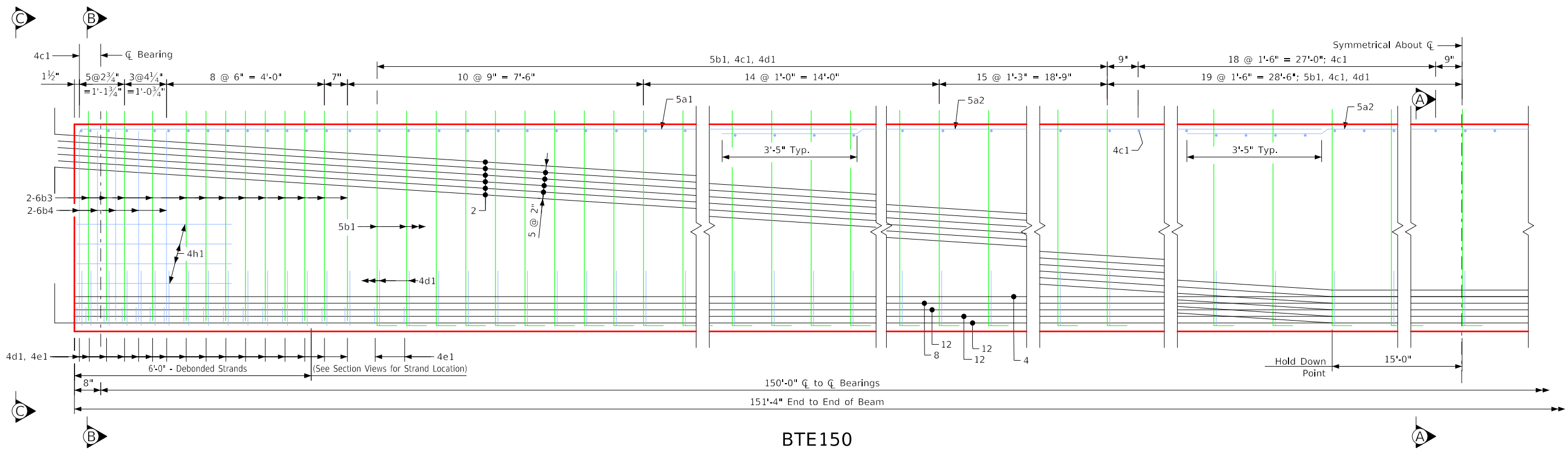
View C-C

- o Deflected Strands
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  Epoxy Coated Bars

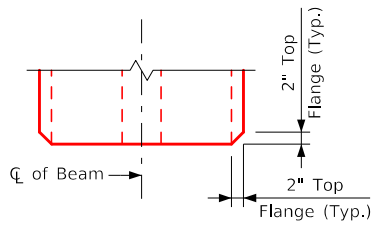
BTE145 Beam Details

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
3:50:24 PM	4/5/2026	bkloss	pw:\NTP\wint1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

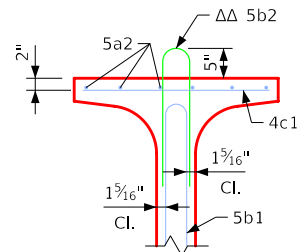


BTE150



Top View

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

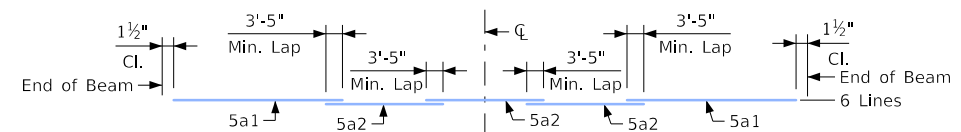


Section A-A (Alternate)

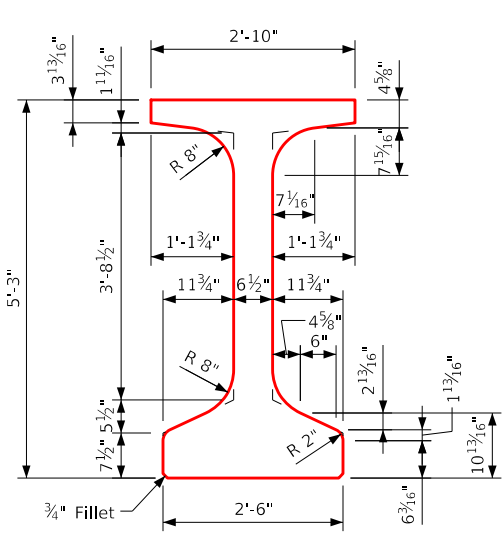
See Alternate Bar Note on Design Sheet No. 4770s2.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
I = 422.790 in.<sup>4</sup>

