NORTHEAST EXTREME TEE (NEXT) BEAM GUIDE DETAILS

These guidelines and guide details have been developed for the purpose of promoting a greater degree of uniformity among owners, engineers and industry with respect to planning, designing, fabricating and constructing the Northeast Extreme Tee (NEXT) Beam for bridges.

In response to needs determined by Northeast Transportation Agencies, and Prestressed Concrete Producers, the PCI Northeast Bridge Technical Committee prepared these guidelines and guide details to promote uniformity of design and details throughout the region.

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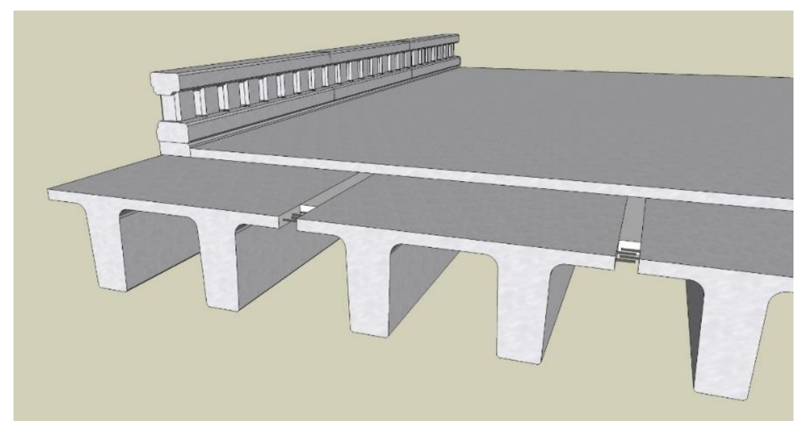

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Precast/Prestressed Concrete Institute Northeast Covering New England and New York

Report Number:
PCINER-12-NEXT

By: Precast/Prestressed Concrete Institute Northeast

Northeast Extreme Tee (NEXT) Beam Guide Details
Second Edition 2021
Issue Date: 1/22/2021

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NEXT Beam Frequently Asked Questions

General Questions

1. **Is the NEXT Beam Proprietary?**
   The NEXT Beam is a regional standard that was developed by the northeast state departments of transportation, consultants, and fabricators. Similar to other standard bridge sections, it is available from multiple fabricators and it is not proprietary.
2. **Who supplies the NEXT Beam?**
   The NEXT Beam is produced by many PCI Certified precast producers. Contact your local PCI Regional Association or local producer.
3. **Is the NEXT Beam acceptable to bridge owner agencies?**
   Yes. The NEXT Beam was developed by a consortium of state bridge engineers from all six New England states and New York and members of the Northeast region of PCI. In addition, many other DOT bridge offices in the United States are using the beam.
4. **Is the NEXT Beam more economical than other bridge systems?**
   The NEXT Beam is efficiently designed to minimize labor in both the manufacturing plant and at the job site. The lack of draped (harped) strands is a significant benefit during fabrication. The elimination of deck forming in the field saves significant time during construction, and also provides an instant platform for work, making for a much safer project. NEXT beam bridges are a cost-effective structure and have reduced the overall cost of building bridges in the Northeast.
5. **What is the difference between the D, E and F Beam?**
   - The ***D Beam (Deck Beam)*** is a beam with an integral full-depth flange that acts as the structural bridge deck. This allows the bridge to be ready for traffic soon after the beams are erected.
   - The ***F Beam (Flange Beam)*** is a beam with a partial-depth flange, which serves as the formwork for a conventional cast-in-place reinforced concrete deck. This results in a monolithic deck surface at the expense of a few extra days of site construction. The top flange of the F Beam eliminates the need for deck forming (including the overhang), which is a tremendous time saver.
   - The ***E Beam (Deck/Flange Beam)*** is a beam that has a top flange that is intended to act as the bottom portion of the structural deck. A reinforced cast-in-place concrete topping is used to complete the structural deck, which will reduce the amount of CIP deck concrete in the field from approximately 8” to 4”. The top flange of the NEXT Beam eliminates the need for deck forming (including the overhang),
6. **How do I handle utilities on my bridge?**
   One of the main reasons the NEXT beam was developed was to handle multiple utilities, unlike the box beam, which can only accommodate a few. Utility supports can be coordinated with the Manufacturer and be cast into the beam at the time of fabrication to expedite installation time out in the field.
7. **Are diaphragms required?**
   Intermediate diaphragms are not required for the NEXT Beams. AASHTO LRFD Bridge Design Specifications require diaphragms at the supports where there is a joint in the deck.
8. **What is the recommended bearing type?**
   NEXT Beams are typically supported on reinforced elastomeric bearing pads. Details have been developed and are found on Detail Sheet NEXT 15 of the guidelines. Bearings that can be adjusted vertically may be beneficial for complex geometries. For example, on a skewed bridge with a vertical curve, the support points are out of plane, creating the need for a variable 4-point support system. The adjustable bearing will solve this problem.

Bridge Geometry Questions

1. **What are the typical span lengths and widths?**
   The NEXT Beam can range from a length of 30’ to 80’ and a nominal width of 8’ to 12’ for the NEXT F beams, 8’ to 10’ for the NEXT D Beams and 8’ to 9.5’ for NEXT E. These span ranges are approximate since they are based on certain design parameters such as parapet weight and overlay options. Actual span capabilities should be checked for each situation based on the actual design parameters. Please consult the attached Detail Sheets.
2. **Can NEXT Beam be used for a skewed bridge?**
   Yes. PCI Northeast recommends a maximum skew for each beam type (AASHTO skew convention) but it may be possible to exceed this value (the largest skew built has been 45 degrees). The concern is with regard to cracking at release in the fabrication plant. Experience with double tee beams has shown the potential for longitudinal cracking in the top flange near the interior stem surfaces. Additional reinforcement has been placed in this region; however, the potential for the development of these cracks is still present and larger skews would mean longer cracks in the end zone. Skewed NEXT D beams general have less cracking than NEXT F or E beams due to the 8” flange and two layers of flange reinforcement. Skewed beams may require special bearing details. See General Question Number 8.
3. **Can the NEXT Beam be used for a curved bridge?**
   The widths of the NEXT Beams can be adjusted readily in fabrication to accommodate gentle curves. The flanges of the exterior NEXT Beams can be curved (in plan) to produce a curved roadway geometry, provided that the flanges fall within the design envelope shown on Detail Sheet NEXT 01.
4. **Can the NEXT Beam be used for a variable width bridge?**
   The widths of the NEXT Beams can be adjusted readily in fabrication to accommodate roadways that are tapered in plan. The flange width of the NEXT Beams can be tapered, creating a slightly ‘pie shaped’ beam that would be used for splayed layouts.
5. **How do you accommodate roadway profiles with a cambered NEXT Beam?**
   The accommodation of roadway profiles with a cambered NEXT beam can be handled in several ways. The thickness of the deck topping concrete on NEXT E and F Beam bridges can be varied. The thickness of the top flange on Next D Beams can be varied; however, this comes at a higher cost due to the need for more complex forming in the fabrication plant. Another option is to vary the thickness of the overlay (if allowed by state standards) to provide the desired profile. See Profile Details on Detail Sheets NEXT 03 through 05.
6. **How do you accommodate roadway cross slopes and crowns?**
   The beams can be set to match the roadway cross slope. This is not normally done with prestressed I-Beams due to issues with stability. The large lateral stiffness of the NEXT Beam allows for this approach, which greatly simplifies the installation. Roadway crowns can be accommodated at the joints between the beams, or within the topping or overlay. See Detail Sheet NEXT 08.
7. **Is it possible to design NEXT Beam that is narrower than the 8-foot minimum?**
   The 8-foot minimum was set to provide relatively equal stem spacing (within 2 feet), to provide room for inspection access of the stems between the beams, and to avoid impacting the curved fillet on the underside of the top flange. A minor reduction from this minimum can be used with permission from the owner.
8. **Is it possible to design half section single tee using the NEXT Beam Form?**
   It is possible to use a half section for cases where a specific bridge width is required or for bridges were staged construction does not permit full width sections.
9. **Is it possible to step (dap) the bottom of the stem at the support?**
   This should only be done for special situations where the height of the bridge seat must be raised (i.e. low clearance straddle bent). Special care should be exercised in the design to prevent cracking in this critical area. The PCI Design Handbook contains a recommended design procedure for this situation.

NEXT Beam Frequently Asked Questions

Design Questions

1. **What bridge software can be used to design a NEXT Beam bridge?**
Engineers in New England and New York have used PS Beam (www.lrfd.com) to design NEXT Beam bridges. ConSpan by Leap (www.bentley.com) and PG Super (www.pgsuper.com) are also viable software packages.
2. **Are the span charts on Detail Sheet NEXT 08 acceptable for preliminary design?**
The values shown are not guaranteed and should be considered approximate. They are intended to be used as a starting point for preliminary layout. The actual maximum span lengths are affected by a number of assumptions, some of which are listed in the notes on Detail Sheet NEXT 08. Check the assumptions against your project design requirements before selecting a beam size. During preliminary design and structure type studies, the beams should be checked to ensure that a section will work.
3. **How do I distribute dead and live load to the NEXT beams?**
Guidelines for the Live Load Distribution Factors for F, E and D Beams are found on Detail Sheet NEXT 01.
4. **Can I design the beams for continuity?**
Yes. This would be done the same way as any prestressed concrete beams. The negative moment reinforcement can be cast into the deck on the NEXT F or E design. For the NEXT D design, mechanical couplers could be considered, or the top flange could be dapped with projecting reinforcing. Care shall be taken with dapping beams. The designer should check stresses in the dapped area. The positive moment reinforcement could be strand extensions or mild reinforcement projecting from the stem.
5. **How do I design deck reinforcement for a NEXT F Beam Bridge?**
The design of the deck is based on a normal stringer bridge. It is recommended that the top flange not be used in the deck design. The deck can be designed by treating each stem as an individual beam with the deck spanning between stems.
6. **How do I design deck reinforcement for a NEXT D and E Beam Bridge?**
The design of the deck is based on a normal stringer bridge. The deck can be designed by treating each stem as an individual beam with the deck spanning between stems. The reinforcing for the NEXT D is fully cast into the top flange. The bottom mat reinforcing for the NEXT E is fully cast into the beam, the top mat is placed in the topping.
7. **How do I design the connection between the NEXT D and E Beams?**
The connections should be a reinforced moment connection. The design of the connection should be based on the moments generated using a standard AASHTO strip method. The deck can be designed by treating each stem as an individual beam with the deck spanning between stems. Once the positive moment is calculated at the joint, the section can be checked assuming that the projecting bars are fully developed. The reinforcing shown on the typical details should work for most scenarios; however, it should be checked for each design.
8. **How do I design integral abutments using the NEXT beam?**
The design of integral abutment bridges using NEXT beams is the same as any stringer bridge. See Detail Sheets NEXT 12-14.
9. **Is post-tensioning required to connect NEXT D Beams (similar to box beams)?**
NEXT D Beams have been developed with reinforced closure joints, which eliminates the need to use transverse post-tensioning to connect the flanges. This meets the AASHTO requirements for load distribution and is considered to be sufficient to make the beams act as a unit.
10. **Some states connect decked beams with welded ties. Is that acceptable for NEXT Beams?**
Welded tie connections are common in parking structures but have been found to be inadequate for truck loading. Most states are changing flange connection details to one similar to those shown in these guide details.
11. **What options are available for connecting the flanges of NEXT D and E Beams?**
The details provided allow for multiple options and fill materials. The most common reinforcing and fill materials are shown on Detail Sheets NEXT 10 and 11. There is also guidance on how to design and detail the connection with alternate materials, which is based on the AASHTO LRFD Guide Specifications for Accelerated Bridge Construction. Note that the width of the joint for NEXT D and E Beams will affect the beam spacing or top flange width.
12. **How do you accommodate top tension stresses at the beam ends after release?**
First and foremost, the design of the beam needs to conform to individual state design requirements. Some states require a design with zero tension at release. Others limit the stress in accordance with the AASHTO LRFD Bridge Design Specifications. It is important to note that the AASHTO LRFD Bridge Design Specifications require longitudinal reinforcing in the top flange at beam ends if the top fiber stresses exceed the specified allowable values. These bars are used to “control” transverse cracking in the top flange at release. This reinforcing is for crack width and length control, not prevention. It is recommended that if fully tensioned top strand is included in the design, they should not be used to meet these AASHTO provisions.
13. **What is the purpose of the J bar in the corner of the NEXT Beam flange/web intersection?**
These bars are used to control top flange end cracking during release and handling. The most common form of potential cracking in this area is a series of vertical hairline cracks located near the inside radius of the top flange / beam stem interface running parallel to the stem. The J bars intersect and are perpendicular to the potential crack plane. End skew of the beams has been found to exacerbate this issue. The use of a semi-integral backwall or integral end diaphragm that is cast in the shop as a secondary pour can help to prevent the growth of these cracks during shipping and erection. This is recommended for bridges with significant skew and if the recommended maximum skew is to be exceeded.
14. **Is confinement reinforcement as specified in the AASHTO LRFD Bridge Design Specifications required for NEXT Beams?**
Most designers have chosen to use an approach similar to box beams, where they use the U-shaped stirrups in the end regions to meet this provision. Separate enclosed confinement reinforcement can be used; however, the designer should verify that there is sufficient room in this end region to accommodate the enclosed hoops.

NEXT Beam Frequently Asked Questions

Deck and Wearing Surface Questions

1. **How do you seal the longitudinal joints between beams?**
   Bridges using the F Beam will have a monolithic deck; therefore, there is no need for a flange edge connection. The D and E Beams have reinforced joints. The design of these joints should be in accordance with the AASHTO LRFD Guide Specifications for Accelerated Bridge Construction. In general, the joints are designed to resist the moments and shears calculated using the AASHTO strip method. The details shown are considered to fully develop the bars on the deck.
2. **Why is the side of the keyway detailed with an exposed aggregate surface?**
   The exposed aggregate surface of the faces of the keys is recommended to improve grout bond and minimize potential for leakage of the joint. This is consistent with the provisions of the AASHTO LRFD Guide Specifications for Accelerated Bridge Construction. Note that there is no amplitude requirement for the roughness of the surface, as long as the aggregate is visible on the surface. Surface profile amplitude is an AASHTO LRFD Bridge Design Specification provision for connecting a precast beam to a cast-in-place deck (interface shear). The shape of the shear keys on NEXT D Beams provides the mechanical shear transfer mechanism, therefore a specific amplitude is not required.
3. **What is the recommended wearing surface?**
   The NEXT E and F Beam has a composite concrete deck cast on top; therefore, any agency standard wearing surface treatment can be used, including bare concrete. The NEXT D Beam has an integral deck cast into the beam. While not necessarily required, a wearing surface (either thin concrete or bituminous) is recommended in order to provide the smoothest riding surface. If bituminous wearing surfaces are used, a waterproofing membrane should be applied prior to paving. Refer to agency standards for acceptable wearing surface options.

Railing Questions

1. **How are concrete railings (parapets) handled?**
   The use and details of concrete railings should conform to state standards. The deck overhang thickness shall be detailed to provide adequate dowel/anchor embedment for the barrier to deck connection. Deck overhangs supporting railings should be designed for the same provisions used for a cast-in-place deck. The required additional top reinforcing is placed in the topping for NEXT F and E beams, and within the top flange for NEXT D beams. .
2. **Can metal bridge railings be used on a NEXT D Beam without a cast in place curb?**
   The use and details of metal railings, with and without curbs, should conform to state standards. The deck overhang thickness shall be detailed to provide adequate dowel/anchor embedment for the railing and curb to deck connection. Deck overhangs supporting railings should be designed for the same provisions used for a cast-in-place deck.
3. **How is the variable height of the concrete railing or curb calculated as shown on Detail Sheet NEXT 03 through 05?**
   This is a relatively complicated calculation. The designer needs to calculate the estimated heights based on at least the following variables:
   - Roadway profile (tangent, crest vertical curve. or sag vertical curve)
   - Estimated beam camber
   - Beam seat elevations
   - Dead load deflection of the beam

   The calculations are similar to those used to calculate beam haunches on prestressed girders with cast-in-place concrete decks. As with beam haunches, the designer can specify that the beam edges be surveyed after erection and the barrier or curb heights adjusted based on camber and construction tolerances.

DESIGN AND IMPLEMENTATION GUIDELINES

IT IS THE DESIGNER'S RESPONSIBILITY TO:

1. DESIGN THE BEAM ACCORDING TO THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (9TH ED.) AND THE REQUIREMENTS OF THE OWNER, INCLUDING:
   - NUMBER OF STRAIGHT STRAND AND LAYOUT
   - 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
2. 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.
3. SPECIFY THE REQUIRED CONCRETE STRENGTHS:
   - RELEASE STRENGTH
   - FINAL STRENGTH
   - STRENGTH OF CONCRETE IN CLOSURE POURS
   - SPEED OF SET
4. CALCULATE CAMBERS AND NOTE THEM ON THE PLANS AT THE FOLLOWING INTERVALS:
   - AT RELEASE
   - 30 DAYS (OR ASSUMED DATE OF INSTALLATION)
   - FINAL
5. INCLUDE THE FOLLOWING NOTE ON THE PLANS:
   THE DESIGN OF SHIPPING AND HANDLING METHODS FOR NEXT BEAMS IS THE RESPONSIBILITY OF THE FABRICATOR. NEXT BEAMS (PARTICULARLY NEXT F AND E BEAMS) ARE SENSITIVE TO LONGITUDINAL TOP FLANGE CRACKING CAUSED BY TWISTING DURING SHIPPING AND HANDLING. THE FABRICATOR SHOULD DEVELOP METHODS THAT MINIMIZE TWISTING OF THE BEAMS. THE SAME LIFTING METHODS SHOULD BE EMPLOYED FOR THE ERECTION OF THE BEAMS AT THE BRIDGE SITE.

GENERAL NOTES

THE BASIS FOR THESE GUIDE DETAILS IS THE AASHTO LRFD BRIDGE DESIG SPECIFICATIONS (9TH EDITION) AND THE AASHTO LRFD GUIDE SPECIFICATIONS FOR ACCELERATED BRIDGE CONSTRUCTION (1ST EDITION).

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.

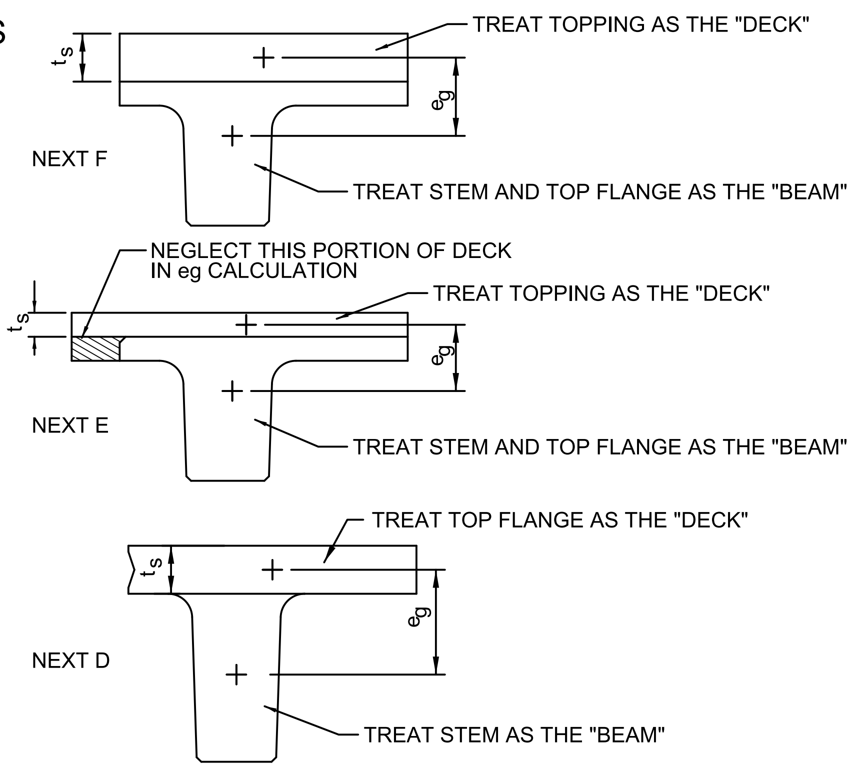
DECK OVERLAYS COMBINED WITH WATERPROOFING MEMBRANES ARE RECOMMENDED FOR THE FOLLOWING REASONS:
- ELIMINATES THE NEED FOR DECK GRINDING
- ACCOUNTS FOR TOP FLANGE DIFFERENTIAL
- PROVIDES ADDITIONAL DECK PROTECTION

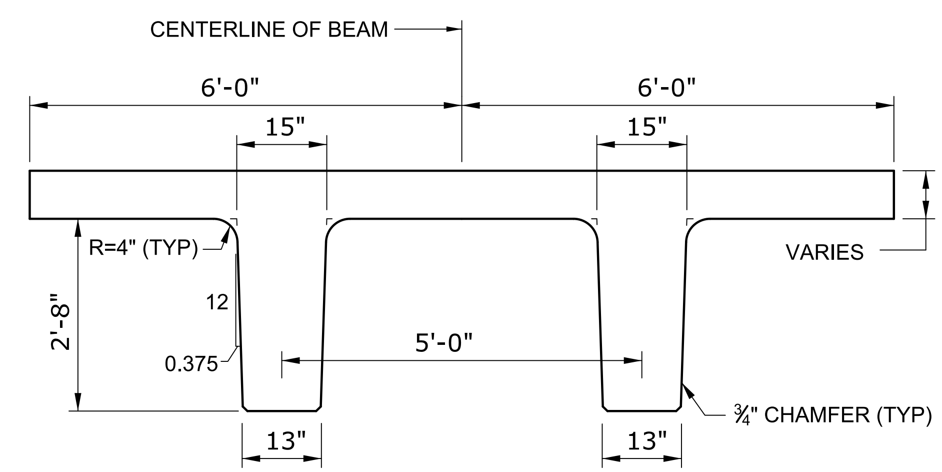
INDEX OF DETAIL SHEETS

LIVE LOAD DISTRIBUTION FACTOR CALCULATIONS

NEXT F AND E BEAMS:
- USE AASHTO CROSS SECTION K (ARTICLE 4.6.2.2.1)
- TREAT EACH STEM AS AN INDIVIDUAL STRINGER (HALF OF TOTAL BEAM SECTION PROPERTIES USED FOR CALCULATION OF I AND A)
- SEE ADJACENT DETAIL FOR CALCULATION OF e_g AND t_s
- USE THE AVERAGE STEM SPACING FOR THE BEAM SPACING TERM IN THE EQUATIONS
- CALCULATE THE DISTRIBUTION FACTORS FOR EACH STEM USING THE TABLES IN ARTICLE 4.6.2.2.2.
- THE APPLICATION OF THE LEVER RULE FOR EXTERIOR STEMS SHALL APPLY
- COMBINE (ADD) THE TWO DISTRIBUTION FACTORS FOR EACH STEM TOGETHER
- APPLY THE COMBINED DISTRIBUTION FACTOR FOR THE DESIGN OF THE ENTIRE NEXT F BEAM

