Prestressed Tips

James Collins – Prestress Services Industries, LLC
Pete White – INDOT Bridge Design

Overview

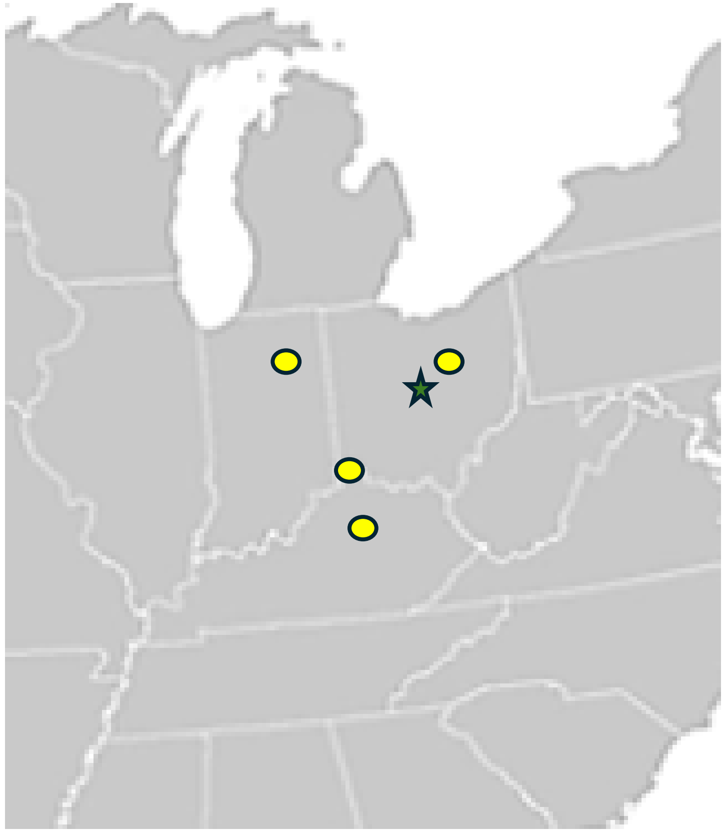
- Who We Are
- Basics of Building a Beam
- Design Pointers
- Common RFIs
- ASCE / INDOT - Design Topic Updates

PRESTRESS

Prestress Services Industries, LLC

PRESTRESS

- I-Girders, Box & NEXT Beams, Architectural Panels, Deck Panels, Custom Prestress Sections
- PCI Certified Production Plants
  - Decatur, IN
  - Mount Vernon, OH
  - Lexington, KY
  - Melbourne, KY
- Prestress Transportation (PST)

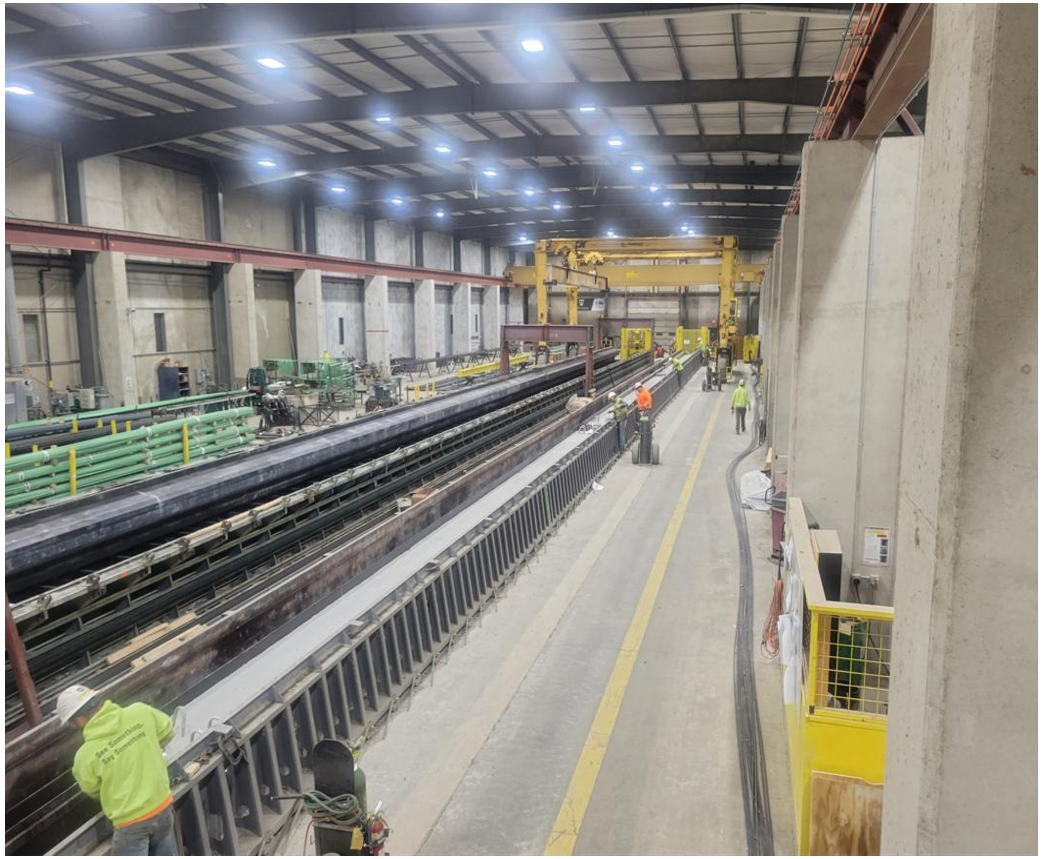


James Collins – Drafting Manager

- Employed at Prestress since January 2008
- Prestress has Produced over 5,180 bridge jobs over 18-year career
- Over 3,000 projects involved with personally (Drawing, Checking, reviewing plans.)
- Over 700 INDOT projects

Basics of Building a Beam

Prestressing Bed Basics



Bottom of the Bed

Soffit

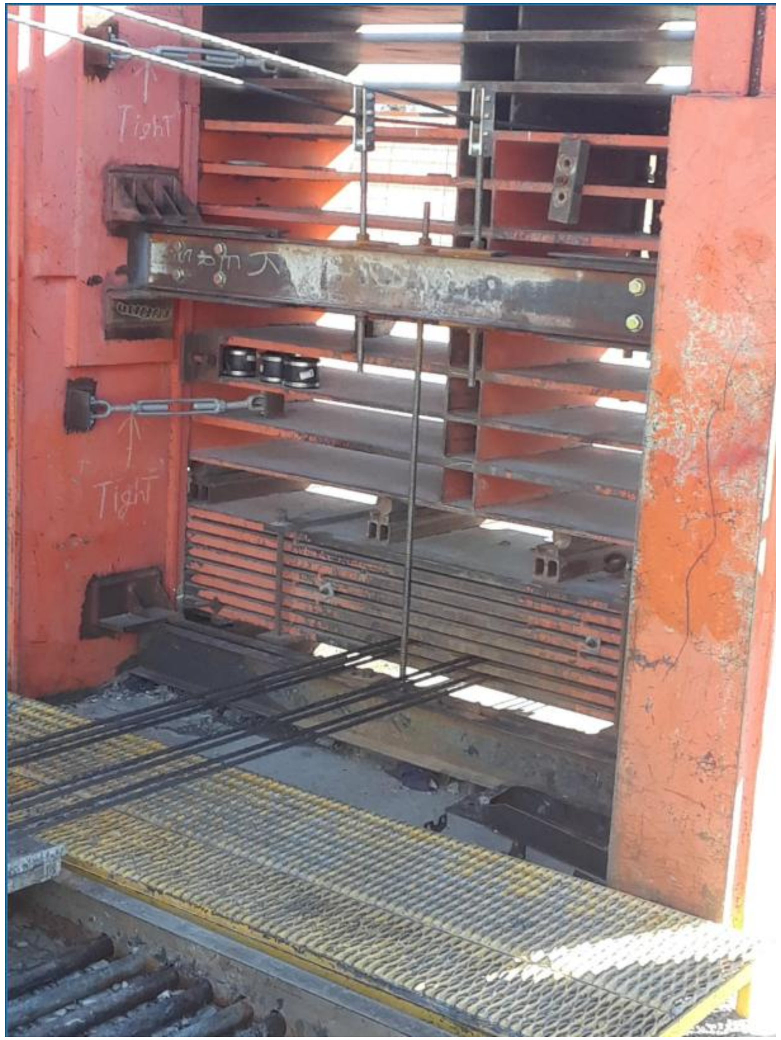
Steam Lines

Subframe

Slab on Ground

Uprights

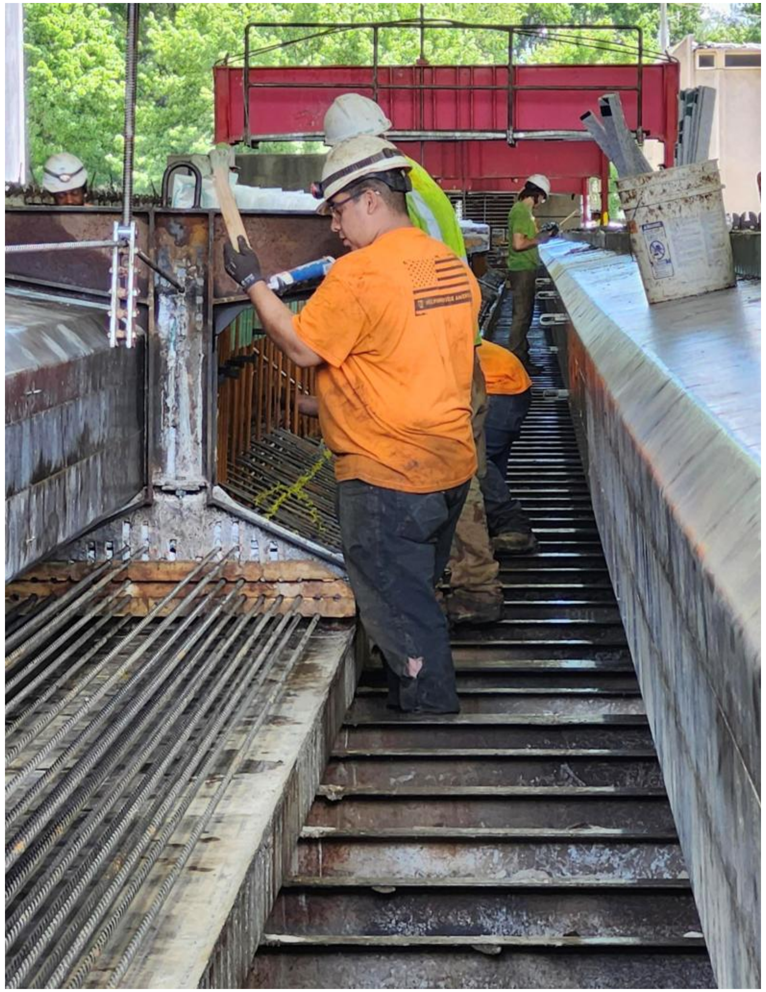
Bunker Stacks



Pull Plates

Strand Chucks and Stressing Jack

Intermediate Beam Ends



Holddowns

bottom of soffit

coil-rod

hold-
down

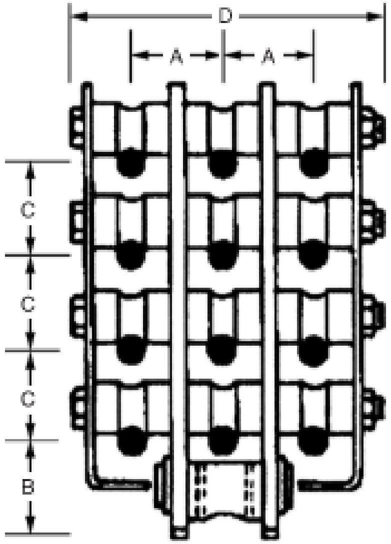
Coupler

ground slab

H-55-R Strand Restraining Device

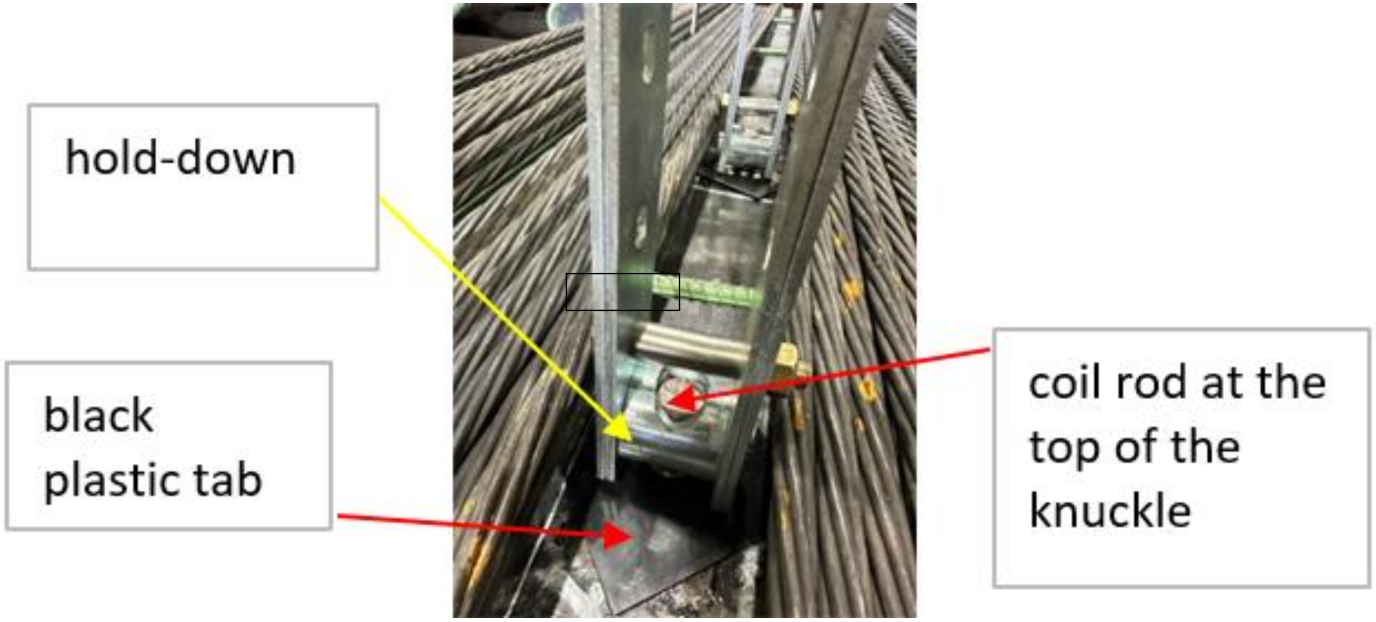
Specifications:

