



# 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).*

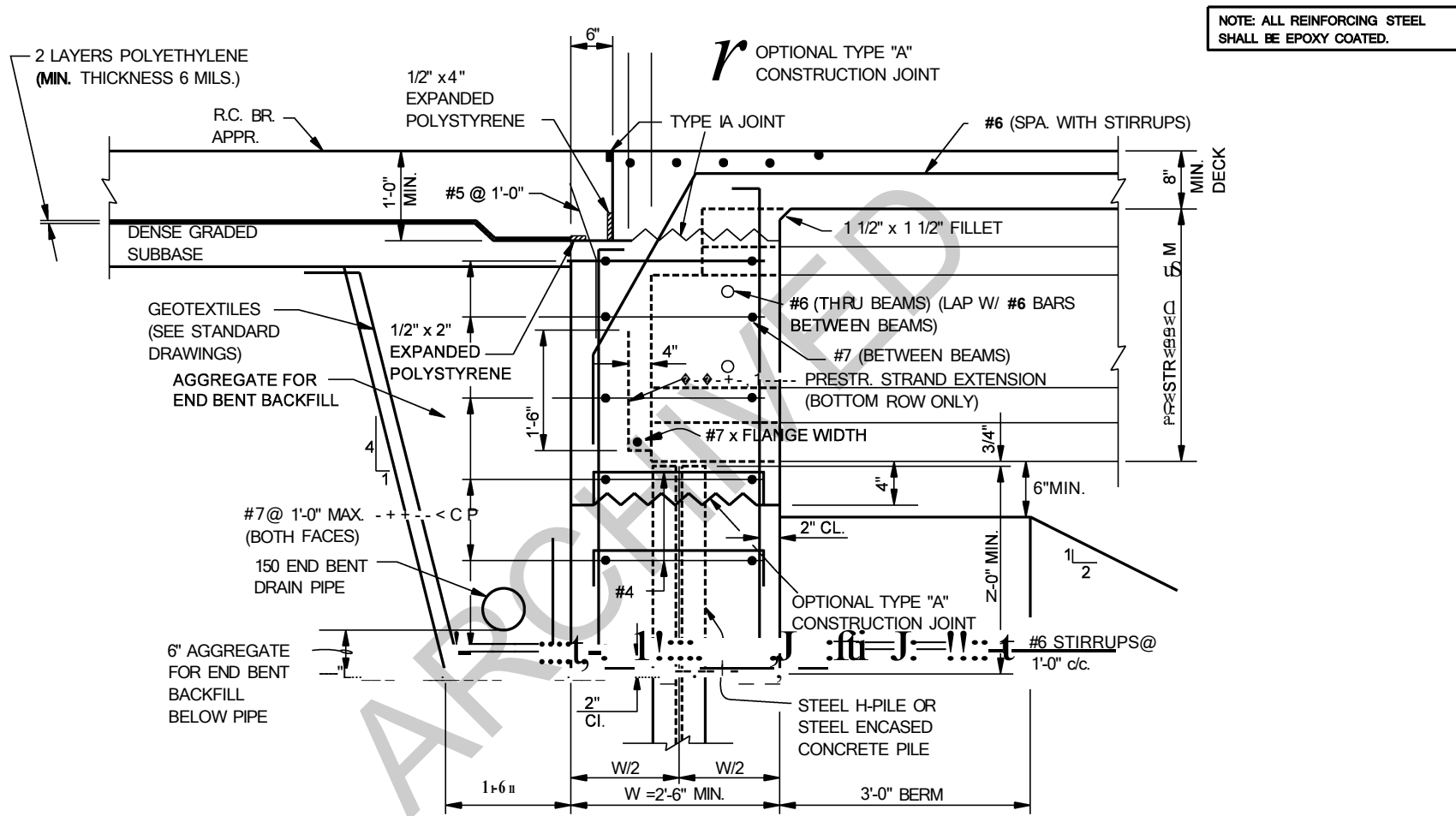
### USE OF INTEGRAL END BENTS

**Figure 08-15B**

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Attachments

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

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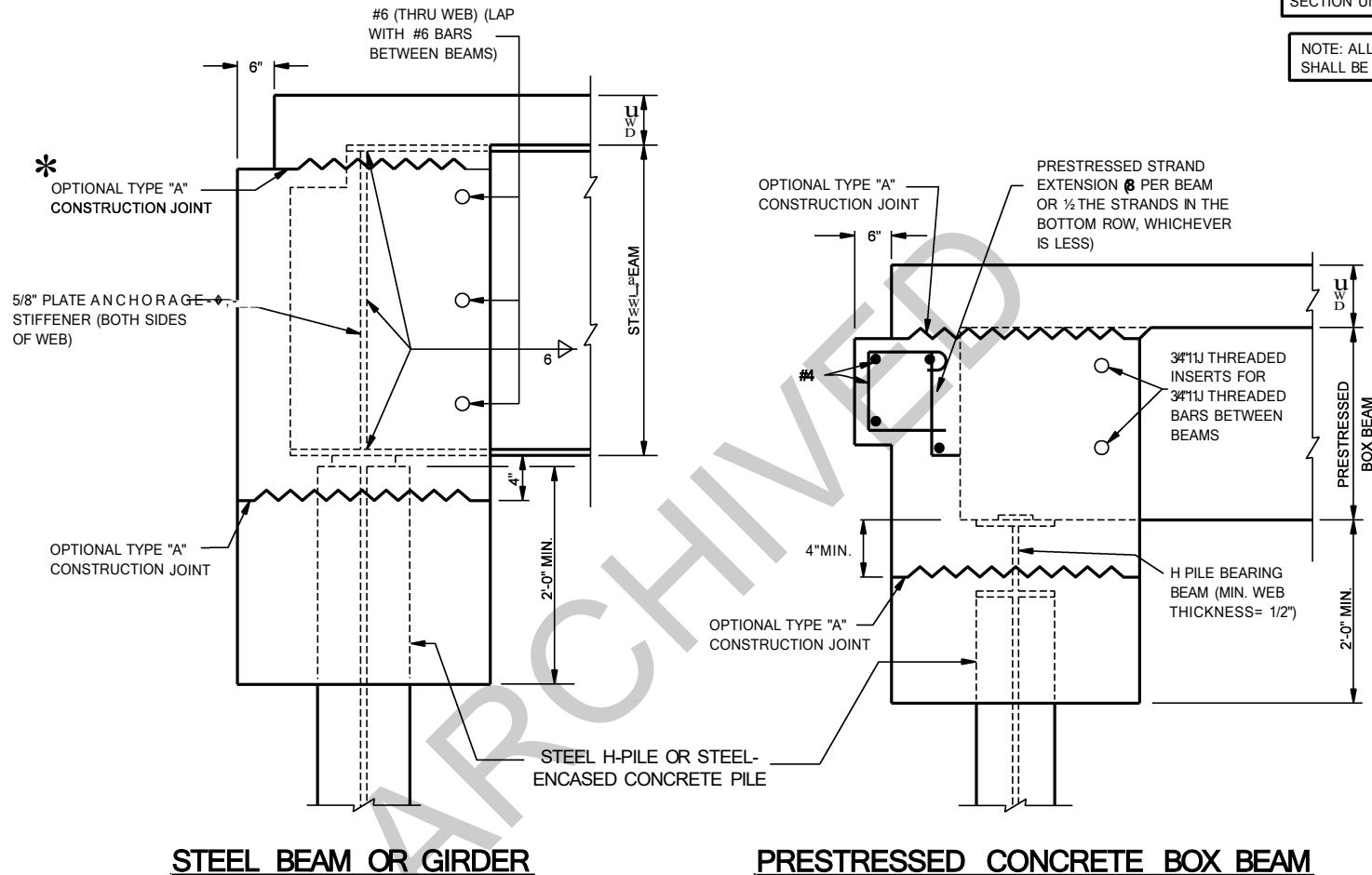


