

INDIANA DEPARTMENT OF TRANSPORTATION

Driving Indiana's Economic Growth

Design Memorandum No. 08-15 Technical Advisory

July 25, 2008

TO: All Design, Operations, District Personnel, and Consultants

FROM: /s/ Anthony L. Uremovich

Anthony L. Uremovich

Design Resources Engineer

Production Management Division

SUBJECT: Minimum Pile Length and Integral End Bents

REVISES: Indiana Design Manual Sections 59-2.02, 66-3.03, and 67-1.0

EFFECTIVE: For Maximum Pile Length,

Request for Geotechnical Report After Date of This Memorandum

For Integral End Bents,

Start Plan Development After Date of This Memorandum

I. Minimum Pile Length

The minimum pile length should be that shown in Figure 08-15A, below.

Pile Size	Minimum Length, ft (m)		
	Clay	Sand	
HP 10	30 (9)	25 (8)	
HP 12	35 (11)	25 (8)	
HP 14	40 (12)	30 (9)	
CFT 14	50 (15)	35 (11)	

MINIMUM PILE LENGTH

Figure 08-15A

If the minimum length shown in Figure 08-15A cannot be attained, the designer must provide calculations to support the use of a shorter length.

II. Pile Embedment into Integral-End-Bent Cap

The embedment of piles into the cap should be 24 in. (600 mm). *Indiana Design Manual* Figures 67-1B and 67-1C have been revised to reflect this, and are attached hereto. The embedded portion should not be wrapped with polystyrene.

III. Maximum Length of Bridge with Integral End Bents

The maximum length of an empirically-designed integral-end-bents bridge should be as shown in Figure 08-15B, below. This figure supersedes *Indiana Design Manual* Figures 59-2B and 67-1A.

Structure Type	Highway Alignment Across Bridge	Maximum Skew	Maximum Bridge Length	Maximum to Zero Point
Reinforced Concrete Slab	No Restrictions	No Restrictions	500 ft (150 m) *	250 ft (75 m) *
Structural Steel	Tangent Only **	30 deg ***	500 ft (150 m) *	250 ft (75 m) *
Prestressed Concrete	No Restrictions	30 deg ***	500 ft (150 m) *	250 ft (75 m) *

Notes:

- * The maximum length indicated may be increased, subject to approval by the Structural Services Office manager, if a rational analysis of induced pile loads indicates that the piles are not overloaded. Two rational analysis methods are described in the Iowa Department of Transportation report, Pile Design and Tests for Integral Abutment Bridges. See Indiana Design Manual Section 67-1.03(03) for an alternative analysis in lieu of the above criteria.
- ** The horizontal alignment may be curved as long as curved beams are not used.
- *** A skew of greater than 30 deg but equal to or less than 45 deg will be permitted if the maximum bridge length does not exceed 250 ft (75 m), or if the maximum to zero point does not exceed 125 ft (37.5 m).

USE OF INTEGRAL END BENTS

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Attachments

[P:\Structural Services\Design Memos\Signed\0815-ta.doc]