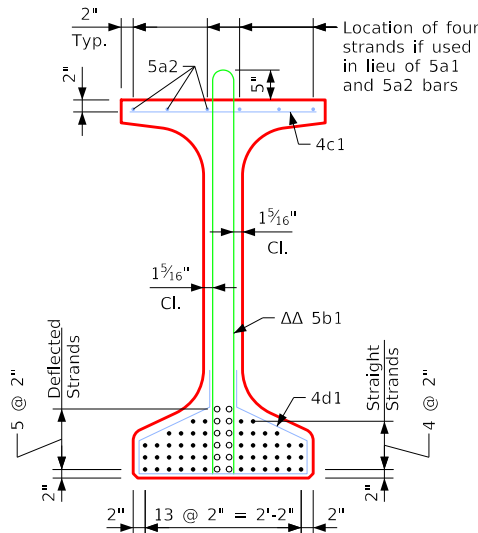
Beam Section Properties



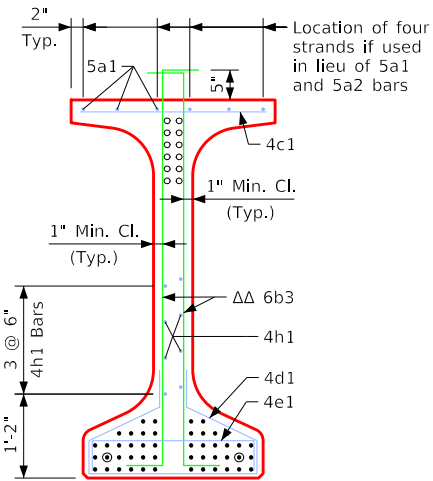
Top Flange Longitudinal Bar Layout



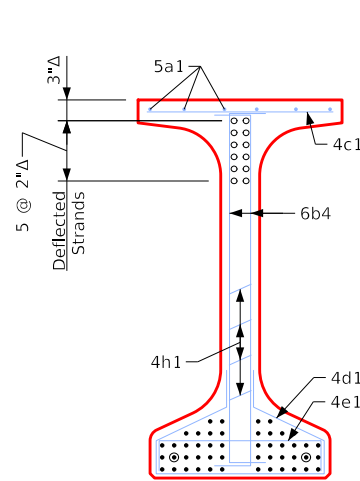
BTE Beam Cross Section



Section A-A



Section B-B



View C-C

- Deflected Strands
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  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.  
Revised 10-2024: Revised strand pattern moving 2 straight strands from row 4 up to row 5 from the bottom of the beam.  
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
3:50:25 PM	4/5/2026	bkloss	pw:\NTP\int1.dot.int.lan:PWMain\Documents\Highway\Bridge\Standards\Bridges\Beams.dgn				

### BTE Beam Data

BTE Beam	Span Length ℄-℄ Bearing	Overall Beam Length (L)	Concrete Strength		Strand Size Dia (in.)	Number of Strands		Total Initial Prestress (kips) ③	Hold Down Force (kips)	Camber (in.) ⑤		Deflection (in.) Δ <sub>D</sub>		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	Time ②				
												(elastic) Δ <sub>I</sub>	(plastic) Δ <sub>T</sub>				
④ BTE155	155'-0"	156'-4"	8.00	10.50	0.60"	50	12	2637	35.6	4.64"	7.42"	5.45"	1.36"	8'-0 1/2"	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'-0 1/2" 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<sub>D</sub>, due to weight of deck and diaphragms for detailing purpose:  
(A) Δ<sub>D</sub>=Δ<sub>I</sub> + Δ<sub>T</sub> for simple span.  
(B) Δ<sub>D</sub>=Δ<sub>I</sub> + 3/4Δ<sub>T</sub> for end spans of continuous bridge.  
(C) Δ<sub>D</sub>=Δ<sub>I</sub> + 1/2Δ<sub>T</sub> for interior spans of continuous bridge.
- ③ Total initial prestress is based on 72.6% f's, f's= 270 ksi. and A<sub>s</sub>= 0.217 in.<sup>2</sup>.
- ④ Requires a 4500 psi., 28 day compressive strength for cast-in-place deck concrete.  
Includes partial length debonded strands, see Beam Sheet for locations and details.
- ⑤ Calculated design cambers are based on multipliers developed from research in Iowa.