**PRESTRESSED CONCRETE I-BEAM**

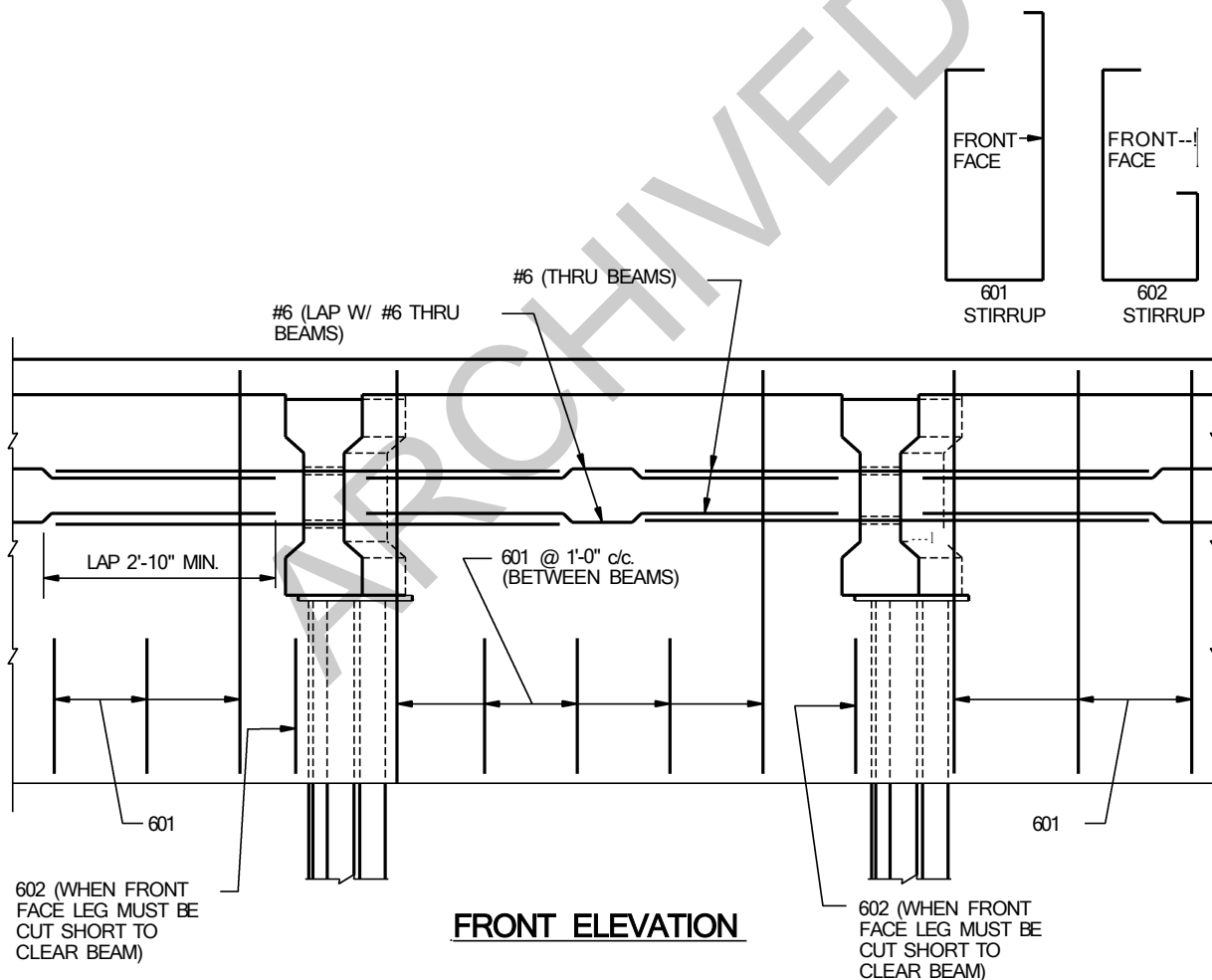
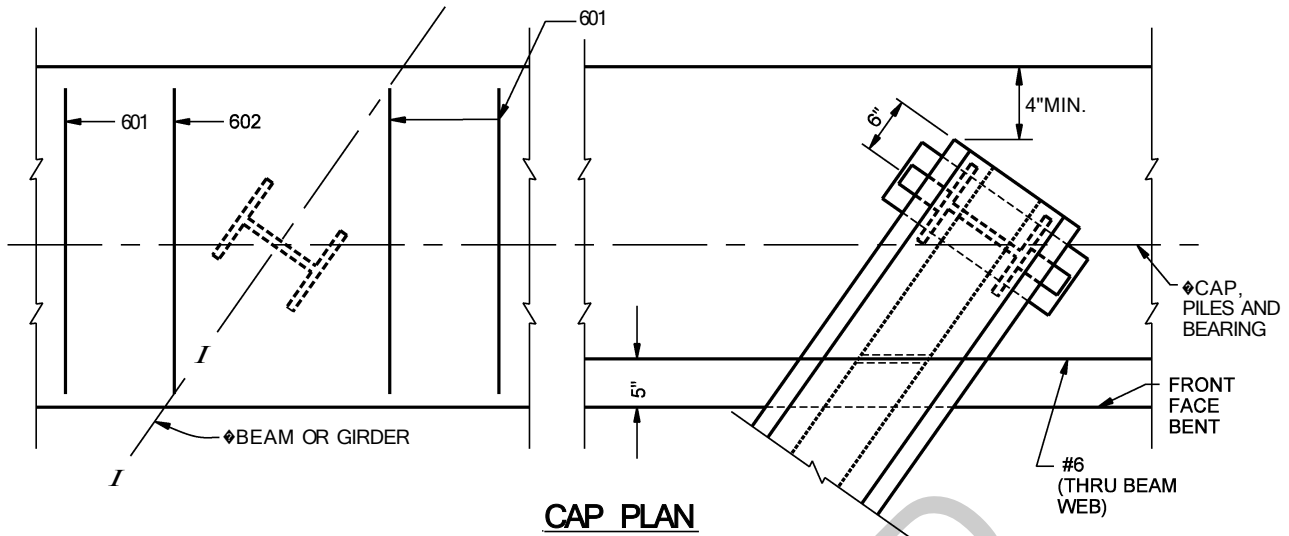
**SUGGESTED INTEGRAL END BENT DETAILS  
 (Beams Attached Directly to Piling, Method A)  
 Figure 67-1 B  
 (Page 1 of 4)**

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 SHALL BE EPOXY COATED.