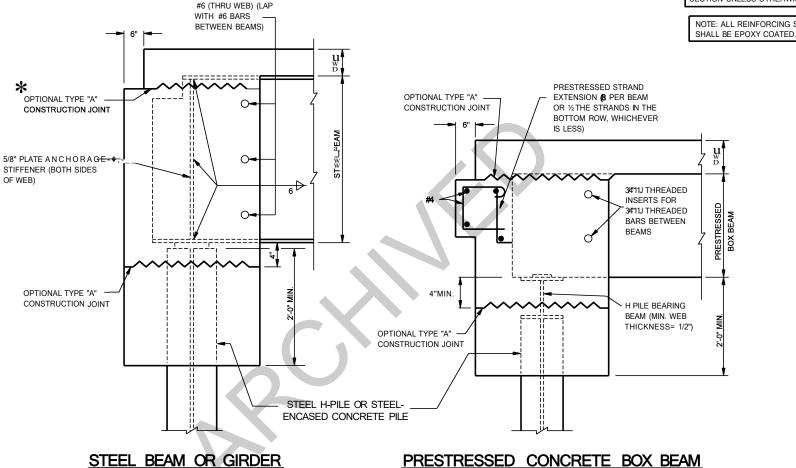
NOTE: ALL REINFORCING STEEL SHALL BE EPOXY COATED. 1 OPTIONAL TYPE "A" 2 LAYERS POLYETHYLENE CONSTRUCTION JOINT (MIN. THICKNESS 6 MILS.) 1/2" x4" **EXPANDED** R.C. BR. POLYSTYRENE TYPE IA JOINT #6 (SPA. WITH STIRRUPS) APPR. [™] M N O E CK Σ #5 @ 1'-0" 1 1/2" x 1 1/2" FILLET DENSE GRADED ≥ เS SUBBASE #6 (THRU BEAMS) (LAP W/ #6 BARS GEOTEXTILES PRASTRABBAD BETWEEN BEAMS) 1/2" x 2" (SEE STANDARD EXPANDED DRAWINGS) . #7 (BETWEEN BEAMS) POLYSTYRENE AGGREGATE FOR PRESTR. STRAND EXTENSION END BENT BACKFILL (BOTTOM ROW ONLY) #7 x FLANGE WIDTH 6"MIN. #7@ 1'-0" MAX. -2" CL. (BOTH FACES) 150 END BENT DRAIN PIPE **OPTIONAL TYPE "A"** 6" AGGREGATE FOR END BENT **BACKFILL** STEEL H-PILE OR **BELOW PIPE** STEEL ENCASED CONCRETE PILE W/2 W/2 W =2'-6" MIN. 3'-0" BERM

PRESTRESSED CONCRETE I-BEAM

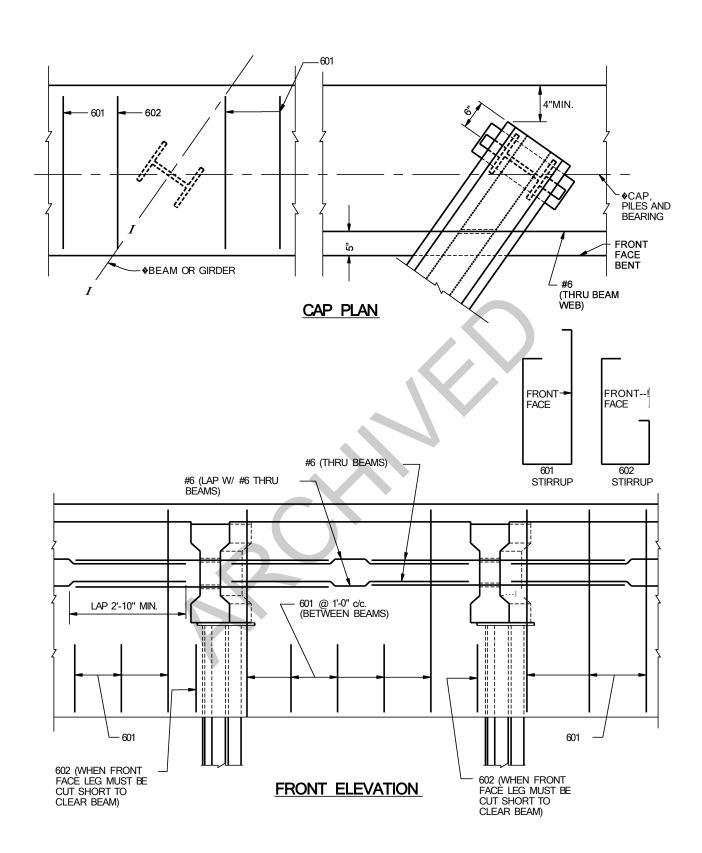
SUGGESTED INTEGRAL END BENT DETAILS (Beams Attached Directly to Piling, Method A) Figure 67-1 B (Page 1 of 4)

REINFORCING DETAILS, BACKFILL BEHIND END BENT AND SIMILAR DETAILS ARE AS SHOWN ON THE PRESTRESSED CONCRETE I-BEAM SECTION UNLESS OTHERWISE NOTED.