### 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.<sup>2</sup>) 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.

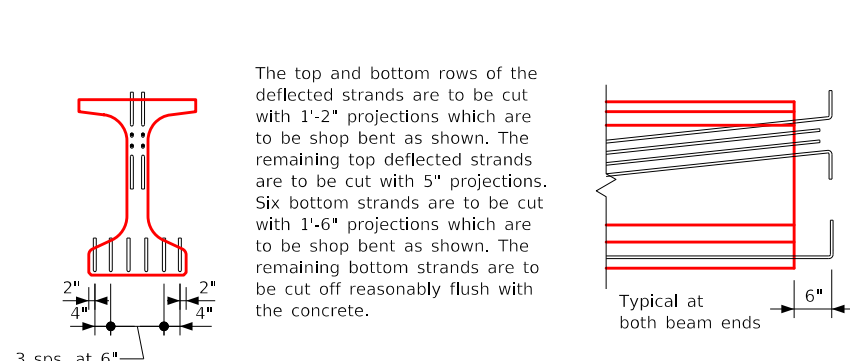
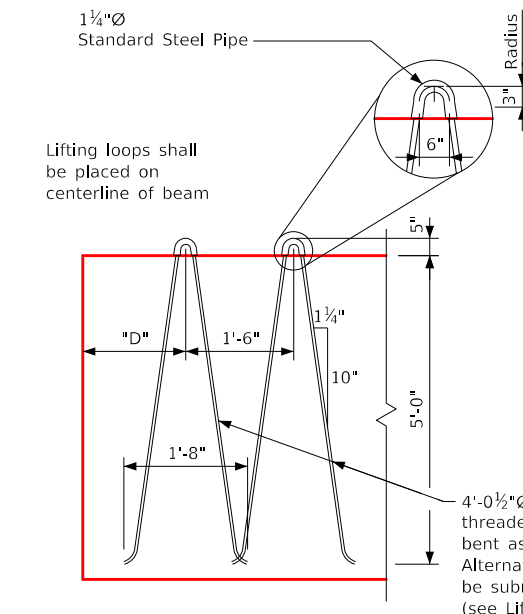
### Specifications:

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.

### 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.



### Strand Projection at Beam Ends When Embedded in Concrete End Diaphragm

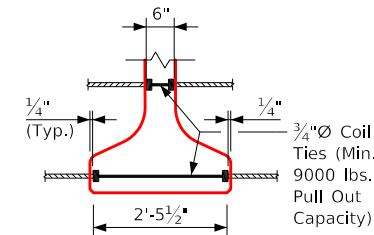
Typical at each end of beam  
**Lifting Loop Detail**

### 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**

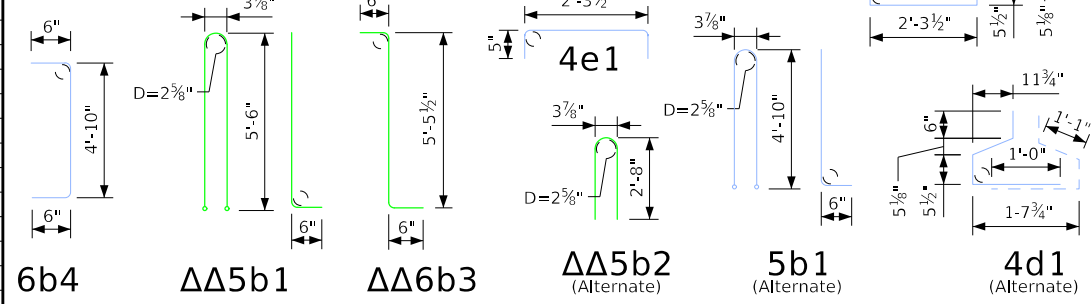
- ΔΔ 5b1 and 6b3 bars to be epoxy coated
- \* 6b3 and 6b4 bars to be used in pairs