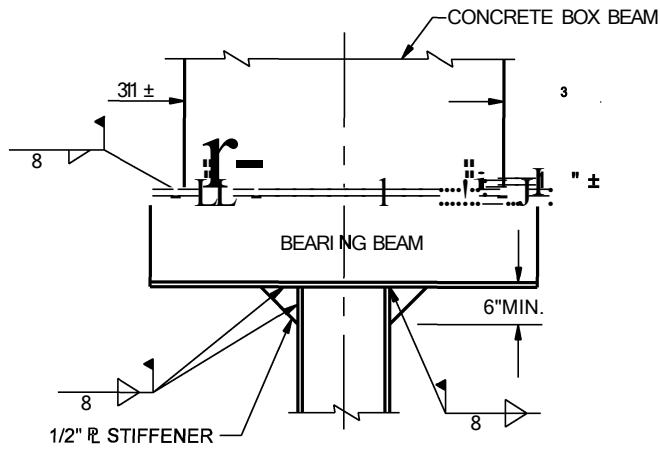


**SUGGESTED INTEGRAL END BENT DETAILS  
(Beams Attached Directly to Piling, Method A)  
Figure 67-1 B  
(Page 2 of 4)**

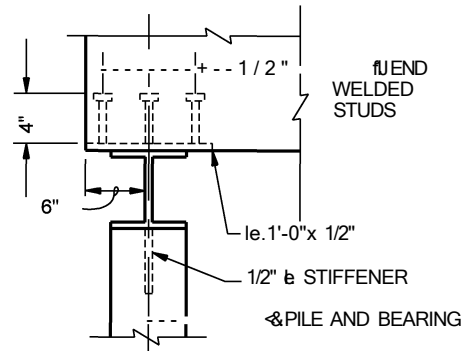


**SUGGESTED INTEGRAL END BENT DETAILS  
(Beams Attached Directly to Piling, Method A)**

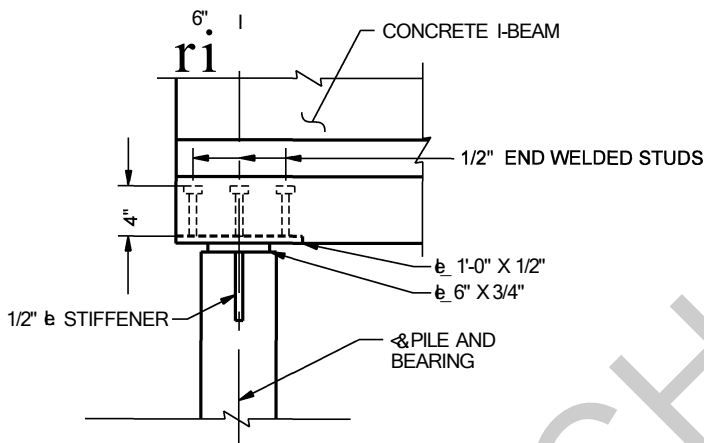
**Figure 67-1 B  
(Page 3 of 4)**



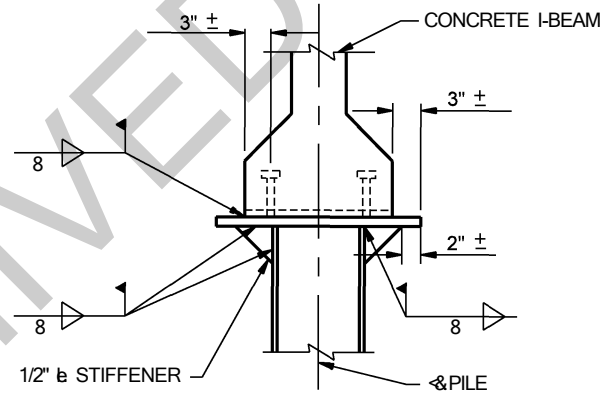
CONCRETE BOX BEAM  
END VIEW



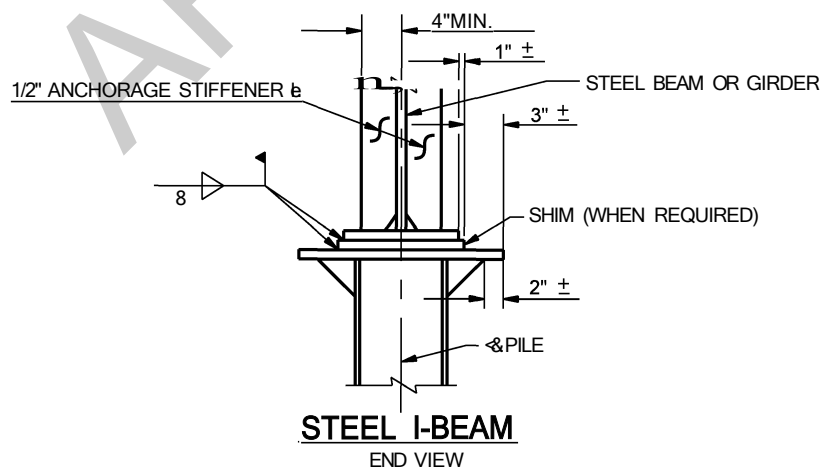
CONCRETE BOX BEAM  
SIDE VIEW



CONCRETE I-BEAM  
SIDE VIEW



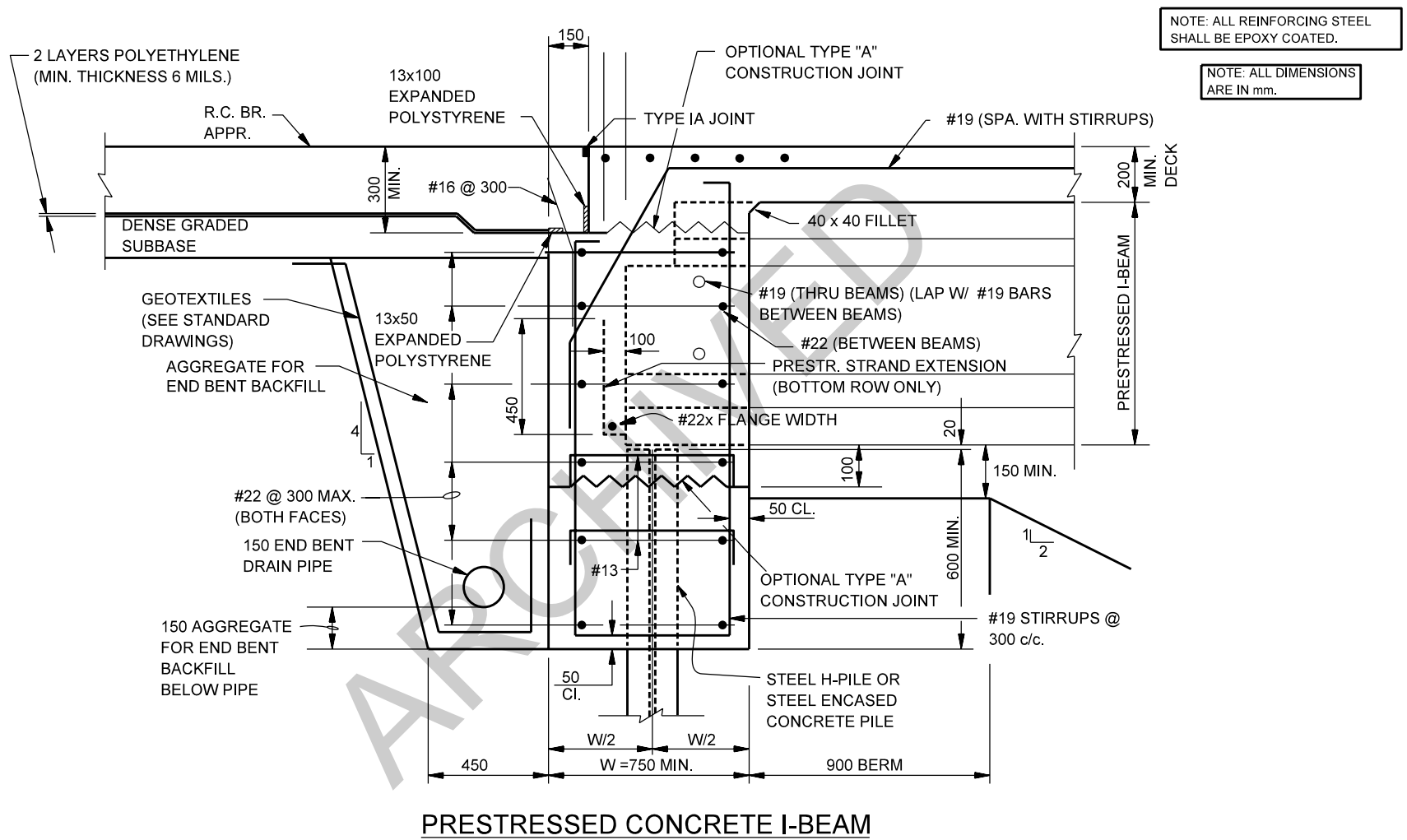
CONCRETE I-BEAM  
END VIEW



STEEL I-BEAM  
END VIEW

**SUGGESTED INTEGRAL END BENT DETAILS  
(Beams Attached Directly to Piling, Method A)**

**Figure 67-1 B  
(Page 4 of 4)**



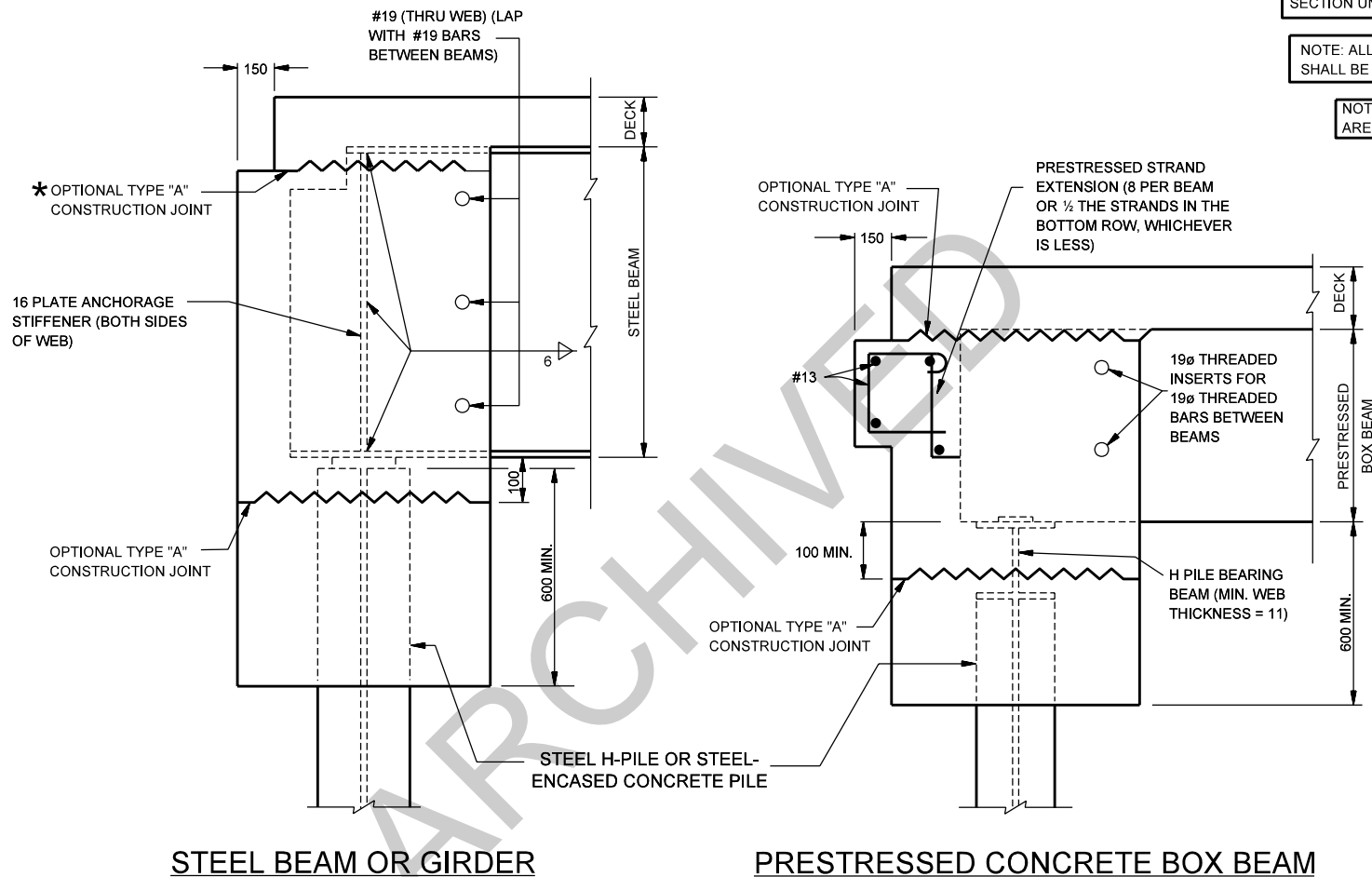
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Figure 67-1B  
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NOTE: ALL DIMENSIONS ARE IN mm.

