NORTHEAST DECK BULB TEE BEAM (NEDBT) USAGE NOTES

IMPLEMENTATION

IT IS THE DESIGNER'S RESPONSIBILITY TO:

DESIGN THE BEAM ACCORDING TO THE REQUIREMNETS OF THE OWNER, INCLUDING:
- NUMBER OF STRAIGHT STRAND AND LAYOUT
- NUMBER OF DRAPED STRAND AND LAYOUT ALONG THE BEAM
- CHECK DECK REINFORCING IN THE TOP FLANGE AND THE CLOSURE POURS ACCORDING TO THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS. USE THE SAME METHODS AS CAST-IN-PLACE DECKS ASSUMING THAT THE BEAM WEB IS A BEAM LINE.
- SIZE AND SPACING OF SHEAR REINFORCING
- BEAM END REINFORCING
- DECK OVERHANG AND BARRIER REINFORCING

CREATE SPECIAL BEAM END DETAILS AS NEEDED, SUCH AS VARYING GEOMETRIC END TREATMENTS, EXTENSIONS OF PRESTRESSING STRAND FOR BEAM ENDS FOR CONTINUITY OF LIVE LOAD, SPECIAL DETAILS FOR INTEGRAL ABUTMENTS, ETC.

DETAIL INTERMEDIATE AND END DIAPHRAGMS ACCORDING TO OWNERS'S STANDARDS.

SPECIFY THE REQUIRED CONCRETE STRENGTHS:
- RELEASE STRENGTH
- FINAL STRENGTH
- STRENGTH OF CONCRETE IN CLOSURE POURS
- SPEED OF SET

INDEX OF SHEETS

GENERAL NOTES

USE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS EXCEPT AS NOTED OTHERWISE, FOR ALL GIRDER DESIGNS

REINFORCING STEEL: fy = 60,000 PSI (COATING AS PER AGENCY STANDARDS)

PRESTRESSING STRAND: LOW RELAXATION STRAND, 0.6" DIAMETER, AASHTO M 203 GRADE 270

A ½" CONCRETE GRINDING ALLOWANCE FOR CORRECTING UNEVEN ROADWAY SURFACES AT LONGITUDINAL JOINTS MAY BE USED. TO ACCOUNT FOR THIS IN DESIGN, ASSUME LOSS OF ½" OF TOP FLANGE IN THE SECTION PROPERTIES, HOWEVER INCLUDE FULL DECK THICKNESS FOR BEAM WEIGHT.

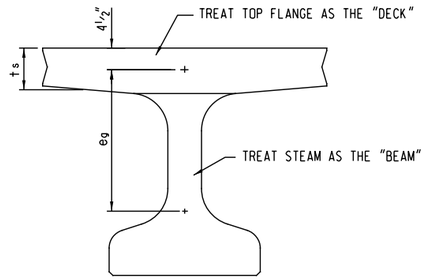
DECK OVERLAYS COMBINED WITH WATERPROOFING MEMBRANES ARE RECOMMENDED FOR THE FOLLOWING REASONS:
- ELIMINATES THE NEED FOR DECK GRINDING
- ACCOUNTS FOR TOP FLANGE DIFFERENTIAL
- PROVIDES ADDITIONAL DECK PROTECTION

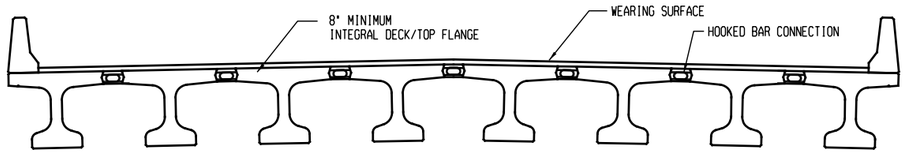
USE AGENCY STANDARD BULB TEE CROSS FRAMES (DIAPHRAGMS). RECOMMENDED INTERMEDIATE CROSS FRAME SPACING:
- QUARTER POINTS OF SPAN FOR SPAN LENGTHS GREATER THAN 120'
- THIRD POINTS OF SPAN FOR SPAN LENGTHS 80' TO 120'
- HALF POINTS OF SPAN FOR SPAN LENGTHS LESS THAN 80'

MAXIMUM RECOMMENDED SKEW ANGLE: 20 DEGREES
TOP FLANGE EDGE DIFFERENTIAL WILL OCCUR ON SKEWED BEAMS LEADING TO COVER ISSUES WITH THE CLOSURE POUR REINFORCING STEEL (SEE DETAIL 4 ON SHEET 05). THIS PHENOMENON IS CAUSED BY THE VARYING SPAN LOCATION FOR EACH FLANGE TIPS ACROSS THE JOINT.
FOR EXAMPLE:
5 FOOT WIDE TOP FLANGE
20 DEGREE SKEW
THE FLANGE TIP ON ONE SIDE OF THE JOINT IS 21 INCHES FARTHER INTO THE SPAN THAN THE ADJACENT FLANGE TIP, THEREFORE THE FLANGE TIP ELEVATION ON ONE SIDE OF THE JOINT WILL BE HIGHER THAN THE ADJACENT FLANGE TIP DUE TO THE HIGHER CAMBER ELEVATION ALONG THE SPAN.
LARGER SKEWS MAY BE POSSIBLE UNDER THE FOLLOWING CONDITIONS:
BEAMS WITH LOW CAMBER VALUES
WIDE CLOSURE POURS WITH STRAIGHT BARS (BARS CAN BE SLIGHTLY BENT TO MAINTAIN COVER)
USE OF AN OVERLAY OR GRINDING TO PROVIDE AN EVEN CROSS SLOPE

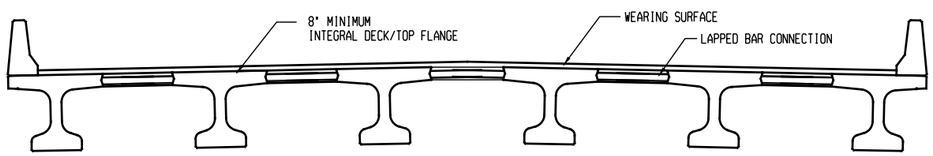
LIVE LOAD DISTRIBUTION FACTOR CALCULATIONS 3

- USE AASHTO CROSS SECTION J (ARTICLE 4.6.2.2.1 AND 4.6.2.2.2) ASSUMING THAT THE DECK IS SUFFICIENTLY CONNECTED TO ACT AS A UNIT
- TREAT THE STEM AS AN INDIVIDUAL STRINGER
- ASSUME THAT THE WEB/BOTTOM FLANGE PORTION OF THE BEAM IS THE STRINGER (UP TO THE TOP OF THE TOP RADIUS)
- ASSUME THAT THE TOP FLANGE PORTION OF THE BEAM IS THE COMPOSITE DECK (TOP OF TOP RADIUS TO THE TOP OF THE BEAM)
- SEE ADJACENT DETAIL FOR CALCULATION OF e_g AND t_s
- CALCULATE THE SECTION PROPERTIES FOR THE WEB/BOTTOM FLANGE PORTION FOR USE IN THE EQUATIONS (I, A, e_g)
- CALCULATE THE DISTRIBUTION FACTOR USING THE TABLES IN ARTICLE 4.6.2.2.2.
- THE APPLICATION OF THE LEVER RULE FOR EXTERIOR BEAMS SHALL APPLY
- FOR WIDE CLOSURE JOINTS, THE CONCRETE IN THE CLOSURE JOINTS MAY BE INCLUDED IN THE CALCULATIONS

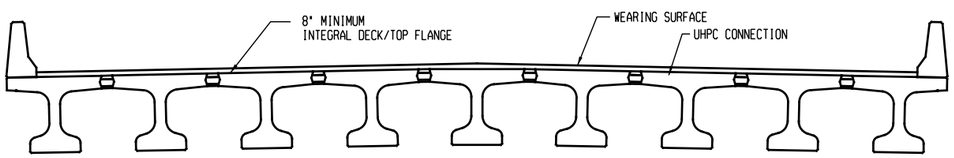




① HOOKED BAR CONNECTION



② LAPPED BAR CONNECTION



③ UHPC CONNECTION

NOTE: MINIMUM CLOSURE POUR WIDTHS SHOWN FOR THE VARIOUS OPTIONS THAT ARE RECOMMENDED. WIDER CLOSURE POURS MAY BE USED
CONSIDER THE EFFECT OF BAR EXTENSIONS ON SHIPPING WIDTHS OF BEAMS.
SEE SHEET NEDBT-05 FOR DETAILS OF THE VARIOUS CLOSURE POUR OPTIONS