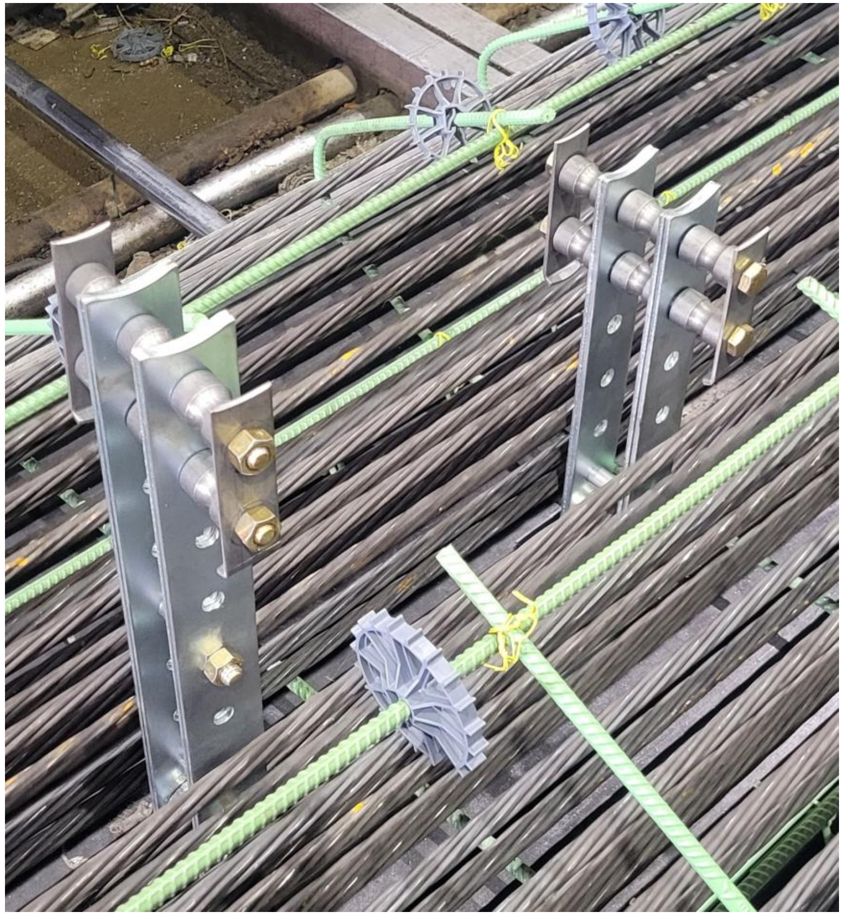
- High Strength Coil Rod Diameter – 1.0" (25 mm).
- Max. safe working load per strand – 4,000 lbs. (17.7 kN) See Note 3 on Page 8.
- Max. safe working load per unit – 48,000 lbs. (212.0 kN) See Note 3 on Page 8.
- (A) Horizontal spacing – 2.0" (50 mm).
- (B) Min. vertical spacing (form to centerline of first strand) – 2.0" (50 mm).
- (C) Standard vertical spacing – 2.0" (50 mm).
- (D) Overall width – 6-7/8" (174.6 mm).



Warning: Safe working load displayed can only be achieved by utilizing Dayton/Richmond B-12 High Strength Coil Rod and B-25 Heavy Coil Nuts.

Holddowns


hold-down
black plastic tab
coil rod at the top of the knuckle



Holddowns

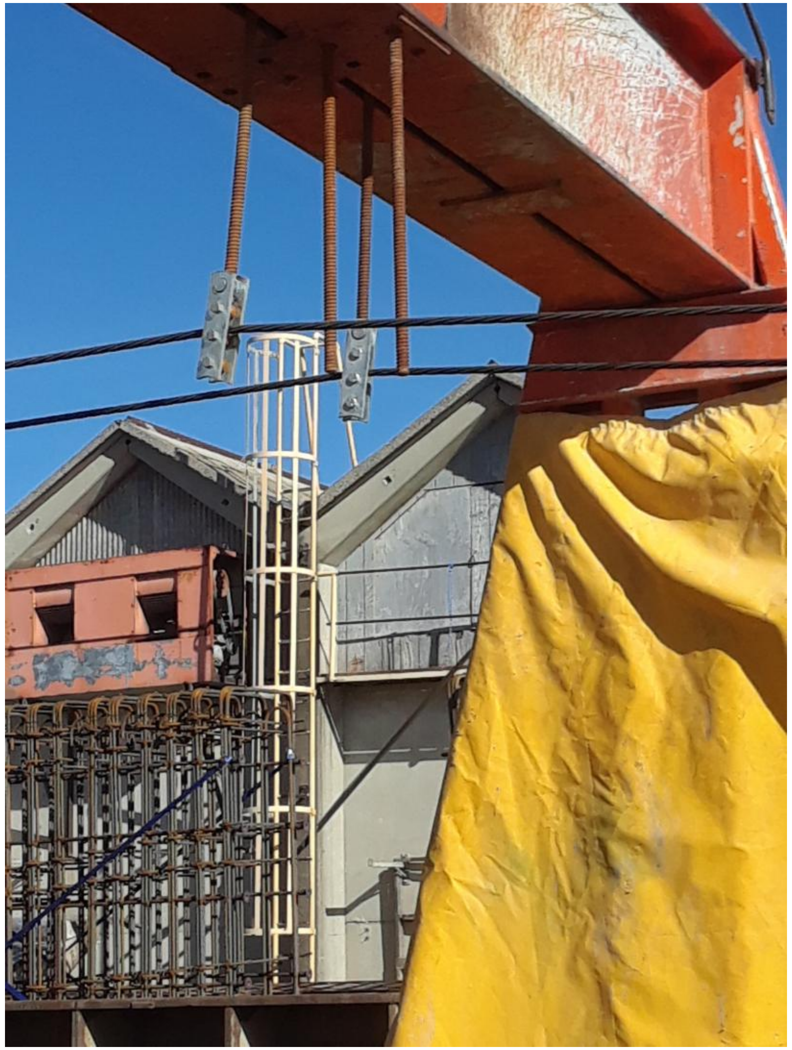
406-12.02(03) Indiana Bulb-Tee Beam [Rev. Oct. 2012, Sep. 2022, Feb. 2025]

Draped strands may be considered for use in a bulb-tee beam if tensile stresses in the top of the beam near its end are exceeded if using straight strands, or to increase shear capacity near beam ends. The maximum allowable compressive strength, tensile strength, extent of strand debonding, and number of top strands should be considered in evaluating the need for draped strands. If draped strands are used, the maximum allowable hold-down force per strand should be 3.8 kip, with a maximum total hold-down force of 33 kips.

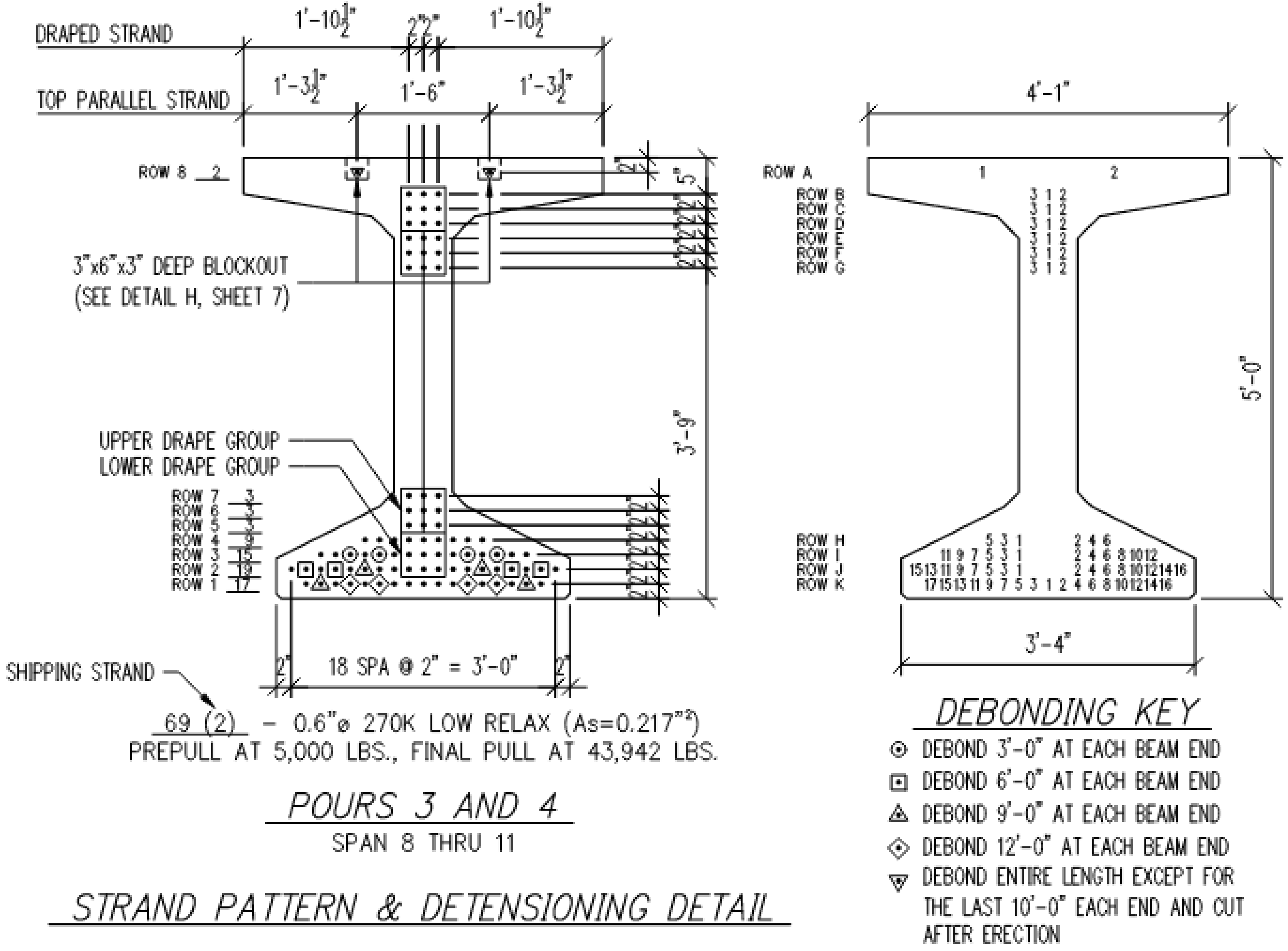
Hold-down points should be located as follows to facilitate beam fabrication:

1. Beams less than or equal to 50 ft long: Use 5′-0″ between hold-down points (2′-6″ each side of the beam centerline).
2. Beams greater than 50 ft long: Use 10′-0″ between hold-down points (5′-0″ each side of the beam centerline).