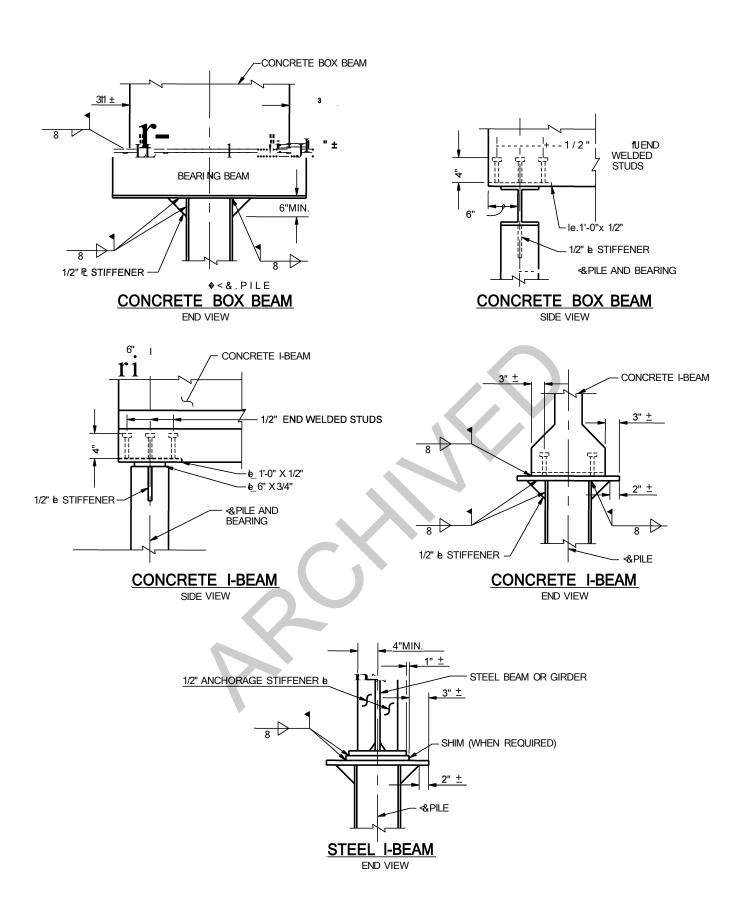
NOTE: ALL REINFORCING STEEL



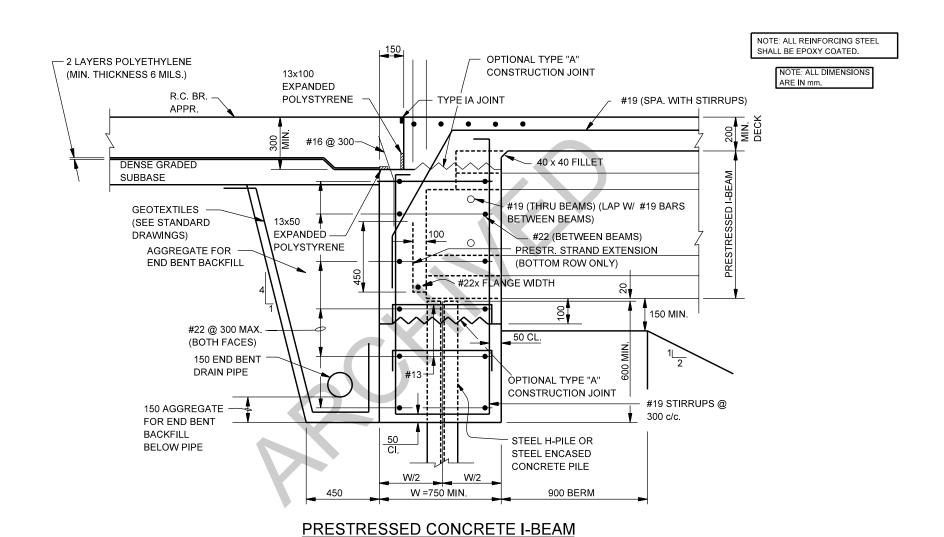
SUGGESTED INTEGRAL END BENT DETAILS (Beams Attached Directly to Piling, Method A) Figure 67-1 B (Page 2 of 4)



SUGGESTED INTEGRAL END BENT DETAILS (Beams Attached Directly to Piling, Method A) Figure 67-1 B (Page 3 of 4)



SUGGESTED INTEGRAL END BENT DETAILS (Beams Attached Directly to Piling, Method A) Figure 67-1 B (Page 4 of 4)