1

Flange Connection	Advantages	Design/Construction Considerations
Hooked Bars with Concrete Closure Pour	• Narrow joint. Less material to place in the field • Can accommodate tight beam spacing resulting in longer spans • Easy to ship without damaging projecting bars	• Vary bridge width by varying the width of the closure pour • Differential camber needs to be controlled in order to accommodate concrete cover in closure pour (see Detail 4 on Sheet 05)
Straight Bars with Concrete Closure Pour	• Can accommodate wide beam spacing • Can accommodate variable width beam spacing more easily	• Vary bridge width by varying the width of the closure pour • Can accommodate differential camber well by adjusting the projecting reinforcing in the closure pour • Shipping of beam with long projecting bars needs to be addressed
Straight Bars with UHPC Closure Pour	• Very narrow joint • Easy to fabricate deck edges with simple side forms • Easy to ship without damaging projecting bars	• Vary bridge width by varying the width of the closure pour (Note: There are cost implications with wide UHPC joints) • Cost of UHPC • Differential camber needs to be controlled in order to accommodate concrete cover in closure pour (see Detail 4 on Sheet 05)

WWW.PCINE.ORG

PCI

PRECAST/PRESTRESSED CONCRETE INSTITUTE NORTHEAST

NORTHEAST DECK BULB TEE BEAM DETAILS

RECOMMENDED USAGE AND NOTES

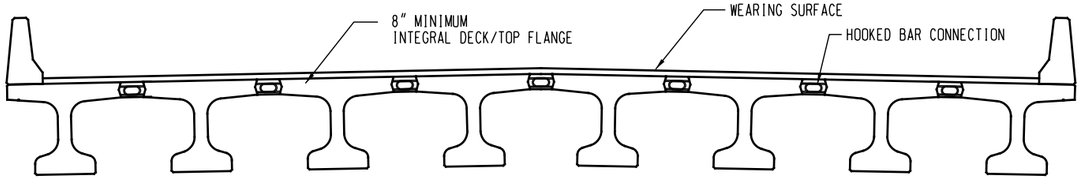
DISCLAIMER: The details shown are guidelines and should not be considered standards. The information has been obtained from sources believed to be reliable. PCI Northeast or its memberships shall not be responsible for any errors, omissions or damages arising out of this information. PCI Northeast has published this work with the understanding that PCI Northeast is supplying information only. PCI Northeast is not rendering engineering or other professional services through this guideline. If such services are required, please seek an appropriate professional.