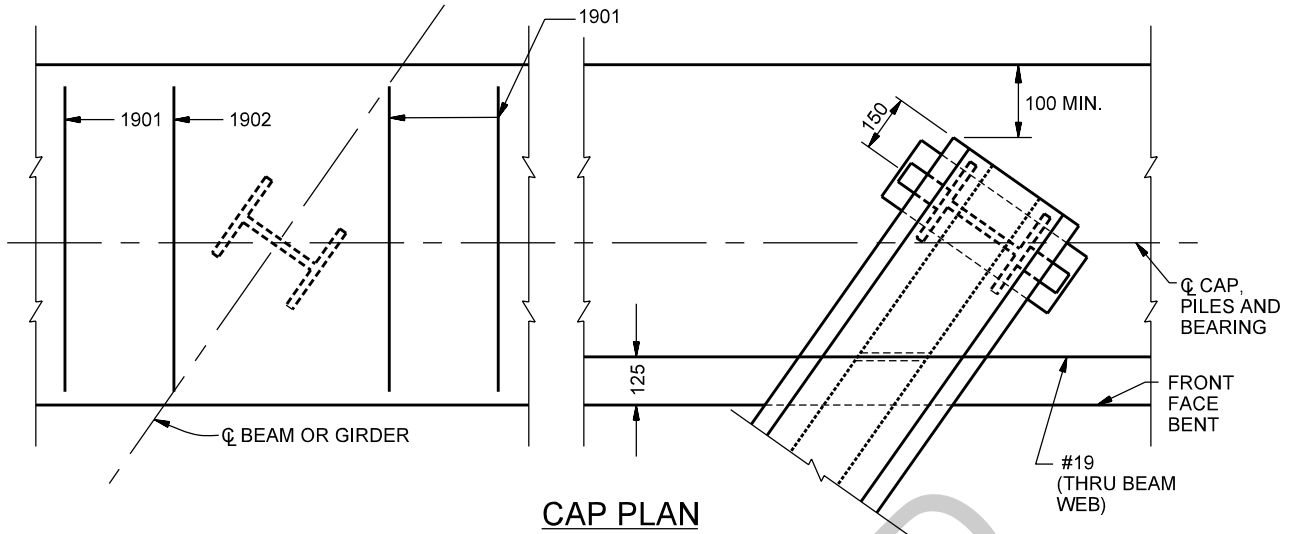


STEEL BEAM OR GIRDER

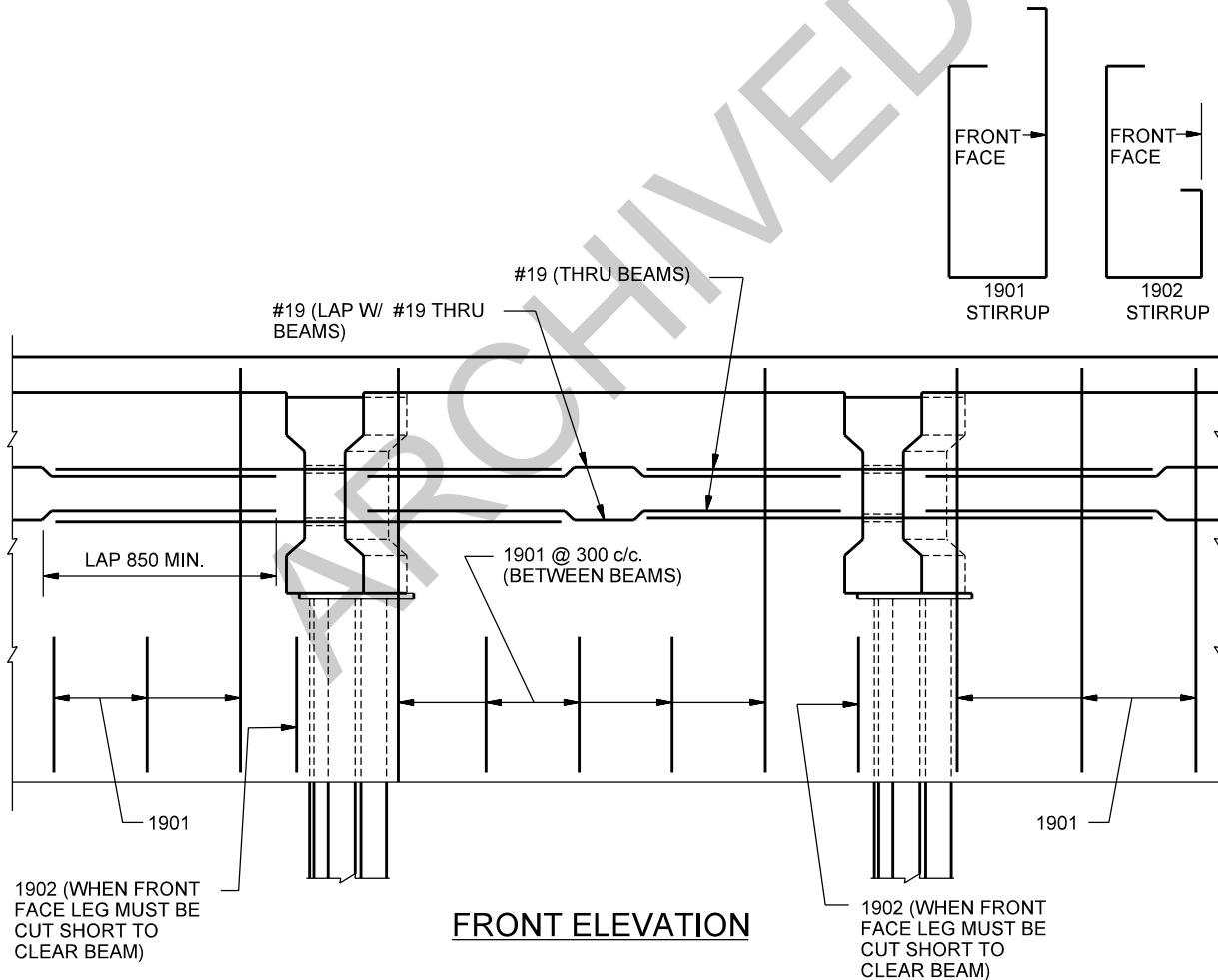
PRESTRESSED CONCRETE BOX BEAM

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

NOTE: ALL DIMENSIONS ARE IN mm.



CAP PLAN

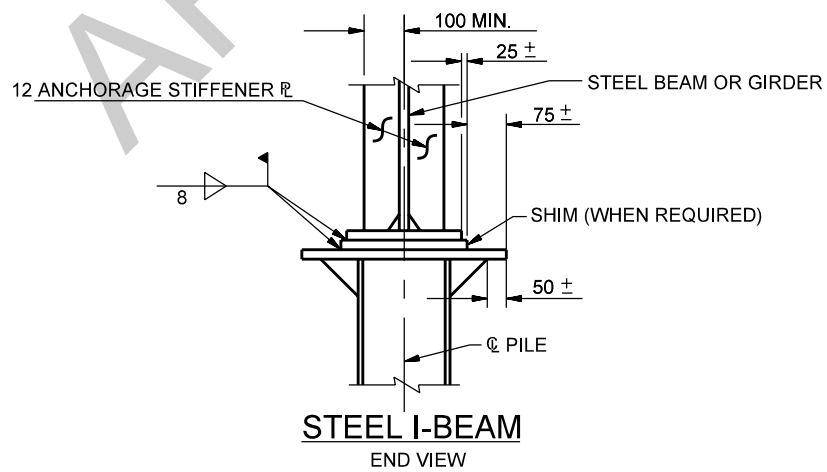
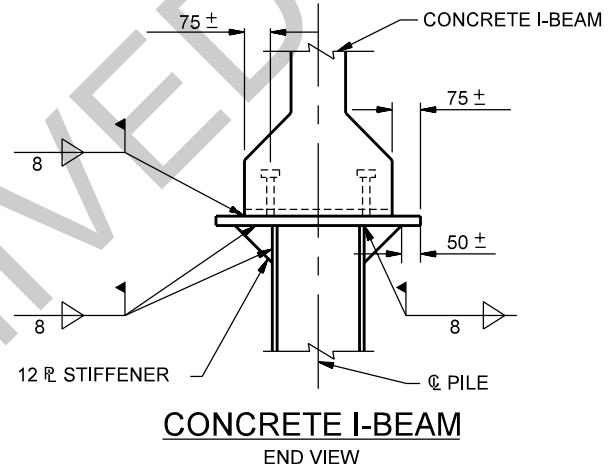
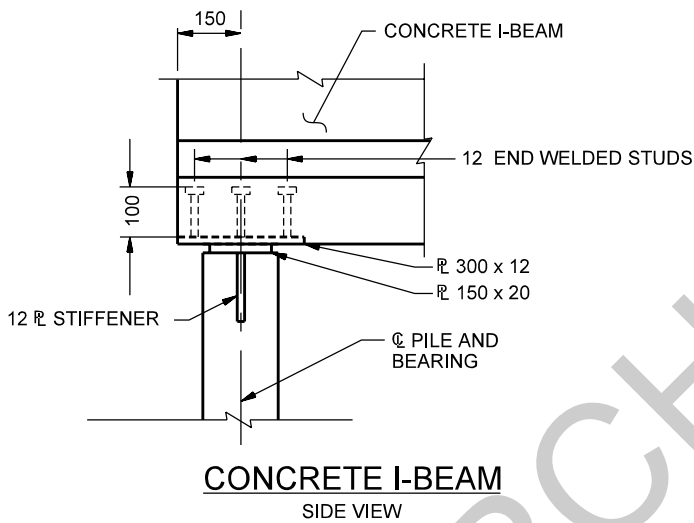
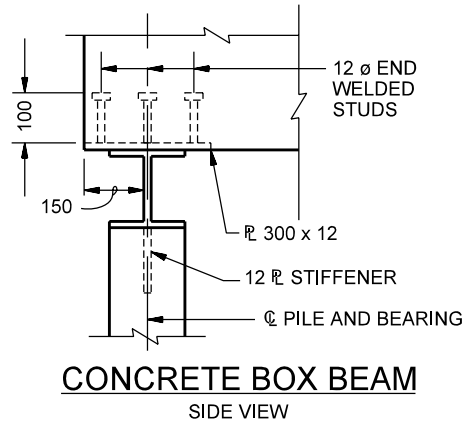
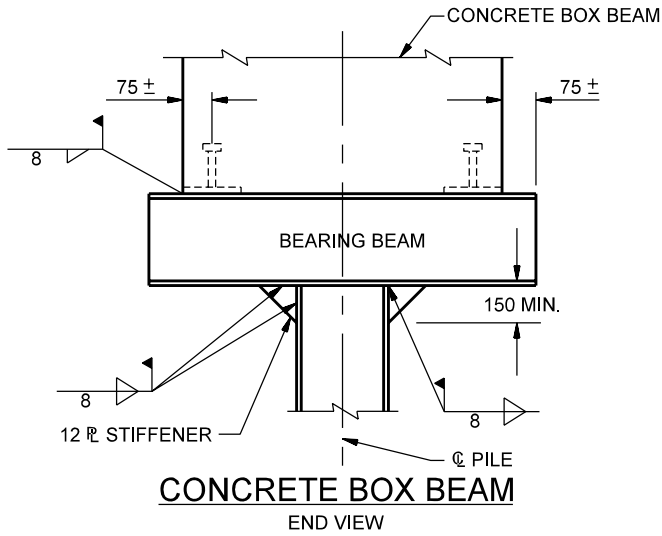