### 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

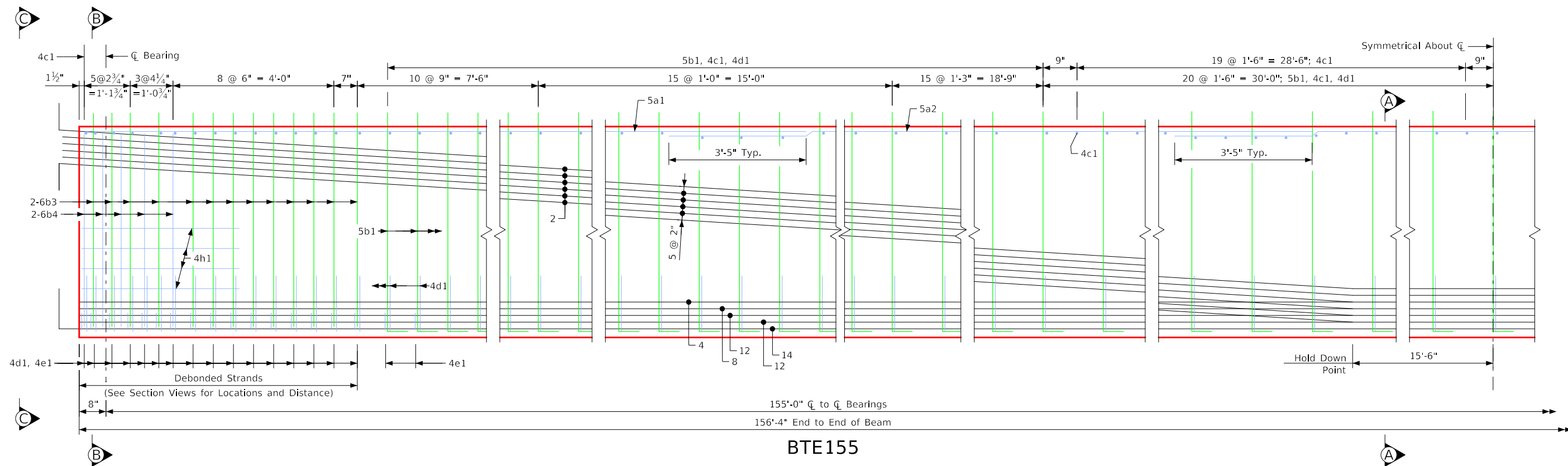
Note: All bar dimensions are out to out  
D = Pin diameter for bending  
(unless otherwise shown)  
#4 Bar D = 2"  
#5 Bar D = 2 1/2"  
#6 Bar D = 4 1/2"



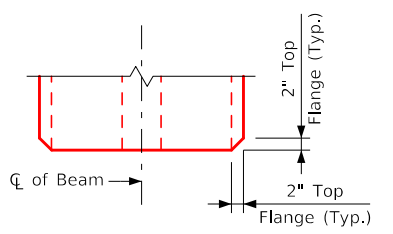
### BTE155 Beam - Data Details

Correction 12-13: Coil Tie Detail was changed to Reflect the Distance Between Coil Tie Anchors Embedded 1/4 Inch. Revised 10-2024: Revised "At Release" and "After Losses" Camber Values. Issued 02-08. Beams.dgn - 4790s1 - This Sheet Re-Issued 04-2024. Sheet Format Update.

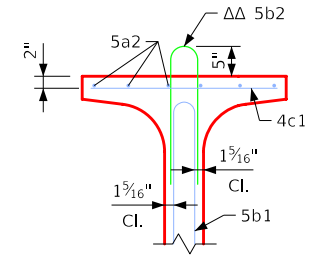
Revision 05-12: Alternate Section A-A 5a1 Bar Changed to 5a2.  
 Revised 10-2024: Shifted the deflected strands up 2" and add 2 straight strands in the bottom row for a total of 14 straight strands. Added 2 debonded strands in the bottom row for a total of 14 straight strands. Added 2 debonded strands in the bottom row for a total of 14 straight strands.  
 Issued 02-08.  
 Beams.dgn - 4790s2 - This Sheet Re-Issued 04-2024. Sheet Format Update.



**BTE155**



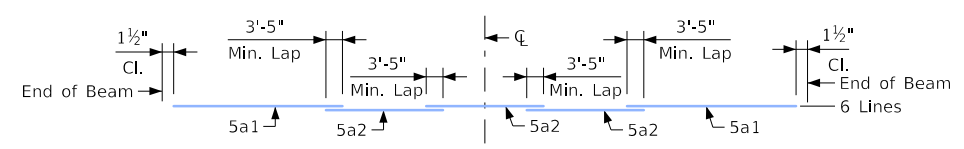
**Top View**  
 The top flange beam corners are to be chamfered 2" as shown at both ends of the beam.