ISSUE DATE: 08-02-16

SHEET: NEDBT - 01

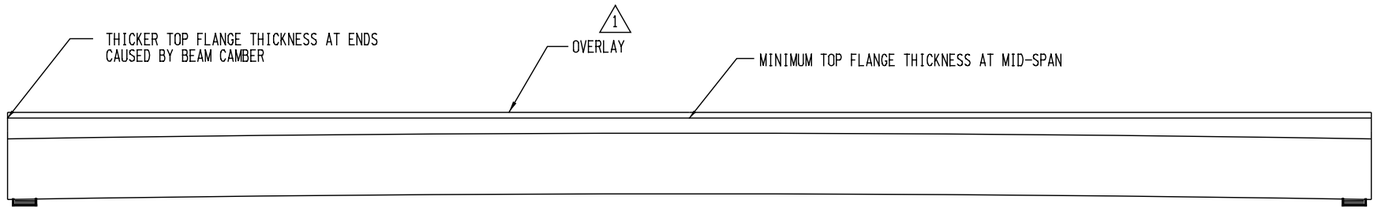
REVISIONS

NO.	DATE	DESCRIPTION
1	5/17	ELIMINATED FLANGE WIDTH VARIATION
2	11/17	VARIOUS EDITORIAL CHANGES
3	03/18	ADDED LLDF NOTES



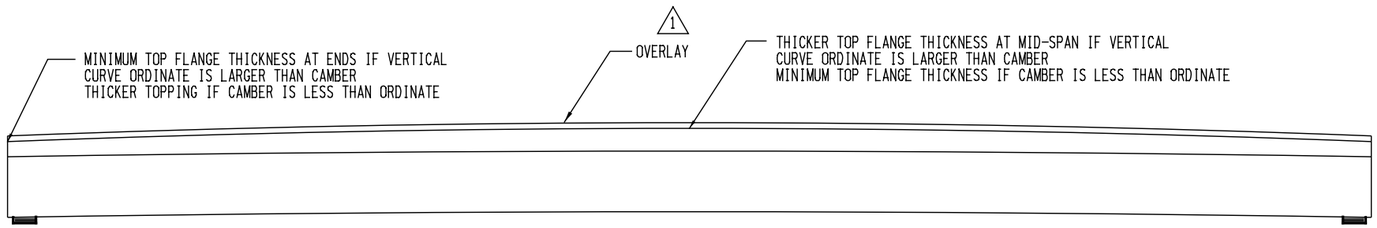
① BRIDGE CROSS SECTION

NOTE: HOOKED BAR CONNECTION DETAILS SHOWN. OTHER CONNECTION DETAILS SIMILAR. ⚠1



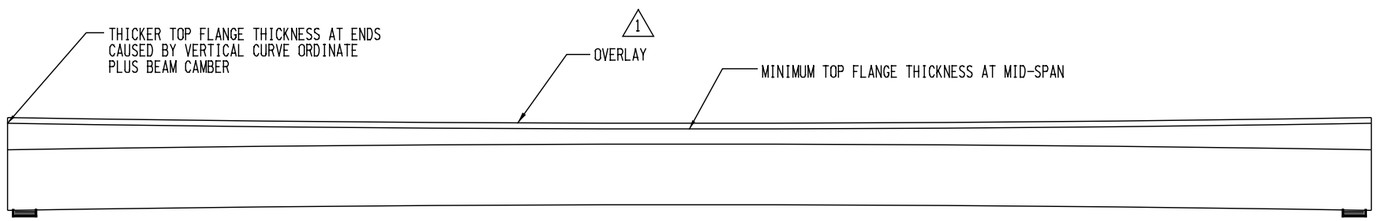
② TANGENT PROFILE

NOTE: OPTION 1 SHOWN, OPTION 2 SIMILAR



③ CREST VERTICAL CURVE PROFILE

NOTE: OPTION 1 SHOWN, OPTION 2 SIMILAR

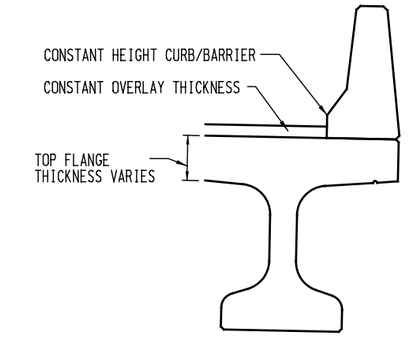


④ SAG VERTICAL CURVE PROFILE

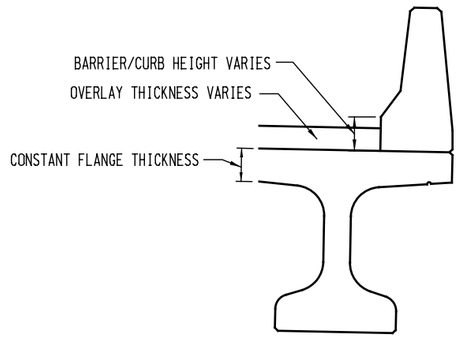
NOTE: OPTION 1 SHOWN, OPTION 2 SIMILAR

⚠1 ⑧ NOTES

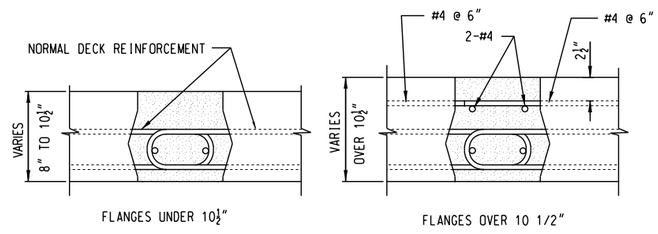
1. THE DETAILS SHOWN DEPICT VARYING THE THICKNESS OF THE TOP FLANGE (OPTION 1). ANOTHER OPTION IS TO VARY THE THICKNESS OF THE OVERLAY (OPTION 2).
2. THE ENGINEER SHOULD DETAIL THE ANTICIPATED VARIABLE THICKNESS OF THE TOP FLANGE OR OVERLAY ON THE PLANS BASED ON THE ESTIMATED CAMBER. THE PLANS SHOULD INCLUDE NOTES REQUIRING SURVEY OF THE BEAMS AFTER ERECTION, AND THEN ADJUSTMENT OF THE OVERLAY THICKNESS MAY BE REQUIRED. THE SAME APPLIES TO THE HEIGHT OF THE CURB OR BARRIER.
3. THE ENGINEER SHOULD ACCOUNT FOR THE ESTIMATED VARIABLE THICKNESS TOP FLANGE AND/OR TOPPING IN THE DESIGN OF THE BEAM.
4. THE ESTIMATED CAMBER USED FOR THE VARIABLE NOTED ABOVE SHOULD BE BASED ON THE ESTIMATED CAMBER AT ERECTION.
5. FOR MORE INFORMATION, SEE THE PCI NORTHEAST DOCUMENT ENTITLED "GUIDELINES FOR CAMBER AND PROFILE MANAGEMENT IN ADJACENT BEAMS" AT WWW.PCINE.ORG.



⑤ OPTION 1: VARY FLANGE THICKESS



⑥ OPTION 2: VARY OVERLAY THICKESS



⑦ FLANGE ADJUSTMENT FOR PROFILE

WWW.PCINE.ORG

PCI

PRECAST/PRESTRESSED CONCRETE INSTITUTE NORTHEAST

NORTHEAST DECK BULB TEE BEAM DETAILS

PROFILE ACCOMMODATION DETAILS

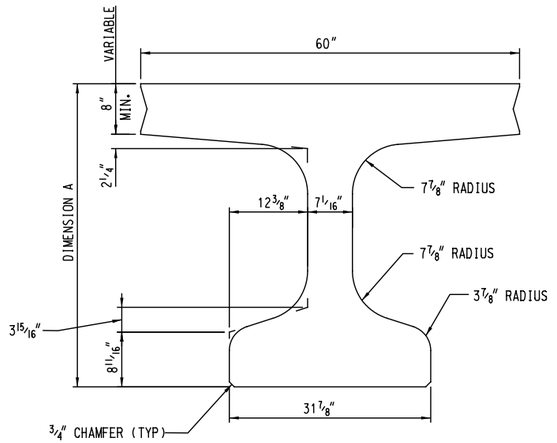
DISCLAIMER: The details shown are guidelines and should not be considered standards. The information has been obtained from sources believed to be reliable. PCI Northeast or its membership staff not be responsible for any errors, omissions or damages arising out of this information. PCI Northeast has published this work with the understanding that PCI Northeast is supplying information only. PCI Northeast is not rendering engineering or other professional services through this guideline. If such services are required, please seek an appropriate professional.

SHEET: NEDBT – 02

ISSUE DATE: 08-02-16

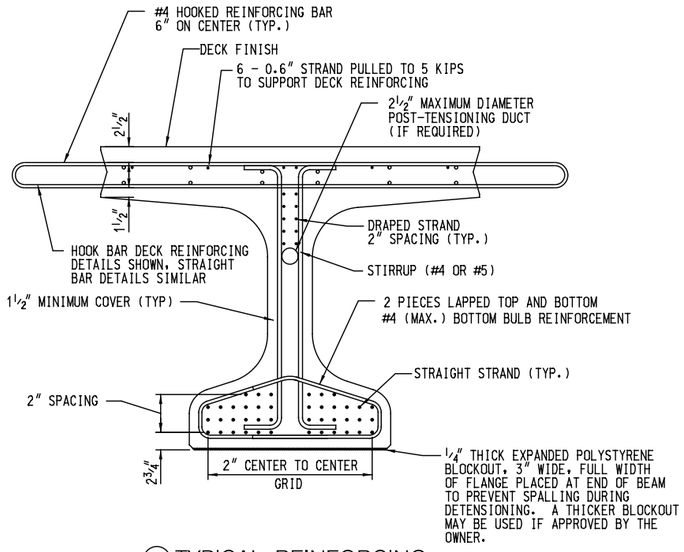
REVISIONS

NO.	DATE	DESCRIPTION
1	5/17	REVISED NOTES, ADDED OVERLAY
2	11/17	VARIOUS EDITORIAL CHANGES

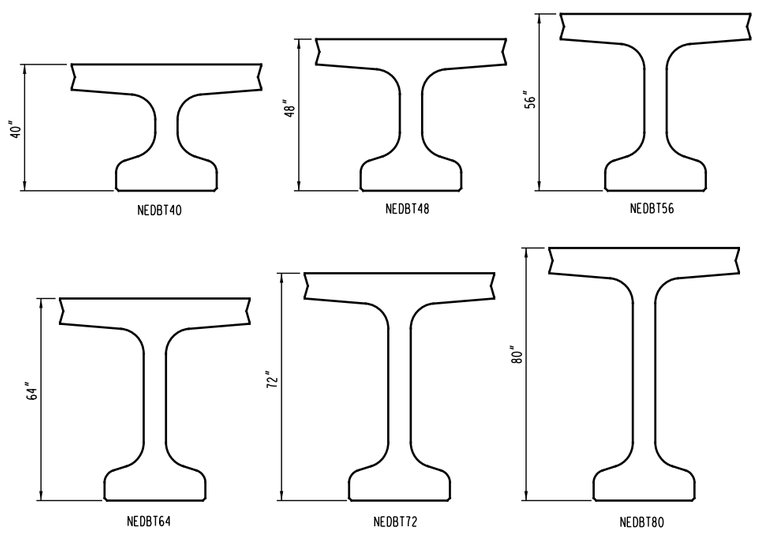


① TYPICAL DECK BULB TEE CROSS SECTION

△1 NOTE: SEE SHEET NEDBT-02 FOR DETAILS OF VARIABLE THICKNESS TOP FLANGE



② TYPICAL REINFORCING



③ AVAILABLE NEDBT BEAM SIZES △1

④ GENERAL NOTES

1. THE TOP FLANGE IS INTENDED TO ACT AS A STRUCTURAL DECK.
2. SHEAR REINFORCING SHOULD BE KEPT TO #5 BARS MAXIMUM IN ORDER TO MAXIMIZE THE COVER ON THE SIDE OF THE STEM.
3. SEE NEDBT-07 FOR UTILITY SUPPORT DETAILS.
4. MINOR ADJUSTMENT OF THE SPACING OF THE TOP LONGITUDINAL REINFORCEMENT IS ALLOWED TO FACILITATE THE INSTALLATION OF THE STIRRUPS.