SUGGESTED INTEGRAL END BENT DETAILS (Beams Attached Directly to Piling, Method A) Figure 67-1B (Page 1 of 4)

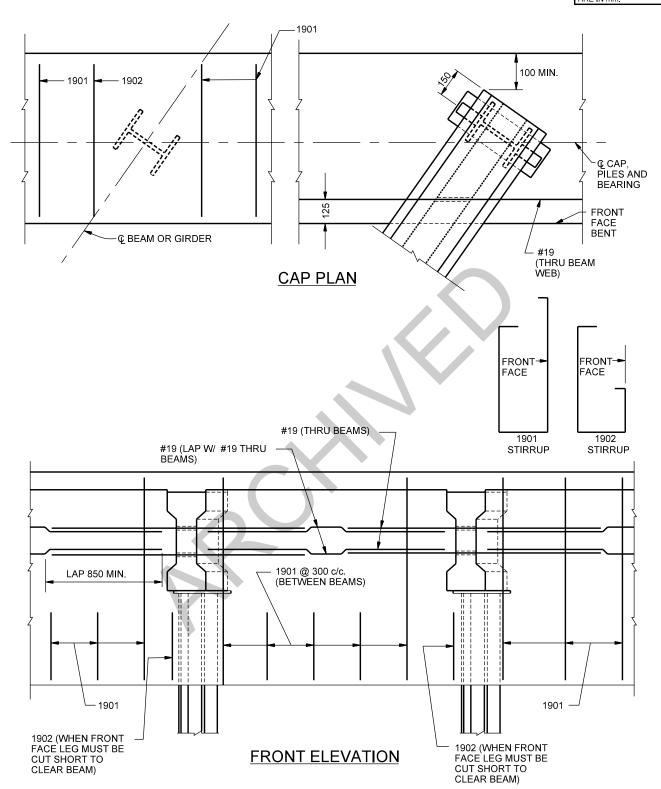
BEHIND END BENT AND SIMILAR DETAILS ARE AS SHOWN ON THE PRESTRESSED CONCRETE I-BEAM SECTION UNLESS OTHERWISE NOTED #19 (THRU WEB) (LAP WITH #19 BARS NOTE: ALL REINFORCING STEEL BETWEEN BEAMS) SHALL BE EPOXY COATED. 150 NOTE: ALL DIMENSIONS ARE IN mm. PRESTRESSED STRAND OPTIONAL TYPE "A" -**EXTENSION (8 PER BEAM** ★ OPTIONAL TYPE "A" CONSTRUCTION JOINT OR 1/2 THE STRANDS IN THE CONSTRUCTION JOINT BOTTOM ROW, WHICHEVER IS LESS) DECK 16 PLATE ANCHORAGE STIFFENER (BOTH SIDES OF WEB) 19ø THREADED INSERTS FOR 19ø THREADED \circ **BOX BEAM** BARS BETWEEN BEAMS OPTIONAL TYPE "A" 100 MIN. CONSTRUCTION JOINT H PILE BEARING BEAM (MIN. WEB THICKNESS = 11) OPTIONAL TYPE "A" CONSTRUCTION JOINT STEEL H-PILE OR STEEL-**ENCASED CONCRETE PILE**