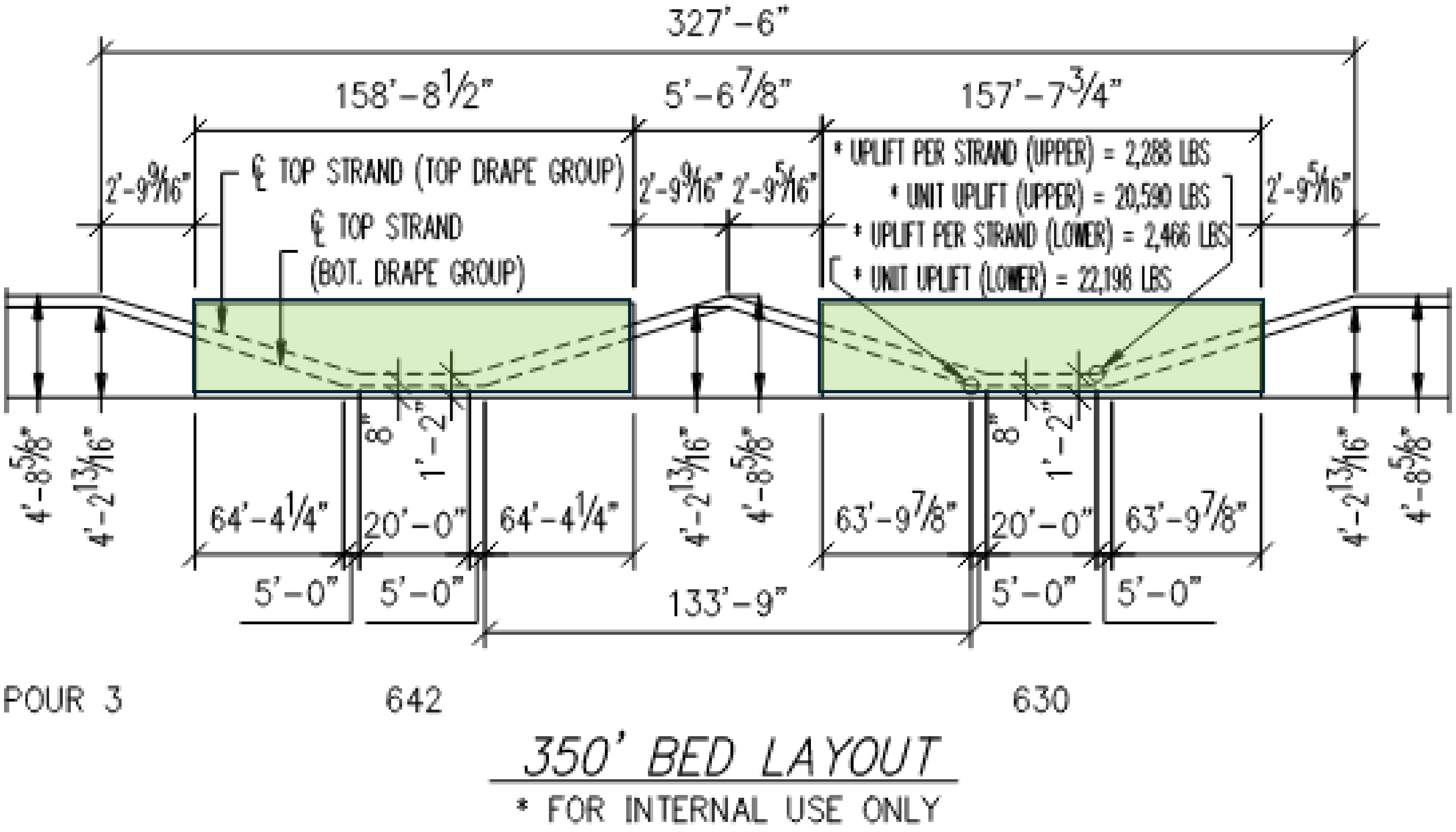
A Frames



Bed Layout


DRAPED STRAND
TOP PARALLEL STRAND
1'-10½"
2"2"
1'-3½"
1'-6"
ROW 8 2
3"x6"x3" DEEP BLOCKOUT
(SEE DETAIL H, SHEET 7)
5"
3'-9"
UPPER DRAPE GROUP
LOWER DRAPE GROUP
ROW 7 3
ROW 6
ROW 5
ROW 4
ROW 3 15
ROW 2 19
ROW 1 17
SHIPPING STRAND
2"
18 SPA @ 2" = 3'-0"
69 (2) – 0.6"ø 270K LOW RELAX (As=0.217"²)
PREPULL AT 5,000 LBS., FINAL PULL AT 43,942 LBS.
POURS 3 AND 4
SPAN 8 THRU 11
STRAND PATTERN & DETENSIONING DETAIL
4'-1"
ROW A
ROW B
ROW C
ROW D
ROW E
ROW F
ROW G
ROW H
ROW I
ROW J
ROW K
5'-0"
3'-4"
DEBONDING KEY
DEBOND 3'-0" AT EACH BEAM END
DEBOND 6'-0" AT EACH BEAM END
DEBOND 9'-0" AT EACH BEAM END
DEBOND 12'-0" AT EACH BEAM END
DEBOND ENTIRE LENGTH EXCEPT FOR THE LAST 10'-0" EACH END AND CUT AFTER ERECTION

Bed Layout


327'-6"
158'-8½"
5'-6⅞"
157'-7¾"
℄ TOP STRAND (TOP DRAPE GROUP)
℄ TOP STRAND
(BOT. DRAPE GROUP)
* UPLIFT PER STRAND (UPPER) = 2,288 LBS
* UNIT UPLIFT (UPPER) = 20,590 LBS
* UPLIFT PER STRAND (LOWER) = 2,466 LBS
* UNIT UPLIFT (LOWER) = 22,198 LBS
2'-9⁹⁄₁₆"
2'-9⁵⁄₁₆"
4'-8⅝"
4'-2¹³⁄₁₆"
64'-4¼"
20'-0"
8"
1'-2"
63'-9⅞"
5'-0"
133'-9"
POUR 3
642
630
350' BED LAYOUT
* FOR INTERNAL USE ONLY

Design Pointers

Camber

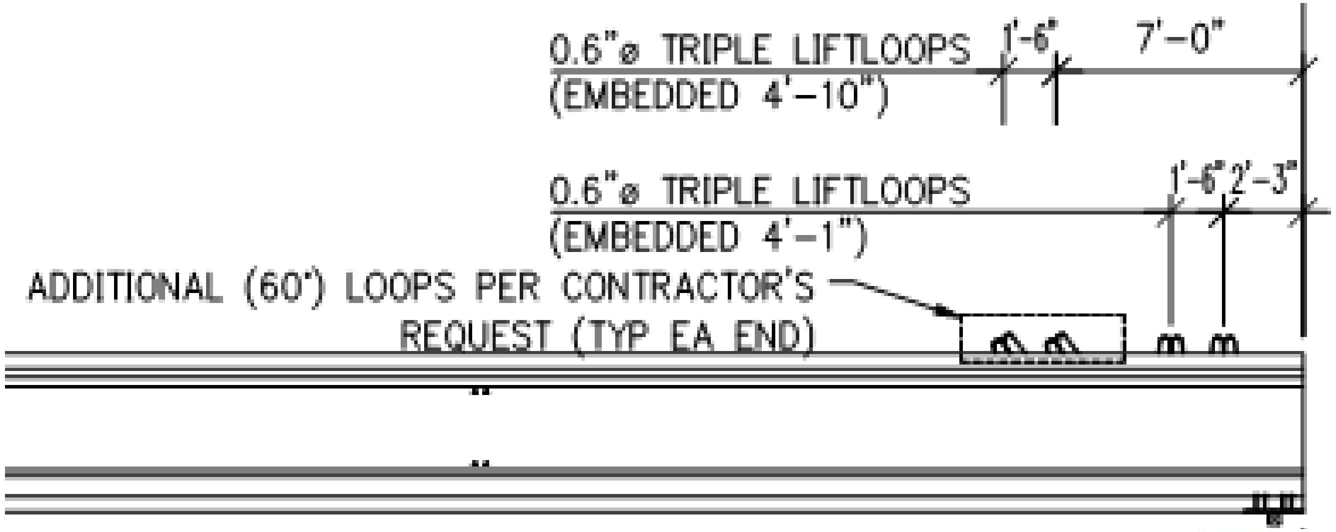
ESTIMATED CAMBERS

SPAN	2, 9 & 16 (EXT)	3, 10 & 17 (EXT)	4, 11 & 18 (EXT)	5, 12 & 19 (EXT)	6, 13 & 20 (EXT)	2-6, 9-13 &,16-20 (INT)
MARK #	504, 506, 525, 532	507, 509, 526, 533	510, 512, 527, 534	513, 515, 528, 535	516, 518, 529, 536	505, 508, 511, 514, 517
CAMBER AT RELEASE	5.7"	5.7"	5.7"	5.7"	5.7"	5.7"
CAMBER AT ERECTION	10.0"	10.0"	10.0"	10.0"	10.0"	10.0"
SUPERIMPOSED DEAD LOAD	-7.3"	-7.3"	-7.3"	-7.3"	-7.3"	-8.6"
RESIDUAL CAMBER	2.7"	2.7"	2.7"	2.7"	2.7"	1.4"

SPAN	1 & 21 (EXT)	1 & 21 (INT)	7, 8, 14 & 15 (EXT)	7, 8, 14 & 15 (INT)
MARK #	501 & 503, 537 & 539	502, 538	519, 521, 530, 522, 524, 531	520, 523
CAMBER AT RELEASE	5.8"	5.8"	5.8"	5.8"
CAMBER AT ERECTION	10.1"	10.1"	10.1"	10.1"
SUPERIMPOSED DEAD LOAD	-6.7"	-7.8"	-6.4"	-7.5"
RESIDUAL CAMBER	3.4"	2.3"	3.7"	2.6"

Lift Loops

- Based on PCI Handbook and Internal PSI Testing
- RFI for Inclined or Additional Loops for Passing
- Over RR Need 150% Capacity
- Specification Section 707



PRESTRESS

Standard Spec 707.08

- Assumed Lifting Point = Transportation Point
  - Box Beams & NEXT Beams: >1.5d and 3'
  - I-Beams/ Bulb-Tees: >d and 3.5'
- PSI Checks Angled Lifting or "Other" Methods

707.08 Handling and Shipping

Precast concrete and precast prestressed concrete structural members shall not be subjected to excessive abuse which produces crushing or undue marring of the concrete. All structural members damaged during handling, storing, transporting, or erecting shall be replaced. Unless otherwise approved, precast concrete and precast prestressed concrete structural members shall be handled with a suitable hoisting device provided with a spreader sling. The spreader shall be of sufficient length to prevent horizontal forces being produced in the structural member due to lifting and shall be equipped with leads and hooks at each end. NEXT beams shall be handled in a manner that minimizes twisting of the beams. NEXT beams shall be lifted by a minimum of four lifting points, two at each end of the beam, with a load equalizing device at one end of the beam that will prevent torsional forces in the beam during lifting. Unless otherwise shown on the contract plans, the location of the lifting points along the tops of the beams shall be in accordance with the transportation support point requirements given herein. If any other method of handling is used, it shall be shown in the working drawings. If the method produces horizontal forces in the precast concrete or precast prestressed concrete structural member, design calculations shall be submitted showing resulting stresses. The design of the structural members shall be satisfactory to handle these stresses in accordance with AASHTO LRFD Bridge Design Specifications. The structural members shall be lifted by the devices and procedures shown on the working drawings.

During transportation, the structural members shall be supported with truck bolsters or battens no less than 4 in. wide which are padded with no less than 1/2 in. of rubber. The ends of I-beams, U-beams, and bulb-tee shall extend no more than the depth of the beam and not more than 3 ft 6 in. beyond the supports. The ends of box beams and NEXT beams shall extend no more than 1 1/2 times their depth and not more than 3 ft beyond the supports. The supports at one end of NEXT beams shall be designed to allow the transportation vehicle to twist about its longitudinal axis independently from the beams, thereby eliminating the possibility of introducing torsional forces in the beams during transportation. The ends of slabs shall extend no more than the depth of the beam beyond the supports.

Contract Plan Lifting Notes

- Be Wary of Old Drawing Sets
- Remove Note

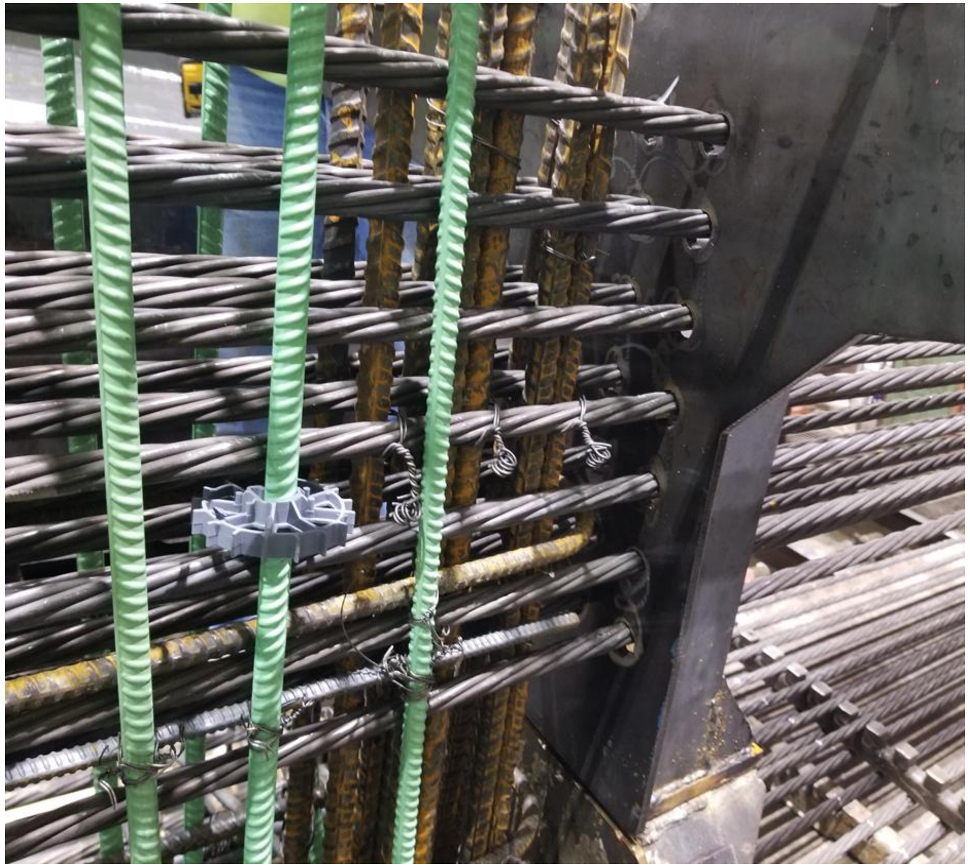
The beams are to be supported at bearing points while stored and while transporting to job site.

Several lifting devices are satisfactory. The type used must be guaranteed by the beam manufacturer and approved by the Engineer on the Shop Drawings.