⑤ DESIGN NOTES

△1

1. THE REINFORCING SHOWN IS SCHEMATIC. DESIGNERS MUST DESIGN THE REINFORCING FOR EACH DESIGN BASED ON THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND AGENCY STANDARDS.
2. THE STRIP METHOD SPECIFIED IN AASHTO LRFD ARTICLE 4.6.2.1 IS RECOMMENDED FOR THE DESIGN OF THE REINFORCING IN THE TOP FLANGE.
3. THE REINFORCING BAR EXTENSIONS FROM THE EDGE OF THE FLANGES SHOWN SHOULD BE DESIGNED TO RESIST THE POSITIVE BENDING MOMENT AT THE CENTER OF THE JOINT AS DETERMINED BY THE AASHTO STRIP METHOD OF DECK DESIGN. THE HOOKED BARS SHOULD BE CONSIDERED A LAP SPLICE WITH THE BARS FULLY DEVELOPED. THE CRACK CONTROL PROVISIONS OF AASHTO ARTICLE 5.7.3.4. SHOULD ALSO BE CHECKED FOR THESE BARS.
4. ADDITIONAL REINFORCING MAY BE REQUIRED FOR DECK OVERHANGS AND BARRIERS.
5. THE DESIGNER SHALL DETAIL ADDITIONAL TOP LONGITUDINAL REINFORCING IN THE TOP FLANGE AT BEAM ENDS IF THE TOP FIBER STRESSES EXCEED 200 PSI. THESE BARS ARE USED TO CONTROL TRANSVERSE CRACKING IN THE TOP FLANGE AT RELEASE. THIS REINFORCING SHALL BE DESIGNED IN ACCORDANCE WITH THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS. THIS REINFORCING IS FOR CRACK WIDTH AND LENGTH CONTROL, NOT PREVENTION. IF FULLY TENSIONED TOP STRANDS ARE INCLUDED IN THE DESIGN, THEY SHOULD NOT BE USED TO MEET THE AASHTO PROVISIONS, SINCE THEY ARE ALREADY BEING USED TO CONTROL STRESS IN THE BEAM.

⑥ STRAND LAYOUT NOTES

△1

1. TWO COLUMNS OF STRAND IN THE CENTER OF THE BEAM MAY BE DRAPED.
2. DEBONDING OF STRANDS IS ALLOWED. THE RESTRICTIONS OUTLINED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SHALL BE FOLLOWED.
3. DEBONDING MAY BE COMBINED WITH DRAPING IF ALLOWED BY AGENCY POLICIES.
4. IT IS RECOMMENDED THAT APPROXIMATELY 50% OF ALL STRAND BE DEBONDED FOR THE FIRST 6" FROM THE END OF THE BEAM IN ORDER TO CONTROL END CRACKING. SPACING RESTRICTIONS OUTLINED IN NOTE 2 DO NOT APPLY TO THIS 6" AREA, BUT DO APPLY BEYOND THIS 6" AREA.
5. STRANDS SHALL BE PLACED WITHIN THE 2"x2" GRID. THE NUMBER AND LOCATION OF STRANDS SHALL BE AS REQUIRED BY DESIGN.
6. THE PATTERN SHOWN IN THE BOTTOM FLANGE DEPICTS THE MAXIMUM NUMBER OF STRANDS ALLOWED (42 STRAND EXCLUDING DRAPED STRAND). THE RECOMMENDED AMOUNT OF DRAPED STRAND SHOULD BE LIMITED TO 10. LARGER AMMOUNTS OF DRAPED STRAND MAY BE POSSIBLE (CONSULT WITH LOCAL FABRICATORS REGARDING CAPACITIES OF PRESTRESSING BEDS).
7. ALL PRESTRESSING STRANDS SHALL BE 0.6" DIAMETER, UNCOATED SEVEN WIRE, LOW RELAXATION STRANDS CONFORMING TO AASHTO M203. THE ULTIMATE STRENGTH OF THE STRANDS SHALL BE 270 KSI.
8. THE ADDITIONAL STRANDS SHOWN IN THE TOP FLANGE ARE USED TO SUPPORT THE TOP FLANGE REINFORCING.

⑦ NEDBT BEAM – SECTION PROPERTIES △1

BEAM DESIGNATION	BEAM DEPTH INCHES	AREA	I	Yb	Yt	St	Sb	WEIGHT
	A	IN^2	IN^4	INCHES	INCHES	IN^3	IN^3	PLF
NEDBT40	40.00	1052	202089	23.43	16.57	12196	8625	1096
NEDBT48	48.00	1109	327115	28.07	19.93	16413	11654	1155
NEDBT56	56.00	1165	486874	32.64	23.36	20842	14916	1214
NEDBT64	64.00	1222	683314	37.16	26.84	25459	18388	1273
NEDBT72	72.00	1279	918385	41.63	30.37	30240	22061	1332
NEDBT80	80.00	1335	1193950	46.06	33.94	35178	25922	1391

△1 ⑧ BEAM DIMENSION NOTES

1. THE DEPTH OF THE BEAMS IS LIMITED TO THE SIZES SHOWN.
2. THE DIMENSIONS SHOWN ARE FIXED.
3. THE ENDS OF THE BEAMS SHOULD BE SKEWED FOR SKEWED BRIDGES. THE ACUTE CORNERS OF THE FLANGE OVERHANGS SHOULD BE CHAMFERED 6"x6" IN ORDER TO MINIMIZE CASTING AND HANDLING DAMAGE.
4. THE DETAILS ON THE VERTICAL EDGE OF THE DECK OF FASCIA BEAMS MAY BE MODIFIED TO MATCH STATE DECK EDGE STANDARDS.

WWW.PCINE.ORG

PCI

PRECAST/PRESTRESSED CONCRETE INSTITUTE NORTHEAST

NORTHEAST DECK BULB TEE BEAM DETAILS

TYPICAL BEAM DETAILS

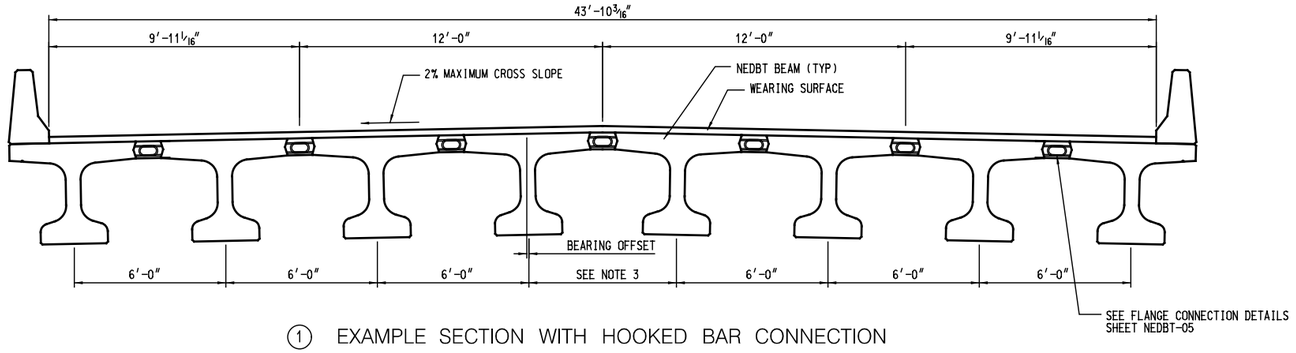
DISCLAIMER: The details shown are guidelines and should not be considered standards. The information has been obtained from sources believed to be reliable. PCINortheast or its membership shall not be responsible for any errors, omissions or damages arising out of this information. PCINortheast has published this work with the understanding that PCINortheast is supplying information only. PCI Northeast is not rendering engineering or other professional services through this guideline. If such services are required, please seek an appropriate professional.