PRESTRESSED CONCRETE BOX BEAM

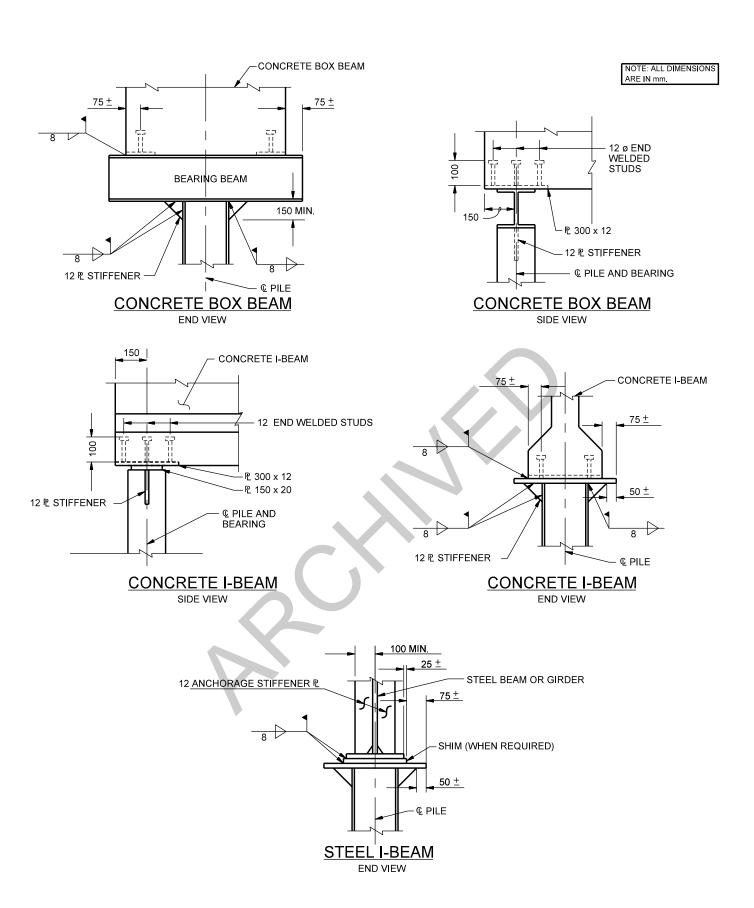
REINFORCING DETAILS, BACKFILL

SUGGESTED INTEGRAL END BENT DETAILS
(Beams Attached Directly to Piling, Method A)
Figure 67-1B
(Page 2 of 4)

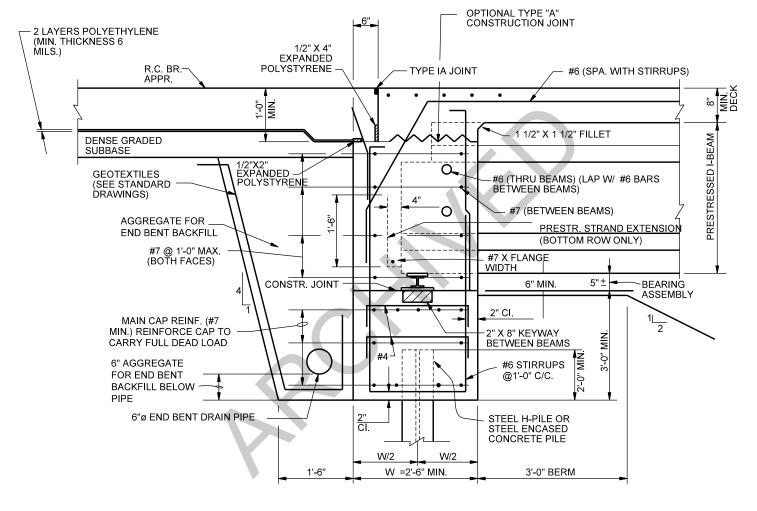
STEEL BEAM OR GIRDER



SUGGESTED INTEGRAL END BENT DETAILS (Beams Attached Directly to Piling, Method A) Figure 67-1B (Page 3 of 4)



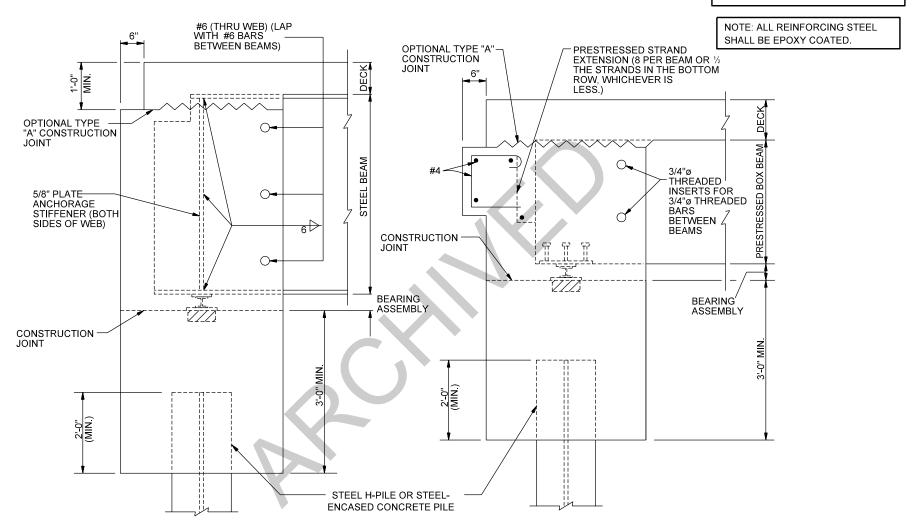
SUGGESTED INTEGRAL END BENT DETAILS (Beams Attached Directly to Piling, Method A) Figure 67-1B (Page 4 of 4)