NEXT D BEAMS:
- USE AASHTO CROSS SECTION I (ARTICLE 4.6.2.2.1) ASSUMING THAT THE DECK IS SUFFICIENTLY CONNECTED TO ACT AS A UNIT
- TREAT EACH STEM AS AN INDIVIDUAL STRINGER (HALF OF TOTAL BEAM SECTION PROPERTIES USED FOR CALCULATION OF I AND A)
- ASSUME THAT THE STEM PORTION OF THE BEAM IS THE STRINGER (UP TO THE UNDERSIDE OF THE TOP FLANGE)
- ASSUME THAT THE FLANGE PORTION OF THE BEAM IS THE COMPOSITE DECK (BOTTOM OF TOP FLANGE TO THE TOP OF THE DECK)
- SEE ADJACENT DETAIL FOR CALCULATION OF e_g AND t_s
- USE THE AVERAGE STEM SPACING FOR THE BEAM SPACING TERM IN THE EQUATIONS
- CALCULATE THE DISTRIBUTION FACTORS FOR EACH STEM USING THE TABLES IN ARTICLE 4.6.2.2.2.
- THE APPLICATION OF THE LEVER RULE FOR EXTERIOR STEMS SHALL APPLY
- COMBINE (ADD) THE TWO DISTRIBUTION FACTORS FOR EACH STEM TOGETHER
- APPLY THE COMBINED DISTRIBUTION FACTOR FOR THE DESIGN OF THE ENTIRE NEXT D BEAM





NEXT BEAM DESIGN ENVELOPE

NOTES:
1. THE PURPOSE OF THIS DETAIL IS TO DEFINE THE ENVELOPE THAT CAN BE USED TO DESIGN A NEXT BEAM. THE LOWER PORTION OF THE ENVELOPE DENOTES THE NEXT BEAM FORM THAT CANNOT BE ALTERED.
2. THE VARIABLE WIDTH OF NEXT BEAM IS ACCOMMODATED WITH ADJUSTABLE SIDE FORMS ON THE TOP FLANGE FORM. THE WIDTH OF THE TOP FLANGE CAN BE EXCEEDED; HOWEVER, IT IS NOT RECOMMENDED AS IT WILL REQUIRE SPECIAL FORMING IN THE SHOP (CONTACT FABRICATORS IF THIS IS DESIRED).
3. ANY REASONABLE THICKNESS OF TOP FLANGE CAN BE PROVIDED.
4. DEPTH VARIATIONS ACCOMMODATED BY INSERTS IN THE BOTTOM OF THE STEMS, RESULTING IN MINOR VARIATIONS IN THE WIDTH OF THE BOTTOM OF THE BOTTOM OF THE STEM.
5. LIMITATIONS ON WIDTH FOR NEXT E BASED ON MAXIMUM SHIPPING WIDTH OF 12 FEET (INCLUDING PROJECTING REINFORCING STEEL). SEE DETAIL SHEET NEXT 06.
6. LIMITATIONS ON WIDTH FOR NEXT D BASED ON WEIGHT OF THE BEAM AND THE OVERALL SHIPPING WIDTH OF THE BEAM WITH PROJECTING REINFORCING STEEL. SEE DETAIL SHEET NEXT 06.

ISSUE DATE: 01/22/2021	BASIS: AASHTO LRFD BRIDGE DESIGN SPEC. - 9th EDTION	SHEET NEXT 01
	GENERAL NOTES	

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NORTHEAST EXTREME TEE (NEXT) BEAM DETAILS (2nd Edition)

REVISIONS

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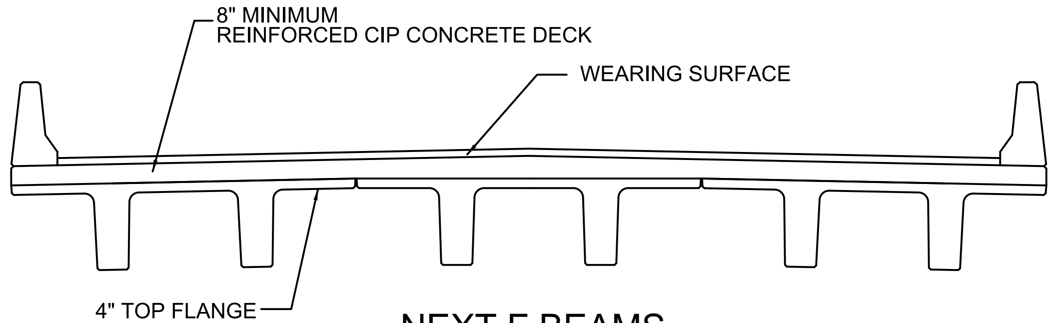
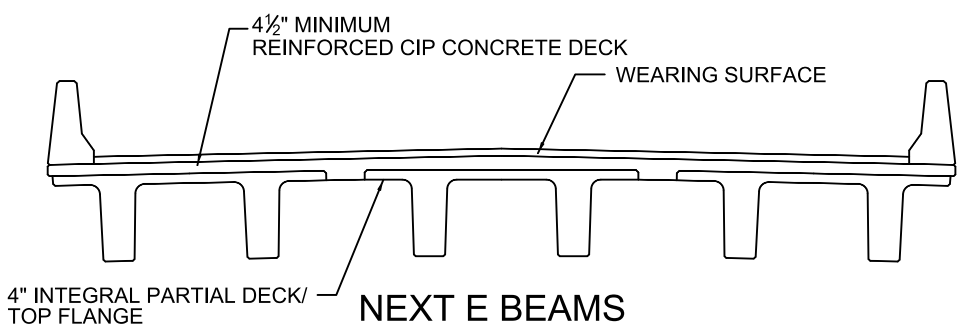
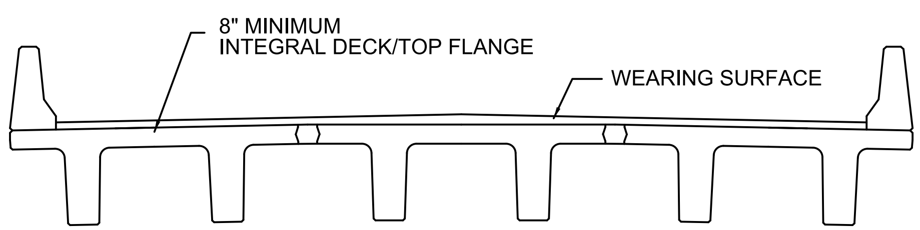


NEXT F BEAMS



NEXT E BEAMS



NEXT D BEAMS

BEAM USAGE GUIDELINES

BEAM TYPE	SHIPPING AND HANDLING	FLANGE CONNECTION	ADVANTAGES	DESIGN/CONSTRUCTION CONSIDERATIONS
NEXT F	• RELATIVELY LIGHT SECTION • CAN BE SHIPPED UP TO 12' WIDE	• NO CONNECTION REQUIRED	• FEWER BEAMS REQUIRED (WIDER) • NO FORMING REQUIRED FOR FLANGE CONNECTION • CAN EASILY ACCOMMODATE VERTICAL CURVES IN CIP TOPPING	• REQUIRES MORE CIP CONCRETE AND TWO LAYER OF DECK REINFORCING (+COST) • POTENTIAL FOR TOP FLANGE LONGITUDINAL CRACKING ALONG THE INSIDE FACE OF THE STEM, PARTICULARLY FOR BEAMS WITH SKEWS GREATER THAN 20 DEGREES • REQUIRES A DECK CURE
NEXT E	• RELATIVELY LIGHT SECTION	• REINFORCED CONCRETE CLOSURE POUR THAT IS INTEGRAL WITH THE TOPPING POUR	• USES LESS TOPPING CONCRETE WHEN COMPARED TO NEXT F • CONNECTION MADE WITH NORMAL DECK CONCRETE • CAN EASILY ACCOMMODATE VERTICAL CURVES WITH CIP TOPPING • LESS CIP CONCRETE AND FIELD PLACED REINFORCING	• REQUIRES FORMING OF LARGER CLOSURE POURS • POTENTIAL FOR TOP FLANGE LONGITUDINAL CRACKING ALONG THE INSIDE FACE OF THE STEM, PARTICULARLY FOR BEAMS WITH SKEWS GREATER THAN 20 DEGREES • REQUIRES A DECK CURE
NEXT D	• RELATIVELY HEAVY SECTION • MAY REQUIRE LARGER CRANES	• NARROW REINFORCED CLOSURE POUR • UHPC • NON-SHRINK GROUT	• NO CIP CONCRETE TOPPING • BEST SECTION FOR ABC • MINIMAL POTENTIAL FOR FLANGE CRACKING DURING HANDLING (VERY STOUT SECTION)	• MORE DIFFICULT TO ACCOMMODATE VERTICAL CURVES (SEE SHEET 05) • VERTICAL CURVES CAN BE ACCOMMODATED WITH A VARIABLE TOP FLANGE THICKNESS, HOWEVER THIS WILL LEAD TO INCREASED FABRICATION COSTS • REQUIRES FORMING OF CLOSURE JOINTS

ISSUE DATE: 01/22/2021 | BASIS: AASHTO LRFD BRIDGE DESIGN SPEC. - 9th EDTION | SHEET NEXT 02

BEAM USAGE

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NORTHEAST EXTREME TEE (NEXT) BEAM DETAILS (2nd Edition)

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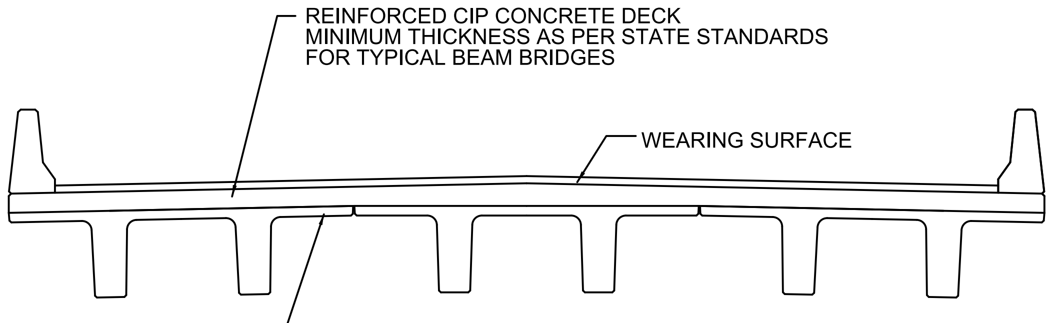
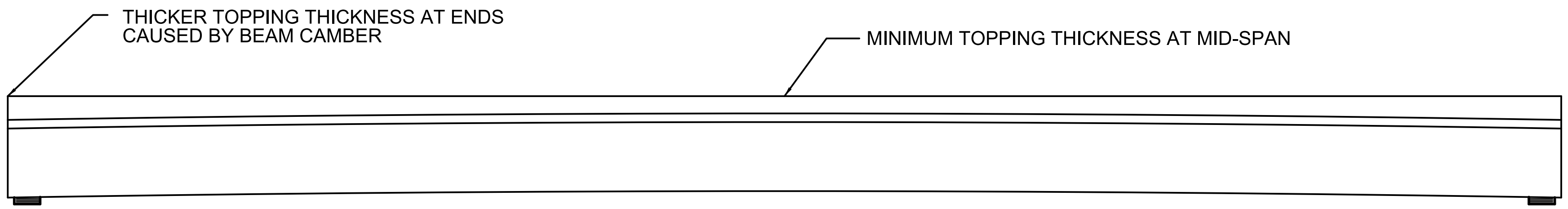
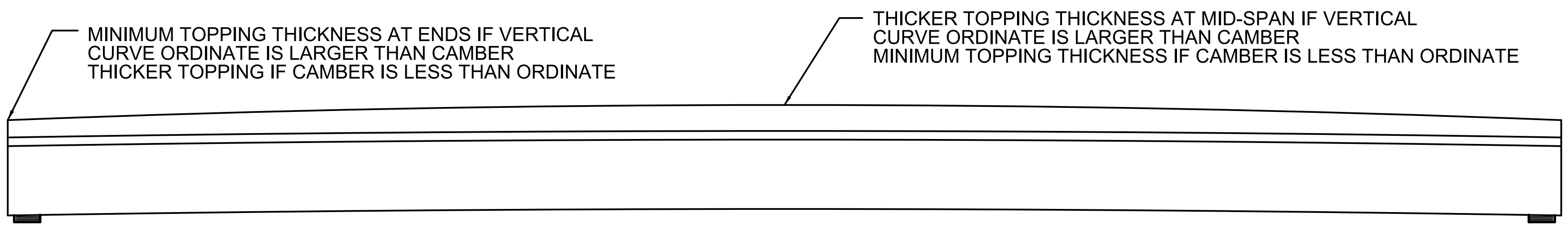
NO.	DATE	DESCRIPTION



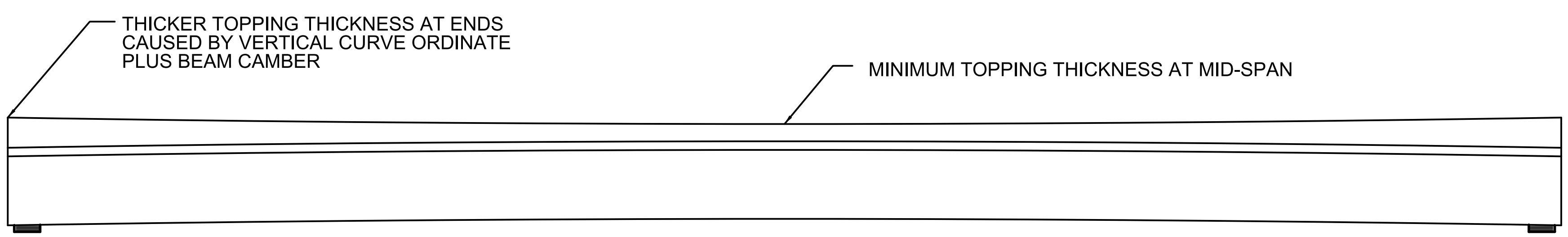
NEXT F BEAMS



NEXT F BEAMS - TANGENT PROFILE



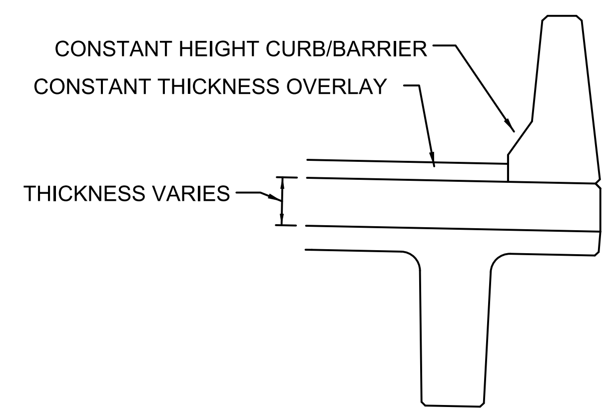
NEXT F BEAMS - CREST VERTICAL CURVE PROFILE



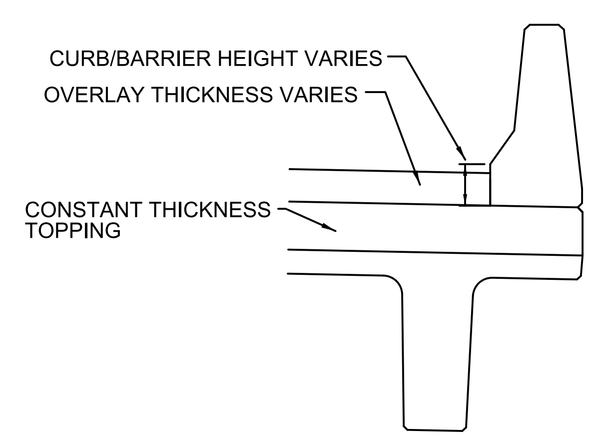
NEXT F BEAMS - SAG VERTICAL CURVE PROFILE

NOTES

1. THE DETAILS SHOWN DEPICT VARYING THE THICKNESS OF THE CONCRETE TOPPING. ANOTHER OPTION IS TO VERY THE THICKNESS OF THE OVERLAY. NOTE THAT THE HEIGHT OF THE CURB OR PARAPET WILL STILL VARY.
2. CREST VERTICAL CURVES: IF THE CAMBER IS LESS THAN THE CURVE ORDINATE, THE DETAILS WILL BE SIMILAR TO THE TANGENT PROFILE DETAILS.
3. THE ENGINEER SHOULD DETAIL THE ANTICIPATED VARIABLE THICKNESS OF THE TOPPING OR OVERLAY ON THE PLANS BASED ON THE ESTIMATED CAMBER. THE PLANS SHOULD INCLUDE NOTES REQUIRING SURVEY OF THE BEAMS AFTER ERECTION, AND THEN ADJUST THE TOPPING THICKNESS AS REQUIRED. THE SAME APPLIES TO THE HEIGHT OF THE CURB OR BARRIER.
4. THE ENGINEER SHOULD ACCOUNT FOR THE ESTIMATED VARIABLE THICKNESS TOPPING IN THE DESIGN OF THE BEAM.
5. THE ESTIMATED CAMBER USED FOR THE VARIABLES NOTED ABOVE SHOULD BE BASED ON THE ESTIMATED CAMBER AT ERECTION.
6. FOR MORE INFORMATION ON ACCOMMODATION OF PROFILES AND CAMBER, SEE PCI NORTHEAST PROFILE AND CAMBER MANAGEMENT GUIDE.



OPTION 1: VARY TOPPING THICKESS



OPTION 2: VARY OVERLAY THICKESS

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NEXT F - PROFILE ACCOMODATION DETAILS		

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PRECAST/PRESTRESSED CONCRETE INSTITUTE NORTHEAST

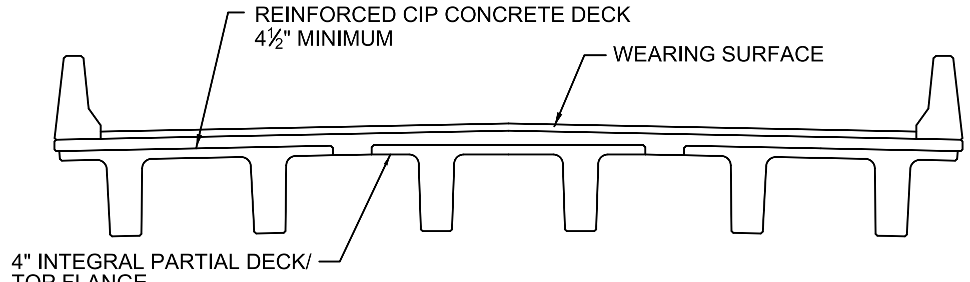
NORTHEAST EXTREME TEE (NEXT) BEAM DETAILS (2nd Edition)

REVISIONS

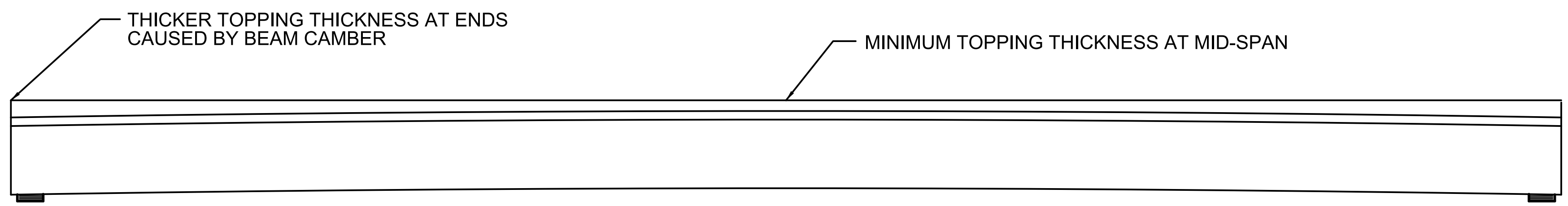
NO.	DATE	DESCRIPTION

NOTES

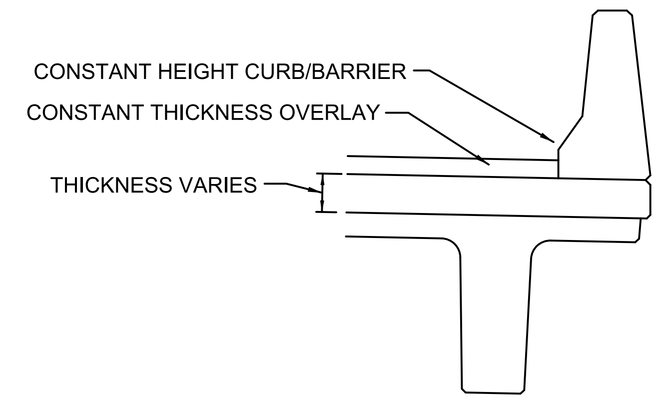
1. THE DETAILS SHOWN DEPICT VARYING THE THICKNESS OF THE CONCRETE TOPPING. ANOTHER OPTION IS TO VERY THE THICKNESS OF THE OVERLAY. NOTE THAT THE HEIGHT OF THE CURB OR PARAPET WILL STILL VARY.
2. CREST VERTICAL CURVES: IF THE CAMBER IS LESS THAN THE CURVE ORDINATE, THE DETAILS WILL BE SIMILAR TO THE TANGENT PROFILE DETAILS.
3. THE ENGINEER SHOULD DETAIL THE ANTICIPATED VARIABLE THICKNESS OF THE TOPPING 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 TOPPING THICKNESS AS REQUIRED. THE SAME APPLIES TO THE HEIGHT OF THE CURB OR BARRIER.
4. THE ENGINEER SHOULD ACCOUNT FOR THE ESTIMATED VARIABLE THICKNESS TOPPING IN THE DESIGN OF THE BEAM.
5. THE ESTIMATED CAMBER USED FOR THE VARIABLES NOTED ABOVE SHOULD BE BASED ON THE ESTIMATED CAMBER AT ERECTION.
6. FOR MORE INFORMATION ON ACCOMMODATION OF PROFILES AND CAMBER, SEE PCI NORTHEAST DOCUMENT ENTITLED GUIDELINES FOR CAMBER AND PROFILE MANAGEMENT IN ADJACENT BEAMS (PCINE-18-GCPMAB).