SHEET: NEDBT – 03

ISSUE DATE: 08-02-16

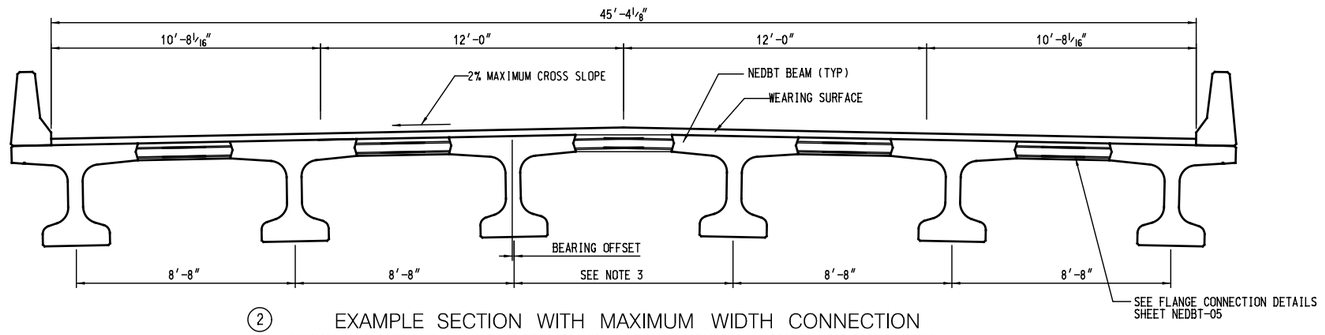
REVISIONS

NO.	DATE	DESCRIPTION
1	5/17	ELIMINATED FLANGE WIDTH VARIATION, TEXT EDITS
2	11/17	VARIOUS EDITORIAL CHANGES



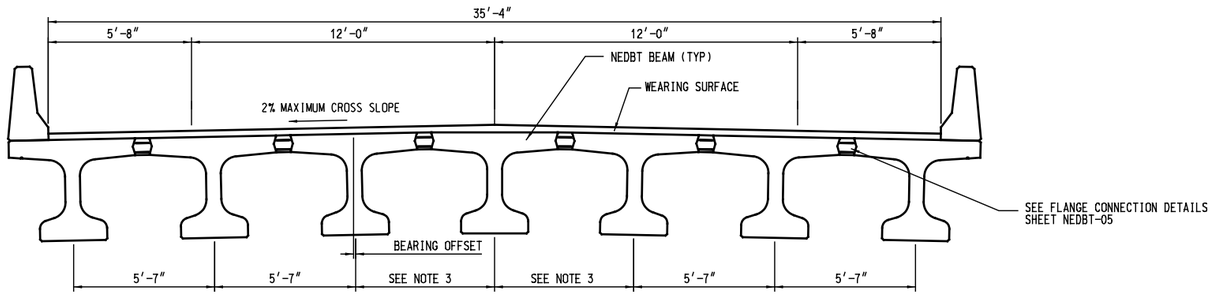
① EXAMPLE SECTION WITH HOOKED BAR CONNECTION

MINIMUM BEAM SPACING SHOWN. WIDER BEAM SPACING ACHIEVED BY DETAILING A WIDER JOINT BETWEEN BEAMS



② EXAMPLE SECTION WITH MAXIMUM WIDTH CONNECTION

MAXIMUM JOINT WIDTH SHOWN. NARROWER BEAM SPACING ACHIEVED BY DETAILING A NARROWER JOINT BETWEEN BEAMS



③ EXAMPLE SECTION WITH UHPC CONNECTION △1

MINIMUM BEAM SPACING SHOWN. WIDER BEAM SPACING ACHIEVED BY DETAILING A WIDER JOINT BETWEEN BEAMS

④ EXAMPLE BRIDGE SECTION NOTES △1

1. THE BRIDGE SECTIONS DEPICT VARIOUS OPTIONS FOR BEAM SPACINGS USING DIFFERENT FLANGE JOINT DETAILS. BEAM SPACINGS CAN BE VARIED BY CHANGING THE WIDTH OF THE CLOSURE POUR JOINT. THE WIDTH OF THE UHPC JOINTS SHOULD BE KEPT NARROW DUE TO THE COST OF THIS MATERIAL.
2. OFFSET THE BEARING SUPPORT LOCATIONS FROM THE BASELINE ACCOUNTING FOR THE CROSS SLOPE AND TILT OF THE BEAMS RELATIVE TO THE LONGITUDINAL AXIS OF THE BEAM. THE DIMENSIONS OF ALL BEARING LOCATIONS ON THE PLANS SHOULD ACCOUNT FOR THIS TILT OFFSET.

⑤ APPROXIMATE MAXIMUM SPAN LENGTHS △2

BEAM SIZE	APPROXIMATE MAXIMUM SPAN LENGTH (FEET)
NEDBT40	105
NEDBT48	121
NEDBT56	132
NEDBT64	142
NEDBT72	151
NEDBT80	159

SPAN TABLE NOTES:

1. CROSS SECTION 1 SHOWN TO THE LEFT WAS ASSUMED, EXCEPT WITH ONLY 5 BEAMS.
2. CROSS SECTION 2 WILL YIELD SHORTER MAXIMUM SPAN LENGTHS WHEN COMPARED TO CROSS SECTION 1.
3. CROSS SECTION 3 WILL HAVE MAXIMUM SPAN LENGTHS APPROXIMATELY EQUAL TO THOSE SHOWN.
4. THE VALUES SHOWN SHOULD BE CONSIDERED APPROXIMATE. THE ACTUAL MAXIMUM SPAN LENGTHS ARE AFFECTED BY A NUMBER OF ASSUMPTIONS. THE SPAN LENGTHS SHOWN ARE GENERALLY BASED ON THE FOLLOWING ASSUMPTIONS.
   - DESIGN SPECIFICATION: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (2014)
   - BARRIERS: MASSDOT CF-PL2 BARRIER
   - WEARING SURFACE: 3″ THICK ASPHALT
   - f'_c = 8000 PSI
   - f'_{ci} = 6000 PSI
   - FINAL SERVICE LIMIT STATE ALLOWABLE TENSION AT THE BOTTOM OF THE BEAM = $0.0948\sqrt{f'_c}$ (KSI)

WWW.PCINE.ORG

PCI

PRECAST/PRESTRESSED CONCRETE INSTITUTE NORTHEAST

NORTHEAST DECK BULB TEE BEAM DETAILS

EXAMPLE BRIDGE SECTIONS

DISCLAIMER: The details shown are guidelines and should not be considered standards. The information has been obtained from sources believed to be reliable. PCI Northeast or its membership shall not be responsible for any errors, omissions or damages arising out of this information. PCI Northeast has published this work with the understanding that PCI Northeast is supplying information only. PCI Northeast is not rendering engineering or other professional services. If such services are required, please seek an appropriate professional.

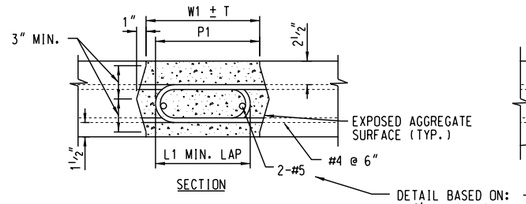
SHEET: NEDBT – 04

ISSUE DATE: 08-02-16

REVISIONS

NO.	DATE	DESCRIPTION
1	5/17	ELIMINATED FLANGE WIDTH VARIATION, INSERTED UHPC SECTION
2	11/17	ADDED SPAN TABLE AND VARIOUS EDITORIAL CHANGES

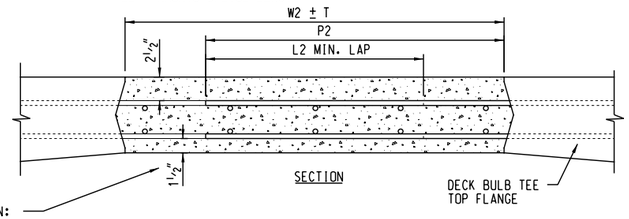
2 T = RECOMMENDED TOLERANCE = 1"
W1 = SPECIFIED JOINT WIDTH, MINIMUM = L1 + T + 1.5, MAXIMUM = 24"
P1 = HOOK BAR PROJECTION FROM BEAM EDGE = 0.5(W1 + L1) + T
L1 = AASHTO HOOK DEVELOPMENT LENGTH



1 HOOKED BARS WITH 4 KSI CONCRETE

A SIMILAR NARROWER JOINT MADE WITH 6 KSI GROUT MAY ALSO BE USED. SEE NEXT-D BEAM DETAILS AT WWW.PCINE.ORG.