PRESTRESSED CONCRETE I-BEAM

SUGGESTED INTEGRAL END BENT DETAILS (Beams Attached to Concrete Cap, Method B) Figure 67-1C (Page 1 of 4)

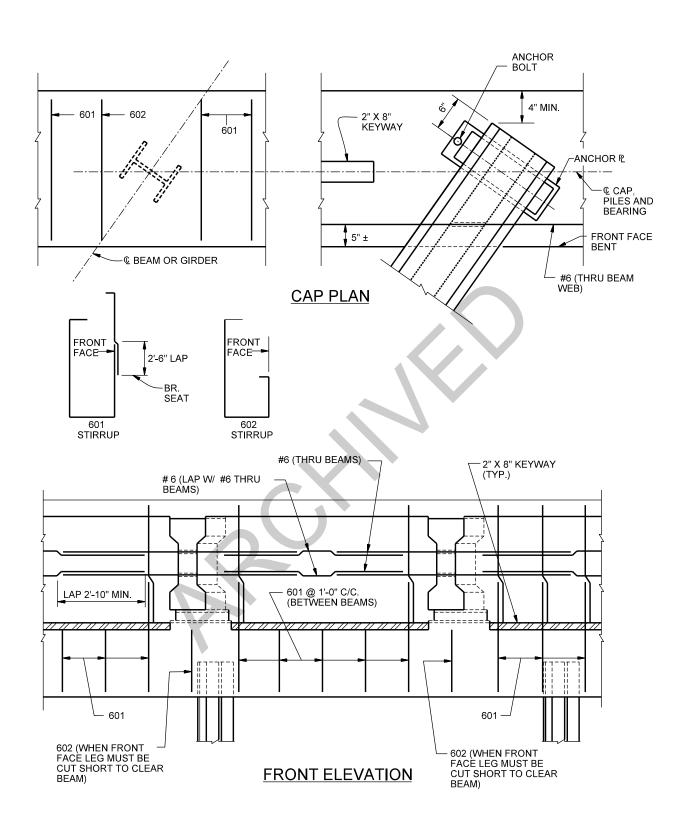
REINFORCING DETAILS, BACKFILL BEHIND END BENT AND SIMILAR DETAILS ARE AS SHOWN ON THE PRESTRESSED CONCRETE I-BEAM SECTION UNLESS OTHERWISE NOTED.



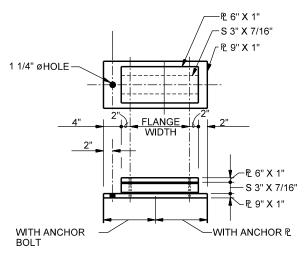
PRESTRESSED CONCRETE BOX BEAM

SUGGESTED INTEGRAL END BENT DETAILS (Beams Attached to Concrete Cap, Method B) Figure 67-1C (Page 2 of 4)

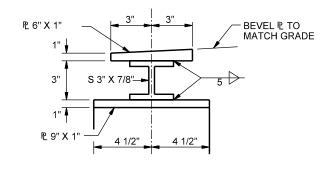
STEEL BEAM OR GIRDER



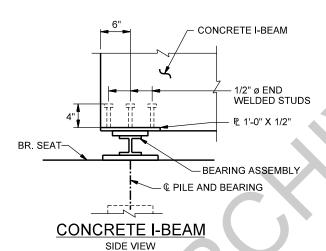
SUGGESTED INTEGRAL END BENT DETAILS (Beams Attached to Concrete Cap, Method B) Figure 67-1C (Page 3 of 4)