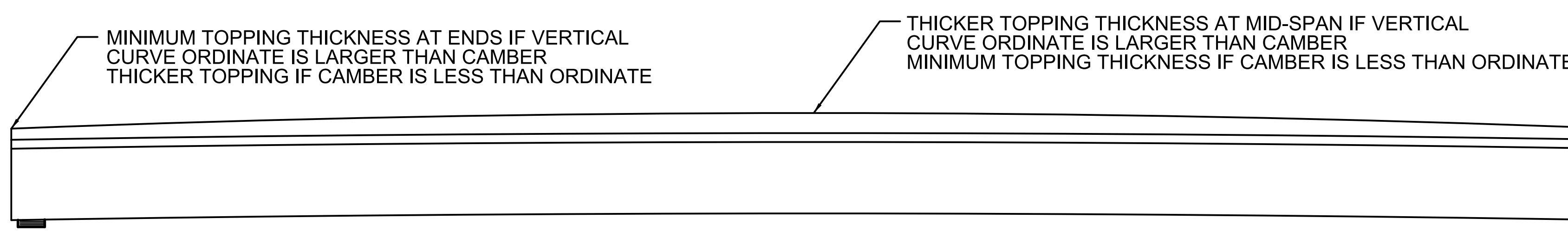
NEXT E BEAMS



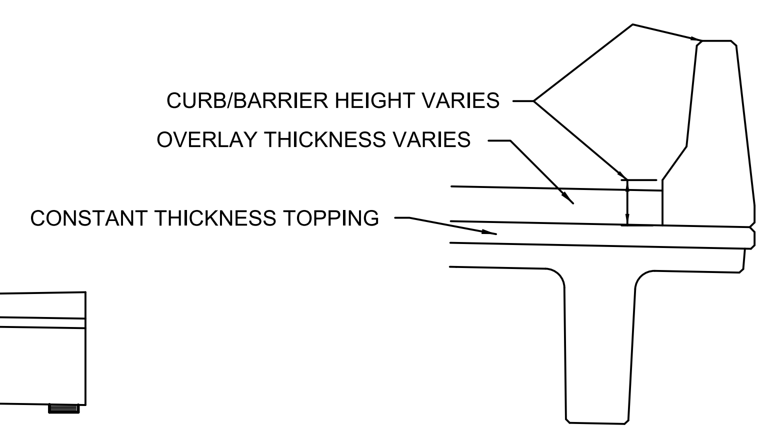
NEXT E BEAMS - TANGENT PROFILE



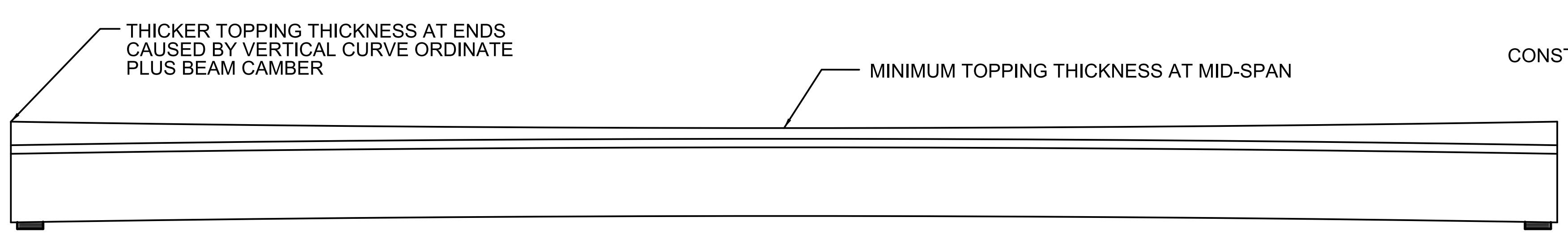
OPTION 1: VARY TOPPING THICKESS



NEXT E BEAMS - CREST VERTICAL CURVE PROFILE



OPTION 2: VARY OVERLAY THICKESS



NEXT E BEAMS - SAG VERTICAL CURVE PROFILE

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NEXT E - PROFILE ACCOMMODATION DETAILS		

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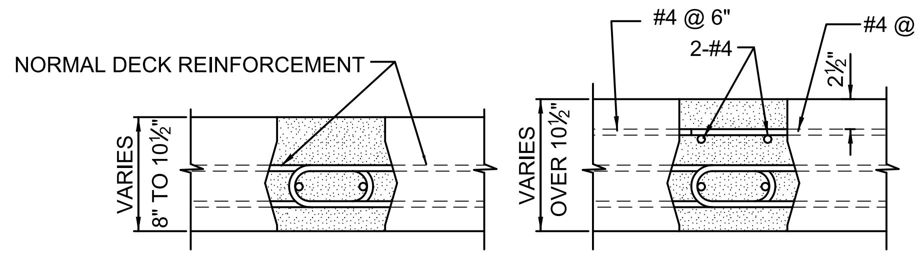
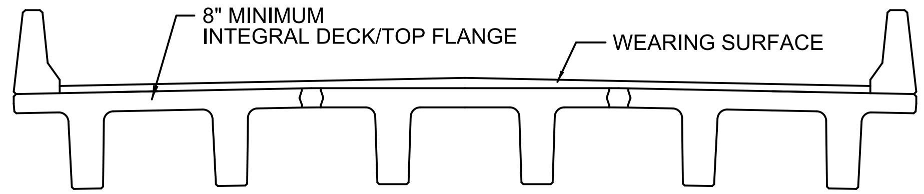


FLANGE ADJUSTMENT FOR PROFILE



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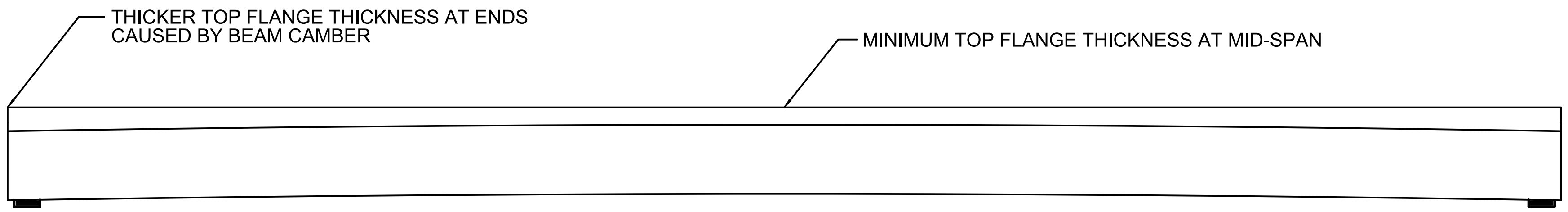
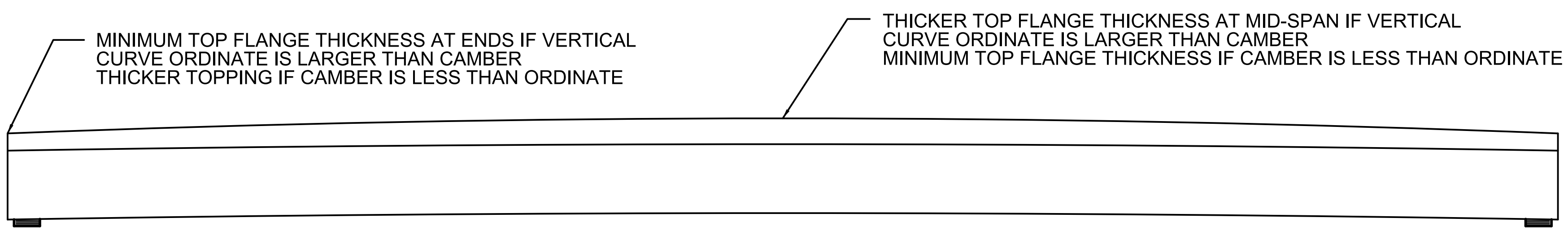
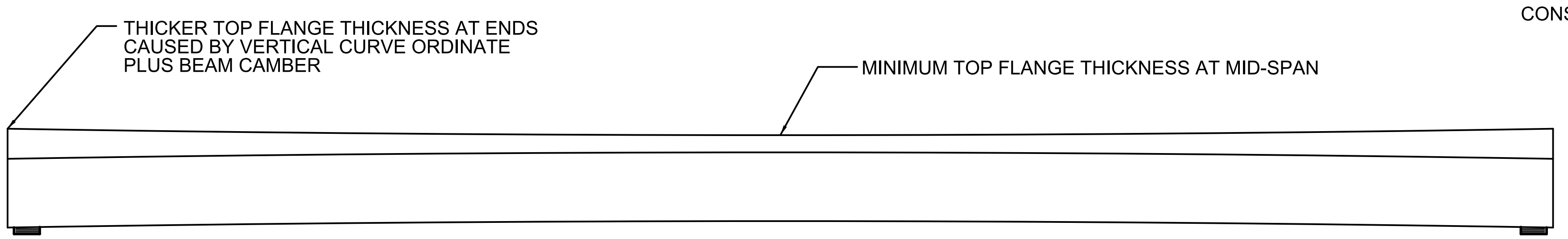


NEXT D BEAMS - TANGENT PROFILE



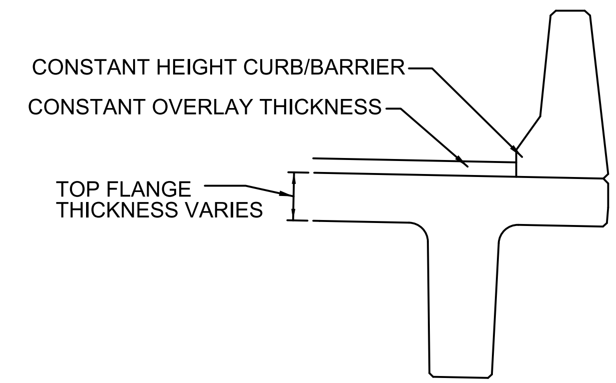
NEXT D BEAMS - CREST VERTICAL CURVE PROFILE



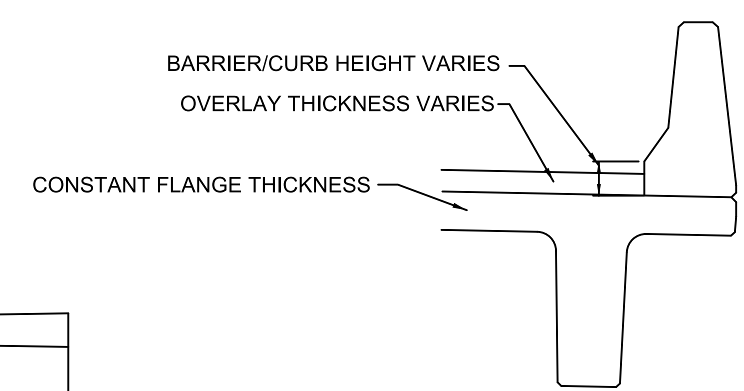
NEXT D BEAMS - SAG VERTICAL CURVE PROFILE

NOTES

1. THE DETAILS SHOWN DEPICT VARYING THE THICKNESS OF THE TOP FLANGE. ANOTHER OPTION IS TO VERY THE THICKNESS OF THE OVERLAY. NOTE THAT THE HEIGHT OF THE CURB OR PARAPET WILL STILL VARY.
2. CREST VERTICAL CURVES: IF THE CAMBER IS LESS THAN THE CURVE ORDINATE, THE DETAILS WILL BE SIMILAR TO THE TANGENT PROFILE DETAILS.
3. 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.
4. THE ENGINEER SHOULD ACCOUNT FOR THE ESTIMATED VARIABLE THICKNESS TOP FLANGE AND/OR TOPPING IN THE DESIGN OF THE BEAM.
5. THE ESTIMATED CAMBER USED FOR THE VARIABLE NOTED ABOVE SHOULD BE BASED ON THE ESTIMATED CAMBER AT ERECTION.
6. FOR MORE INFORMATION ON ACCOMMODATION OF PROFILES AND CAMBER, SEE PCI NORTHEAST DOCUMENT ENTITLED GUIDELINES FOR CAMBER AND PROFILE MANAGEMENT IN ADJACENT BEAMS (PCINE-18-GCPMAB).



OPTION 1: VARY FLANGE THICKESS



OPTION 2: VARY OVERLAY THICKESS

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NORTHEAST EXTREME TEE (NEXT) BEAM DETAILS (2nd Edition)

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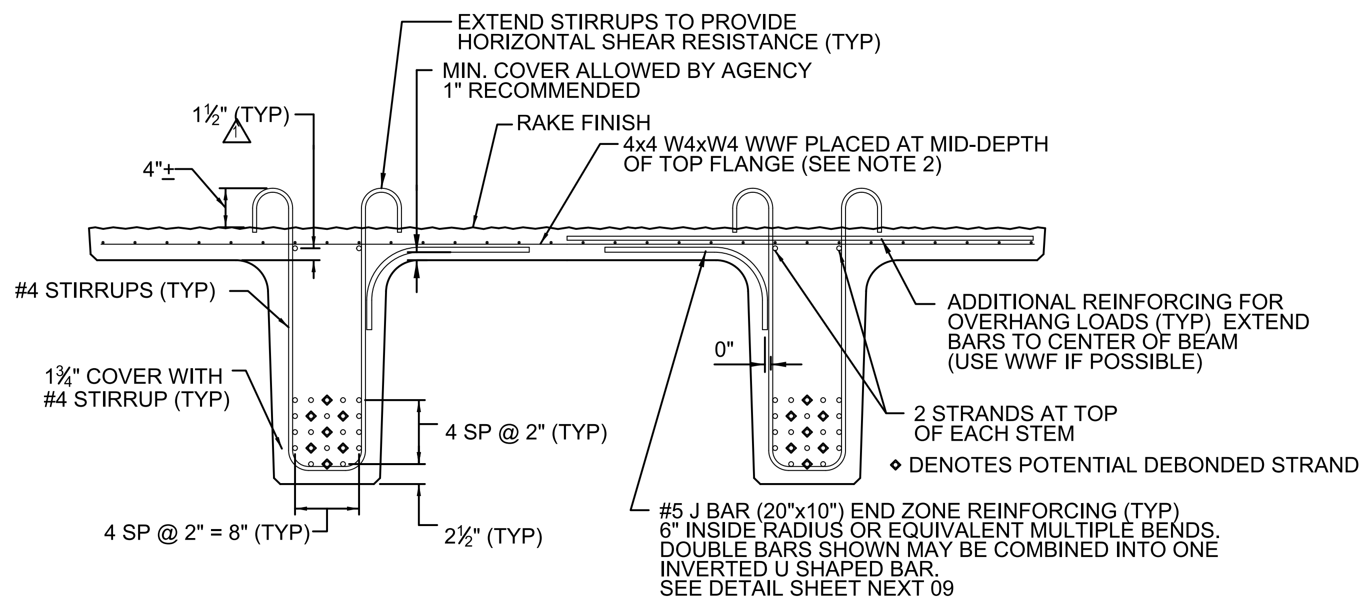
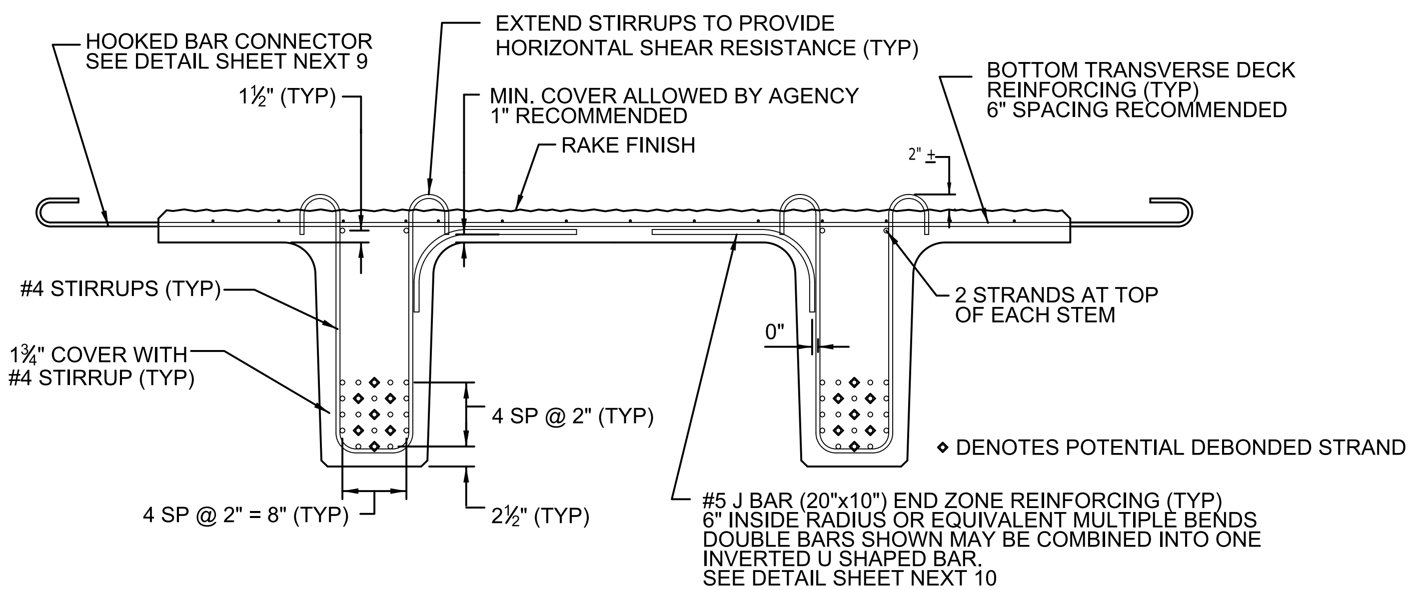
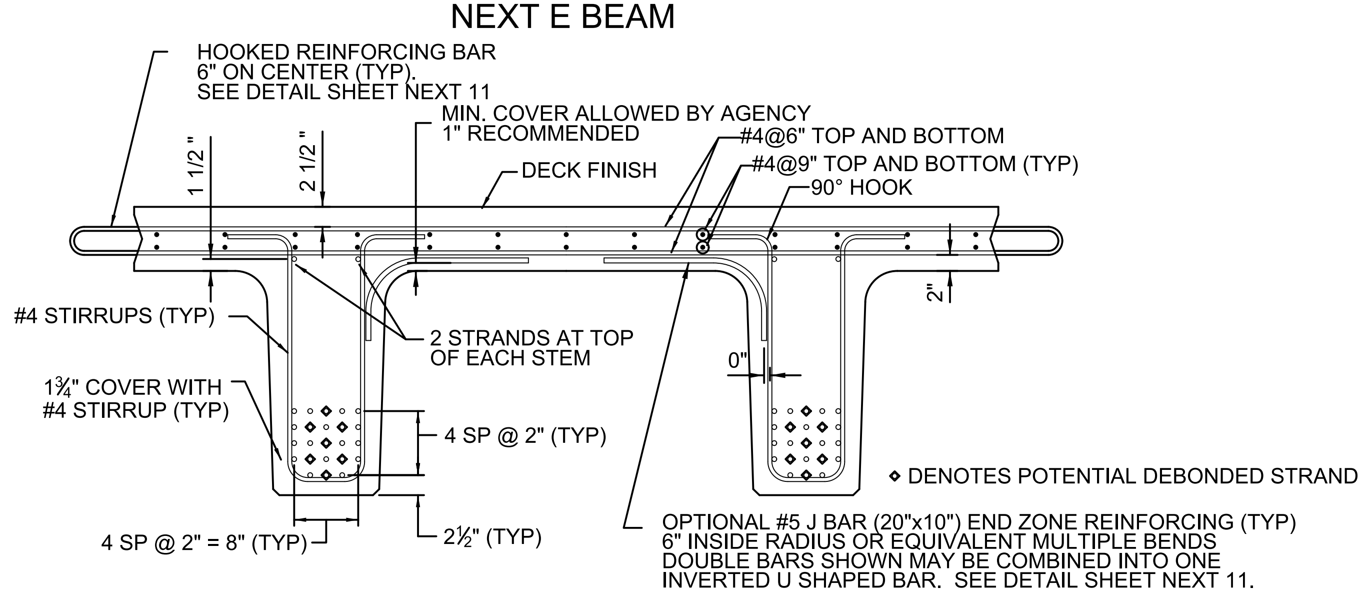
	NEXT D - PROFILE ACCOMODATION DETAILS	



NEXT F BEAM



NEXT E BEAM



NEXT D BEAM

NEXT F NOTES

1. THE TOP FLANGE IS INTENDED TO ACT AS A DECK FORM ONLY. A REINFORCED CAST-IN-PLACE CONCRETE DECK SHOULD BE DESIGNED TO SPAN BETWEEN STEMS. THE WELDED WIRE FABRIC SHOWN IS PRELIMINARY AND SHOULD BE USED TO SUPPORT THE WET DECK CONCRETE ONLY. THE REINFORCING SHOWN IS BASED ON AN 8" THICK CAST-IN-PLACE DECK. DESIGNERS SHOULD VERIFY THIS REINFORCING FOR EACH DESIGN BASED ON THE ACTUAL DECK THICKNESS.
2. THE WELDED WIRE FABRIC MAY BE CUT TO FACILITATE THE INSTALLATION AROUND THE STIRRUPS, PROVIDED THAT EQUIVALENT BARS ARE ADDED ADJACENT TO THE CUT FABRIC. EQUIVALENT MILD REINFORCEMENT MAY ALSO BE USED IN PLACE OF THE WWF, PROVIDED THAT THE SPACING OF THE BARS DOES NOT EXCEED 12 INCHES. DESIGNER TO VERIFY THE SIZE OF FABRIC TO RESIST TOPPING LOADS.
3. THE ADDITIONAL TOP STEEL IN THE BEAM OVERHANGS SHOULD ONLY BE USED WHERE THE WELDED WIRE FABRIC CANNOT SUPPORT THE OVERHANG LOADS.
4. SHEAR REINFORCING SHOULD BE KEPT TO #4 BARS IN ORDER TO MAXIMIZE THE COVER ON THE SIDE OF THE STEM.
5. SEE DETAIL SHEET NEXT 15 FOR UTILITIES SUPPORT DETAILS.