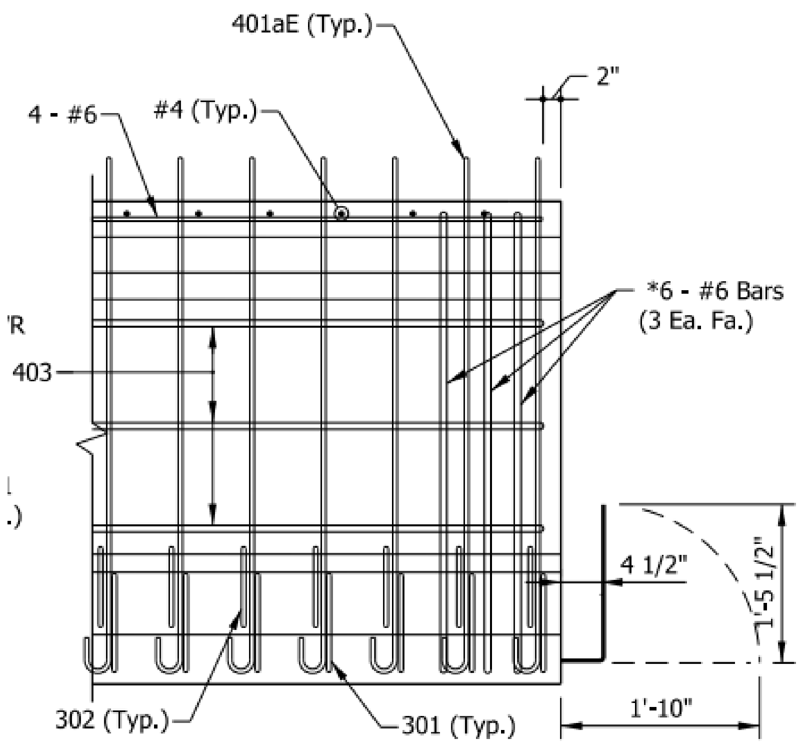
Welded Wire Reinforcement (WWR)

- Mats have 6-9 Week Leadtime
- Enable Cage Pre-Fabrication
- Maximum Limits of D31 at 2”
- Cross wire is 40% size of Main
  Ie: 0.4*0.31in2 = 0.124 in2

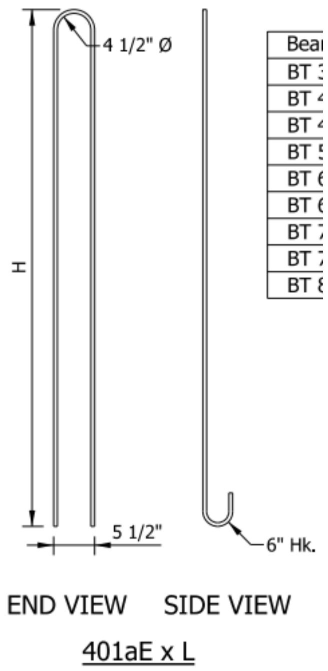
End of Beam Web Congestion



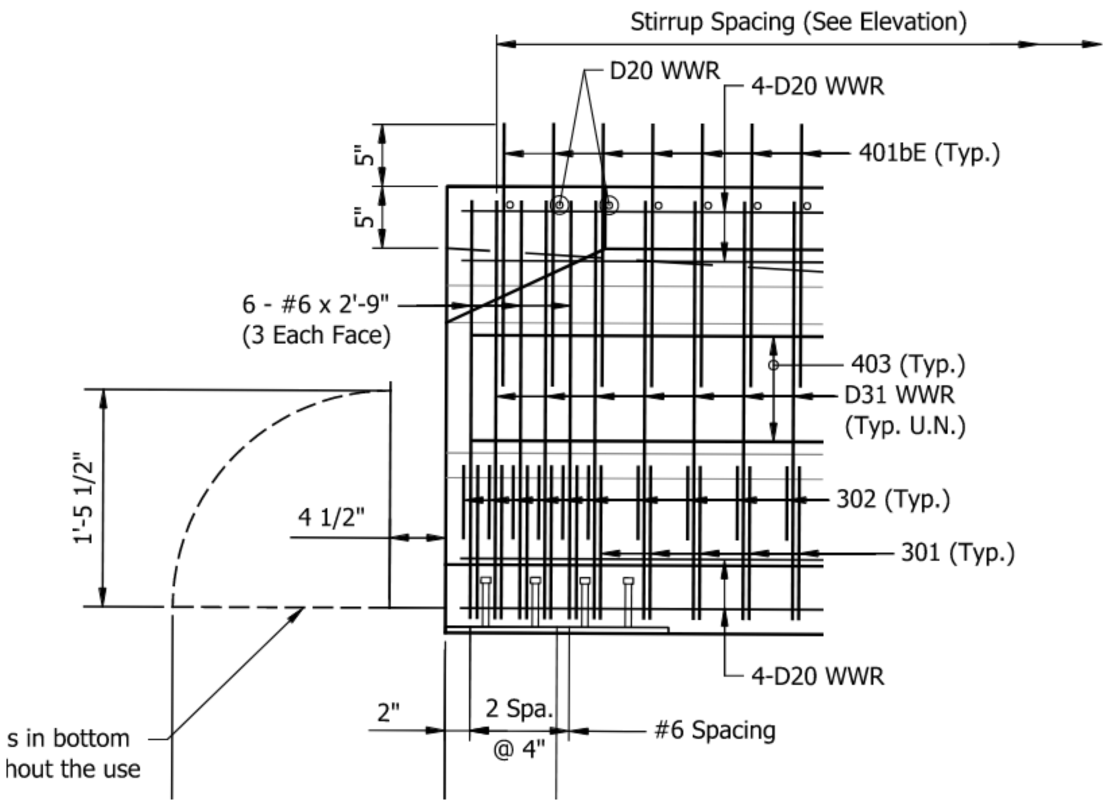
End of Beam Web Congestion



Sample Beam End Elevation



Typical 401a Bar

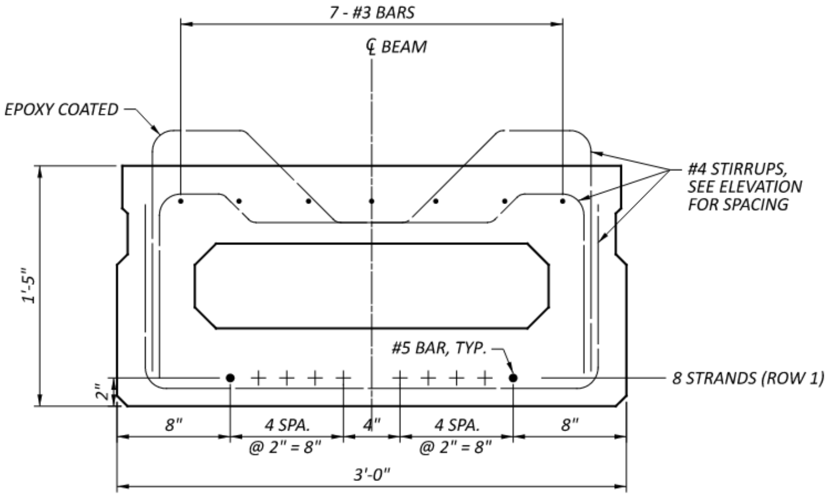


Sample WWR Beam End Elevation

Prestressing Strand Pattern & Debonding

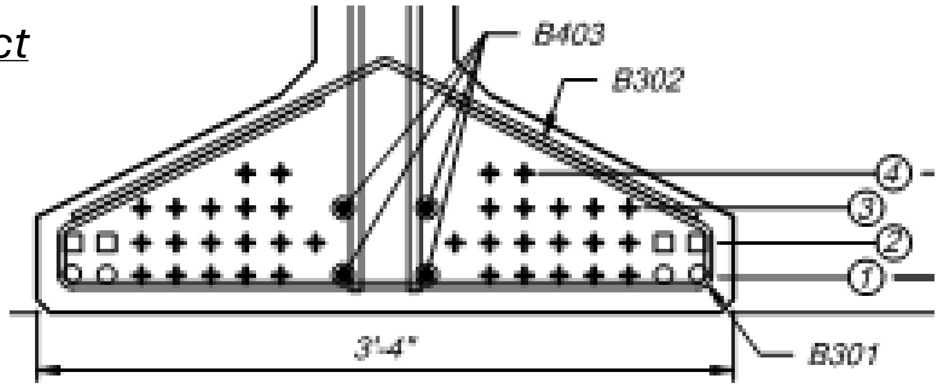
- Spread Strands Across Beam Width
- Top Flange Strands Outside of Draped Strands
- INDOT Design Manual 406-10.0
- Debonding Staggered in Alternate Positions, Rows
- Avoid Debonding:
  - Outermost Side Strands
  - Strands Under Web