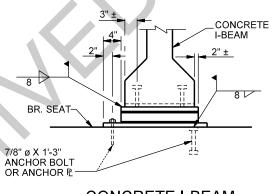


BEARING ASSEMBLY TOP / SIDE VIEW

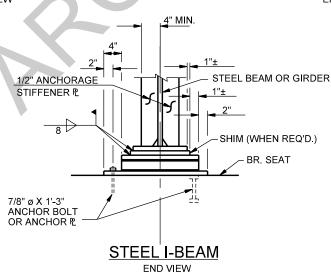


BEARING ASSEMBLY END VIEW





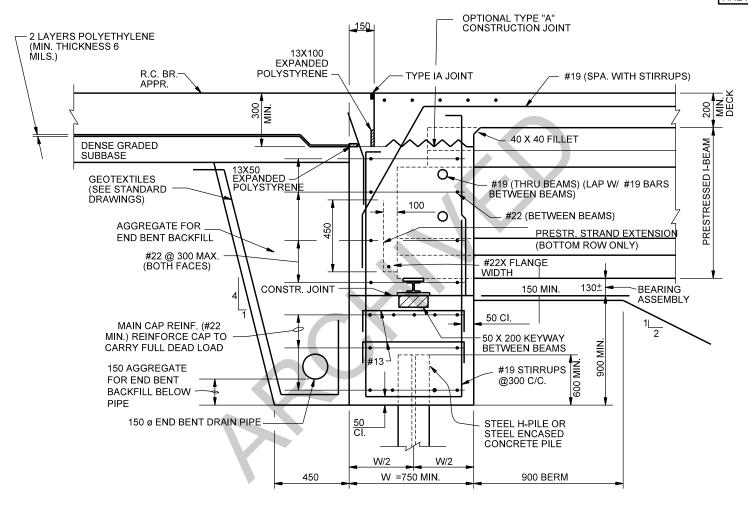
CONCRETE I-BEAM END VIEW



SUGGESTED INTEGRAL END BENT DETAILS
(Beams Attached Directly to Concrete Cap, Method B)
Figure 67-1C
(Page 4 of 4)

NOTE: ALL REINFORCING STEEL SHALL BE EPOXY COATED.

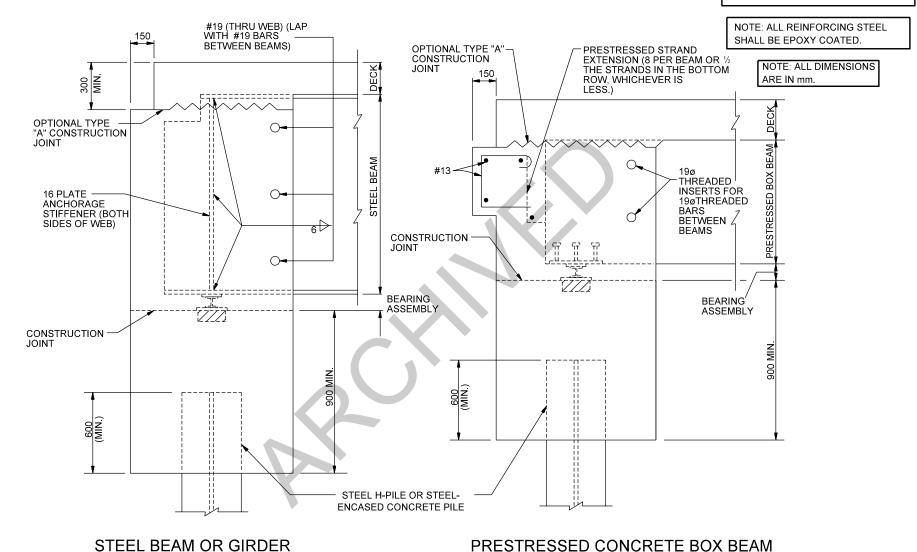
NOTE: ALL DIMENSIONS ARE IN mm.