NEXT E NOTES

1. THE TOP FLANGE IS INTENDED TO ACT AS THE BOTTOM PORTION OF THE DECK. A REINFORCED CAST-IN-PLACE CONCRETE TOPPING SHOULD BE DESIGNED TO COMPLETE THE STRUCTURAL DECK. THE REINFORCING SHOWN IS BASED ON A PRELIMINARY DESIGN OF A NEXT BEAM WITH AN 8½ INCH THICK DECK. DESIGNERS SHOULD VERIFY THIS REINFORCING FOR EACH DESIGN BASED ON THE ACTUAL DECK THICKNESS.
2. THE DESIGN OF THE DECK REINFORCING SHOULD BE BASED ON A CONVENTIONAL CAST-IN-PLACE CONCRETE DECK ASSUMING THAT THE STEMS ARE INDIVIDUAL BEAMS.
3. SHEAR REINFORCING SHOULD BE KEPT TO #4 BARS IN ORDER TO MAXIMIZE THE COVER ON THE SIDE OF THE STEM.
4. SEE DETAIL SHEET NEXT 15 FOR UTILITIES SUPPORT DETAILS.

NEXT D NOTES

1. THE TOP FLANGE IS INTENDED TO ACT AS A STRUCTURAL DECK.
2. SHEAR REINFORCING SHOULD BE KEPT TO #4 BARS IN ORDER TO MAXIMIZE THE COVER ON THE SIDE OF THE STEM.
3. SEE DETAIL SHEET NEXT 15 FOR UTILITY SUPPORT DETAILS.
4. MINOR ADJUSTMENT OF THE SPACING OF THE TOP LONGITUDINAL REINFORCEMENT IS ALLOWABLE TO FACILITATE THE INSTALLATION OF THE STIRRUPS.

DESIGN NOTES

1. THE REINFORCING SHOWN IS PRELIMINARY AND NOT GUARANTEED. DESIGNERS MUST VERIFY THE REINFORCING FOR EACH DESIGN BASED ON THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS OR STATE STANDARDS.
2. THE STRIP METHOD SPECIFIED IN AASHTO LRFD ARTICLE 4.6.2.1 IS RECOMMENDED FOR THE DESIGN OF THE REINFORCING IN THE NEXT E AND D BEAMS.
3. THE REINFORCING BARS EXTENSIONS SHOWN IN THE NEXT E AND D BEAMS 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 NESTED HOOKED BARS CAN BE CONSIDERED A LAP SPLICE WITH THE BARS FULLY DEVELOPED. THE CRACK CONTROL PROVISIONS OF AASHTO ARTICLE 5.6.7 SHOULD ALSO BE CHECKED FOR THESE BARS.
4. ADDITIONAL REINFORCEMENT 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. IT IS RECOMMENDED THAT IF FULLY TENSIONED TOP STRAND ARE INCLUDED IN THE DESIGN, THEY SHOULD NOT BE USED TO MEET THESE AASHTO PROVISIONS, SINCE THEY ARE ALREADY BEING USED TO CONTROL STRESS IN THE BEAM.

STRAND LAYOUT NOTES

1. STRAIGHT STRAND ONLY. DRAPED STRANDS ARE NOT PERMITTED.
2. DEBONDING OF STRAND IS ALLOWED. FOLLOW THE LATEST PROVISIONS FOR DEBONDING IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (ARTICLE 5.9.4.3.3). THE DEBONDED STRAND PATTERNS SHOWN ARE THE RECOMMENDED MAXIMUM DEBONDING IN EACH STEM BASED ON THE SPECIFICATIONS AND BEAMS WITH THE MAXIMUM NUMBER OF STRANDS. SIMILAR DEBONDING CAN BE USED FOR SECTIONS WITH FEWER STRANDS, PROVIDED THAT THE PROVISIONS FOR "DEBONDED STRANDS" IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS ARE FOLLOWED.
3. AASHTO PROVISIONS FOR DEBONDED STRANDS (ARTICLE 5.9.4.3.3) REGARDING LONGITUDINAL LIMITS OF DEBONDING SHALL ALSO BE FOLLOWED.
4. DEBONDING SHOULD BE SYMETRICAL ABOUT THE CETNERLINE OF THE BEAM. SYMETRY ABOUT THE STEM IS PREFERRED, BUT NOT MANDATORY.
5. STRANDS SHALL BE PLACED WITHIN THE 2"x2" GRID. THE PATTERN MAY BE RAISED IN 2" INCREMENTS FOR DESIGNS THAT REQUIRE PRESTRESS AT A HIGHER ELEVATION. THE NUMBER AND LOCATION OF STRANDS SHALL BE AS REQUIRED BY DESIGN.
6. THE PATTERN SHOWN DEPICTS THE MAXIMUM NUMBER OF STRANDS ALLOWED (50 STRAND INCLUDING THE TOP STRAND). THIS IS BASED ON THE CAPACITY OF TYPICAL CASTING BEDS.
7. THE TWO BOTTOM CORNER STRAND IN EACH STEM ARE OMITTED TO PROVIDE ROOM FOR THE SHEAR REINFORCEMENT BAR BENDS.
8. ALL PRESTRESSING STRAND 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.
9. ADDITIONAL STRAND TENSIONED TO A NOMINAL VALUE MAY BE ADDED TO THE TOP FLANGE TO SUPPORT THE TOP FLANGE REINFORCING.

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NEXT BEAM - TYPICAL BEAM REINFORCING		

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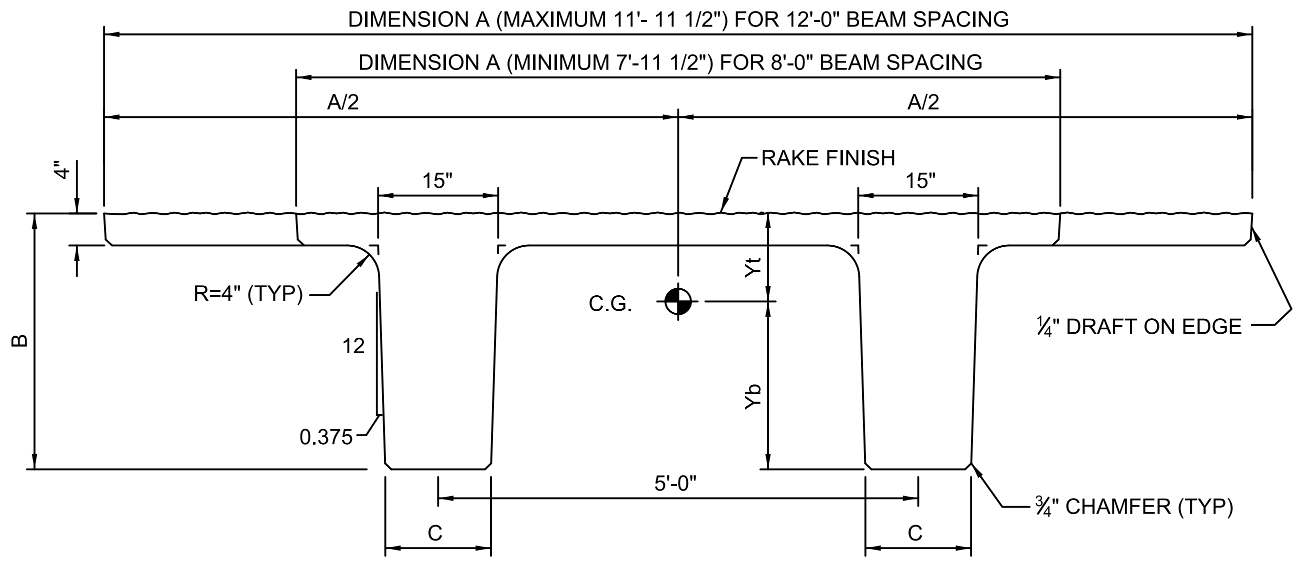
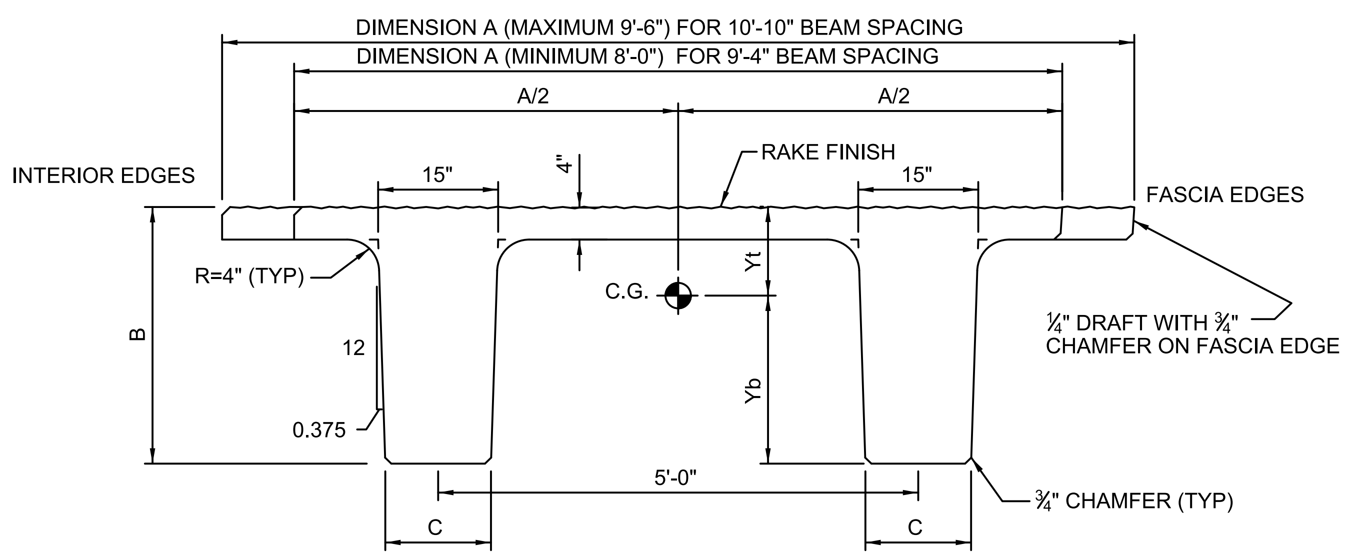
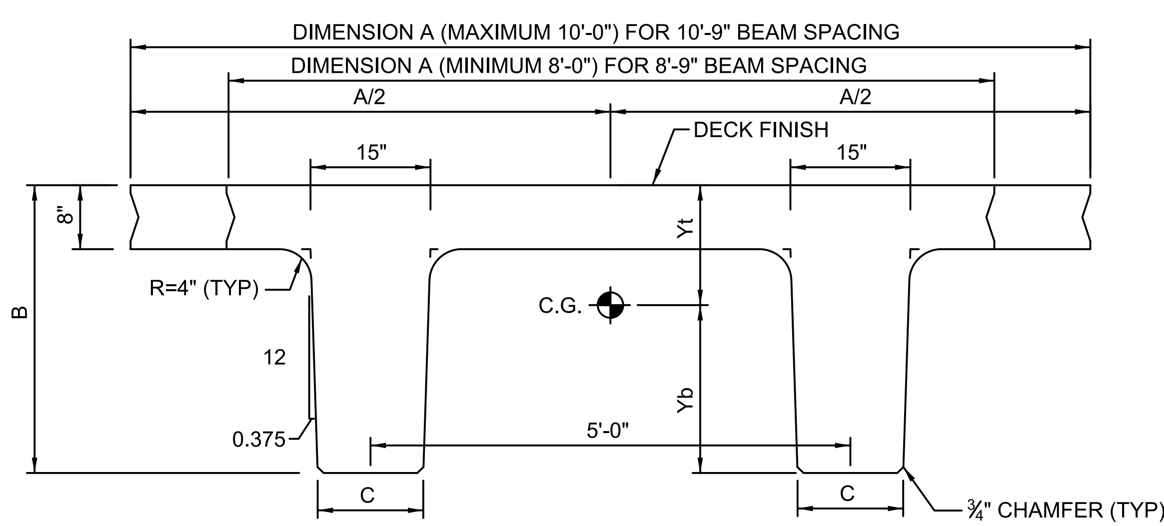


NEXT F BEAM



NEXT E BEAM



NEXT D BEAM

NEXT BEAM - SECTION PROPERTIES

BEAM DESIGNATION	BEAM WIDTH INCHES	BEAM DEPTH INCHES	BASE STEM WIDTH INCHES	AREA IN^2	I IN^4	Yb INCHES	Yt INCHES	St IN^3	Sb IN^3	WEIGHT PLF
	A	B	C			D	E			
MINIMUM WIDTH BEAMS										
NEXT 36 F	95.50	36.00	13.00	1287	160240	21.77	14.23	11261	7361	1341
NEXT 32 F	95.50	32.00	13.25	1182	115813	19.51	12.49	9272	5936	1231
NEXT 28 F	95.50	28.00	13.50	1075	79901	17.24	10.76	7426	4635	1120
NEXT 24 F	95.50	24.00	13.75	966	51823	14.95	9.05	5726	3466	1006
NEXT 36 E	96.00	36.00	13.00	1289	160546	21.79	14.21	11298	7368	1343
NEXT 32 E	96.00	32.00	13.25	1184	116028	19.53	12.47	9305	5941	1233
NEXT 28 E	96.00	28.00	13.50	1078	80042	17.26	10.74	7453	4637	1123
NEXT 24 E	96.00	24.00	13.75	969	51906	14.97	9.03	5748	3467	1009
NEXT 40 D	96.00	40.00	13.00	1667	238087	25.47	14.53	16381	9349	1736
NEXT 36 D	96.00	36.00	13.25	1562	176727	23.03	12.97	13630	7672	1627
NEXT 32 D	96.00	32.00	13.50	1456	126155	20.57	11.43	11039	6132	1517
NEXT 28 D	96.00	28.00	13.75	1347	85684	18.07	9.93	8626	4743	1403
MAXIMUM WIDTH BEAMS										
NEXT 36 F	143.50	36.00	13.00	1479	185525	23.36	12.64	14678	7942	1541
NEXT 32 F	143.50	32.00	13.25	1374	134258	20.98	11.02	12183	6399	1431
NEXT 28 F	143.50	28.00	13.50	1267	92661	18.57	9.43	9826	4990	1320
NEXT 24 F	143.50	24.00	13.75	1158	60045	16.12	7.88	7620	3725	1206
NEXT 36 E	114.00	36.00	13.00	1361	170830	22.44	13.56	12598	7613	1418
NEXT 32 E	114.00	32.00	13.25	1256	123575	20.14	11.86	10419	6136	1308
NEXT 28 E	114.00	28.00	13.50	1150	85300	17.81	10.19	8371	4789	1198
NEXT 24 E	114.00	24.00	13.75	1041	55322	15.45	8.55	6470	3581	1084
NEXT 40 D	120.00	40.00	13.00	1859	258217	26.55	13.45	19204	9724	1936
NEXT 36 D	120.00	36.00	13.25	1754	191497	24.02	11.99	15978	7974	1827
NEXT 32 D	120.00	32.00	13.50	1648	136539	21.44	10.56	12926	6369	1717
NEXT 28 D	120.00	28.00	13.75	1539	92622	18.80	9.20	10072	4926	1603

BEAM DIMENSION NOTES

ALL NEXT BEAM TYPES:

1. THE WIDTH OF BEAMS SHOWN ARE THE MINIMUM AND MAXIMUM WIDTH BEAMS. VARIATION BETWEEN THESE LIMITS IS ALLOWED IN ORDER TO CONSTRUCT A BRIDGE TO THE REQUIRED WIDTH. THE VARIATION IN WIDTH IS ACCOMPLISHED BY VARYING THE OVERHANG DIMENSIONS. THE DESIGNER WILL NEED TO CALCULATE BEAM PROPERTIES FOR BEAMS THAT ARE NOT EQUAL TO THE WIDTHS LISTED.
2. BRIDGES WITH SMALL CURVATURE CAN BE BUILT USING THESE SECTIONS BY VARYING THE OVERHANG OF THE FASCIA BEAMS ALONG THE LENGTH. INTERIOR BEAMS SHOULD ALWAYS BE SYMMETRICAL ABOUT THE VERTICAL AXIS. NON-SYMMETRICAL SECTIONS ARE POSSIBLE, HOWEVER THE BEAM MAY REQUIRE A SPECIAL DESIGN WITH A NON-SYMMETRICAL STRAND PATTERN.
3. THE STEM WIDTH AND SPACING ARE FIXED.
4. 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.

NEXT D BEAMS:

1. THE SPACING OF BEAMS ON A TYPICAL BRIDGE SHALL BE THE WIDTH OF THE BEAM PLUS 9" (EX.: BEAM SPACING = 10'-9" FOR THE 10'-0" SECTION).
2. MODIFY THE FASCIA BEAM DECK EDGE TO MATCH STATE STANDARDS.

NEXT F BEAMS:

1. THE ACTUAL WIDTH OF THE BEAM TAKE INTO ACCOUNT A NOMINAL "WIDE GAP BETWEEN BEAMS TO ACCOUNT FOR TOLERANCES. THE SPACING OF BEAMS ON A TYPICAL BRIDGE SHALL BE AT THE NOMINAL SPACING (EX.: BEAM SPACING = 12 FEET FOR THE 11'-11"SECTION).

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NEXT BEAM - SECTION PROPERTIES		

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NORTHEAST EXTREME TEE (NEXT) BEAM DETAILS (2nd Edition)

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BRIDGE SECTION NOTES

1. THE BRIDGE SECTIONS DEPICTED REPRESENT THE TYPICAL USE OF THE MINIMUM WIDTH AND MAXIMUM WIDTH NEXT BEAMS.
2. IN SPECIAL CASES, A HALF WIDTH BEAM SECTION CAN BE USED TO ACCOMODATE UNUSUAL BRIDGE WIDTHS. SPECIAL TEMPORARY BRACING WILL BE REQUIRED FOR SHIPPING AND ERECTION. THIS OPTION SHOULD ONLY BE USED IN SPECIAL SITUATIONS AND WITH APPROVAL FROM THE OWNER. IN LIEU OF THIS OPTION, THE DESIGNER CAN CONSIDER THE USE OF WIDER OR NARROWER BEAMS WITHIN THE LIMITS OF THE BEAM FORMS. (12' MAXIMUM CONCRETE SECTION). THIS OPTION MAY REQUIRE SPECIAL SHIPPING CONSIDERATIONS, WHICH WILL LEAD TO AN INCREASE IN SHIPPING COSTS.
3. OFFSET THE BEARING SUPPORT LOCATIONS FROM THE ROADWAY BASELINE ACCOUNTING FOR THE CROSS SLOPE AND ROTATION OF THE BEAMS RELATIVE TO THE LONGITUDINAL AXIS OF THE BEAM. THE DIMENSIONS OF ALL BEARING LOCATIONS ON THE PLANS SHOULD ACCOUNT FOR THIS ROTATIONAL OFFSET.

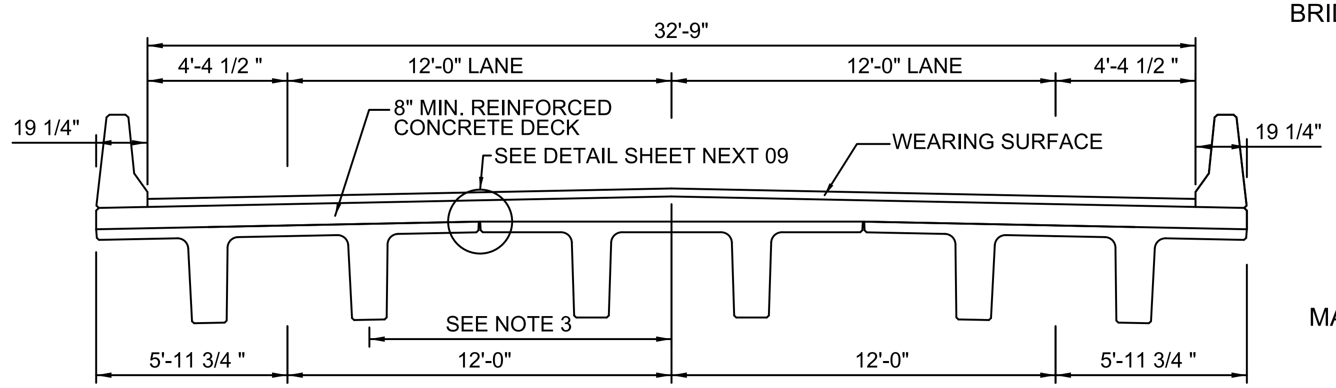
MAXIMUM SPAN LENGTH DESIGN ASSUMPTIONS

THE VALUES SHOWN ARE NOT GUARANTEED AND SHOULD BE CONSIDERED APPROXIMATE. THE ACTUAL MAXIMUM SPAN LENGTHS ARE AFFECTED BY A NUMBER OF ASSUMPTIONS. THE FOLLOWING ARE THE DESIGN CRITERIA AND ASSUMPTIONS USED FOR THE DEVELOPMENT OF THESE MAXIMUM SPAN LENGTHS.