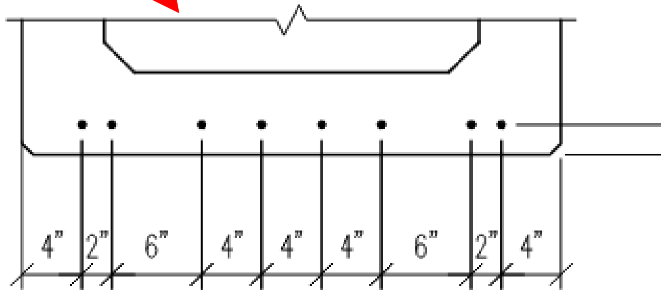
Prestressing Strand Pattern & Debonding



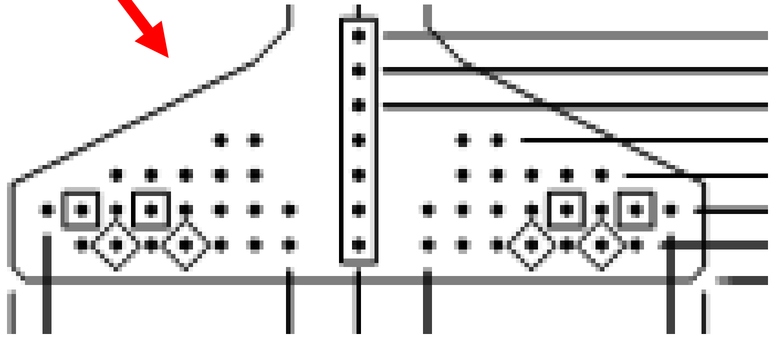
CB17-36 SECTION

Sample Contract Plan Sections

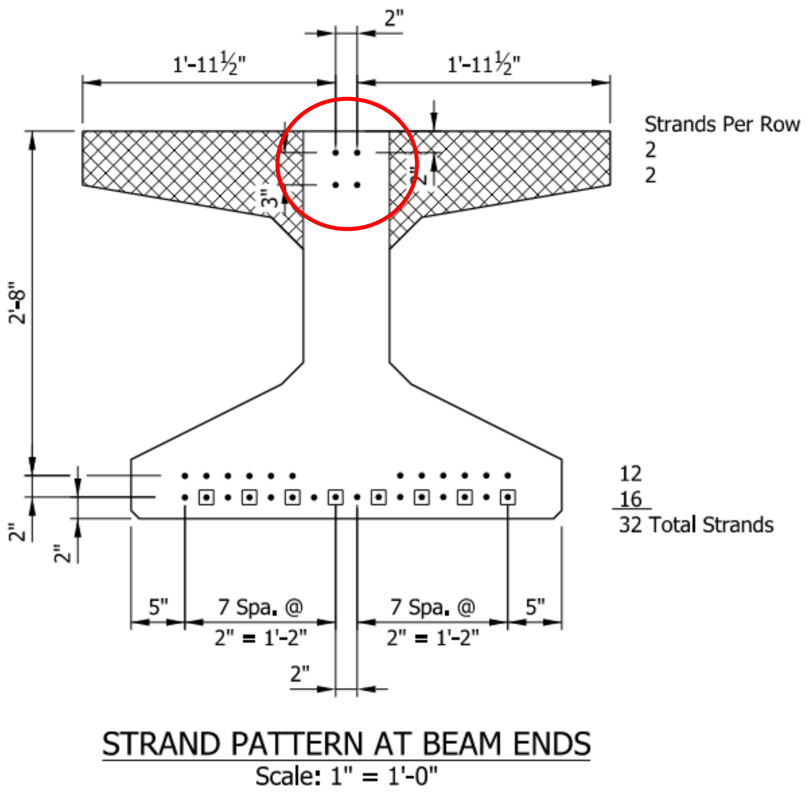




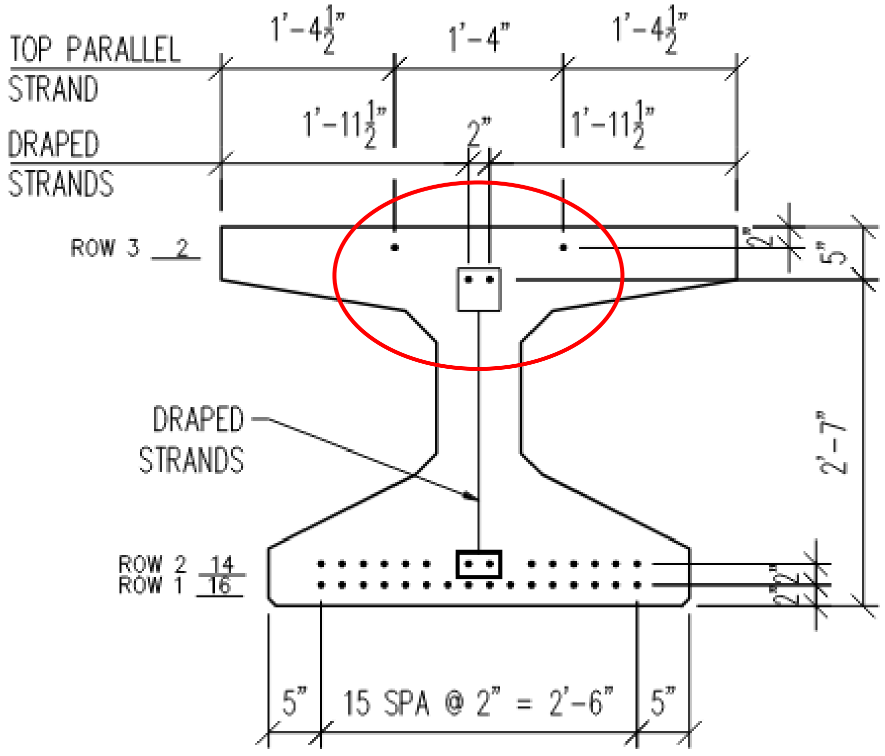
Sample Shop Drawing Sections



Prestressing Strand Pattern & Debonding



Sample Contract Plan Section



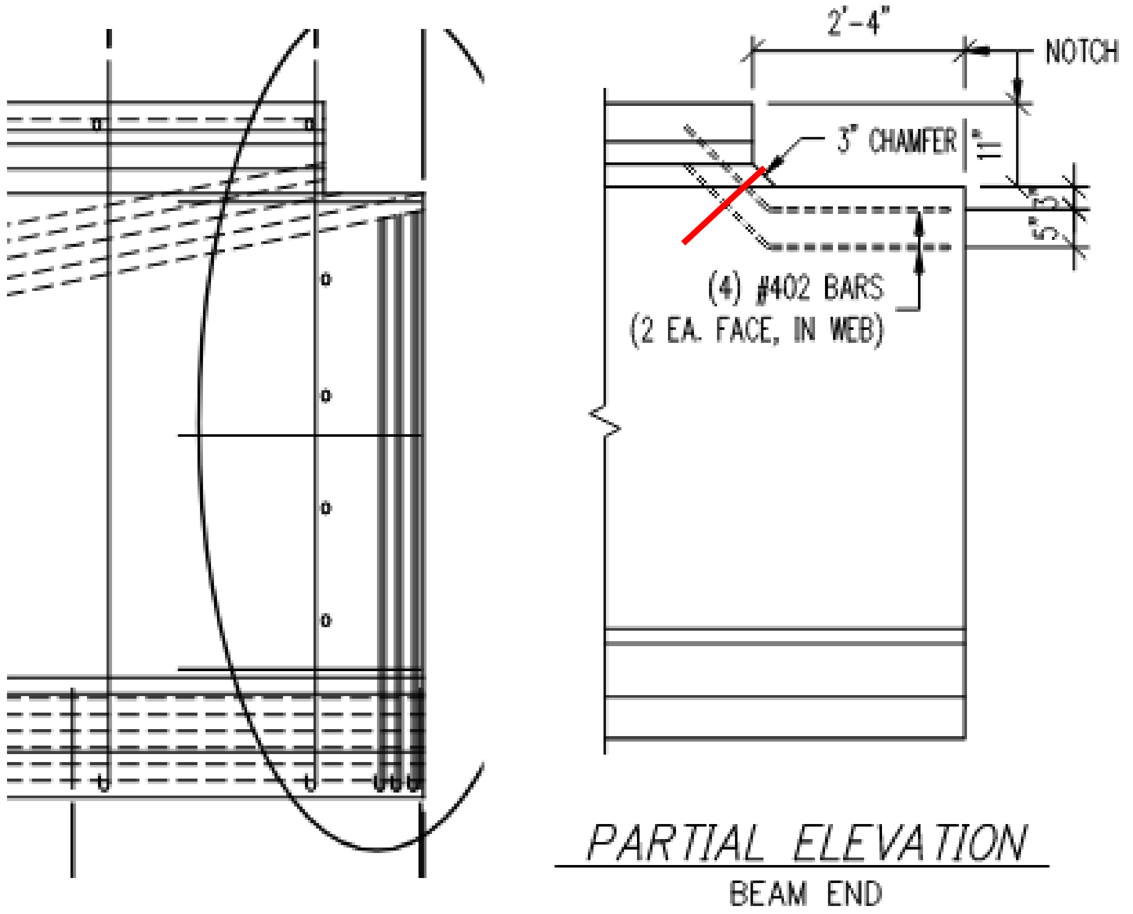
Sample Shop Drawing Section

Skewed Box Beams

- Minimize Skew as Possible
- Clip Corners for Reduced Cracking
- Recognize Big Skews Don't Sit Evenly
- Design for Unevenness
- Shims Now Included

Beam End Notches

- Beam End Notches Create Corners
- Avoid or Minimize Notches
- Lower Draped Strand
- Provide Additional Reinforcement to Prevent Crack Propagation



Common RFIs

Request for Information (RFI)

PRESTRESS

RFI Form
REQUEST FOR INFORMATION

PLEASE SEND ALL HARDWARE (NOT SUPPLIED BY PSI) THAT IS TO BE CAST IN THE BEAMS TO:

Requested Delivery Date:

Anticipated days beam seats will be poured, prior to delivery:

Mt. Vernon Plant @ 435 Columbus Road, Mt. Vernon, OH 43050

RE:			
Date:		Requested Return Date:	
To:		From:	

Deck Forming:

Is there a minimum/maximum casting date between beam and deck fabrication?	YES	NO
If YES to above questions please specify how many days		
Is this a phase job?	YES	NO
Beam lines requiring inserts:		
Using exterior form hangers / inserts?	YES	NO
Type:	Spacing:	
Using stay in place forms & metal deck clips?	YES	NO
Spacing:	Gauge:	

Additional Hardware:

Require safety post inserts?	YES	NO
Insert Type & Size:	Spacing:	
Other inserts?	YES	NO
Insert Type & Size:	Spacing:	

Diaphragms:

Concrete Diaphragm Notice: For diaphragms at the beam ends, PSI will only provide straight threaded bars. Contractor is responsible for field bending as needed.

None	Concrete	Steel	Steel Supplier name:

Product Inspection:

State Job:	LPA:	County:	Private:

Sealer: Please be sure to fill out all information

Sealer requirement?	YES	NO (skip section)	Federal Color:
Ext. Bottom	Ext. Face	Tops	All Beams
Thoroseal	Silane	Non-epoxy urethane	Other (specify)

Lifting devices: *Indicate 90° to pass beams (2 cranes) or 60° for single crane*

Requesting alternate lift loops? (including loops to pass beams)	YES	NO

Lifting loops will be provided in accordance with applicable state standards and the latest edition of the PCI Design Handbook. Beams are designed to be picked using all provided lift loops simultaneously and equally, engaged 90° to the beam (vertical). Prestress Services is not liable for any improper use of the provided loops.

Disclaimer: Additional lifting loops may be provided in alternate locations and orientations upon request. The design, capacities, locations of any additional lift loops is the sole responsibility of the contractor and designer. It will be their responsibility to provide design calculations to the fabricator prior to the submittal of the beam shop drawings. The calculations will show that the additional lift loops can handle the beams, as well as showing that there will be no adverse effects on the beams. Prestress Services Industries, LLC reserves the right to reject any and all lift loop requests. The Fabricator shall install appropriately sized loops at the angle and location requested in accordance with all applicable PCI standards.

Designer = responsible for checking the beam being picked with loops at location dictated by Contractor.
Fabricator = responsible for installing safe lifting loops at the location and angle already checked by designer.
Contractor/Erector = responsible for all lifting/rigging operations and equipment (anything used for lifting, but excluding the loops in the beams)

P23358 – Allen Co., OH – Preliminary for Plant Review < 01 Cover Sheet > KRUCKER 11/8/2023 8:28 AM

GENERAL NOTES

1. ALL 17"x48" COMPOSITE BOX BEAMS ARE MADE IN ACCORDANCE WITH 2019 OHIO DEPARTMENT OF TRANSPORTATION SPECIFICATIONS, AND STANDARD DRAWING PSBD-2-07 AND THE 9th EDITION, 2020 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND THE ODOT BRIDGE DESIGN MANUAL, 2020. LOADING IS PER HL93., FWS = 0.060 KSF.
2. CONCRETE: 150 LBS/CF (INCLUDES REINFORCEMENT).
3. CONCRETE STRENGTHS: 6,000 PSI AT RELEASE, 8,000 PSI AT 28 DAYS.
4. FINISHES: TOP – SCORE 1½" O.C. ¼" DEEP.
   BOTTOM & SIDES – AS CAST AGAINST FORMS.
   ENDS – FIELD APPLY TYPE B WATERPROOFING THAT ARE NOT COMPLETELY ENCASED IN CONCRETE (BY OTHERS)
   SURFACE PREP – 100 GRIT SANDBLAST/WATER BLAST FINISH ACCORDING TO ODOT CMS 512.03 SECTION F. SEALER PREP TO BE COMPLETED BY PS.
   SEALER – EPOXY-URETHANE TO BE FURNISHED AND APPLIED BY PS. COLOR: LIGHT NEUTRAL, FED#: 17778
   COVERAGE – ODOT APPROVED EPOXY/URETHANE APPLIED AT AN APPROVED RATE AS SPECIFIED PER MANUFACTURER (LISTED ON ODOT QUALIFIED PRODUCTS LIST) RECOMMENDATIONS (SEE DETAIL)
   KEYWAYS – MEDIUM SANDBLAST AT PLANT WITHIN FOUR DAYS PRIOR TO SHIPPING.
   BEAM ENDS – SEAL ALL STRANDS WITH TYPE E WATERPROOFING PER 512.08. WATERPROOFING SHALL EXTEND A MINIMUM OF 2" SURROUNDING EACH STRAND END. (BY OTHERS)
5. HANDLING DEVICES SHALL BE IN ACCORDANCE TO THE CURRENT EDITION PCI DESIGN HANDBOOK.
6. ESTIMATED CAMBER:

	SPAN 1 & 3	SPAN 2
AT DAY 0 =	15/16"	1 3/16"
AT DAY 30 =	1 11/16"	2 1/8"
REAMAINING DEAD LOAD DEFLECTION =	7/16"	9/16"

7. LIFTLOOPS ARE TO BE REMOVED AND PATCHED AFTER ERECTION (NOT BY PS).
8. BEAM SHIPPING LENGTHS & WEIGHTS (FOR INTERNAL USE ONLY):

MK 201, 203, 207 & 209	MK 202 & 208	MK 204 & 206	MK 205
SHIPPING WEIGHT: 17 TONS	SHIPPING WEIGHT: 17 TONS	SHIPPING WEIGHT: 18 TONS	SHIPPING WEIGHT: 18 TONS
SHIPPING LENGTH: 51'-1 "	SHIPPING LENGTH: 51'-1"	SHIPPING LENGTH: 53'-9"	SHIPPING LENGTH: 53'-9"
SHORT POINT TO SHORT POINT: 45'-9"	SHORT POINT TO SHORT POINT: 45'-9"	SHORT POINT TO SHORT POINT: 48'-11"	SHORT POINT TO SHORT POINT: 48'-11"
SHIPPING WIDTH: 4'-0"	SHIPPING WIDTH: 4'-0"	SHIPPING WIDTH: 4'-0"	SHIPPING WIDTH: 4'-0"
SHIPPING HEIGHT: 1'-10"	SHIPPING HEIGHT: 1'-10"	SHIPPING HEIGHT: 1'-10"	SHIPPING HEIGHT: 1'-10"

LIFTING LOOP GUIDELINES:

ALL LIFTING DEVICES PROVIDED BY PRESTRESS SERVICES ARE DESIGNED TO BE USED SIMULTANEOUSLY AND EQUALLY, 90 DEGREES TO THE BEAM AS RECOMMENDED BY PCI GUIDELINES WITH THE USE OF A SPREADER BEAM OR TWO CRANES. ANY ADDITIONAL LIFTING DEVICES THAT ARE REQUESTED THAT DEVIATE FROM THIS STANDARD FOR ERECTING PURPOSES IS THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR IS ADVISED TO HAVE AN ENGINEER REVIEW ANY DEVIATION FROM THIS STANDARD WITH CONSIDERATION GIVEN TO BEAM STRESSES, STRENGTH, AND STABILITY. PRESTRESS SERVICES WILL NOT BE LIABLE FOR ANY VARIATIONS TO THE STANDARD PROCEDURE.

NOTES

DRAWING INDEX

SHEET #	SHEET TITLE	BY XXX / DATE X/X/XX / ISSUED FOR SUBMITTAL	XXX / X/X/XX / APPROVAL	XXX / X/X/XX / REVISION	XXX / X/X/XX / REVISION	XXX / X/X/XX / REVISION
1	COVER SHEET					
2	ERECTION LAYOUT & DETAILS					
3	ERECTION DETAILS					
4	BEAM DETAILS					
5	BAR BENDING DETAILS					
6	REINFORCEMENT SECTIONS					
7	STRAND DETIALS & END MATS					
8	201 REINFORCEMENT					
9	202 REINFORCEMENT					
10	203 REINFORCEMENT					
11	204 REINFORCEMENT					
12	205 REINFORCEMENT					
13	206 REINFORCEMENT					
14	207 REINFORCEMENT					
15	208 REINFORCEMENT					
16	209 REINFORCEMENT					
17	201 HARDWARE					
18	202 HARDWARE					
19	203 HARDWARE					
20	204 HARDWARE					
21	205 HARDWARE					
22	206 HARDWARE					
23	207 HARDWARE					
24	208 HARDWARE					
25	209 HARDWARE					

SHIPLOOSE HARDWARE

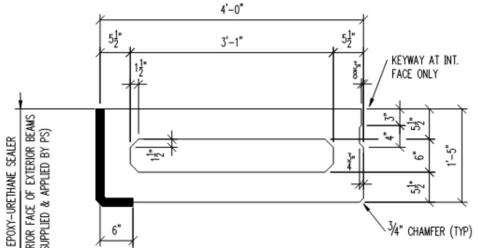
- 66 – 1"øx8'-0" TIE RODS (G)
- 132 – ½"x4"x4" PLATE WASHERS w/1⅛"ø HOLE (G)
- 132 – 1"ø HEAVY HEX NUTS (G)
- 24 – 1"øx2'-5" DOWEL RODS (SMOOTH, A-311) (G)
- 48 – 1"øx1'-10" DOWEL RODS (SMOOTH, A-311) (G)
- 72 – 1"x6"x6" PEJF GROUT RETAINERS
- 232 LF – 7 STRAND JUTE
- 70 LBS – INTERPLAST N GROUT ADDITIVE

INSTALLED HARDWARE

14 – TOTAL GAL. OF EPOXY-URETHANE. CALCULATED AT A RATE OF 120 SF/GAL

COATINGS (LEGEND)

(G) HOT DIP GALVANIZED ASTM A123 OR A153
(EP) ELECTROPLATED ASTM B633
(B) BLACK ASTM A615



TYPICAL SECTION
CB17480

PLEASE SUBMIT DRAWINGS TO THE OFFICE OF MATERIALS MANAGEMENT: ANDREA SALYER, AND SARAH OTT PER ODOT CMS 501.04

LPA PROJECT

COVER SHEET

ALLEN COUNTY, OHIO PID: 115921
S WEST ST. OVER OTTAWA RIVER
BRIDGE ID: ALL-MEST-00.090 SFN: 260096
17"x48" COMPOSITE BOX BEAMS