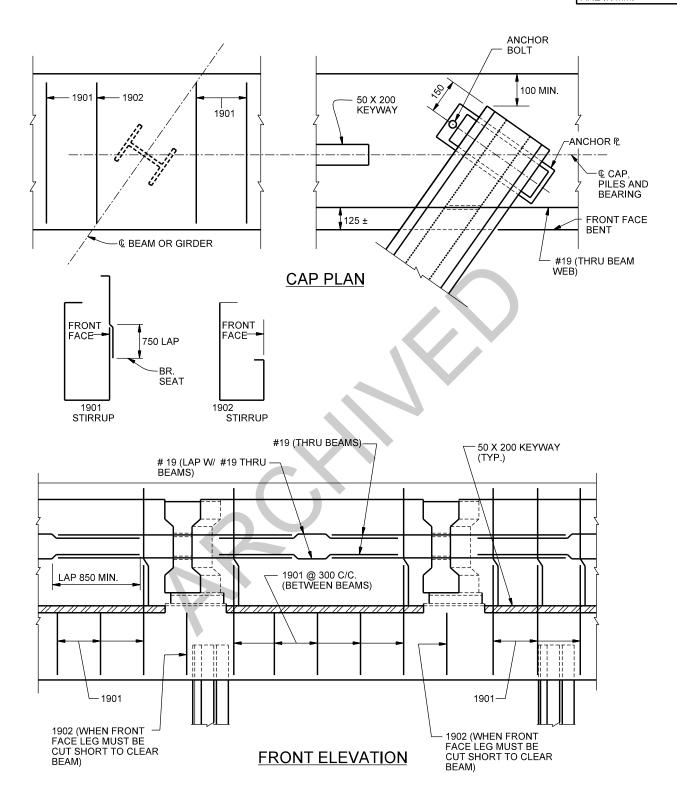
PRESTRESSED CONCRETE I-BEAM

SUGGESTED INTEGRAL END BENT DETAILS (Beams Attached to Concrete Cap, Method B) Figure 67-1C (Page 1 of 4)

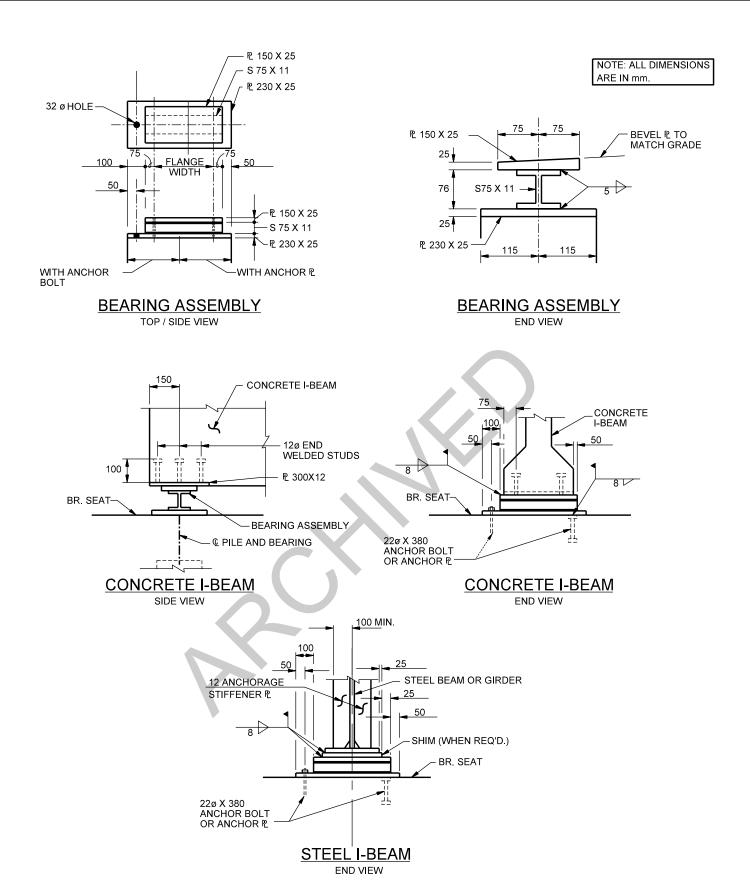
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SUGGESTED INTEGRAL END BENT DETAILS (Beams Attached to Concrete Cap, Method B) Figure 67-1C (Page 2 of 4)



SUGGESTED INTEGRAL END BENT DETAILS (Beams Attached to Concrete Cap, Method B)
Figure 67-1C
(Page 3 of 4)



SUGGESTED INTEGRAL END BENT DETAILS
(Beams Attached Directly to Concrete Cap, Method B)
Figure 67-1C
(Page 4 of 4)