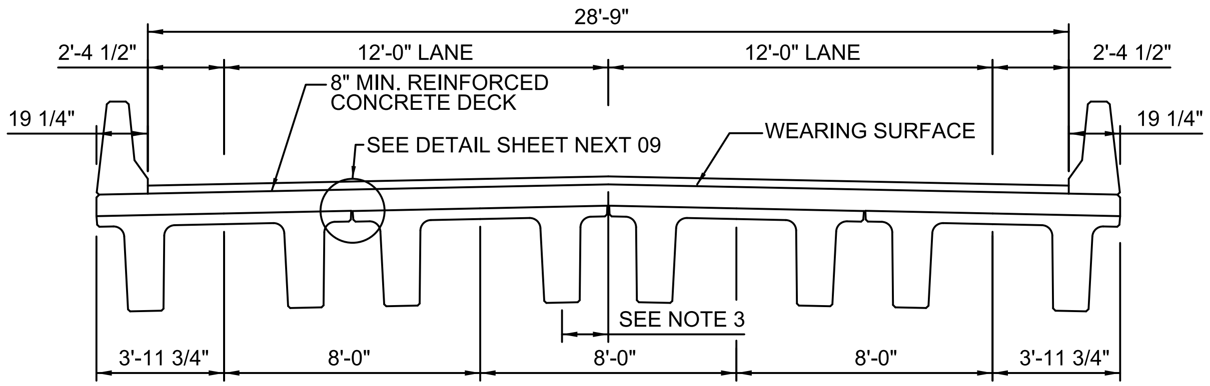
1. THE DESIGNS CORRESPOND TO THE CROSS SECTION GEOMETRIES SHOWN ON THIS SHEET. DIFFERENT CONFIGURATIONS WILL PRODUCE DIFFERENT MAXIMUM SPAN LENGTHS.
2. DESIGN SPECIFICATIONS: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION (2014) WITH 2015 & 2016 INTERIM REVISIONS
3. BARRIERS: MASSDOT CF-PL2 BARRIER (457 PLF)
4. WEARING SURFACE: 3" THICK ASPHALT
5. UTILITY LOADS: NONE
6. COMPOSITE TOPPING CONCRETE STRENGTH (NEXT F AND E): 4 KSI
7. DEBONDING: INCLUDED AT BEAM ENDS
8. TOP STRAND ARE CONSIDERED TO BE FULLY TENSIONED
9. ALLOWABLE TENSILE STRESSES: BASED ON EXTREME EXPOSURE
10. BEAM DESIGNS ARE FOR SIMPLY SUPPORTED INTERIOR BEAMS
11. LIVE LOAD DISTRIBUTION FACTORS: AASHTO LRFD SPECIFICATION (TYPE K) (ARTICLES 4.6.2.2.1 AND 4.6.2.2.2) WITH EACH STEM TREATED AS AN INDIVIDUAL BEAM USING AVERAGE STEM SPACING
12. BARRIER WEIGHT IS EVENLY DISTRIBUTED TO ALL BEAMS
13. SUPPLEMENTAL BONDED LONGITUDINAL REINFORCEMENT MAY BE REQUIRED AT THE TOP OF BEAM ENDS TO MEET THE ALLOWABLE TEMPORARY TENSILE STRESS LIMIT REQUIREMENTS AT RELEASE.
14. AASHTO LRFD RECOMMENDED SPAN/DEPTH RATIOS WERE NOT CONSIDERED (SEE FOOTNOTE 1). DESIGNERS SHOULD LIMIT SPAN LENGTHS ACCORDING TO THE OWNER'S REQUIREMENTS FOR SPAN/DEPTH RATIOS.
15. ALL DESIGNS WERE GOVERNED BY THE SERVICE LIMIT STATE.

APPROXIMATE MAXIMUM SPAN LENGTHS				
BEAM TYPE	NOMINAL BEAM WIDTH (FEET)	MAXIMUM SAN LENGTH IN FEET (NUMBER OF STRAND)		
		f'c = 6 ksi	f'c = 8 ksi	f'c = 10 ksi
36F	8	63(32)	81(50)	82(50)
32F	8	58(30)	73(46)	77(50)
28F	8	50(26)	65(42)	71(50)
24F	8	44(24)	56(36)	64(50)
36F	12	54(30)	70(48)	72(50)
32F	12	49(28)	63(44)	68(50)
28F	12	44(26)	56(40)	63(50)
24F	12	37(22)	48(36)	57(50)
36E	8	55(30)	73(48)	75(50)
32E	8	50(28)	65(44)	70(50)
28E	8	42(24)	56(38)	64(50) [1]
24E	8	36(22)	48(34)	58(50) [1]
36E	9.5	52(30)	69(48)	72(50)
32E	9.5	45(26)	61(42)	67(50)
28E	9.5	40(24)	53(38)	61(50) [1]
24E	9.5	34(22)	46(34)	54(48) [1]
40D	8	68(36)	84(50)	86(50)
36D	8	60(32)	79(50) [1]	81(50)
32D	8	52(28)	72(48) [1]	75(50) [1]
28D	8	44(24)	61(42) [1]	68(50) [1]
40D	10	64(36)	79(50)	80(50)
36D	10	56(32)	74(50)	75(50)
32D	10	48(28)	67(48) [1]	70(50) [1]
28D	10	42(26)	57(42) [1]	63(50) [1]

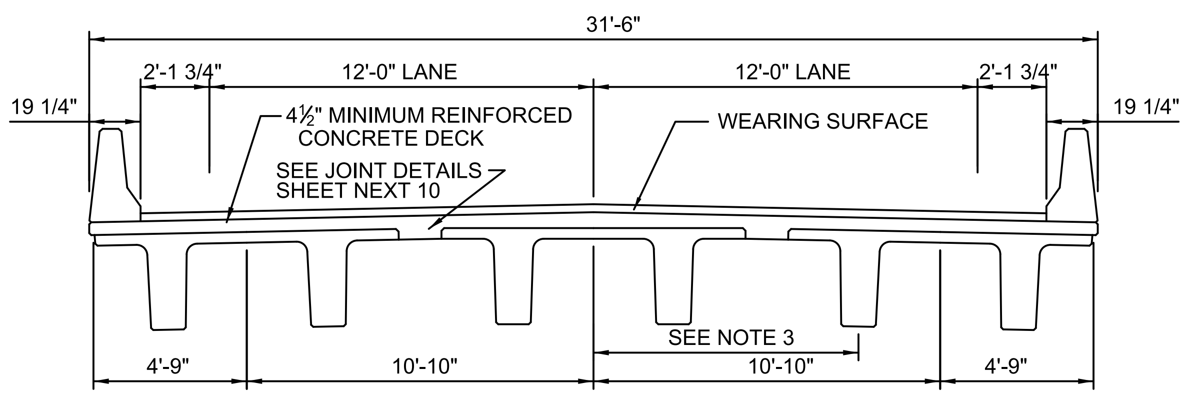
[1] DENOTES BEAMS THAT DO NOT MEET THE AASHTO RECOMMENDED MAXIMUMM SPAN/DEPTH RATIOS



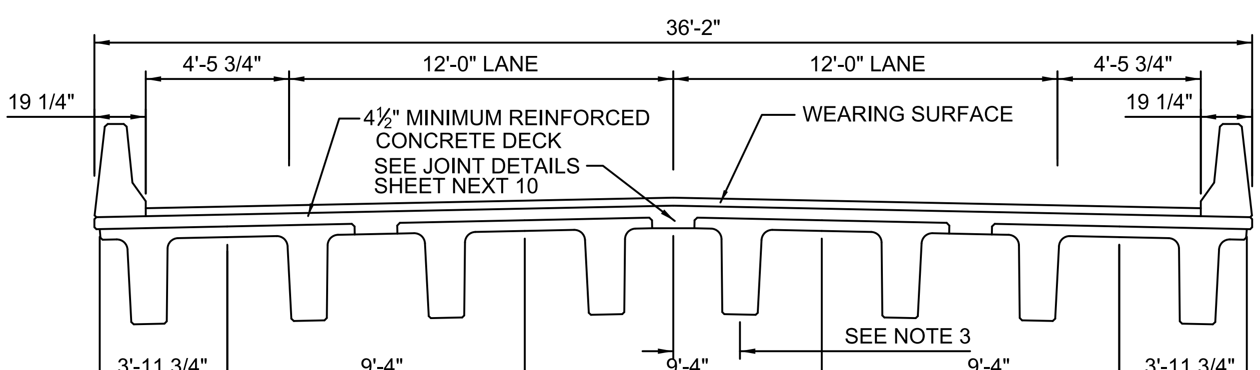
NEXT F BEAMS - MAXIMUM WIDTH BEAMS



NEXT F BEAMS - MINIMUM WIDTH BEAMS

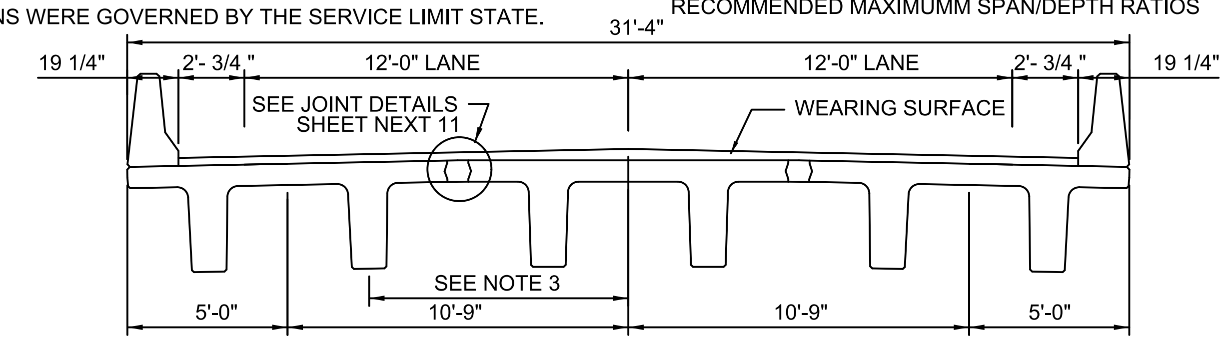


NEXT E BEAMS - MAXIMUM WIDTH BEAMS

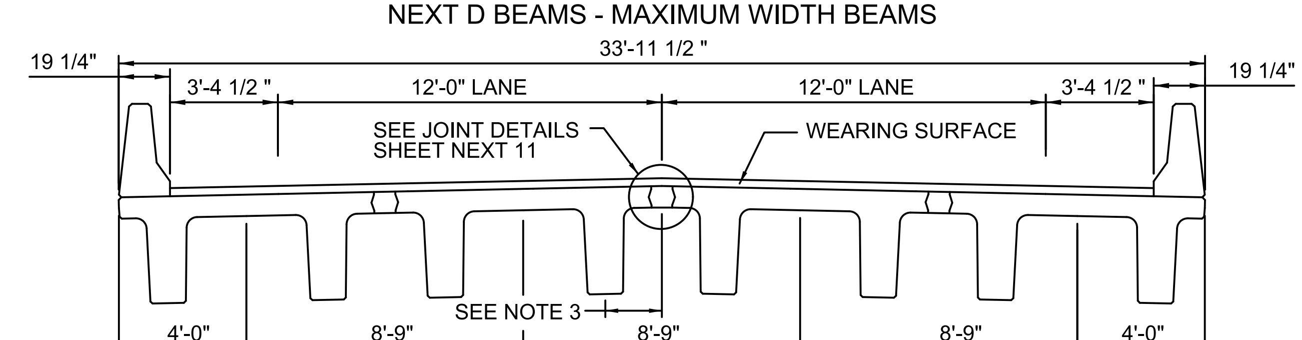


NEXT E BEAMS - MINIMUM WIDTH BEAMS

NOTE: BEAM SPACING AND OVERALL DIMENSIONS FOR NEXT E BEAMS ARE SHOWN BASED ON A 10" WIDE JOINT. ADJUST SPACING FOR OTHER JOINT WIDTHS.



NEXT D BEAMS - MAXIMUM WIDTH BEAMS



NEXT D BEAMS - MINIMUM WIDTH BEAMS

NOTE: BEAM SPACING AND OVERALL DIMENSIONS FOR NEXT D BEAMS ARE SHOWN BASED ON A 9" WIDE JOINT. ADJUST SPACING FOR OTHER JOINT WIDTHS.

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NEXT BEAM - TYPICAL BRIDGE SECTIONS		

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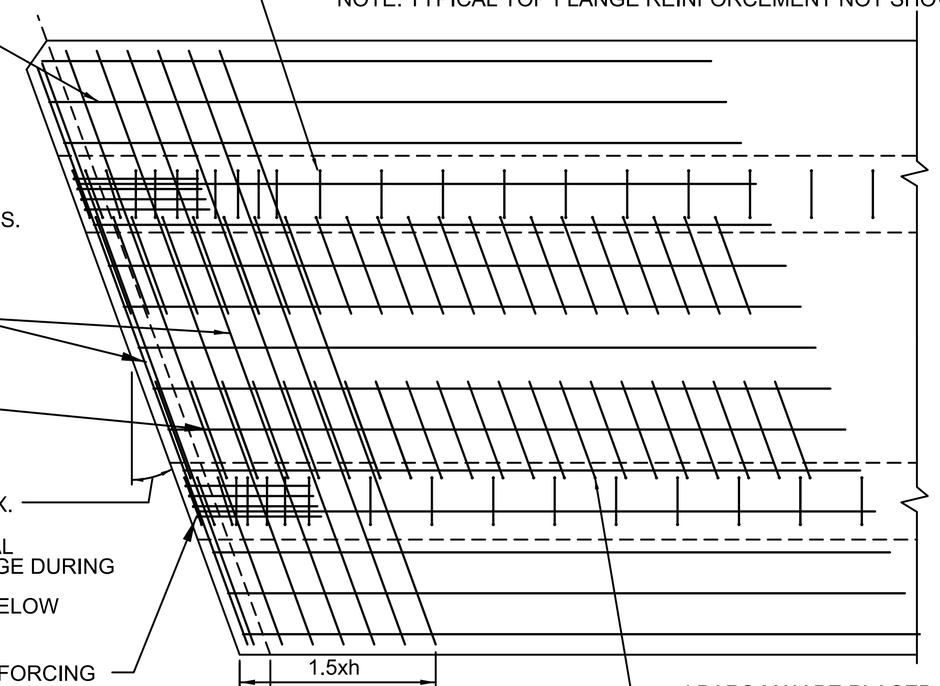
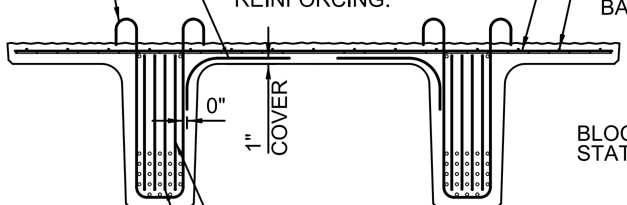
NORTHEAST EXTREME TEE (NEXT) BEAM DETAILS (2nd Edition)

REVISIONS

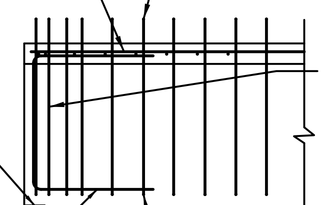
NO.	DATE	DESCRIPTION



PLAN - SKEWED END



END ELEVATION - STEM END

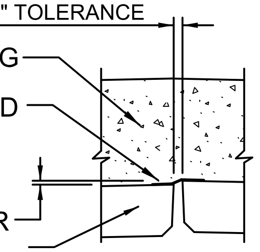


ELEVATION - STEM END

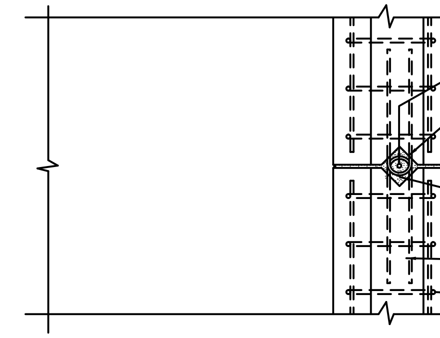
NEXT F BEAM - END REINFORCING DETAILS

NOTES:

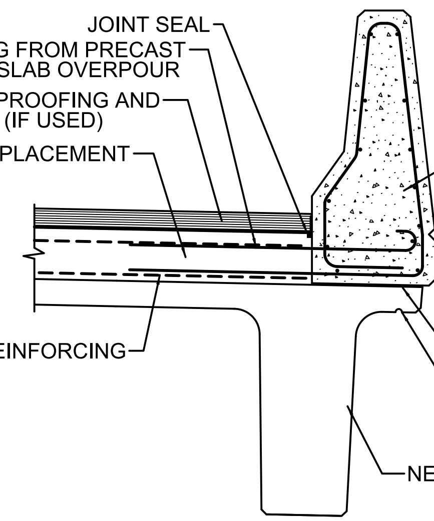
1. THE BARS SHOWN ARE APPROXIMATELY THE MAXIMUM NUMBER THAT CAN BE FIT WITHIN THE NEXT 24 BEAM. SOME OR ALL OF THESE ADDITIONAL END VERTICAL BARS MAY NOT BE NECESSARY DEPENDING ON THE DESIGN.
2. THE AMOUNT OF SPLITTING REINFORCING MAY BE REDUCED BY DEBONDING STRAND IN THIS AREA. ADDITIONAL SPLITTING EINFORCING SHOULD BE PLACED IN AREAS WHERE DEBONDING IS TERMINATED.
3. PLACE 2-#4 BARS AT THE BEAM END, THEN #4 @ 6 INCHES IN THE TOP FLANGE FOR A DISTANCE OF 1.5h TO CONTROL TOP FLANGE END CRACKING DURING RELEASE AND HANDLING. THE MOST COMMON FORM OF POTENTIAL CRACKING IN THIS AREA IS A SERIES OF VERTICAL HAIRLINE CRACKS THROUGH THE INSIDE RADIUS OF THE TOP FLANGE / BEAM STEM INTERFACE RUNNING PARALLEL TO THE STEM. #5 J BARS ARE USED TO SUPPLEMENT THIS REINFORCING. THE TWO J SHAPED BARS SHOWN MAY BE COMBINED INTO ONE INVERTED U SHAPED BAR. THE USE OF A SEMI-INTEGRAL BACKWALL OR INTEGRAL END DIAPHRAGM THAT IS CAST IN THE SHOP AS A SECONDARY POUR CAN HELP TO PREVENT THE GROWTH OF THESE CRACKS DURING SHIPPING AND ERECTION. THIS IS RECOMMENDED IF THE SKEW LIMIT IS TO BE EXCEEDED.
4. THE DESIGNER SHALL DETAIL ADDITIONAL TOP LONGITUDINAL REINFORCING IN THE TOP FLANGE AT BEAM ENDS IF THE TOP FIBER STRESSES EXCEED 200 PSI (NOTE THAT SOME BRIDGE OWNERS HAVE DIFFERENT STRESS LIMITS IN THIS PORTION OF THE BEAM). 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 (ARTICLE 5.9.2.3.1b). THIS REINFORCING IS FOR CRACK WIDTH AND LENGTH CONTROL, NOT PREVENTION. IF FULLY TENSIONED TOP STRAND ARE INCLUDED IN THE DESIGN, THEY SHOULD NOT BE USED TO MEET THESE AASHTO PROVISIONS.



NEXT F BEAM - GAP FORM DETAIL



PLAN



SECTION

NEXT F BEAM - PRECAST PARAPET OPTIONS

CONSTRUCTION SEQUENCE
1. ERECT NEXT BEAM
2. PLACE PRECAST BARRIER IN GROUT BED, GROUT JOINTS IN BETWEEN BARRIER SEGMENTS
3. PLACE DECK REINFORCEMENT AND CAST THE DECK OVERPOUR
4. SEAL THE JOINT BETWEEN THE PARAPET AND DECK WITH FLEXIBLE JOINT SEAL
5. PLACE WEARING SURFACE (IF REQUIRED)

NOTES:
1. THIS DETAIL IS SCHEMATIC. ACTUAL DETAIL WOULD NEED TO BE FULLY DESIGNED.
2. MASSDOT CONCRETE BARRIER SHOWN, OTHER BARRIERS SIMILAR.
3. THIS DETAIL CAN BE MODIFIED FOR ANY TYPICAL BARRIER SHAPE INCLUDING RAILINGS WITH CONCRETE CURBS.
4. ALL REINFORCING IN BEAM AND DECK POUR NOT SHOWN.
5. STIRRUP SPACING MAY NEED TO BE MODIFIED IF ONE LEG OF STIRRUP IS ELIMINATED IN ORDER TO ALLOW SETTING OF BARRIER BASE.

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NEXT F BEAM - DECK DETAILS		

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NORTHEAST EXTREME TEE (NEXT) BEAM DETAILS (2nd Edition)

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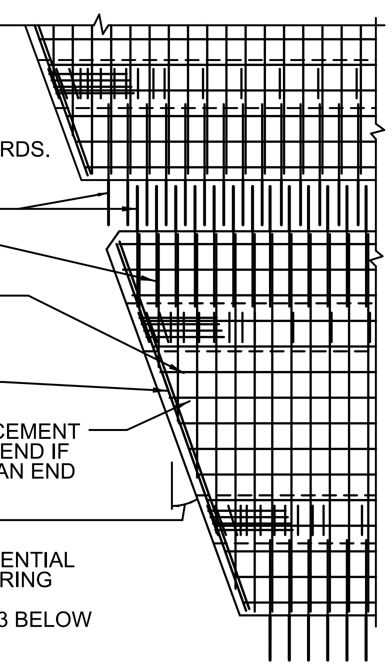
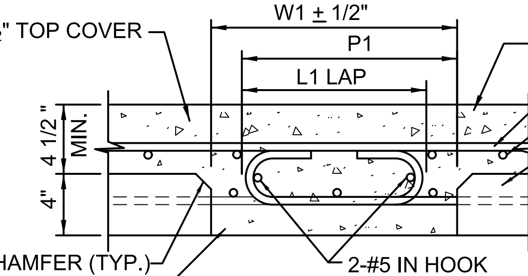
NOTES:
1. DESIGNERS SHOULD CONSULT WITH SEVERAL FABRICATORS FOR LONG SPAN SKEWED BEAMS REGARDING POTENTIAL SHIPPING LIMITATIONS.
2. ACUTE CORNER OVERHANGS MAY REQUIRE SPECIAL DETAILING THAT IS CONSISTENT WITH STATE STANDARDS.