CONTRACTOR: RB JERGENS

PRESTRESS SERVICES INDUSTRIES LLC

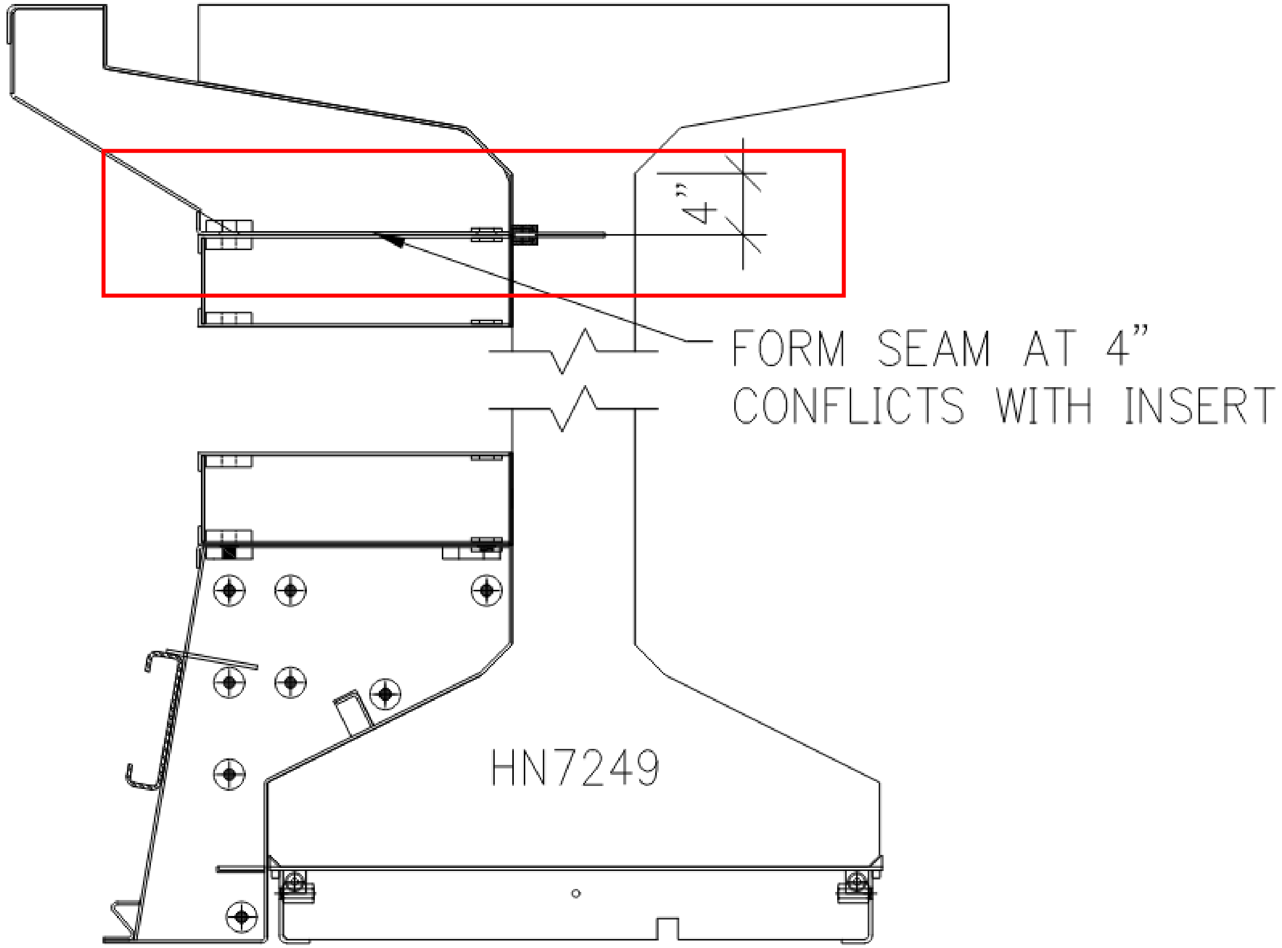
Production: Mt. Vernon, OH (740) 393-1121	Drafting: Columbus, OH (859) 299-0461	
DATE: 10-12-23	DRAWN: KADEN RUCKER	CHECKED: ISSAC HEARN
REVISIONS		
CODE: CB17480	SHEET: 1 OF 25	JOB NO: P23358

PRESTRESS

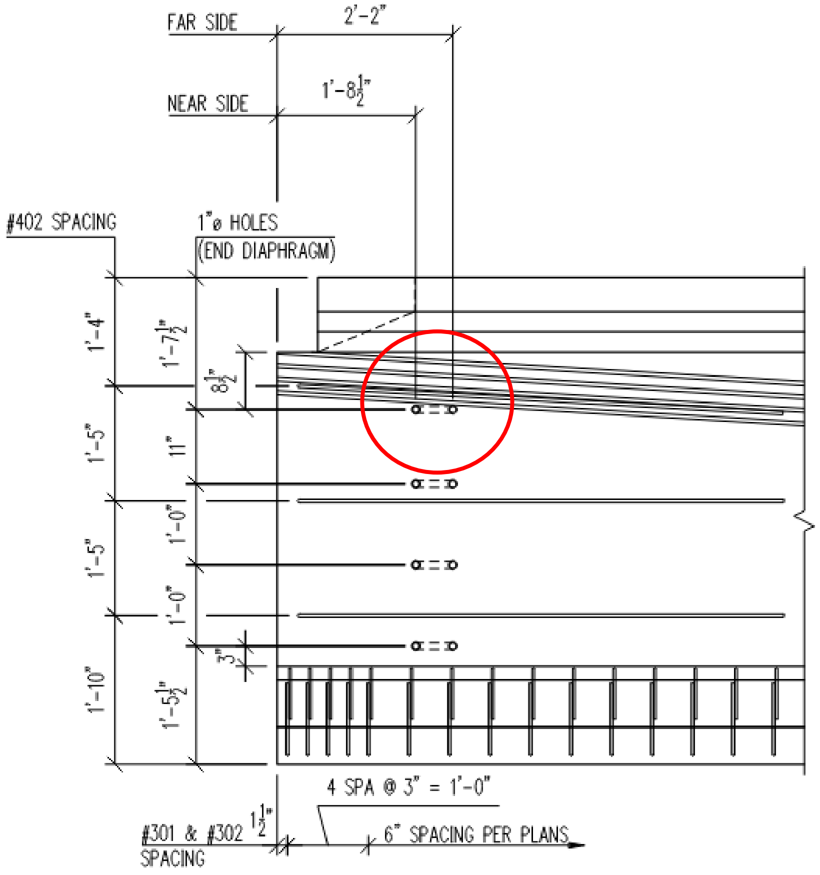
Box Beam Drains

- Sized for thickness of bottom slab (5.5” Typ.)
- 1” Diameter

Inserts at Form Seams



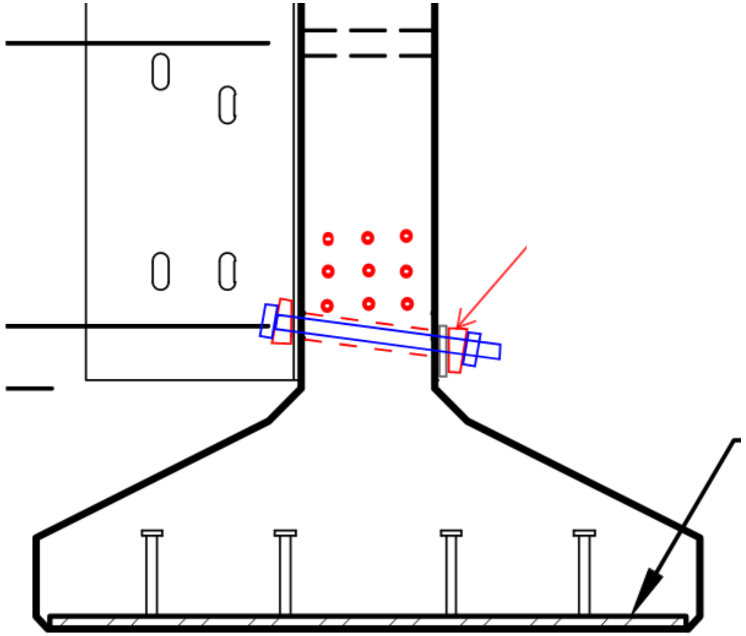
Web Holes & Inserts



PARTIAL ELEVATION

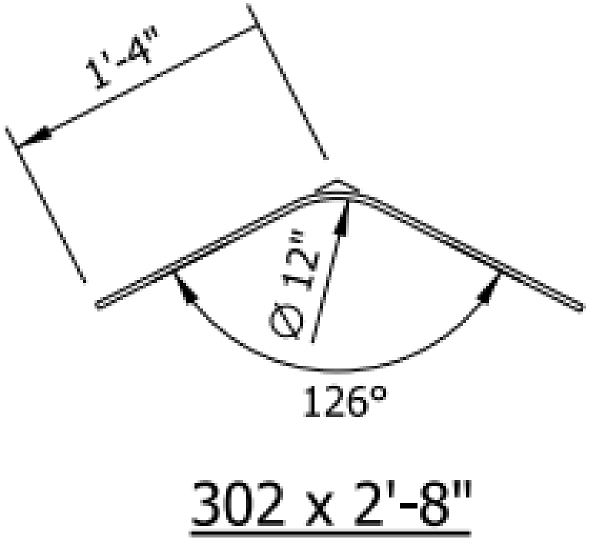
TYPICAL BEAM END

(NORTH END SHOWN, SOUTH END SIMILAR)

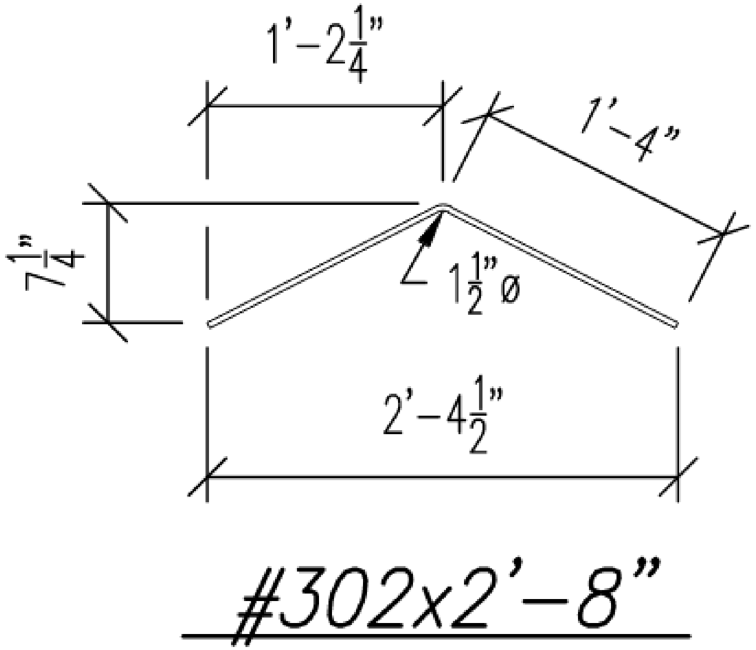


PRESTRESS

Bottom Bulb Confinement Bars



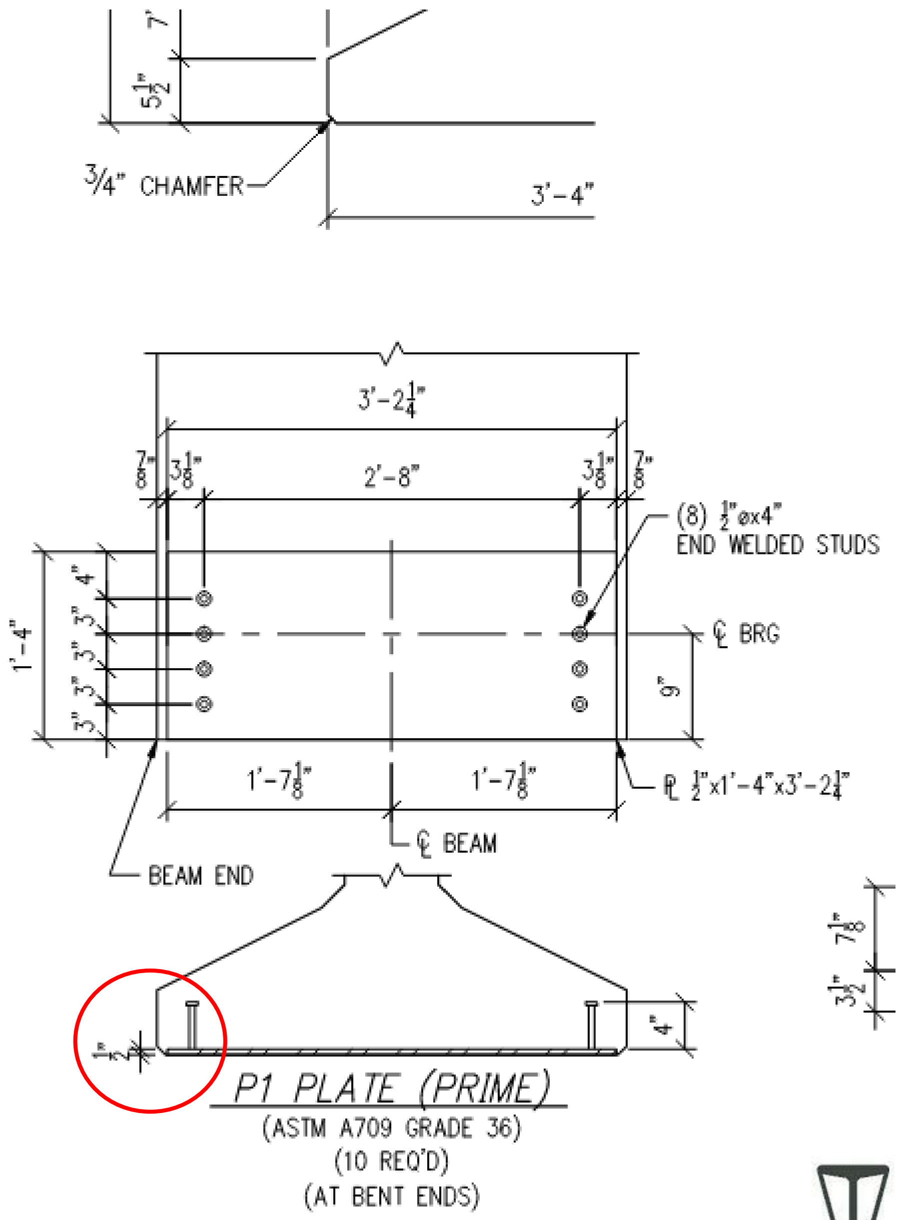
Design Manual Detail



Shop Drawing Detail

Bearing Plates

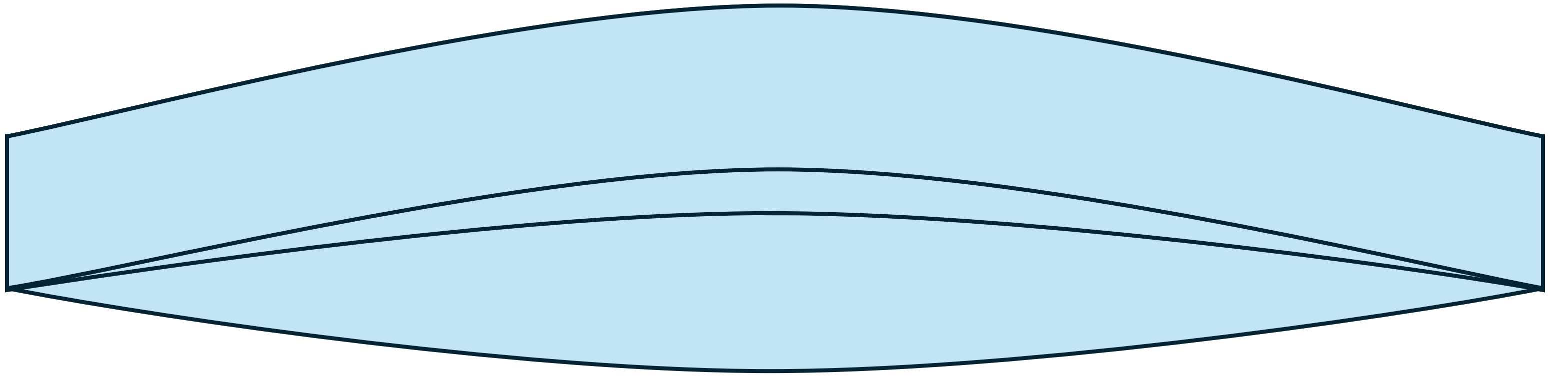
- Bottom Flange Corner ¾” Chamfer
- Bearing Plates 1/8” Narrower Each Side (1/4” Total)
- Prevents Binding of Plate in Form
- Ensure Stud Spacing Works with Bar Spacing