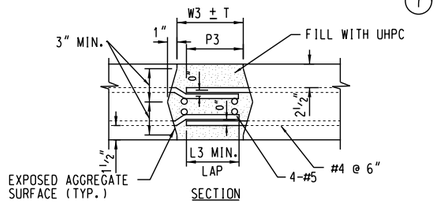
2 T = RECOMMENDED TOLERANCE = 1"
W2 = SPECIFIED JOINT WIDTH: MINIMUM = L2 + T + 1.5, MAXIMUM = 44"
P2 = BAR PROJECTION FROM BEAM EDGE = 0.5(W2 + L2) + T
L2 = AASHTO SPLICE LENGTH



2 STRAIGHT BARS WITH 4 KSI CONCRETE

SIZE AND SPACING OF LONGITUDINAL BARS AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

2 T = RECOMMENDED TOLERANCE = 1"
W3 = SPECIFIED JOINT WIDTH: MINIMUM = L3 + T + 1.5
P3 = BAR PROJECTION FROM BEAM EDGE = 0.5(W3 + L3) + T
L3 = 8db = 4"

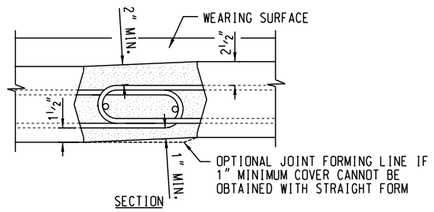


3 STRAIGHT BARS WITH UHPC

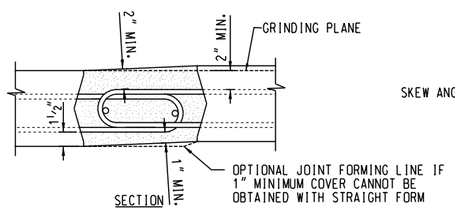
MINIMUM STRENGTH OF UHPC = 14 KSI

7 FLANGE CONNECTION NOTES

1. CONNECTION REINFORCING TO BE PLACED ALONG THE ENTIRE SPAN WITH 6" SPACING.
2. FOR SKEWED BRIDGES, PLACE CONNECTOR REINFORCING PERPENDICULAR TO BEAM EDGE. BEND CONNECTOR REINFORCING WITHIN THE FLANGE IN ACUTE CORNERS TO PRODUCE A SQUARE PROJECTION.
3. METHOD OF FORMING CLOSURE POUR TO BE DETERMINED BY THE CONTRACTOR. THE FORMS NEED TO BE REMOVABLE AND ABLE TO ACCOMMODATE DIFFERENTIAL CAMBER. FORM SUPPORTS SHOULD NOT PENETRATE THROUGH TOP OF POUR UNLESS APPROVED BY THE ENGINEER.
4. CONCRETE CLOSURE POUR MATERIAL IN DETAIL 1 AND 2 TO BE A MIX THAT HAS A MINIMUM COMPRESSIVE STRENGTH OF 4ksi. HIGHER STRENGTH MIXES MAY BE USED, WHICH MAY RESULT IN SHORTER LAP LENGTHS.
5. EXPOSED AGGREGATE SURFACE OF THE FACES OF THE KEYS IS RECOMMENDED TO IMPROVE BOND.
6. DESIGNERS ARE RESPONSIBLE FOR THE VERIFICATION OF THE DESIGN OF THIS JOINT. THIS DETAIL CAN BE CONSIDERED EQUIVALENT TO A TENSION LAP SPLICE.
7. THE DESIGNER SHOULD ALLOW THE FABRICATOR TO MAKE MINOR CHANGES TO THE DIMENSIONS OF THE SHEAR KEYS TO ACCOMMODATE VARIATIONS IN EXISTING FORMS.
8. THE CONNECTIONS HAVE BEEN DESIGNED TO MEET THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.



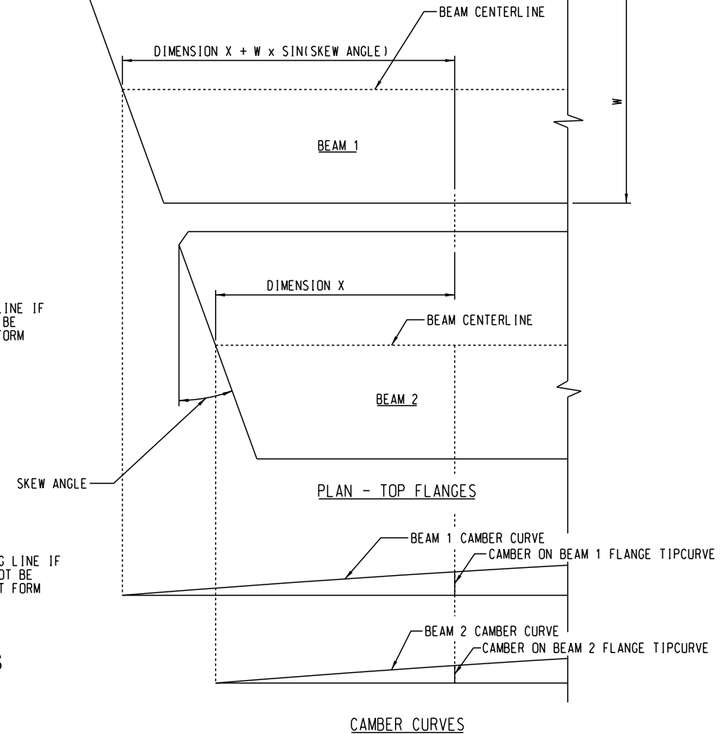
¾" MAXIMUM JOINT DIFFERENTIAL – WEARING SURFACE DETAIL



¾" MAXIMUM JOINT DIFFERENTIAL – BARE DECK DETAIL

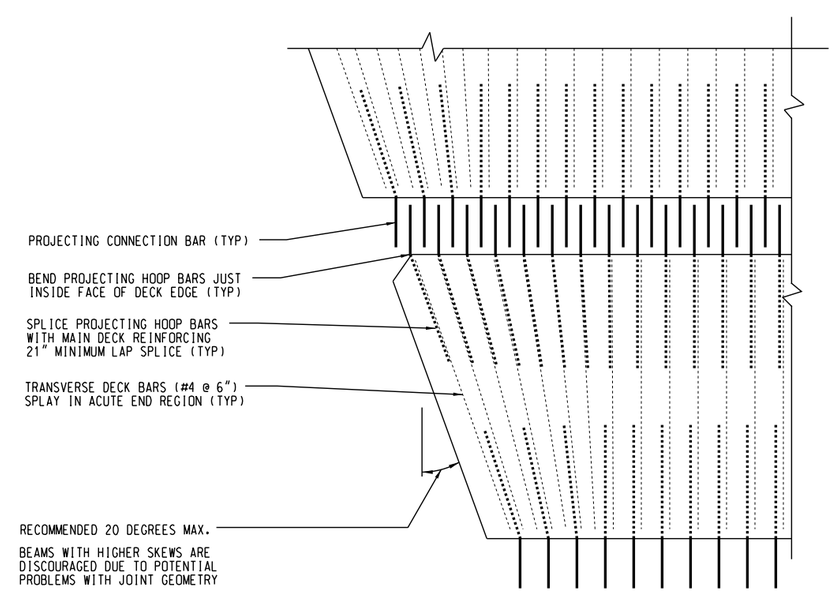
4 JOINT GRADE DIFFERENTIAL DETAILS

NOTES:
1. HOOKED BAR DETAIL SHOWN, OTHER JOINTS SIMILAR
2. GRADE DIFFERENTIAL CAN BE CAUSED BY THE FOLLOWING:
   CAMBER TOLERANCES
   SKEW EFFECTS (SEE DETAIL 5 ON THIS SHEET)
   BEAM SEAT TOLERANCES



NOTE:
THIS DETAIL IS PROVIDED TO EXPLAIN THE POTENTIAL FOR GRADE DIFFERENTIAL ACROSS THE CLOSURE POUR JOINT. THIS DOES NOT ACCOUNT FOR FABRICATION CAMBER TOLERANCES, WHICH WOULD BE ADDITIVE TO THIS EFFECT.

5 GRADE DIFFERENTIAL AT CLOSURE POURS DUE TO SKEW EFFECTS



NOTES:

1. USE THIS DETAIL FOR ALL SKEWED BEAMS.
2. OTHER REINFORCING BARS SUCH AS END ZONE REINFORCING NOT SHOWN FOR CLARITY.
3. THE BAR LAYOUT SHOWN IS APPROXIMATE. THE FABRICATOR SHALL LAY OUT BARS TO PROVIDE A MAXIMUM OF 6" SPACING BETWEEN ADJACENT TRANSVERSE DECK BARS.