FRONT ELEVATION

**SUGGESTED INTEGRAL END BENT DETAILS**  
(Beams Attached Directly to Piling, Method A)

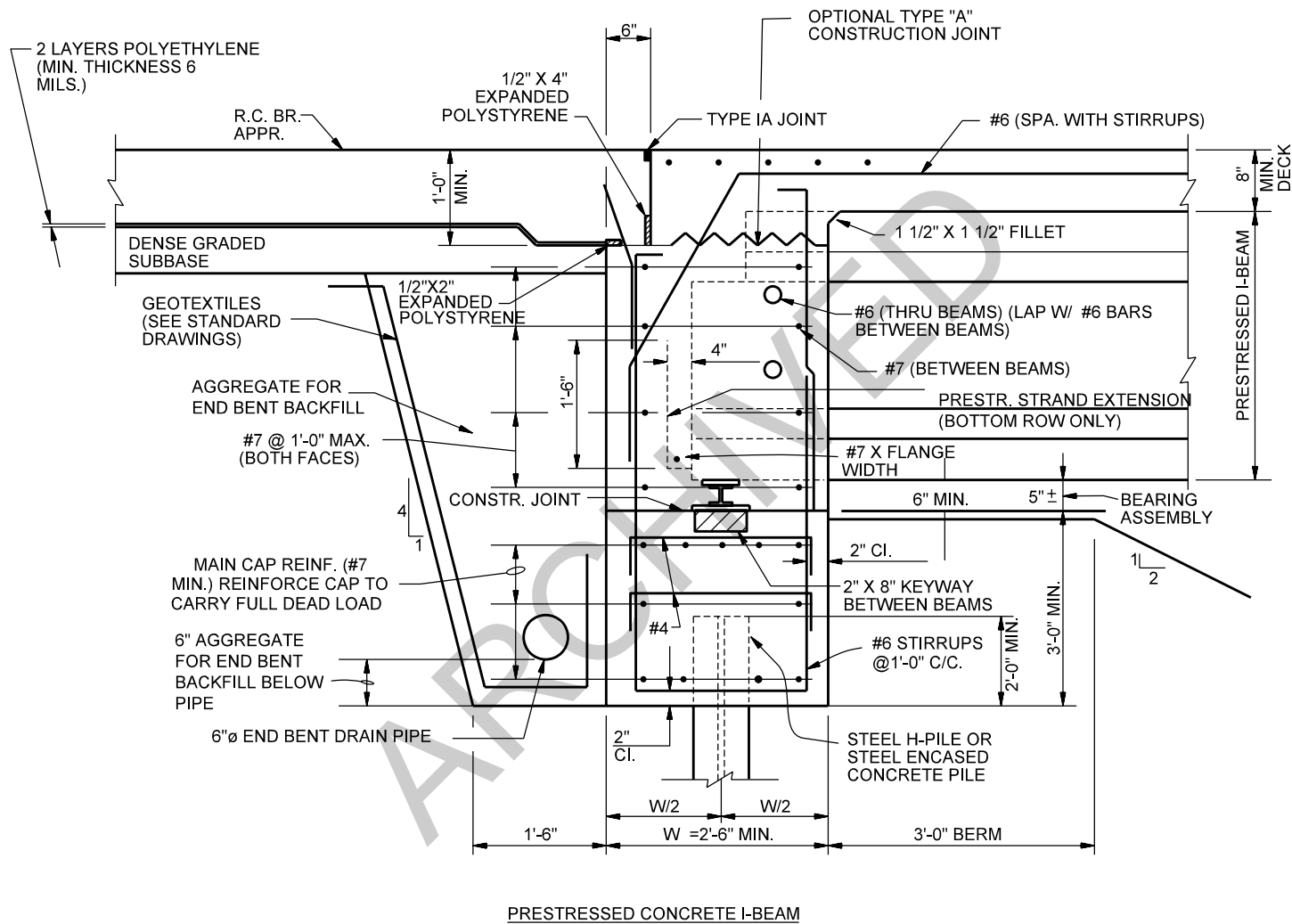
Figure 67-1B  
(Page 3 of 4)

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**SUGGESTED INTEGRAL END BENT DETAILS**  
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Figure 67-1B  
(Page 4 of 4)

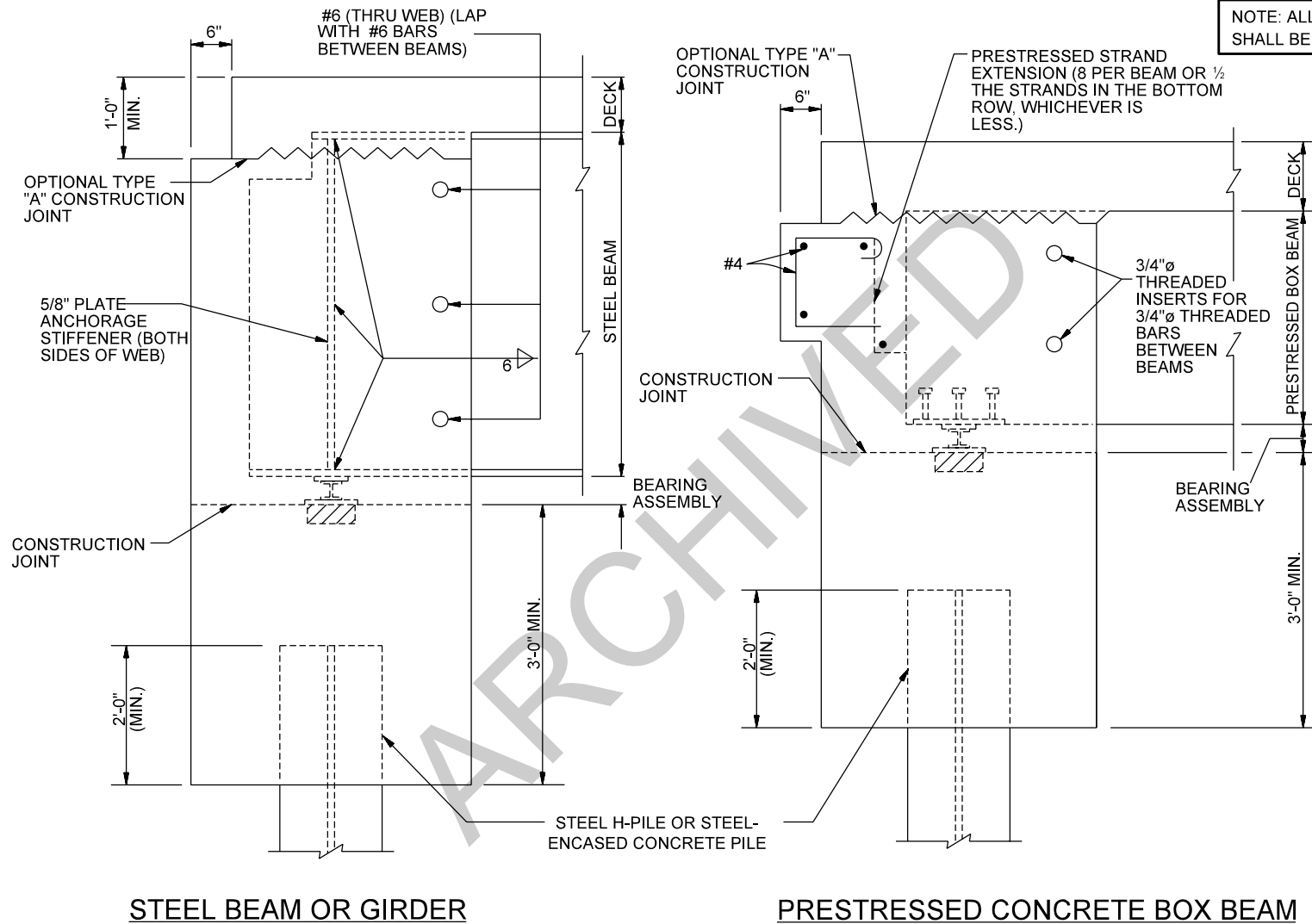
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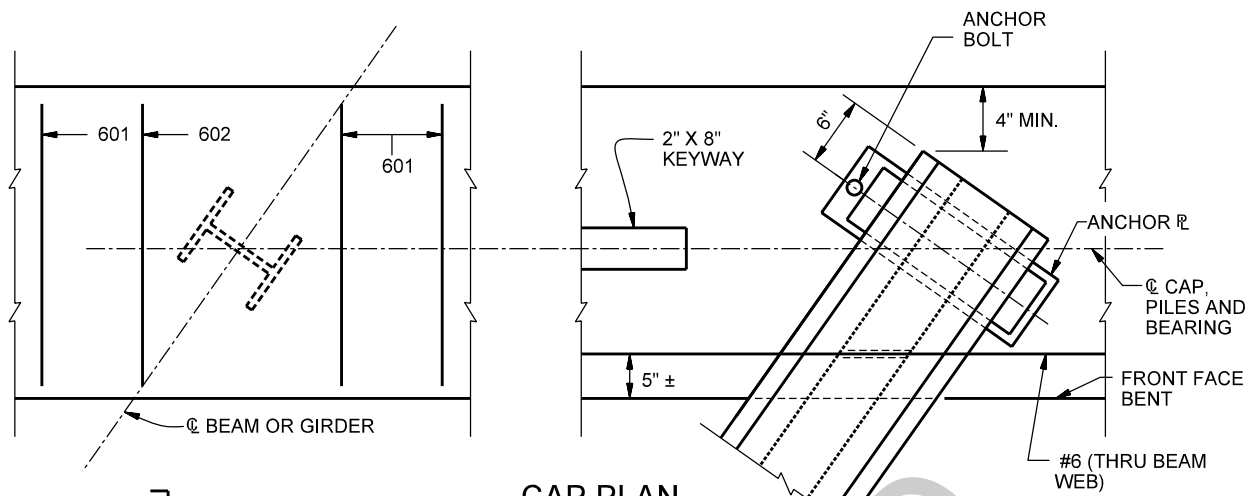
SUGGESTED INTEGRAL END BENT DETAILS  
(Beams Attached to Concrete Cap, Method B)  
Figure 67-1C  
(Page 1 of 4)