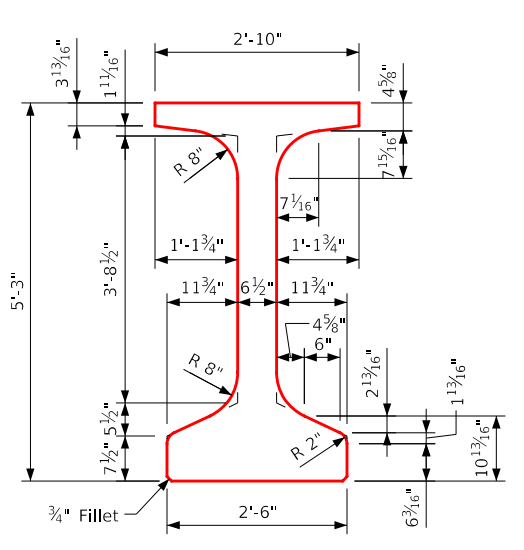
**Section A-A (Alternate)**  
 See Alternate Bar Note on Design Sheet No. 4790s1.

Area = 807.4 in.<sup>2</sup>  
 $\bar{y}_b = 28.75$  in.  
 I = 422.790 in.<sup>4</sup>

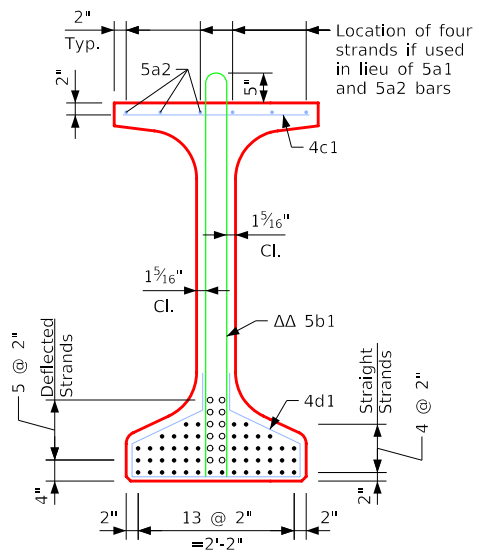
**Beam Section Properties**



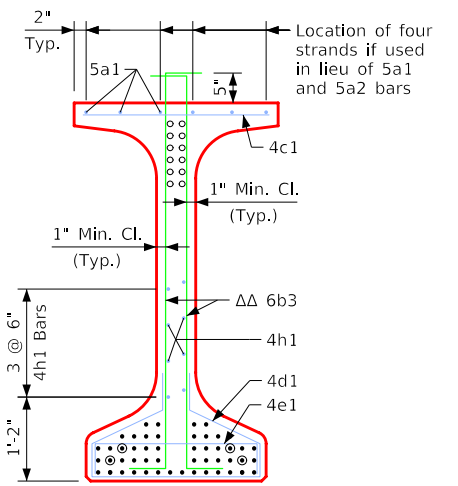
**Top Flange Longitudinal Bar Layout**



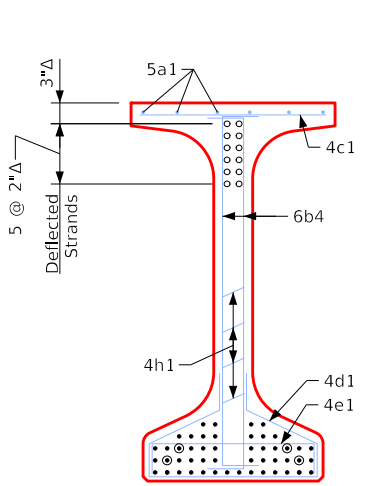
**BTE Beam Cross Section**



**Section A-A**



**Section B-B**



**View C-C**

- Deflected Strands
- $\Delta$  Dimensions at End of Beam
- $\Delta\Delta$  Epoxy Coated Bars
- ⊙ Strands Debonded: 3'-0" from Beam Ends - 3rd Row from Bottom, 6'-0" from Beam Ends - 2nd Row from Bottom

**BTE155 Beam Details**