ASCE / INDOT – Design Topic Updates

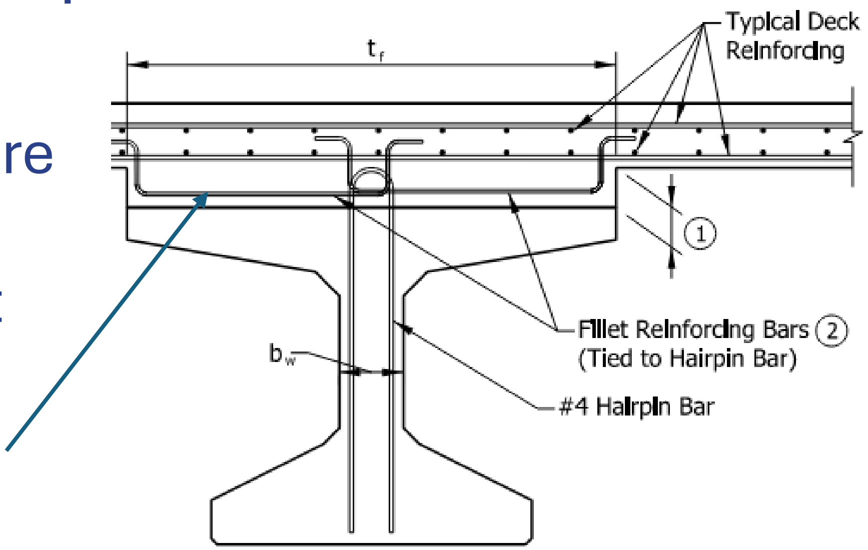
Beam Camber

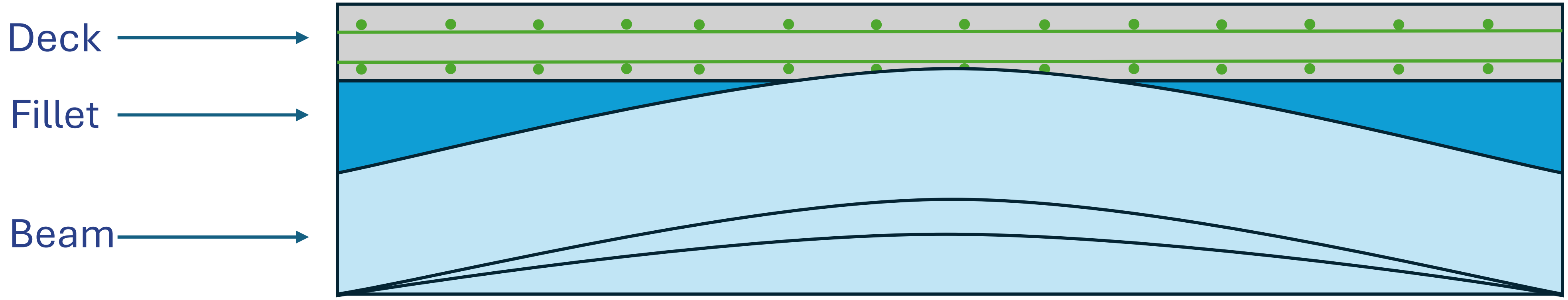
- What is prestressed beam camber?
  - (-) Downward deflection due to beam self weight
  - (+) Upward deflection due to internal prestressing
  - (=) Beam camber at release (immediately after strand detensioning)
  - Beam camber at erection (considers increase in camber due to creep)
  - Highly variable and hard to accurately predict (concrete stiffness, humidity, temperature, time)



Beam Camber

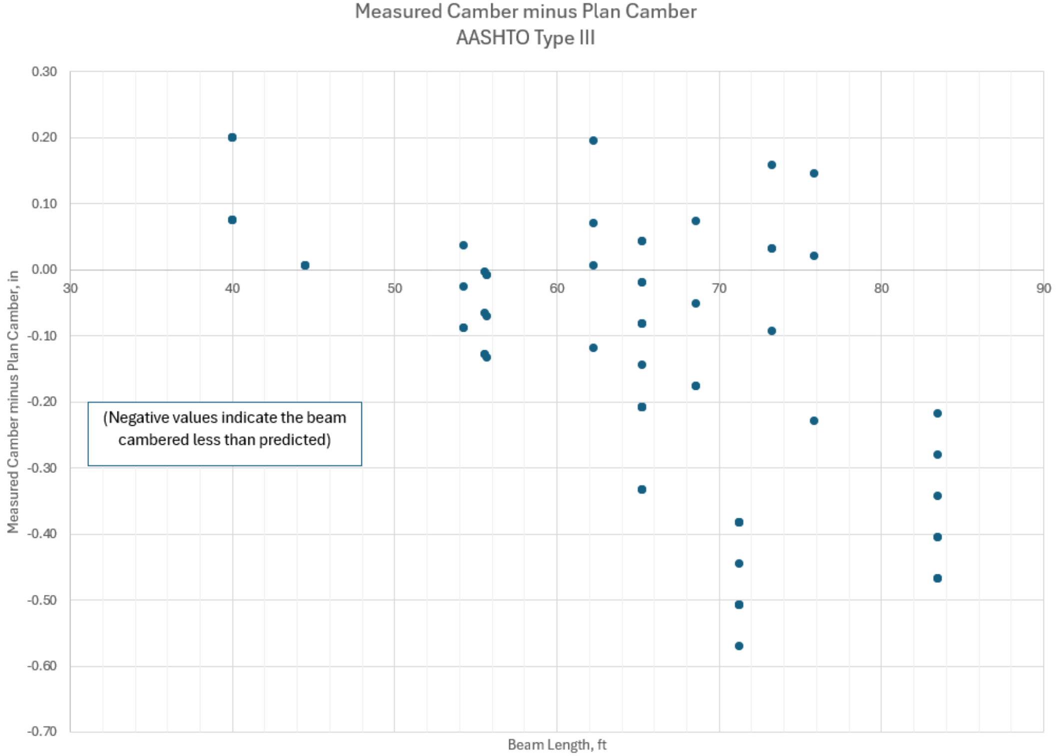
- What issues can result from unanticipated prestressed beam camber?
  - Too much camber can cause beam to interfere with deck reinforcement
  - Too little camber can result in excessive fillet loads
  - Too little camber can require additional fillet reinforcing

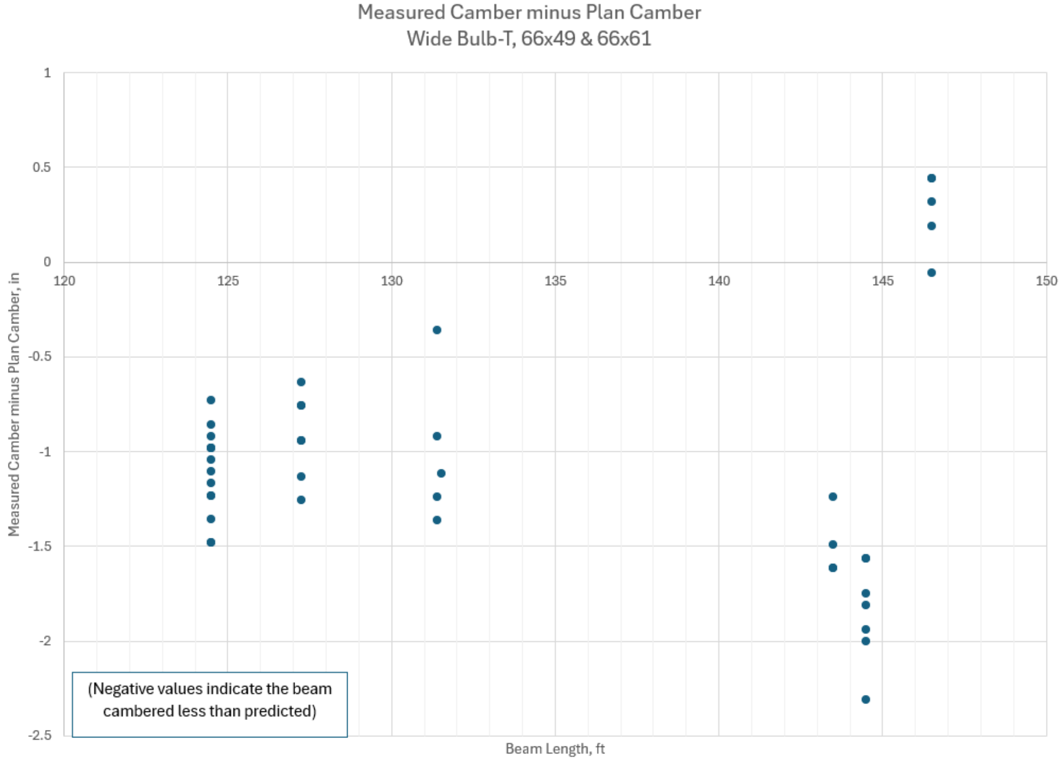




Beam Camber

- Prestress Services shared as-built camber data for hundreds of prestressed beams.
  - Discrepancies between predicted and actual cambers much more pronounced in larger beams, and under-camber much more frequent than over-camber in all sizes





Beam Camber

- New IDM Figure 406-12E provides example of fillet load calculations
  - Example has been simplified by assuming a constant grade vertical roadway profile
  - Project-specific calculations should include appropriate vertical curve corrections in fillet thickness calculations
  - Beam seat elevations should be based on full anticipated camber (not 75% of calculated)

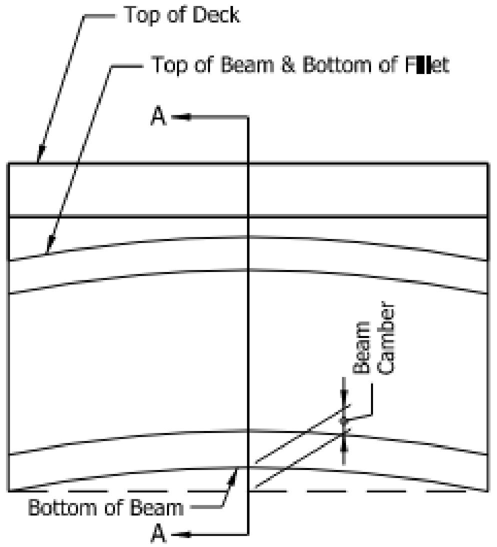
EXAMPLE FILLET DESIGN: THICKNESS USED TO CALCULATE FILLET LOAD

Anticipated Camber from Beam Analysis:
Prestress Camber at Release: 6.0 in.
Beam Self Weight at Release: -3.0 in.
Beam Camber at Release = 6.0 in. – 3.0 in. = 3.0 in.
Deflection Multiplier at Erection: 1.75

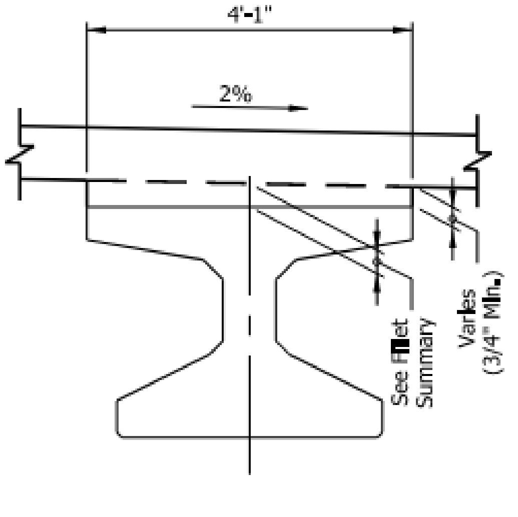
Design Camber at Erection used for Geometry:
Calculate beam camber at erection = (6.0 in. – 3.0 in.)(1.75) = 5.25 in.
Minimum fillet thickness at mid-span of beam = 0.75 in. + 49 in. x 0.5 x 2% = 1.24 in. (see 404-2.02(03))
Fillet thickness at ends of beam = 5.25 in. + 1.24 in. = 6.49 in. (Assuming a constant grade vertical roadway profile. Bridges constructed with vertical curves will require vertical curve correction calculations.)