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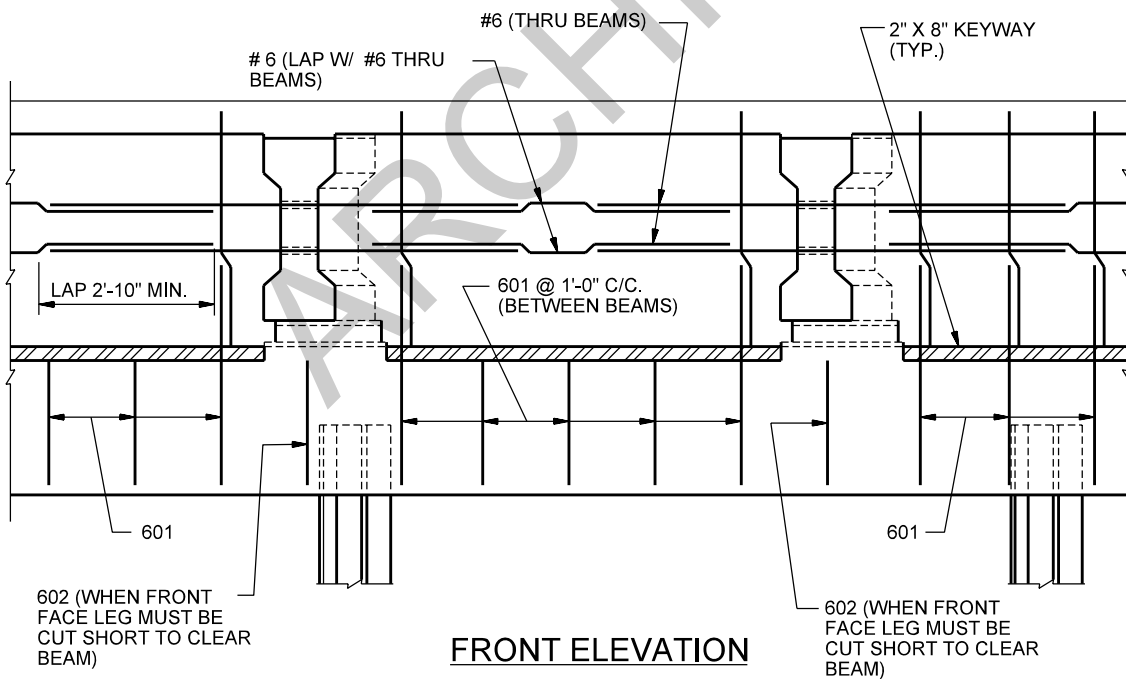
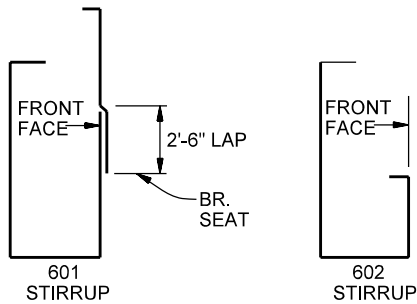
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SUGGESTED INTEGRAL END BENT DETAILS  
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 Figure 67-1C  
 (Page 2 of 4)

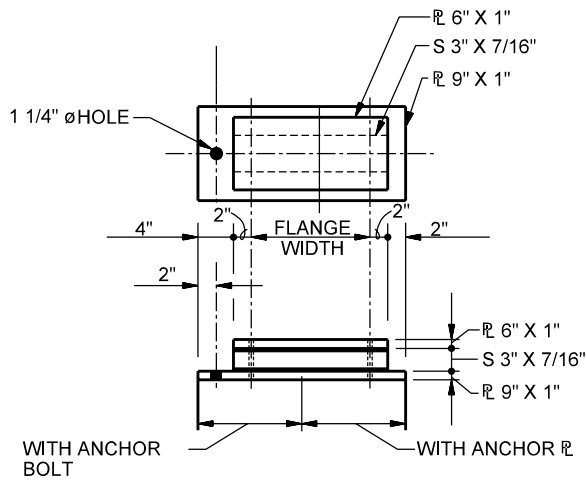


**CAP PLAN**

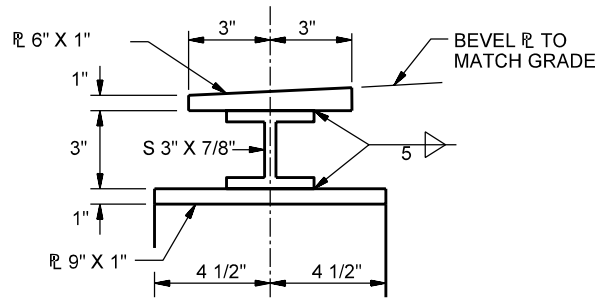


**FRONT ELEVATION**

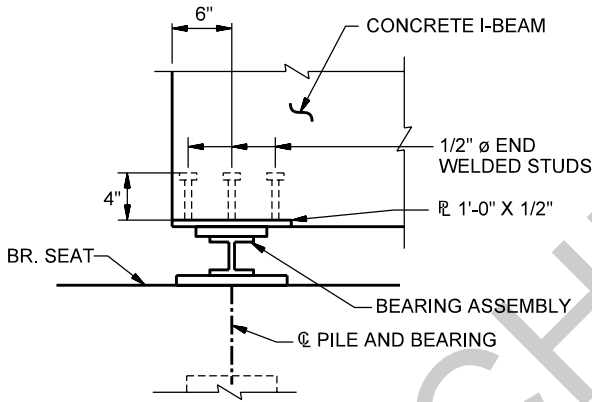
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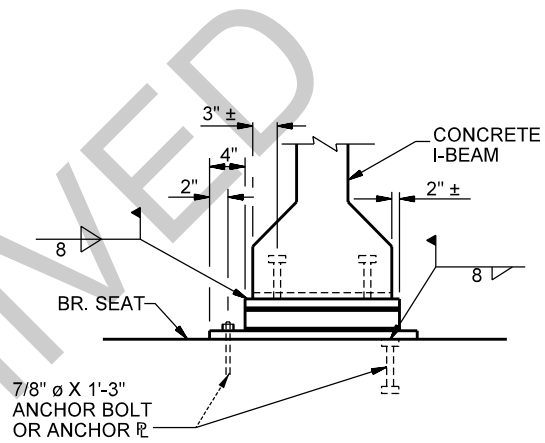
**BEARING ASSEMBLY**  
TOP / SIDE VIEW