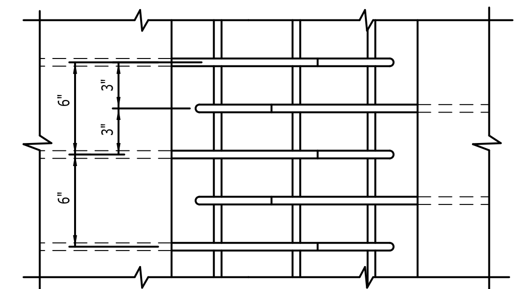
PLAN

NEXT E BEAM - MAIN DECK REINFORCING DETAILS SKEWED BEAM ENDS

T = RECOMMENDED TOLERANCE = 0.5" (SEE NOTE 9)
W1 = SPECIFIED JOINT WIDTH, MINIMUM=L1+T+1.5
P1 = HOOK BAR PROJECTION FROM PANEL EDGE = 0.5(W1+L1)+T
L1 = AASHTO HOOK DEVELOPMENT LENGTH (ARTICLE 5.10.8.2.4)



SECTION



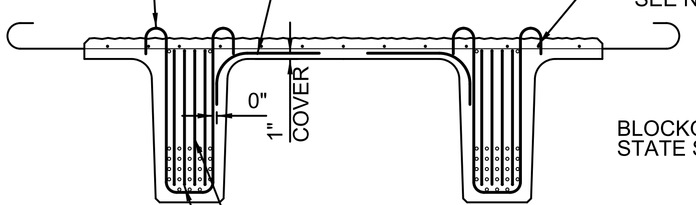
PLAN

SAMPLE DESIGNS
FOR f'c = 4KSI
#4 DECK BARS W1 = 11 1/2" P1 = 11" L1 = 9 1/2"
#5 DECK BARS W1 = 13 1/2" P1 = 13" L1 = 11 1/2"
FOR f'c = 5KSI
#4 DECK BARS W1 = 10 1/2" P1 = 10" L1 = 8 1/2"
#5 DECK BARS W1 = 12 1/2" P1 = 12" L1 = 10 1/2"

NEXT E BEAM - FLANGE CONNECTION DETAILS

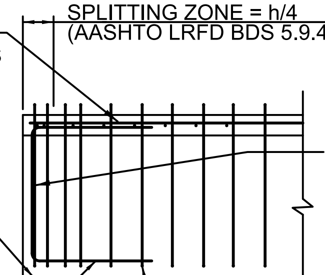
FLANGE CONNECTOR NOTES:

1. CONNECTOR 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 NEEDS TO BE REMOVABLE AND ABLE TO ACCOMMODATE DIFFERENTIAL CAMBER. FORM SUPPORTS SHOULD NOT PENETRATE THROUGH TOP OF POUR UNLESS APPROVED BY THE ENGINEER. GALVANIZED OR STAINLESS STEEL INSERTS CAST INTO THE UNDERSIDE OF THE BEAM MAY BE USED WITH PERMISSION OF THE OWNER.
4. DESIGNERS ARE RESPONSIBLE FOR THE VERIFICATION OF THE DESIGN OF THIS JOINT. THE BASIS OF THE DESIGN IS THAT THE MINIMUM DEVELOPMENT LENGTH AS SPECIFIED IN AASHTO FOR HOOKED BARS IS EQUIVALENT TO A TENSION LAP SPLICE.
5. THE DIMENSION SHOWN IS APPLICABLE TO A DESIGN WITH THE PARAMETERS LISTED.
6. #4 BARS ARE REQUIRED TO PROVIDE THE MINIMUM CONCRETE COVER SHOWN. IF LARGER BARS ARE USED, A THICKER TOPPING POUR MAY BE REQUIRED IN ORDER TO ACCOMMODATE THE HOOK DIMENSIONS.



END ELEVATION - STEM END

NOTE: h = TOTAL HEIGHT OF MEMBER

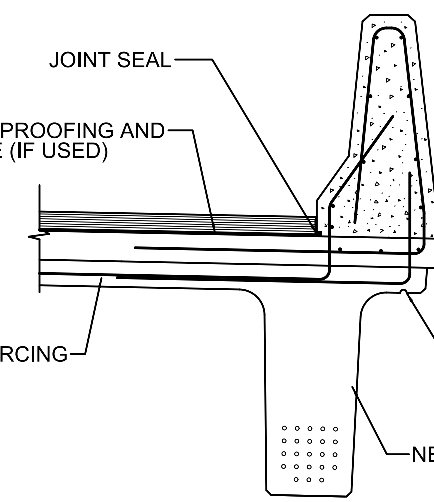


ELEVATION - STEM END

NEXT E BEAM - END REINFORCING DETAILS

NOTES:

1. THE BARS SHOWN ARE APPROXIMATELY THE MAXIMUM NUMBER THAT CAN BE FIT WITHIN THE NEXT 24 BEAM. SOME OR ALL OF THESE ADDITIONAL END VERTICAL BARS MAY NOT BE NECESSARY DEPENDING ON THE DESIGN.
2. THE AMOUNT OF SPLITTING REINFORCING MAY BE REDUCED BY DEBONDING STRAND IN THIS AREA. ADDITIONAL SPLITTING REINFORCING SHOULD BE PLACED IN AREAS WHERE DEBONDING IS TERMINATED.
3. PLACE 2-#4 BARS AT THE BEAM END TO CONTROL TOP FLANGE END CRACKING DURING RELEASE AND HANDLING. THE MOST COMMON FORM OF POTENTIAL CRACKING IN THIS AREA IS A SERIES OF VERTICAL HAIRLINE CRACKS THROUGH THE INSIDE RADIUS OF THE TOP FLANGE / BEAM STEM INTERFACE RUNNING PARALLEL TO THE STEM. #5 J BARS AND BOTTOM DECK REINFORCING BARS ARE USED TO SUPPLEMENT THIS REINFORCING. THE TWO J SHAPED BARS SHOWN MAY BE COMBINED INTO ONE INVERTED U SHAPED BAR. THE USE OF A SEMI-INTEGRAL BACKWALL THAT IS CAST IN THE SHOP AS A SECONDARY POUR CAN HELP TO PREVENT THE GROWTH OF THESE CRACKS DURING SHIPPING AND ERECTION. THIS IS RECOMMENDED IF THE SKEW LIMIT IS TO BE EXCEEDED.
4. SPLAY STIRRUPS IN ENDS OF STEM. SEE DETAIL SHEET NEXT 08 FOR THE LAYOUT OF STIRRUPS (SIMILAR TO NEXT F BEAMS).
5. THE DESIGNER SHALL DETAIL ADDITIONAL TOP LONGITUDINAL REINFORCING IN THE TOP FLANGE AT BEAM ENDS IF THE TOP FIBER STRESSES EXCEED 200 PSI (NOTE THAT SOME BRIDGE OWNERS HAVE DIFFERENT STRESS LIMITS IN THIS PORTION OF THE BEAM). 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 (ARTICLE 5.9.2.3.1b). THIS REINFORCING IS FOR CRACK WIDTH AND LENGTH CONTROL, NOT PREVENTION. IF FULLY TENSIONED TOP STRAND ARE INCLUDED IN THE DESIGN, IT IS RECOMMENDED THAT THEY NOT BE USED TO MEET THESE AASHTO PROVISIONS.



NEXT E BEAM - RAILING OPTIONS

NOTES:
1. THIS DETAIL IS SCHEMATIC. ACTUAL DETAIL WOULD NEED TO BE FULLY DESIGNED.
2. MASSDOT CONCRETE BARRIER SHOWN, OTHER BARRIERS SIMILAR.
3. THIS DETAIL CAN BE MODIFIED FOR ANY TYPICAL BARRIER SHAPE INCLUDING RAILINGS WITH CONCRETE CURBS.
4. ALL REINFORCING IN BEAM AND DECK POUR NOT SHOWN.

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NEXT E BEAM - DECK DETAILS		

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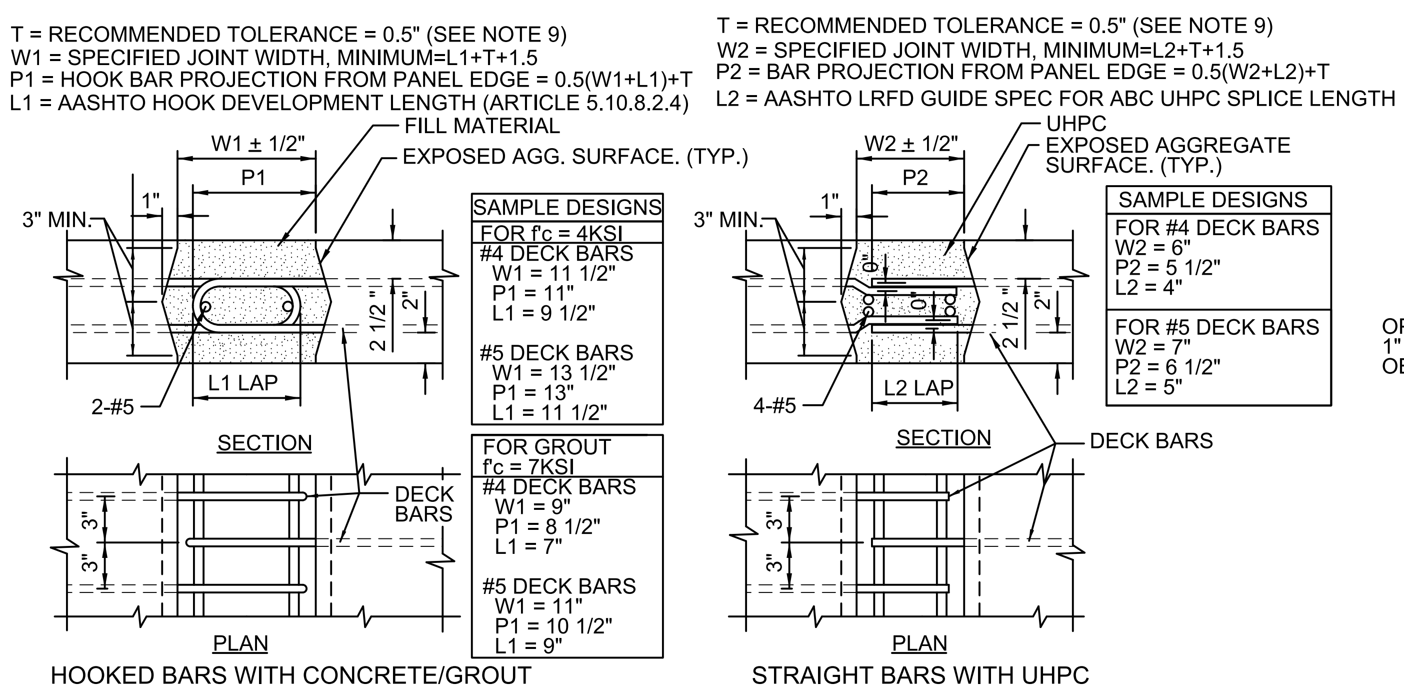
NORTHEAST EXTREME TEE (NEXT) BEAM DETAILS (2nd Edition)

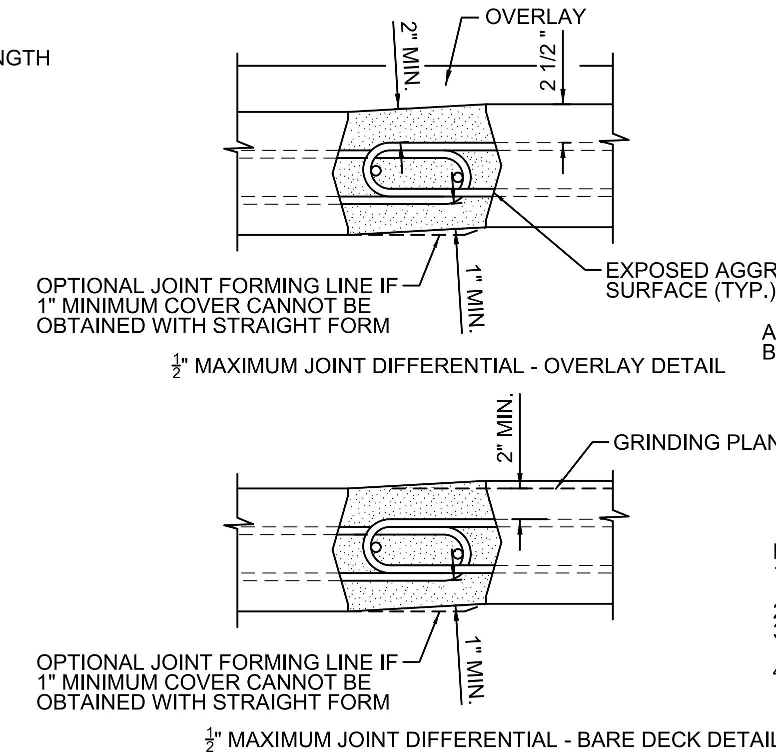
REVISIONS

NO.	DATE	DESCRIPTION

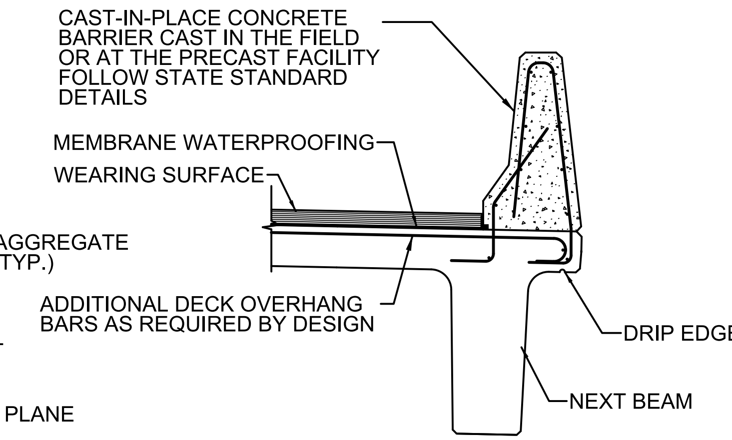


NEXT D BEAM - FLANGE CONNECTOR DETAILS

NOTES:
1. CONNECTOR 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. EXPOSED AGGREGATE SURFACE OF THE FACES OF THE KEYS IS RECOMMENDED TO IMPROVE GROUT BOND AND MINIMIZE POTENTIAL FOR LEAKAGE.
5. DESIGNERS ARE RESPONSIBLE FOR THE VERIFICATION OF THE DESIGN OF THE REINFORCEMENT IN THIS JOINT. FOLLOW THE PROVISIONS OF THE AASHTO LRFD GUIDE SPECIFICATIONS FOR ABC. SAMPLE DESIGNS SHOWN IN BOXES.
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 WIDTH OF THE JOINT WILL AFFECT THE BEAM SPACING.
9. THE JOINT WIDTH TOLERANCE IS USED TO ACCOMMODATE THE FABRICATION AND ERECTION TOLERANCES
10. PRELIMINARY CALCULATIONS HAVE SHOWN THAT #4 BARS SHOULD WORK IN ALL NEXT D BEAM SPACINGS. IF #5 BARS HOOKED ARE DESIRED, THE TOP FLANGE (DECK) THICKNESS MAY NEED TO BE INCREASED IN ORDER TO FIT THE BAR HOOK WITHIN THE TOP FLANGE WITH THE RECOMMENDED CONCRETE COVER SHOWN. MAINTAIN RECOMMENDED BOTTOM COVER TO AVOID INTERFERENCE WITH TOP STAND IN BEAM.

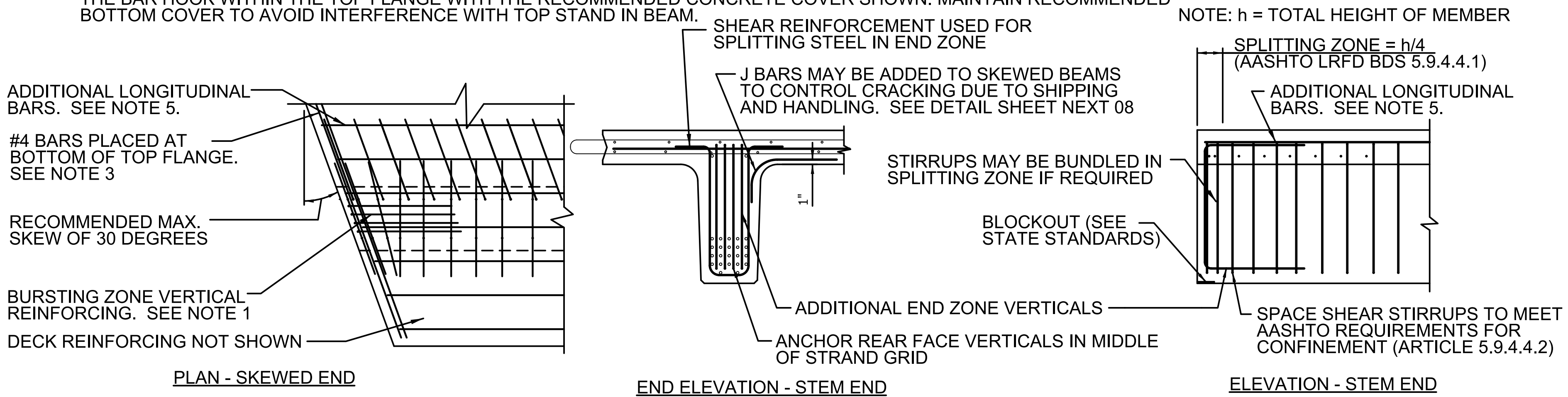


CAMBER DIFFERENTIAL DETAILS



NEXT D BEAM - BARRIER/RAIL ATTACHMENT

NOTES:
1. THIS DETAIL IS SCHEMATIC. ACTUAL DETAIL WOULD NEED TO BE FULLY DESIGNED.
2. CONCRETE PARAPET SHOWN. OTHER PARAPETS SIMILAR.
3. THIS DETAIL CAN BE MODIFIED FOR ANY TYPICAL CONCRETE PARAPET SHAPE.
4. ALL REINFORCING IN BEAM NOT SHOWN.

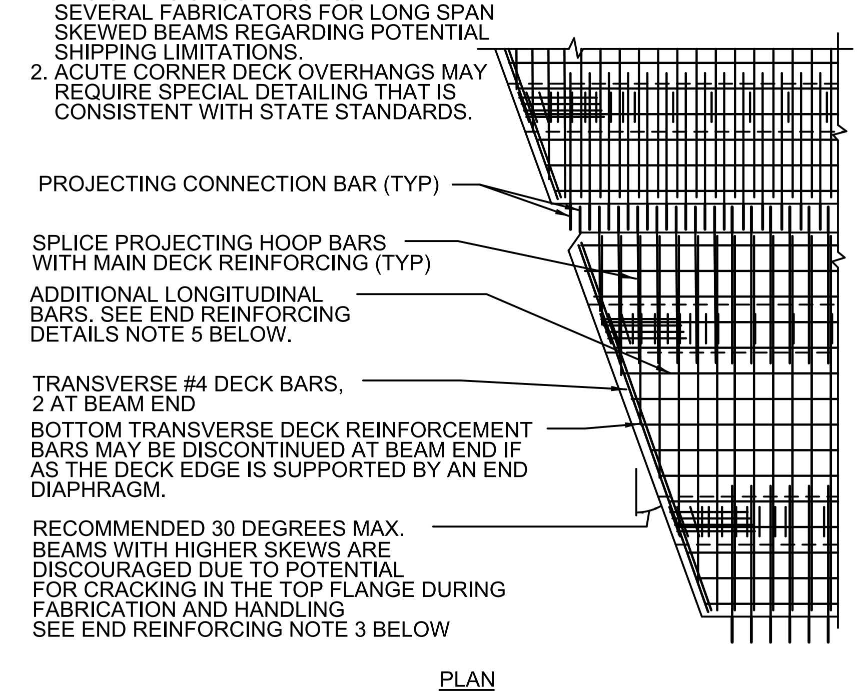


NEXT D BEAM - END REINFORCING DETAILS

NOTES:

1. THE BARS SHOWN ARE APPROXIMATELY THE MAXIMUM NUMBER THAT CAN BE FIT WITHIN THE NEXT 28 D BEAM. SOME OR ALL OF THESE ADDITIONAL END VERTICAL BARS MAY NOT BE NECESSARY DEPENDING ON THE DESIGN.
2. THE AMOUNT OF SPLITTING REINFORCING MAY BE REDUCED BY DEBONDING STRAND IN THIS AREA. ADDITIONAL SPLITTING REINFORCING SHOULD BE PLACED IN AREAS WHERE DEBONDING IS TERMINATED.
3. PLACE 2-#4 BARS AT THE BEAM END IN THE TOP FLANGE TO CONTROL TOP FLANGE END CRACKING DURING RELEASE AND HANDLING. THE MOST COMMON FORM OF POTENTIAL CRACKING IN THIS AREA IS A SERIES OF VERTICAL HAIRLINE CRACKS THROUGH THE INSIDE RADIUS OF THE TOP FLANGE / BEAM STEM INTERFACE RUNNING PARALLEL TO THE STEM. #5 J BARS ARE USED TO SUPPLEMENT THIS REINFORCING.
THE TWO J SHAPED BARS SHOWN MAY BE COMBINED INTO ONE INVERTED U SHAPED BAR. THE USE OF A SEMI-INTEGRAL BACKWALL THAT IS CAST IN THE SHOP AS A SECONDARY POUR CAN HELP TO PREVENT THE GROWTH OF THESE CRACKS DURING SHIPPING AND ERECTION. THIS IS RECOMMENDED IF THE SKEW LIMIT IS TO BE EXCEEDED.
4. BEAMS MAY BE FABRICATED WITH HIGHER SKEWS, HOWEVER ADDITIONAL CRACKING IN THE TOP FLANGE MAY OCCUR.
5. THE DESIGNER SHALL DETAIL ADDITIONAL TOP LONGITUDINAL REINFORCING IN THE TOP FLANGE AT BEAM ENDS IF THE TOP FIBER STRESSES EXCEED 200 PSI (NOTE THAT SOME BRIDGE OWNERS HAVE DIFFERENT STRESS LIMITS IN THIS PORTION OF THE BEAM). 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 (ARTICLE 5.9.2.3.1b). THIS REINFORCING IS FOR CRACK WIDTH AND LENGTH CONTROL, NOT PREVENTION. IF TOP LONGITUDINAL REINFORCING IS USED, THE ALLOWABLE TENSILE STRESSES MUST STILL BE LIMITED TO THE THE REQUIREMENTS SPECIFICED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

NOTES:
1. DESIGNERS SHOULD CONSULT WITH SEVERAL FABRICATORS FOR LONG SPAN SKEWED BEAMS REGARDING POTENTIAL SHIPPING LIMITATIONS.
2. ACUTE CORNER DECK OVERHANGS MAY REQUIRE SPECIAL DETAILING THAT IS CONSISTENT WITH STATE STANDARDS.