6 MAIN DECK REINFORCING DETAILS – SKEWED BEAM ENDS

WWW.PCINE.ORG

PCI

PRECAST/PRESTRESSED CONCRETE INSTITUTE NORTHEAST

NORTHEAST DECK BULB TEE BEAM DETAILS

BEAM DECK DETAILS

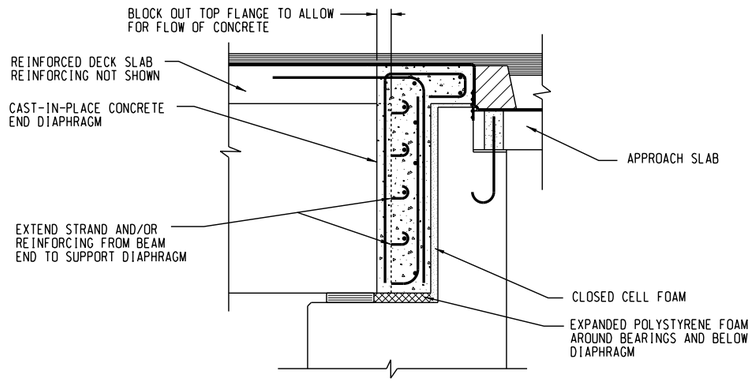
DISCLAIMER: The details shown are guidelines and should not be considered standards. The information has been obtained from sources believed to be reliable. PCI Northeast or its memberships shall not be responsible for any errors, omissions or damages arising out of this information. PCI Northeast has published this work with the understanding that PCI Northeast is supplying information only. PCI Northeast is not rendering engineering or other professional services through this guideline. If such services are required, please seek an appropriate professional.

ISSUE DATE: 08-02-16

SHEET: NEDBT – 05

REVISIONS

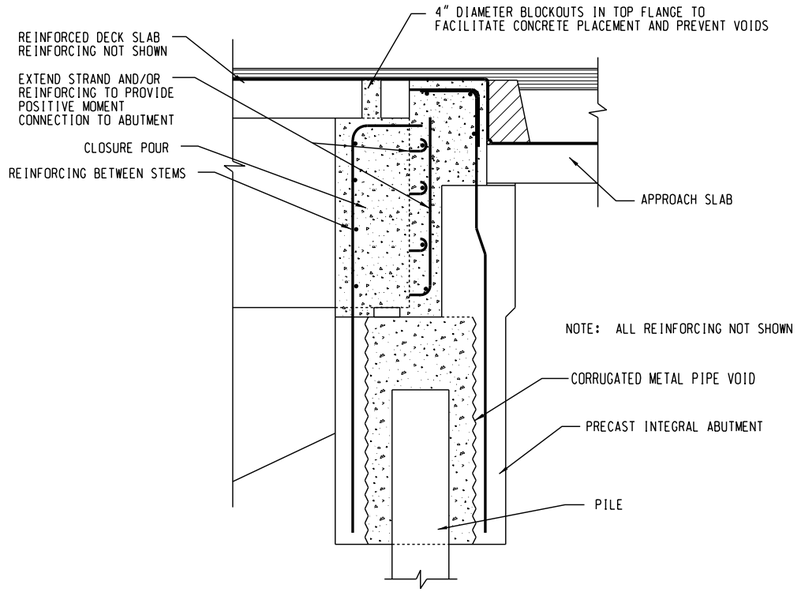
NO.	DATE	DESCRIPTION
1	11/17	VARIOUS EDITORIAL CHANGES
2	3/18	MODIFIED JOINT DIMENSIONS



① SAMPLE END DIAPHRAGM DETAIL CANTILEVER ABUTMENT

NOTES:

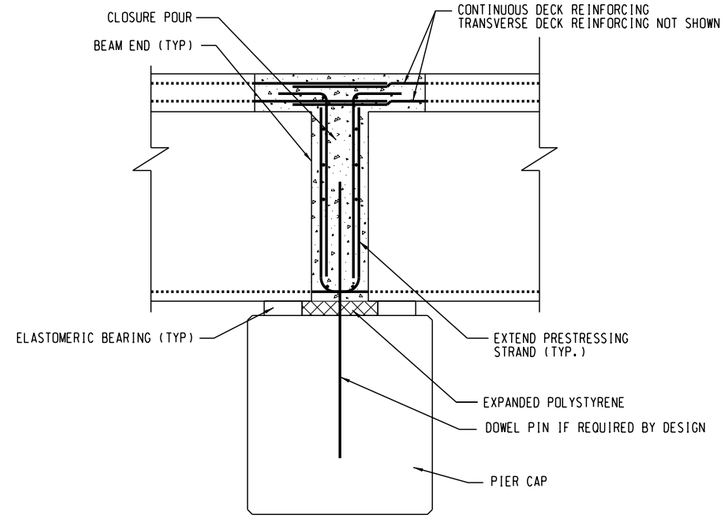
1. THESE DETAILS ARE SIMILAR TO MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARDS FOR TYPE 1 APPROACH SLABS. DETAILS FOR OTHER STATES WILL VARY.
2. INTERMEDIATE DIAPHRAGMS ARE NOT REQUIRED (SEE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS)



② SAMPLE INTEGRAL ABUTMENT SECTION

NOTES:

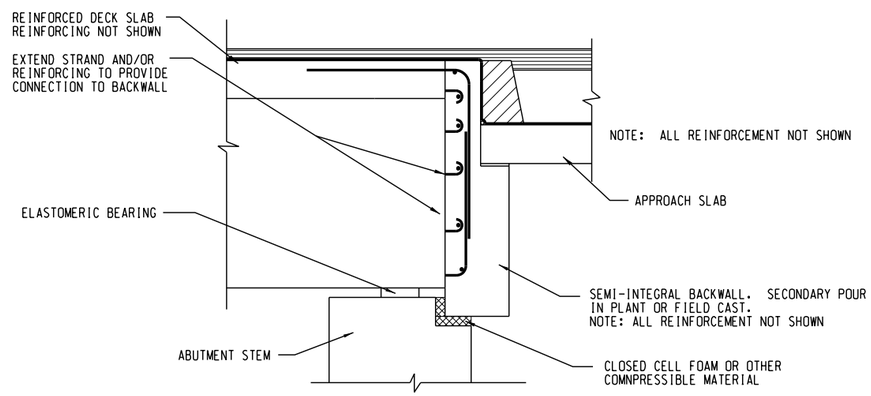
1. THESE DETAILS ARE BASED ON MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARDS FOR TYPE 2 APPROACH SLABS. DETAILS FOR OTHER STATES WILL VARY.
2. A PRECAST PIECE SIMILAR TO THE BACKWALL PIECE CAN BE USED AT THE ENDS OF THE ABUTMENT ALSO.



③ SAMPLE PIER CONTINUITY DETAIL

NOTES:

1. THE DETAILS SHOWN ARE SCHEMATIC. REFER TO STATE STANDARDS FOR SPECIFIC DETAILS.
2. IF THE TOP FLANGE IS BLOCKED OUT AS SHOWN, THE ENGINEER SHOULD CHECK STRESSES IN THE REMAINING STEM (WITHOUT THE FLANGE). DEBONDING OF STRAND OR ADDITIONAL REINFORCMENT MAY BE REQUIRED TO ADDRESS THIS CONDITION.



④ SAMPLE SEMI-INTEGRAL ABUTMENT SECTION

NOTES:

1. THESE DETAILS ARE BASED ON MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARDS FOR TYPE 2 APPROACH SLABS. DETAILS FOR OTHER STATES WILL VARY.

WWW.PCINE.ORG

PCI

PRECAST/PRESTRESSED CONCRETE INSTITUTE NORTHEAST

NORTHEAST DECK BULB TEE BEAM DETAILS

BEAM SUBSTRUCTURE DETAILS

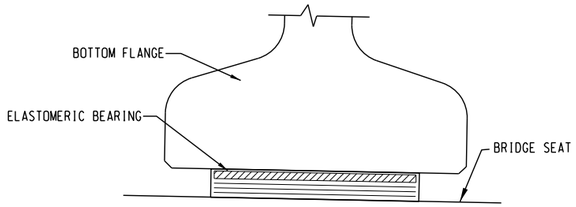
DISCLAIMER: The details shown are guidelines and should not be considered standards. The information has been obtained from sources believed to be reliable. PCI Northeast or its memberships shall not be responsible for any errors, omissions or damages arising out of this information. PCI Northeast has published this work with the understanding that PCI Northeast is supplying information only. PCI Northeast is not rendering engineering or other professional services through this guideline. If such services are required, please seek an appropriate professional.