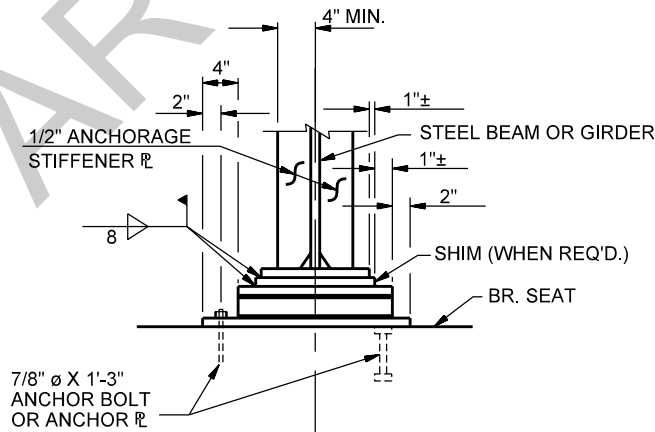
**BEARING ASSEMBLY**  
END VIEW



**CONCRETE I-BEAM**  
SIDE VIEW



**CONCRETE I-BEAM**  
END VIEW



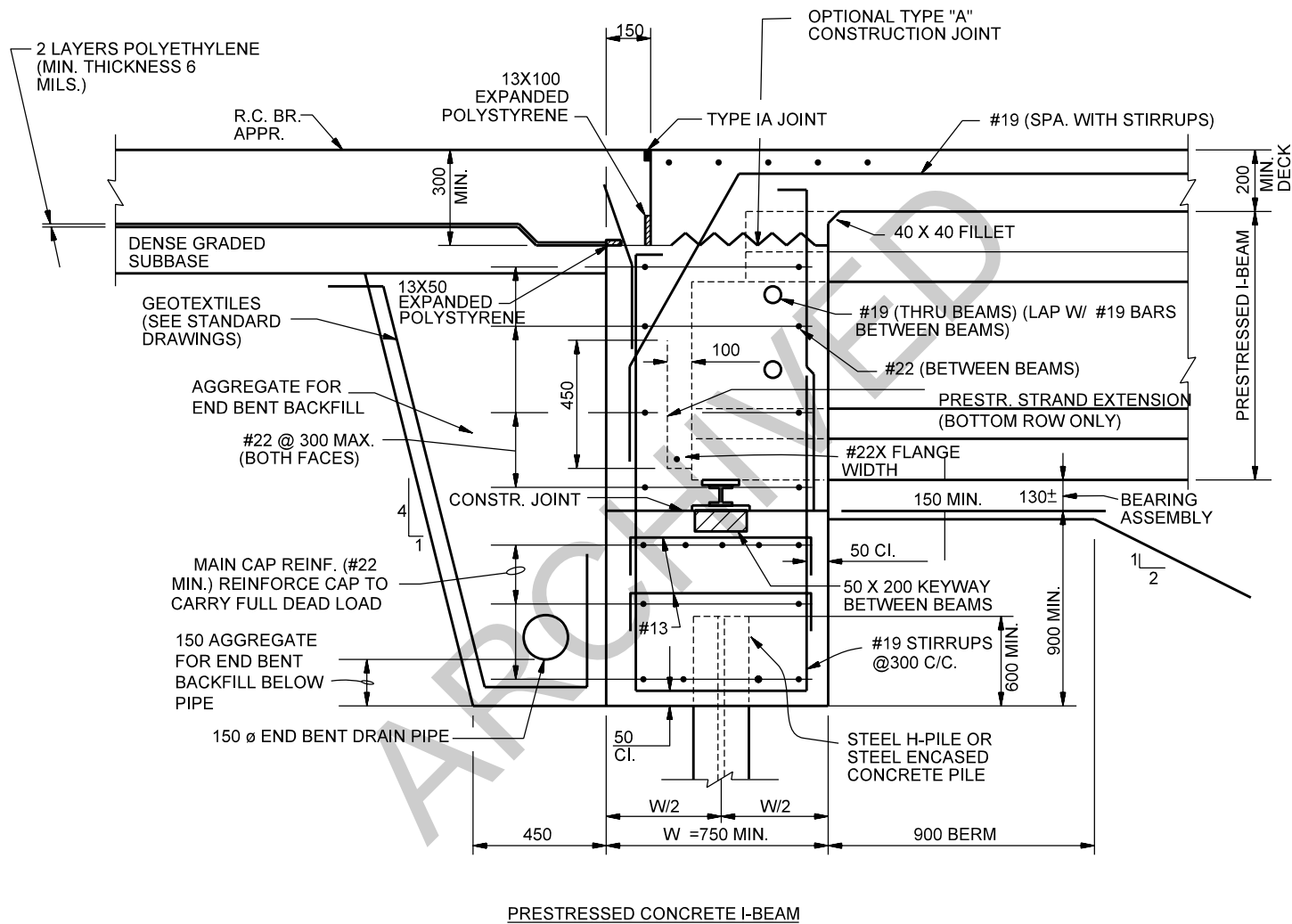
**STEEL I-BEAM**  
END VIEW

**SUGGESTED INTEGRAL END BENT DETAILS**  
(Beams Attached Directly to Concrete Cap, Method B)

Figure 67-1C  
(Page 4 of 4)