NEXT D BEAM - MAIN DECK REINFORCING DETAILS SKEWED BEAM ENDS

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NORTHEAST EXTREME TEE (NEXT) BEAM DETAILS (2nd Edition)

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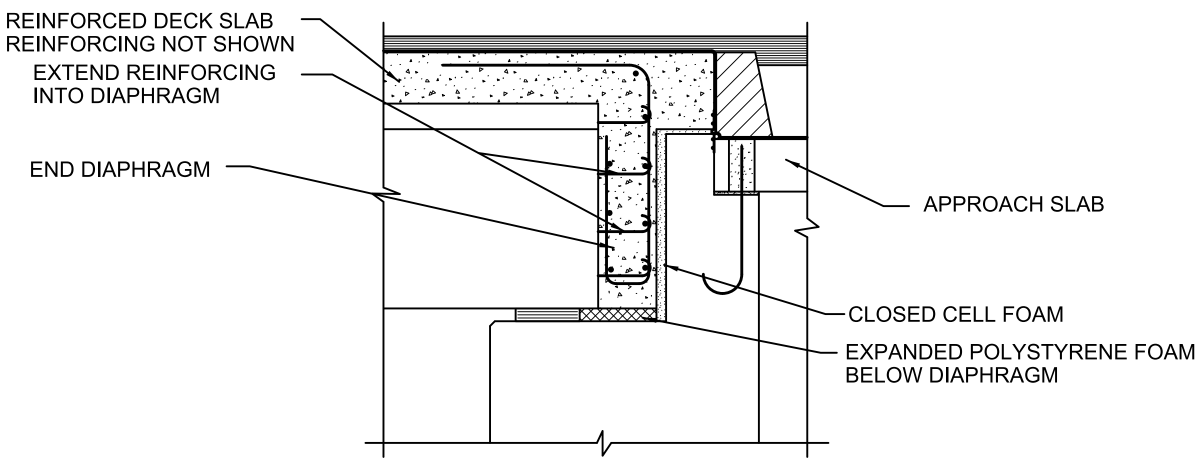
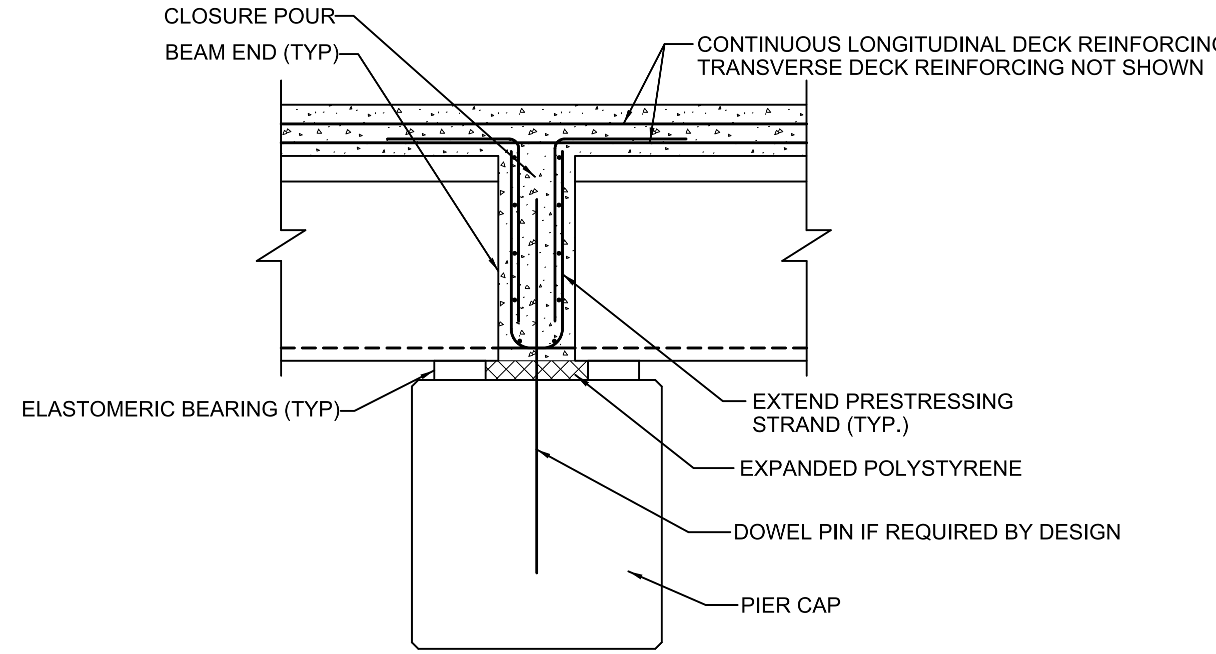


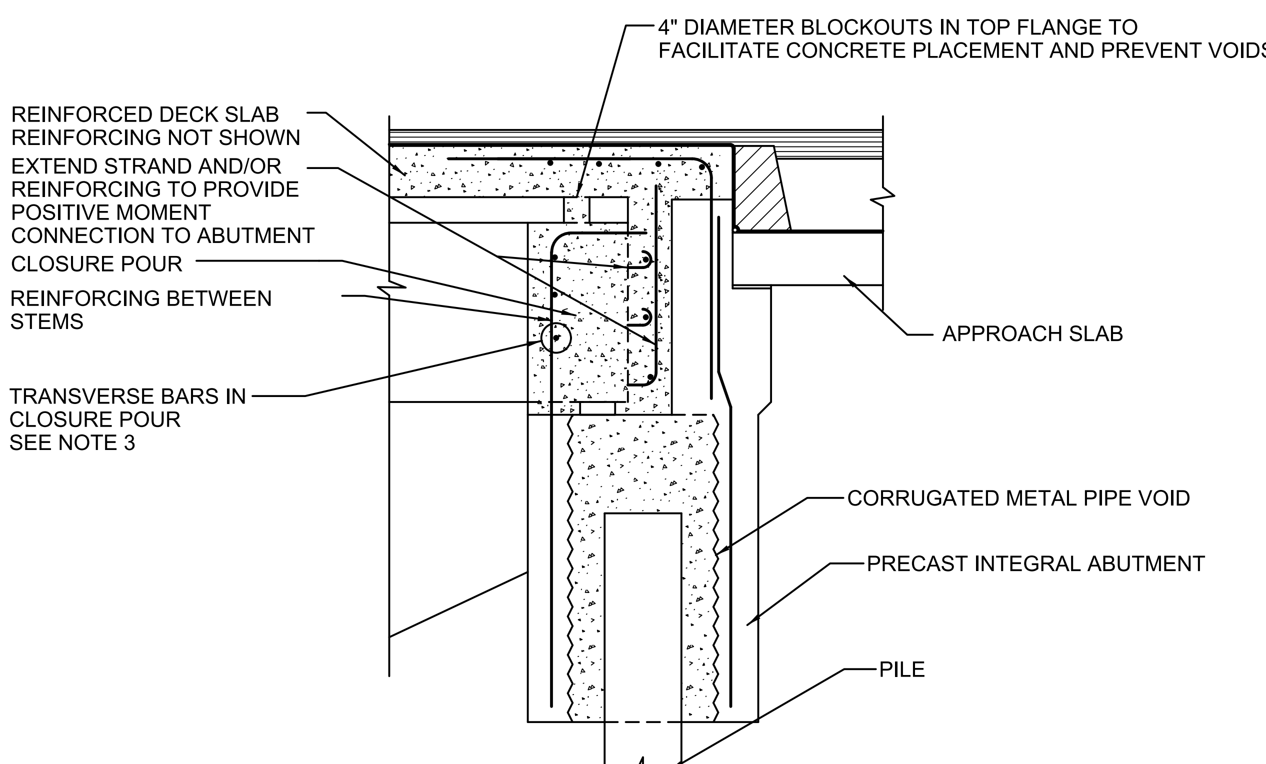
NEXT F - SAMPLE END DIAPHRAGM DETAIL CANTILEVER ABUTMENT

NOTES:
1. THESE DETAILS ARE BASED ON MASSACHUSETTS DEPARTMENT OF TRANSPORTAION STANDARDS FOR TYPE 1 APPROACH SLABS. DETAILS FOR OTHER STATES WILL VARY.
2. INTERMEDIATE DIAPHRAGMS ARE NOT REQUIRED.



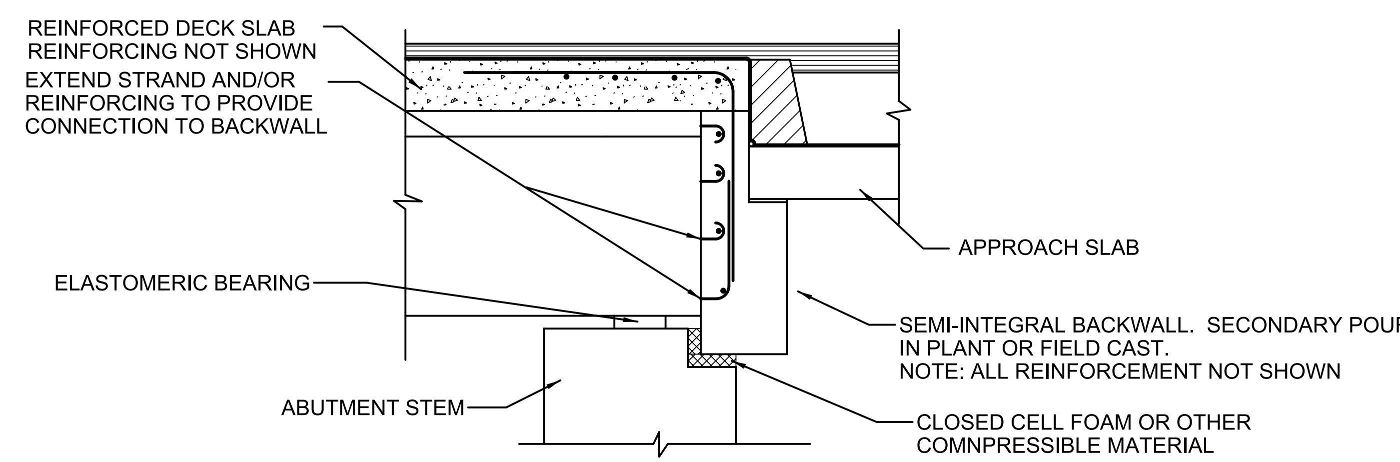
NEXT F - SAMPLE PIER CONTINUITY DETAIL

NOTES:
1. THE DETAILS SHOWN ARE SCHEMATIC. REFER TO STATE STANDARDS FOR SPECIFIC DETAILS.
2. THE DESIGNER SHOULD SPECIFY THE TIMING AND SEQUENCE OF THE PLACEMENT OF THE DECK AND CLOSURE POUR CONCRETE IN ORDER TO ALLOW FOR BEAM ROTATION WITHOUT CRACKING OF THE END DIAPHRAGM.



NEXT F - 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. IT IS PREFERRED TO DESIGN THE END DIAPHRAGM WITH THE TRANSVERSE BARS NOT PASSING THROUGH THE BEAM STEM. IF BARS ARE TO BE PASSED THROUGH THE STEM, THE SLEEVES CAST INTO THE BEAM SHOULD BE LOCATED ABOVE THE STRANDS.



NEXT F - 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.

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NEXT F BEAM - SUBSTRUCTURE DETAILS		

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NORTHEAST EXTREME TEE (NEXT) BEAM DETAILS (2nd Edition)

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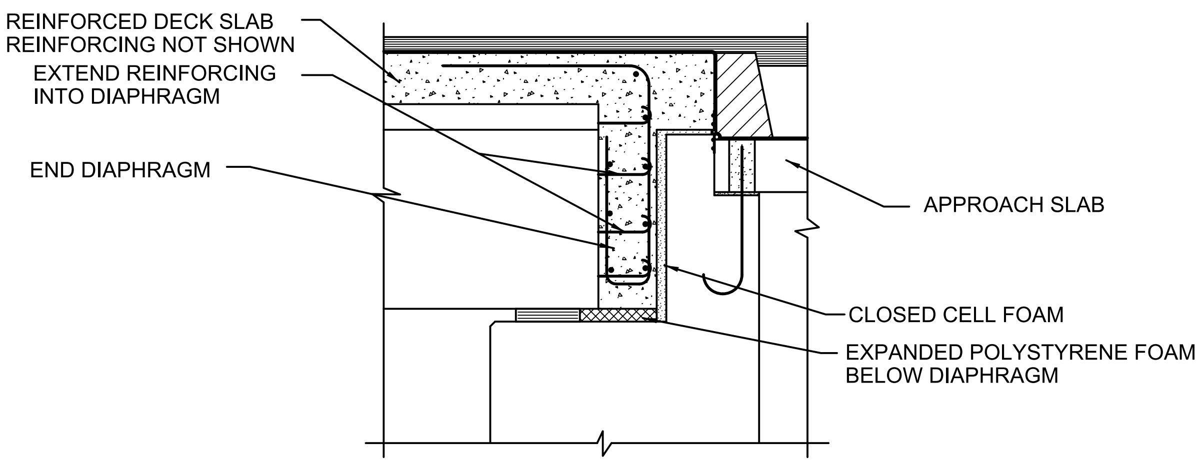
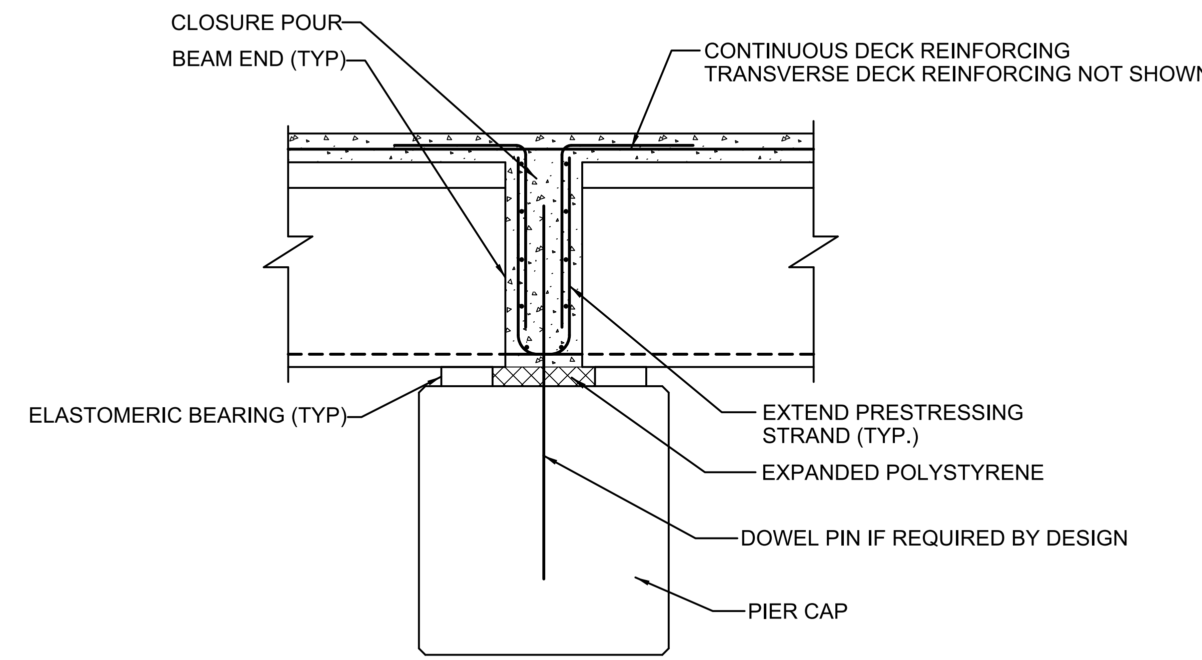


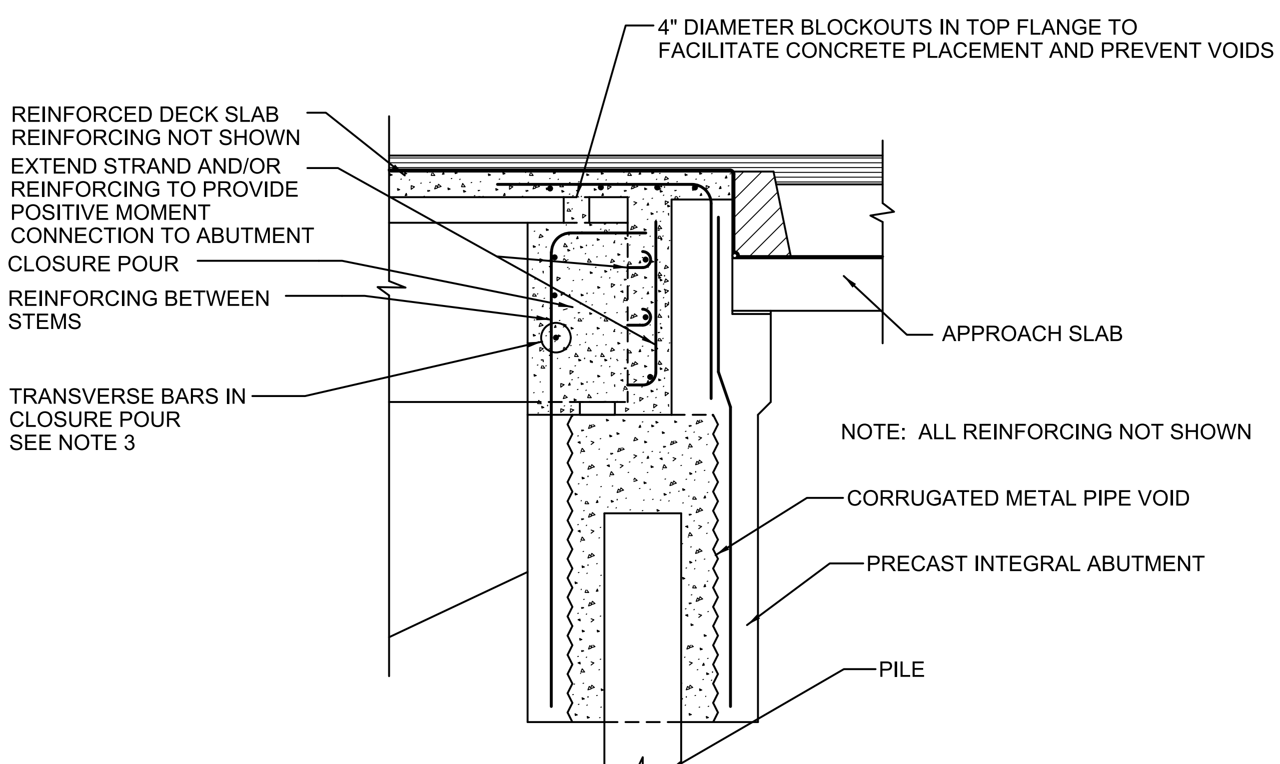
NEXT E - SAMPLE END DIAPHRAGM DETAIL CANTILEVER ABUTMENT

NOTES:
1. THESE DETAILS ARE BASED ON MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARDS FOR TYPE 1 APPROACH SLABS. DETAILS FOR OTHER STATES WILL VARY.
2. INTERMEDIATE DIAPHRAGMS ARE NOT REQUIRED.



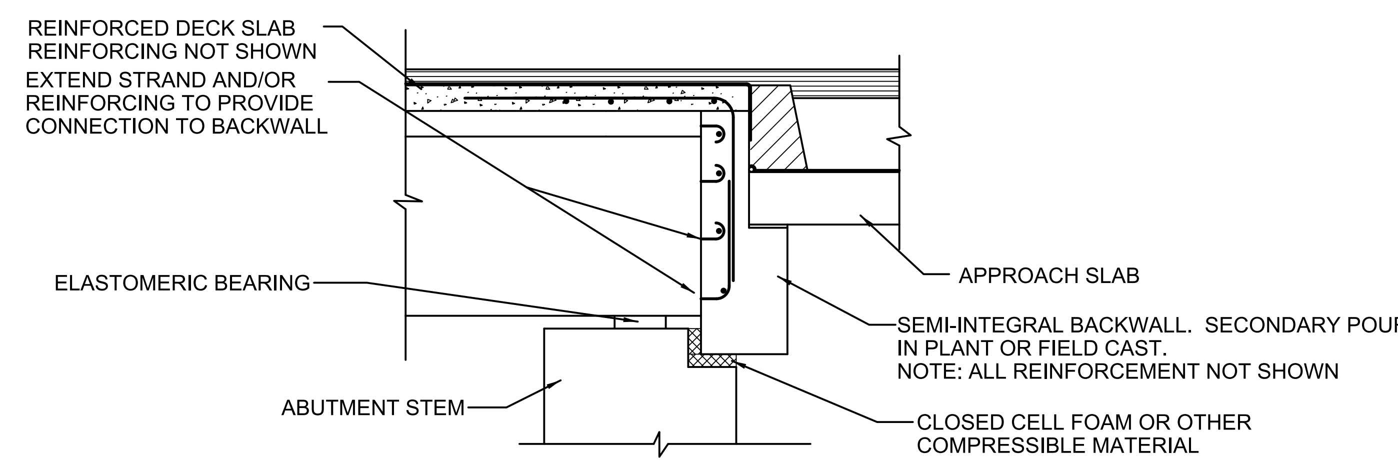
NEXT E - SAMPLE PIER CONTINUITY DETAIL

NOTES:
1. THE DETAILS SHOWN ARE SCHEMATIC. REFER TO STATE STANDARDS FOR SPECIFIC DETAILS.
2. THE DESIGNER SHOULD SPECIFY THE TIMING AND SEQUENCE OF THE PLACEMENT OF THE DECK AND CLOSURE POUR CONCRETE IN ORDER TO ALLOW FOR BEAM ROTATION WITHOUT CRACKING OF THE END DIAPHRAGM.



NEXT E - 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. IT IS PREFERRED TO DESIGN THE END DIAPHRAGM WITH THE TRANSVERSE BARS NOT PASSING THROUGH THE BEAM STEM. IF BARS ARE TO BE PASSED THROUGH THE STEM, THE SLEEVES CAST INTO THE BEAM SHOULD BE LOCATED ABOVE THE STRANDS.



NEXT E - 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.