Assumed Camber at Erection used for Fillet Loads:
Calculate beam camber used to calculate fillet load = 5.25 in. x 75% = 3.94 in. (see 406-12.04(03))
Min. fillet thickness for fillet load = 1.24 in. + (5.25 in. – 3.94 in.) = 2.55 in.

Fillet Summary:
Design fillet thickness used to calculate fillet load varies from 6.49 in. at beam ends to 2.55 in. at mid-span
Actual fillet thickness used for bridge geometry varies from 6.49 in. at beam ends to 1.24 in. at mid-span



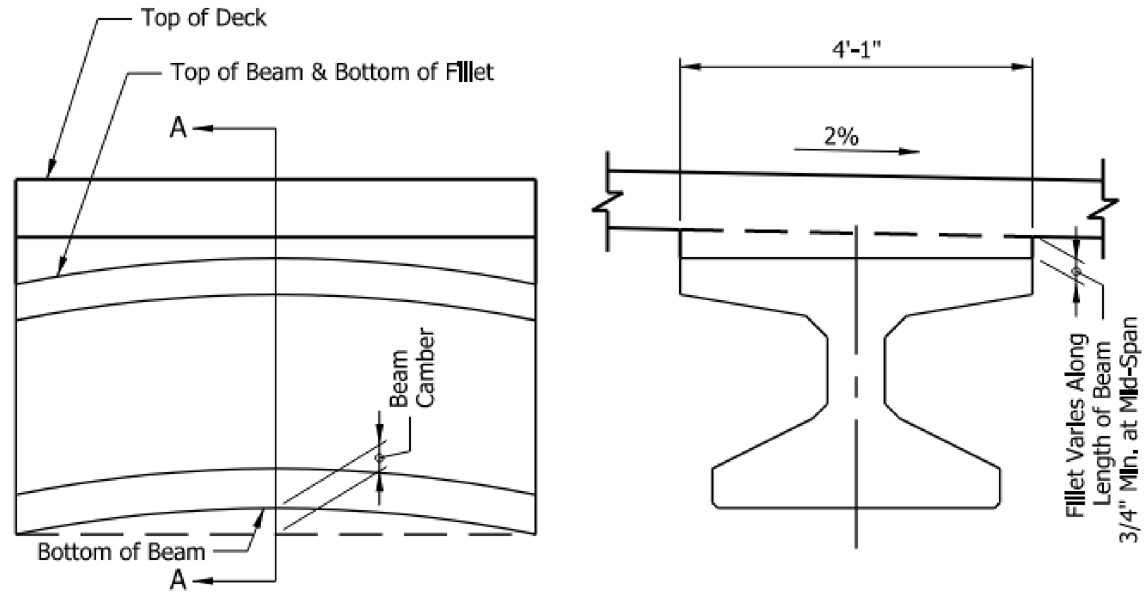
ELEVATION VIEW



SECTION A-A

Beam Camber

- How can we better deal with prestressed beam camber?
  - Make sure plans are consistent and clear
  - New IDM Figure 406-12F provides example of camber information to be shown on design plans
  - Continue to evaluate predicted versus measured beam camber to determine if multipliers should be updated, but for now continue to IDM guidance of 1.75



ELEVATION VIEW

SECTION A-A

	TABLE OF CAMBERS (In.)				
		Span A Ext. Beam	Span A Int. Beam	Span B Ext. Beam	Span B Int. Beam
(1)	Beam Camber at Release	3.00	3.00	3.25	3.25
(2)	Beam Camber at Erection	5.25	5.25	5.69	5.69
(3)	Deflection due to Deck Pour	-2.50	-2.50	-2.80	-2.80
(4)	Residual Beam Camber	2.75	2.75	2.89	2.89

Camber Notes:

(1) Beam camber at release is the upward camber due to prestress minus the downward deflection due to beam self-weight, without time dependent creep effects.

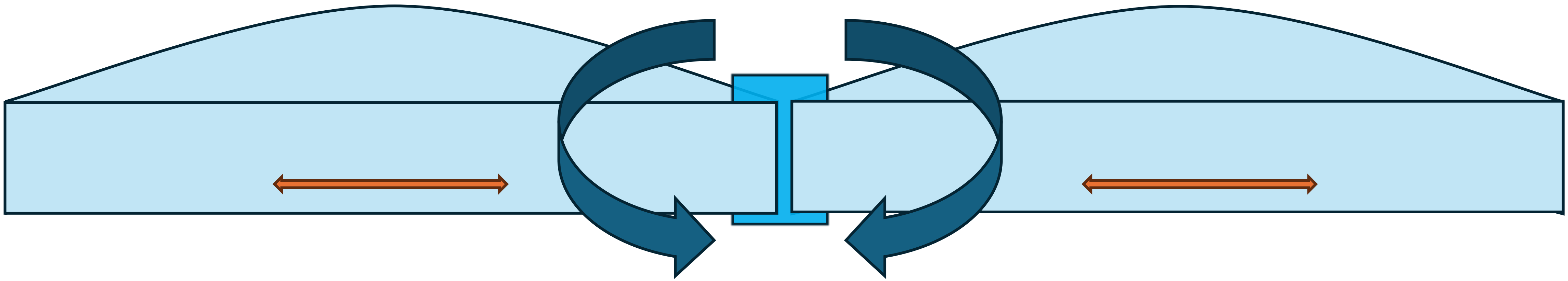
(2) Beam camber at erection is upward camber due to prestress minus the downward deflection due to beam self-weight, with time dependent creep effects.

(3) Deflection due to deck pour is the beam deflection due to the weight of wet concrete at the time of deck pour.

(4) Residual camber is the difference between beam camber at erection and the deflection due to deck pour and represents the camber of the beam immediately after the deck pour.

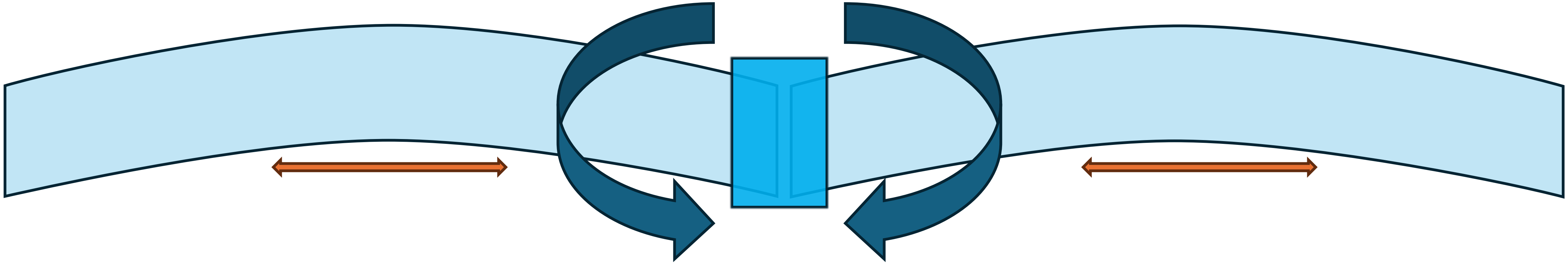
Beam Camber

- Effect of beam camber over time on continuous bridges
  - If unrestrained, beams continue to camber upwards for about 120 days
  - Continuity is often established by pier diaphragms prior final camber
  - Pier diaphragms provide restraint against camber (halt upward deflection)
  - Secondary positive restraining moment develop
  - Increase in tension at the bottom of the beams



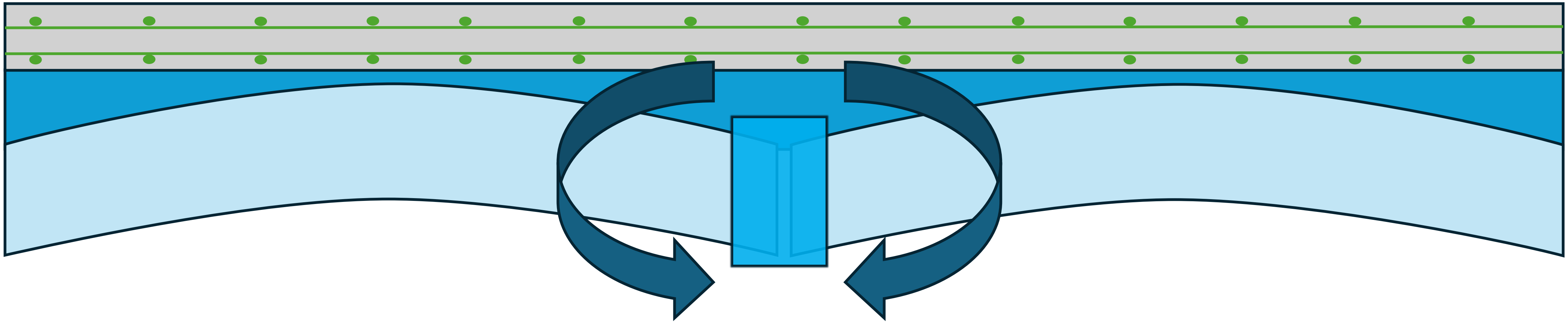
Beam Camber

- How do we design prestressed beams to account for secondary restraining moments?
  - Assume a reasonable time between beam casting and pier diaphragm pour (more time reduces restraining moments but constrains construction schedules)
  - Secondary restraining moment might necessitate additional strands
  - IDM 406-12.06(04) specifies between 28 days and no more than 60 days
  - A note should be placed on the plans indicating, *"The beams shall be cast a minimum of [ ] days prior to pouring the pier diaphragm."*



Beam Camber

- Secondary restraining moments shouldn't be considered if they result in a less conservative design
  - Positive restraining moments at interior supports will offset negative moments due to loads that are applied to the composite section
  - Longitudinal deck reinforcement requirements will be reduced, so positive restraining moments should be ignored when designing for negative moment capacity



Beam Camber

- Changes in beam camber over time can result in secondary positive restraining moments in continuous structures only
  - Single-span (or multi-span without continuity diaphragms) bridges don’t provide any resistance to beam end rotation due to creep
  - Integral and semi-integral end bents are assumed to allow rotation at beam ends

Please don’t include notes related to casting dates on plans for single-span bridges

GENERAL BEAM NOTES

1. Beams shall be cast a minimum of 60 days prior to pouring the deck.
2. Allowance in the beam length should be made, during fabrication to

Beam Camber

- 2026 Standard Drawings for Elastomeric Bearing Assemblies will include standard load and flange plates, and standard shims that can be used to account for unanticipated camber

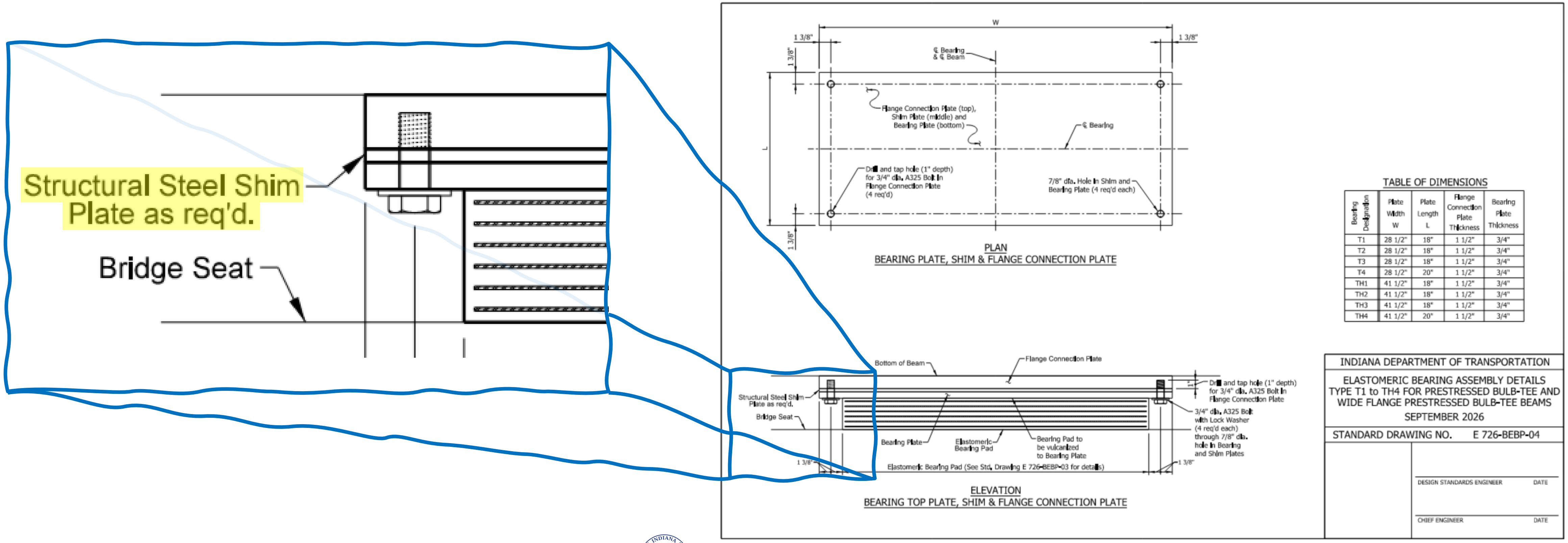


TABLE OF DIMENSIONS

Bearing Designation	Plate Width W	Plate Length L	Flange Connection Plate Thickness	Bearing Plate Thickness
T1	28 1/2"	18"	1 1/2"	3/4"
T2	28 1/2"	18"	1 1/2"	3/4"
T3	28 1/2"	18"	1 1/2"	3/4"
T4	28 1/2"	20"	1 1/2"	3/4"
TH1	41 1/2"	18"	1 1/2"	3/4"
TH2	41 1/2"	18"	1 1/2"	3/4"
TH3	41 1/2"	18"	1 1/2"	3/4"
TH4	41 1/2"	20"	1 1/2"	3/4"

Questions?

Prestress Services Industries, LLC

PRESTRESS

- Sales:
  – Dave Szydlik dszydlik@prestressservices.com

- Project Services:
  – Shanon Schug sschug@prestressservices.com

- Engineering:
  – Celeste Spaans, PE cspaans@prestressservices.com

- Drafting:
  — James Collins jcollins@prestressservices.com