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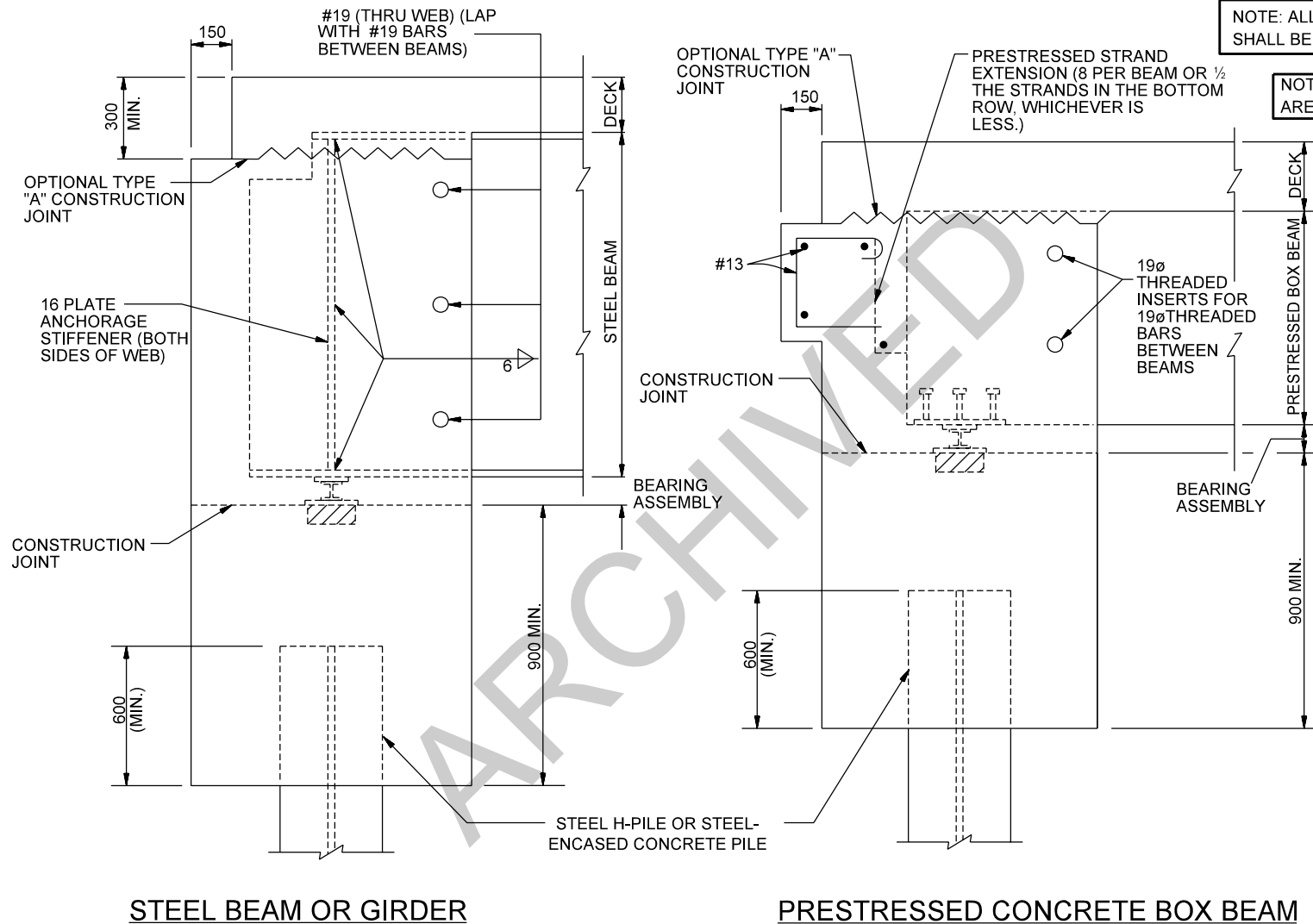
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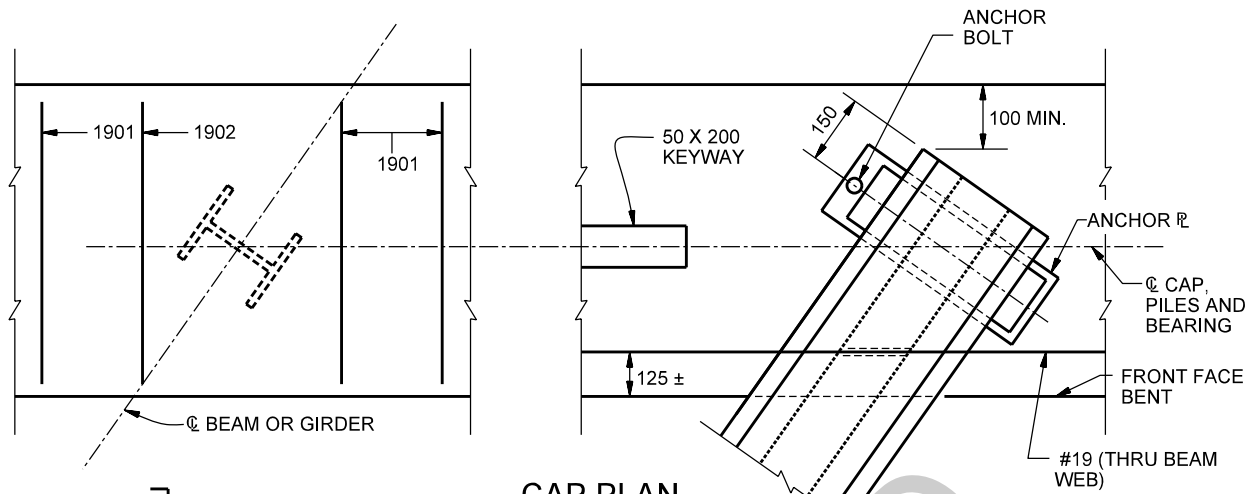
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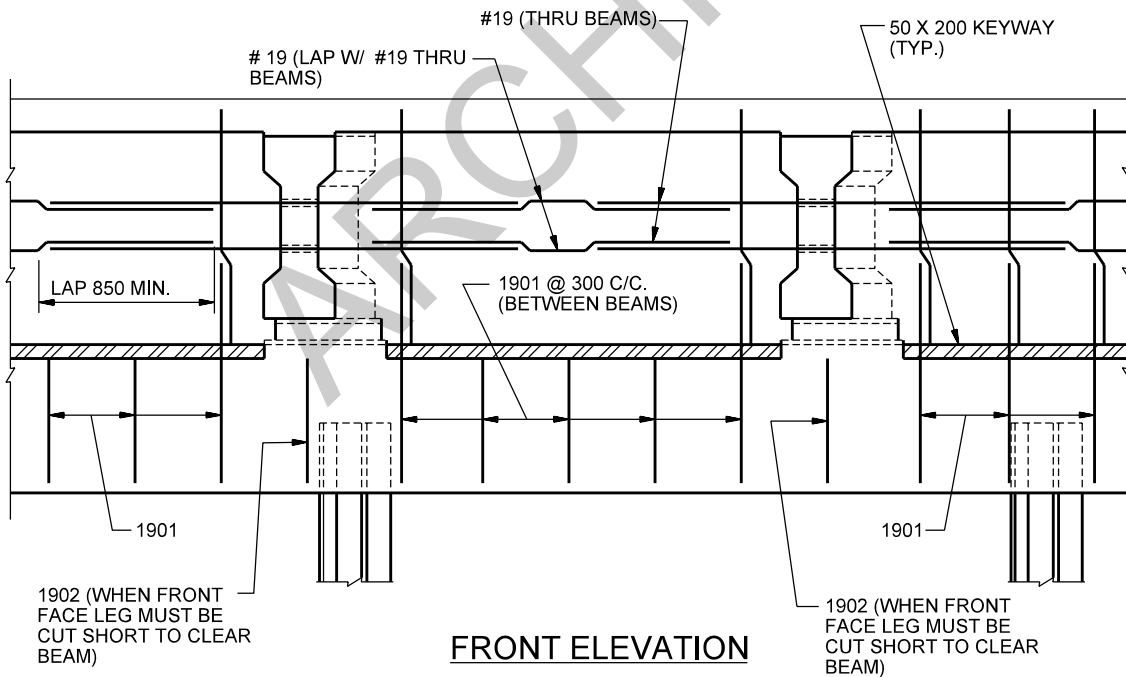
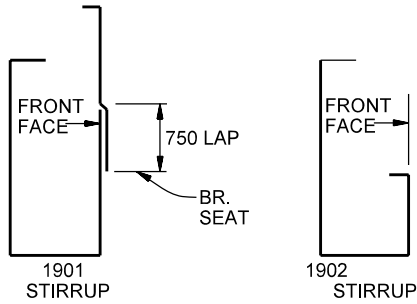


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 Figure 67-1C  
 (Page 2 of 4)

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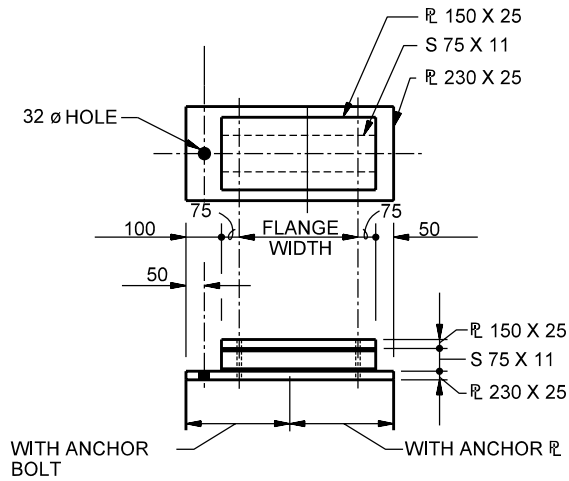


CAP PLAN

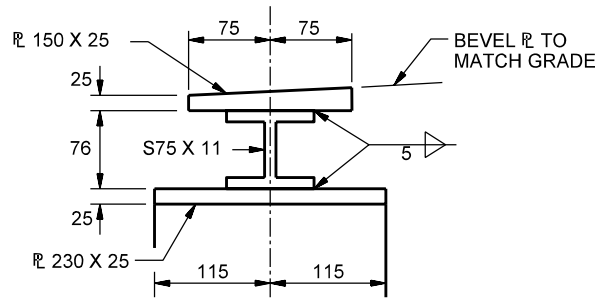


FRONT ELEVATION

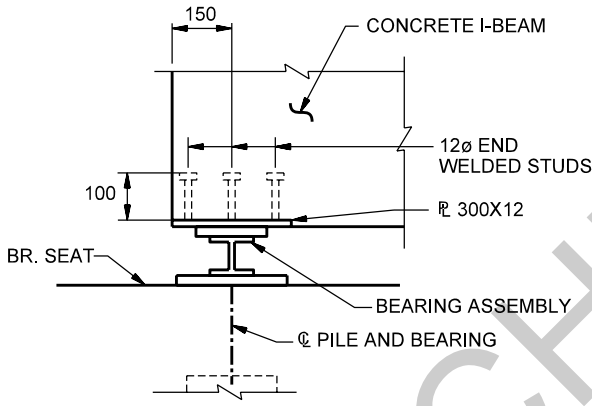
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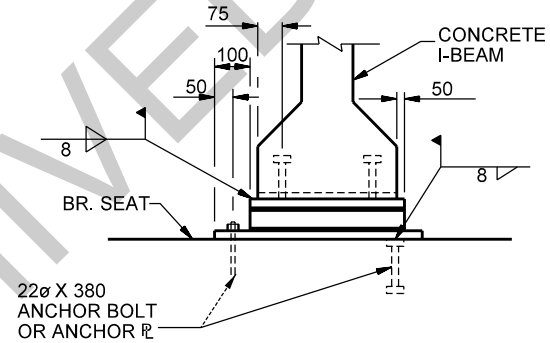
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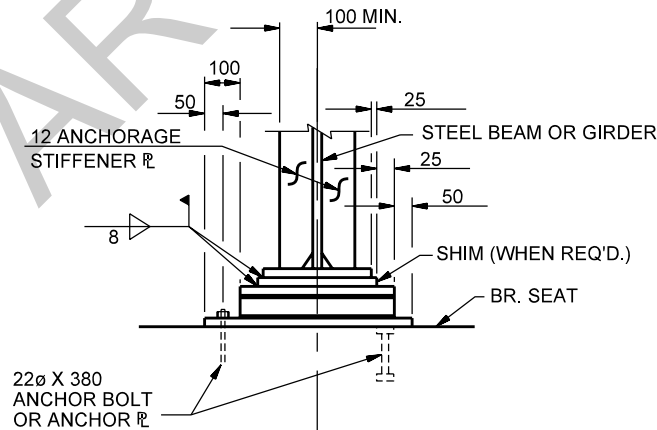
**BEARING ASSEMBLY**  
END VIEW



**CONCRETE I-BEAM**  
SIDE VIEW



**CONCRETE I-BEAM**  
END VIEW



**STEEL I-BEAM**  
END VIEW

**SUGGESTED INTEGRAL END BENT DETAILS**  
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