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NORTHEAST EXTREME TEE (NEXT) BEAM DETAILS (2nd Edition)

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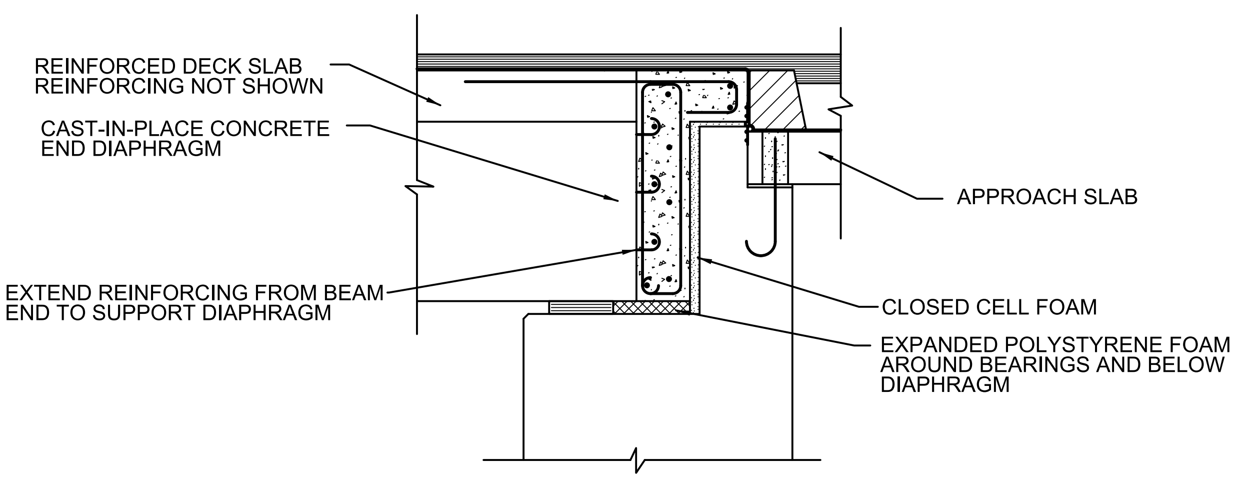
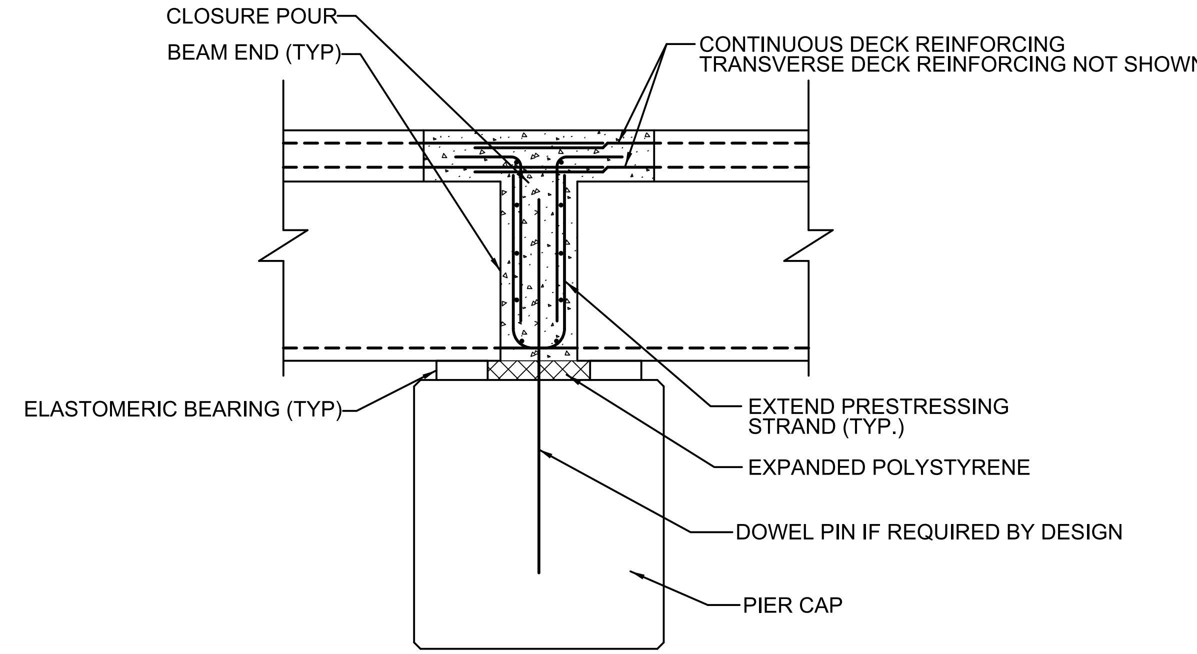


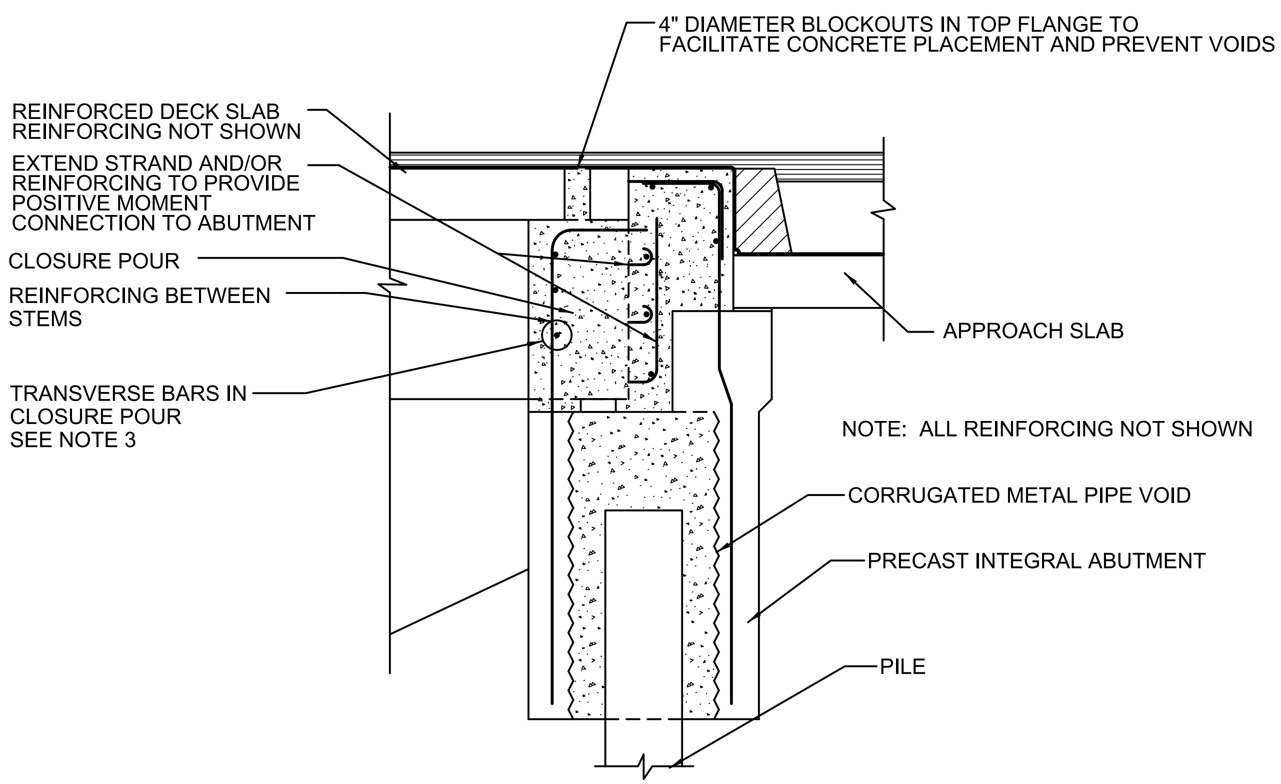
NEXT D - SAMPLE END DIAPHRAGM DETAIL CANTILEVER ABUTMENT

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.



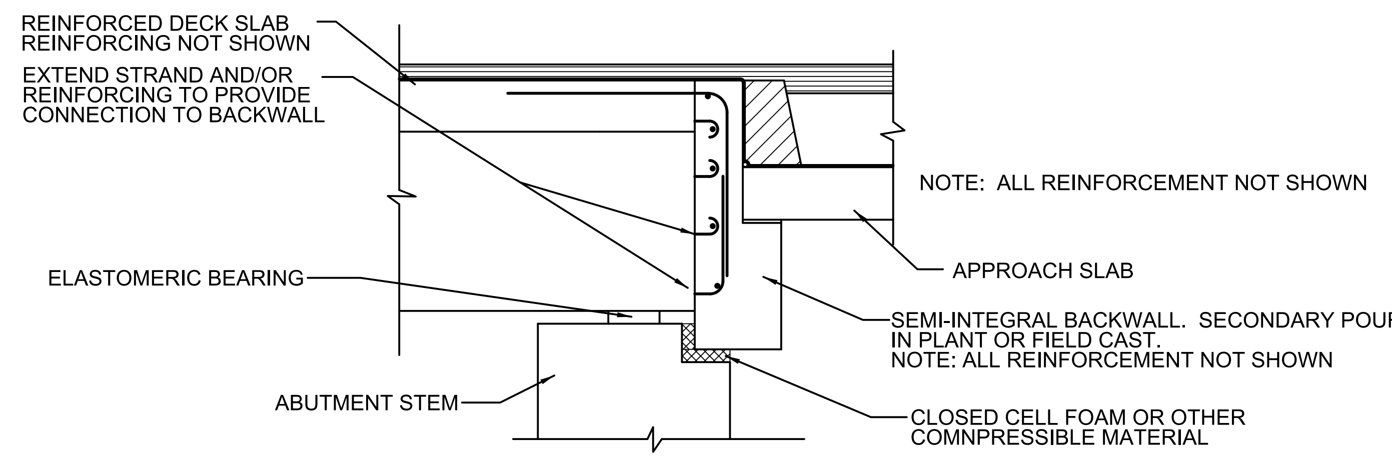
NEXT D - SAMPLE PIER CONTINUITY DETAIL

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.



NEXT D - 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. IT IS PREFERRED TO DESIGN THE END DIAPHRAGM WITH THE TRANSVERSE BARS NOT PASSING THROUGH THE BEAM STEM. IF BARS ARE TO BE PASSED THROUGH THE STEM, THE SLEEVES CAST INTO THE BEAM SHOULD BE LOCATED ABOVE THE STRANDS.



NEXT D - 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.

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NORTHEAST EXTREME TEE (NEXT) BEAM DETAILS (2nd Edition)

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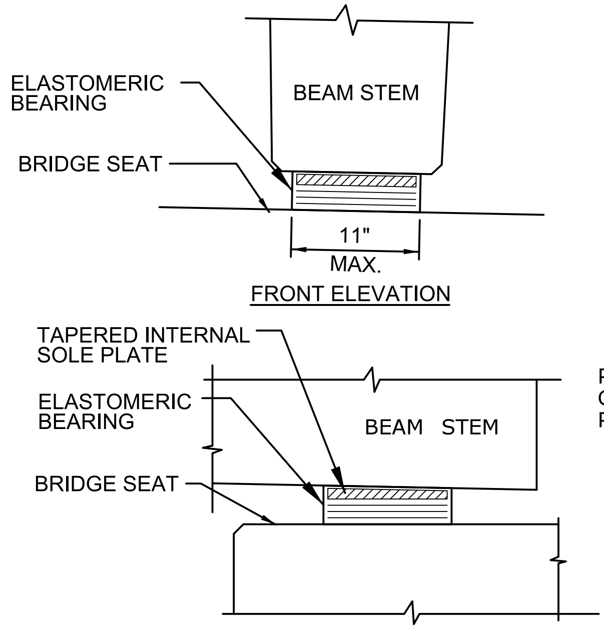
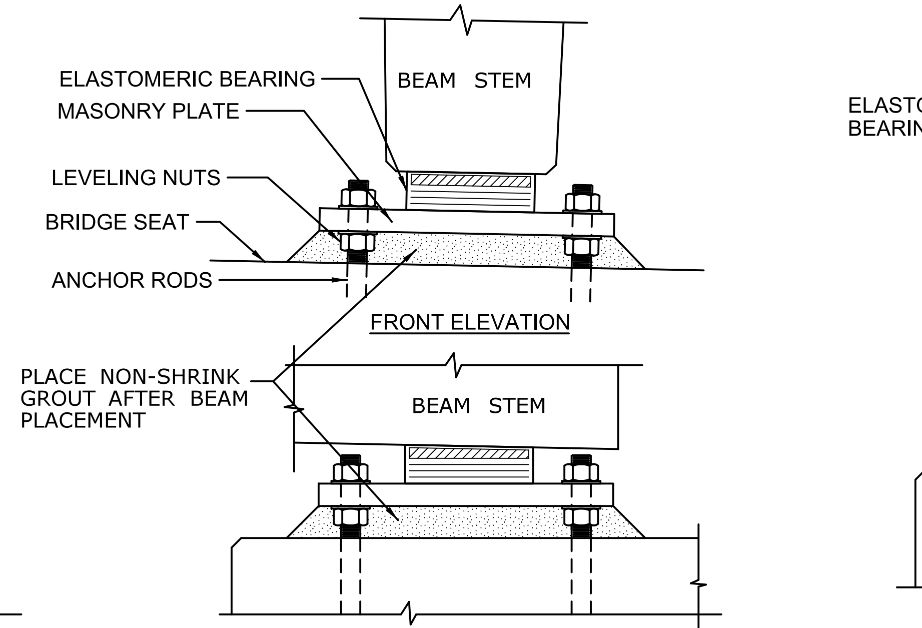


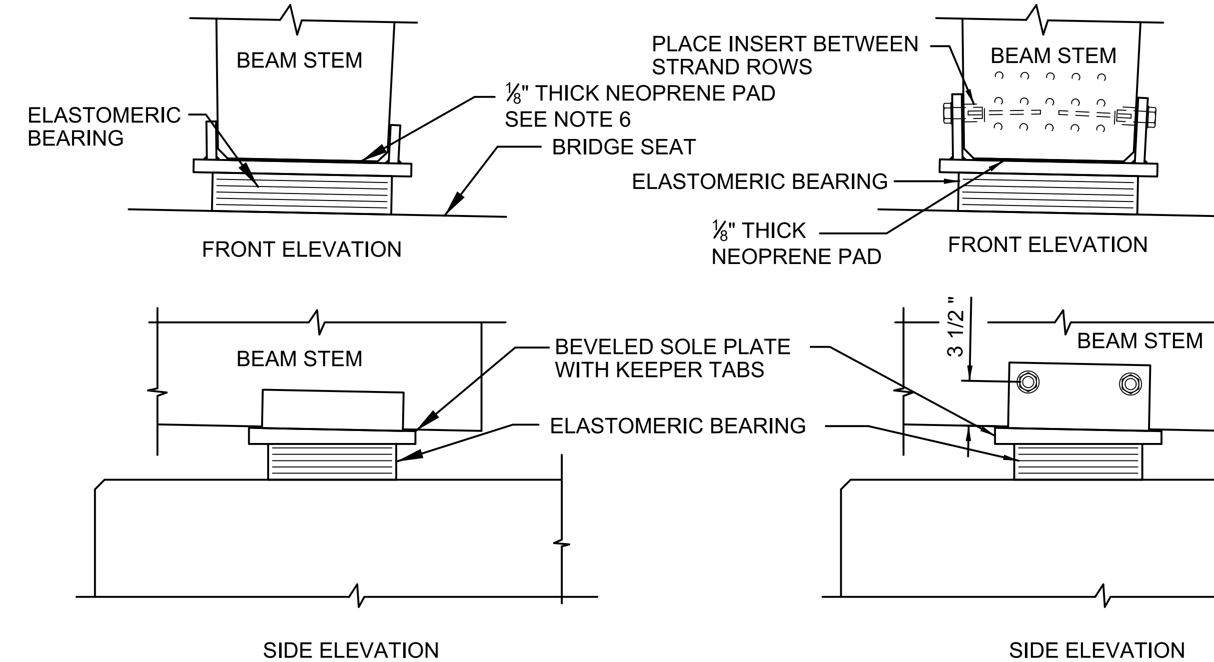
NARROW ELASTOMERIC BEARING

NOTES:
1. THESE DETAILS ARE ONLY REQUIRED FOR NON-INTEGRAL SUBSTRUCTURES WITH BEARINGS THAT ARE EQUAL TO OR LESS THAN 11 1/2" WIDE.
2. A TAPERED ELASTOMERIC BEARINGS 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.
4. ELASTOMERIC SHIMS MAY BE USED TO PROPERLY SEAT BEAMS AND ADJUST THE ELEVATION OF THE TOP OF THE BEAM.
5. TYPICAL KEEPER BLOCKS MAY BE USED BETWEEN THE STEMS FOR LATERAL RESISTANCE.



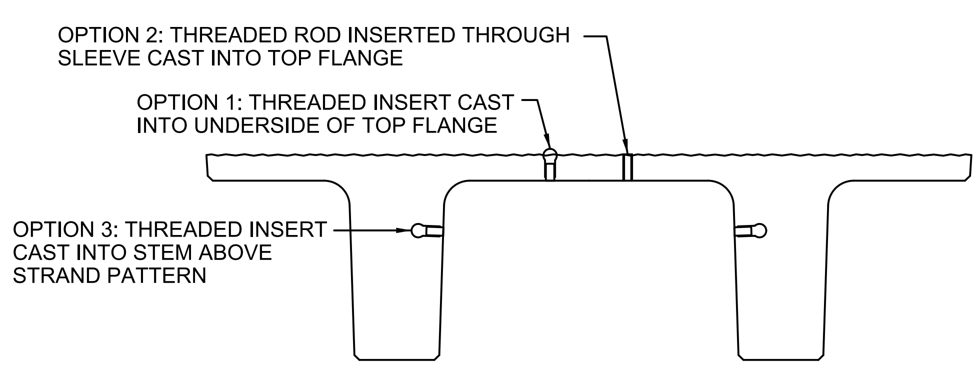
OPTIONAL ADJUSTABLE BEARING

NOTES:
1. THESE DETAILS CAN BE USED FOR HIGH SKEW BEAMS WHERE DIFFERENTIAL ELEVATIONS OF BEAM STEMS MIGHT OCCUR DUE TO BEAM CAMBER.
2. THESE DETAILS ARE ONLY REQUIRED FOR NON-INTEGRAL SUBSTRUCTURES.
2. GRADE ADJUSTMENT PLATES CAN BE USED WITH NARROW OR WIDE BEARING DETAILS.
3. SIZE THE SOLE PLATE TO SUPPORT THE SELF WEIGHT OF THE BEAMS. PLACE GROUT PRIOR TO PLACING ADDITIONAL LOAD ON THE BEARING.
4. BRIDGE SEAT AND MASONRY PLATE SHOULD BE SLOPED TO MATCH THE SLOPE OF THE BEAM TOPS ALONG THE CENTERLINE OF BEARINGS.



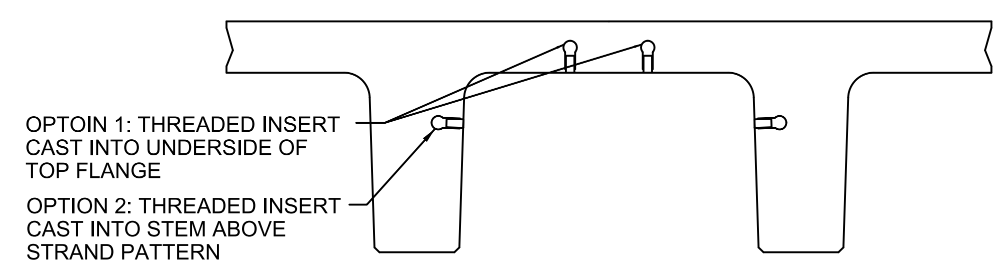
WIDE ELASTOMERIC BEARINGS

NOTES:
1. THESE DETAILS ARE ONLY REQUIRED FOR NON-INTEGRAL SUBSTRUCTURES.
2. BEARING MAY BE TAPERED IN LIEU OF THE BEVELED SOLE PLATE. SEE NARROW BEARING DETAILS ON THIS SHEET.
3. BRIDGE SEAT AND BEARING ASSEMBLY SHOULD BE SLOPED TO MATCH THE CROSS SLOPE OF THE ROADWAY ABOVE.
4. THE SOLE PLATE CAN BE KEPT IN PLACE WITH FRICTION (NON-BOLTED OPTION). ADDITIONAL FIXITY CAN BE OBTAINED BY BOLTING THE SIDE TABS INTO THE BEAM STEM (BOLTED OPTION). PLACE INSERT BETWEEN STRAND ROWS. DESIGNER TO SIZE INSERT BASED ON ANTICIPATED LOADS. LOOP FERRULE INSERT SHOWN, OTHERS SIMILAR.
5. THE NON-BOLTED OPTION IS THE PREFERRED OPTION. USE OF THE BOLTED OPTION MAY REQUIRE THE DRILLING OF HOLES IN THE BEAM FORM FOR THE INSERTS.
6. ELASTOMERIC SHIMS MAY BE USED BETWEEN THE BOTTOM OF STEM AND TOP OF PLATE ON NON-BOLTED BEARINGS TO PROPERLY SEAT BEAMS AND ADJUST THE ELEVATION OF THE TOP OF THE BEAM. BOLTED BEARINGS WOULD REQUIRE THE SHIMS TO BE PLACED ON TOP OF OR BELOW THE BEARING.
7. TYPICAL KEEPER BLOCKS MAY BE USED BETWEEN THE STEMS FOR LATERAL RESISTANCE.
8. THE BOLTED PLATE OPTION SHOWN MAY BE MODIFIED TO PRODUCE A TYPICAL FIXED ELASTOMERIC BEARING. REFER TO STATE STANDARDS.



NEXT F AND E BEAMS SAMPLE UTILITY SUPPORT

NOTES:
1. HANGER RODS FOR UTILITIES SHOULD BE ATTACHED TO THE BEAM BY MEANS OF CAST-IN-PLACE INSERTS OR THROUGH SLEEVES CAST INTO THE TOP FLANGE. 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. REFER TO STATE STANDARDS AND UTILITY COMPANY STANDARDS FOR SPECIFIC UTILITY SUPPORT REQUIREMENTS.
3. THIS DETAIL SHOWS THE UTILITY SUPPORT BETWEEN THE BEAM STEMS. OTHER LOCATIONS ARE ACCEPTABLE. REFER TO OWNER REQUIREMENTS FOR UTILITY LOCATIONS.
4. THE DESIGN ENGINEER SHOULD DETAIL ANY ADDITIONAL REINFORCING REQUIRED TO RESIST THE UTILITY LOADS.



NEXT D BEAM SAMPLE UTILITY SUPPORT

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. REFER TO STATE STANDARDS AND UTILITY COMPANY STANDARDS FOR SPECIFIC UTILITY SUPPORT REQUIREMENTS.
3. THIS DETAIL SHOWS THE UTILITY SUPPORT BETWEEN THE BEAM STEMS. OTHER LOCATIONS ARE ACCEPTABLE. REFER TO OWNER REQUIREMENTS FOR UTILITY LOCATIONS.
4. THE DESIGN ENGINEER SHOULD DETAIL ANY ADDITIONAL REINFORCING REQUIRED TO RESIST THE UTILITY LOADS.

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NORTHEAST EXTREME TEE (NEXT) BEAM DETAILS (2nd Edition)

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