ISSUE DATE: 08-02-16

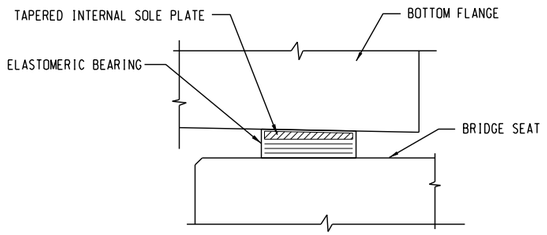
SHEET: NEDBT – 06

REVISIONS

NO.	DATE	DESCRIPTION
1	11/17	VARIOUS EDITORIAL CHANGES



FRONT ELEVATION

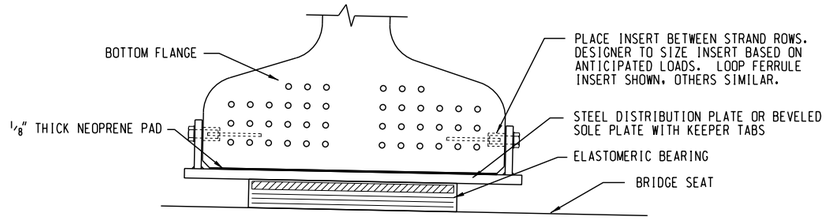


SIDE ELEVATION

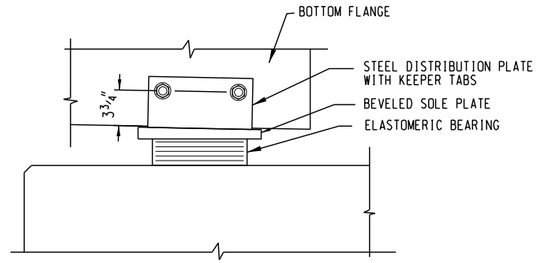
① ELASTOMERIC BEARING DETAILS

NOTES:

1. THESE DETAILS ARE ONLY REQUIRED FOR NON-INTEGRAL SUBSTRUCTURES WITHOUT ANCHOR BOLTS.
2. A TAPERED ELASTOMERIC BEARING IS SHOWN. THIS IS BASED ON MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARDS THAT INCLUDE THE USE OF AN EMBEDDED TAPERED STEEL SOLE PLATE IN THE BEARING. DETAILS FOR OTHER STATES WILL VARY.
3. BRIDGE SEAT AND BEARING MAY BE SLOPED TO MATCH THE CROSS SLOPE OF THE ROADWAY ABOVE (2% MAX.).
4. ELASTOMERIC SHIMS MAY BE USED TO PROPERLY SEAT BEAMS AND ADJUST THE ELEVATION OF THE TOP OF THE BEAM.
5. KEEPER BLOCKS MAY BE USED BETWEEN THE STEMS FOR LATERAL RESISTANCE.



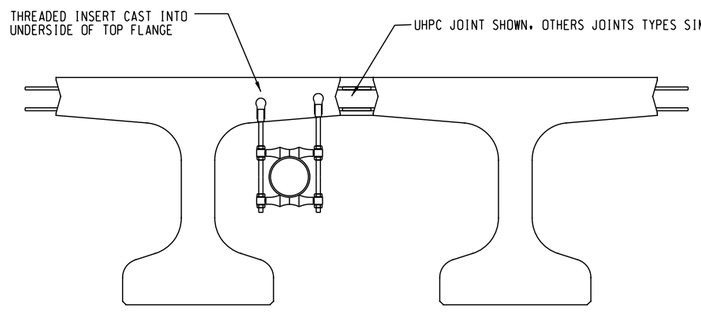
FRONT ELEVATION



SIDE ELEVATION

② BEARING WITH BOLTED BEAM CONNECTION

NOTES:
1. THESE DETAILS ARE ONLY REQUIRED FOR NON-INTEGRAL SUBSTRUCTURES.
2. EMBEDDING OF PLATES INTO BEAM FLANGES IS NOT RECOMMENDED DUE TO INTERFERENCE WITH STRAND PATTERNS AND DIFFICULTY IN FABRICATION. PLATES PROJECTING FROM FLANGES AND ANCHORED TO THE FLANGE SHOULD NOT BE USED.
3. THESE DETAILS MAY BE USED FOR FIXED BEARING DESIGNS. BEAM CONNECTION DETAILS WILL BE SIMILAR.
4. TAPERED BEARING SHOWN. DISTRIBUTION PLATE CAN BE BEVELED TO ALLOW FOR THE USE OF NON-TAPERED BEARINGS.
5. BRIDGE SEAT AND BEARING ASSEMBLY SHOULD BE SLOPED TO MATCH THE CROSS SLOPE OF THE ROADWAY ABOVE (2% MAX.).
6. KEEPER BLOCKS MAY BE USED BETWEEN THE STEMS FOR LATERAL RESISTANCE.



③ SAMPLE UTILITY SUPPORT DETAILS △1

NOTES:

1. HANGER RODS FOR UTILITIES SHOULD BE ATTACHED TO THE BEAM BY MEANS OF CAST-IN-PLACE INSERTS. OVERHEAD DRILLED-IN ANCHORS SHOULD NOT BE USED. REFER TO STATE POLICIES FOR OVERHEAD ANCHORING.
2. PLACEMENT OF THE ANCHORS IN THE FLANGE IS PREFERRED. PLACEMENT OF ANCHORS IN THE STEM MAY BE CONSIDERED, HOWEVER THE POTENTIAL FOR INTERFERENCE WITH THE STEM REINFORCING AND STRAND SHOULD BE INVESTIGATED.
3. ONE TYPE OF UTILITY SHOWN, OTHER UTILITIES SIMILAR. REFER TO INDIVIDUAL UTILITY COMPANY DETAILS.
4. THIS DETAIL SHOWS THE UTILITY SUPPORT ON ONE FLANGE. LARGER UTILITIES MAY BE SUPPORTED BY TWO ADJACENT FLANGES. OTHER FLANGE LOCATIONS ARE ALSO ACCEPTABLE.
5. UTILITY SUPPORT ANCHORS MAY ALSO BE PLACED WITHIN THE CLOSURE POURS.
6. THE DESIGN ENGINEER SHOULD DETAIL ANY ADDITIONAL REINFORCING REQUIRED TO RESIST THE UTILITY LOADS.

④ DIAPHRAGMS AND CROSS FRAME NOTES:

1. DETAILS FOR CROSS FRAMES AND DIAPHRAGMS SHALL BE CONSISTENT WITH DETAILS USED FOR THE NORTHEAST BULB TEE GIRDER.
2. CROSS FRAMES SHOULD BE USED TO MAINTAIN STABILITY OF THE BEAMS DURING ERECTION.
3. IF CAST-IN-PLACE DIAPHRAGMS ARE USED, TEMPORARY BRACING SHALL BE DETAILED OR SPECIFIED.
4. IF BOLT ON CROSS FRAMES ARE USE, THEY SHALL BE INSTALLED BETWEEN EACH BEAM PRIOR TO RELEASING THE BEAM FROM THE CRANE.

WWW.PCINE.ORG

PCI

PRECAST/PRESTRESSED CONCRETE INSTITUTE NORTHEAST

NORTHEAST DECK BULB TEE BEAM DETAILS

MISCELLANEOUS DETAILS

DISCLAIMER: The details shown are guidelines and should not be considered standards. The information has been obtained from sources believed to be reliable. PCI Northeast or its memberships shall not be responsible for any errors, omissions or damages arising out of this information. PCI Northeast has published this work with the understanding that PCI Northeast is supplying information only. PCI Northeast is not rendering engineering or other professional services. If such services are required, please seek an appropriate professional.

ISSUE DATE: 08-02-16

SHEET: NEDBT – 07

REVISIONS

NO.	DATE	DESCRIPTION
1	5/17	CHANGED DETAIL TO NARROW FLANGE
2	11/17	VARIOUS EDITORIAL CHANGES