



# INDIANA DEPARTMENT OF TRANSPORTATION

*Driving Indiana's Economic Growth*

## Design Memorandum No. 08-21 Policy Change

October 28, 2008

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

**FROM:** /s/ Anthony L. Uremovich  
Anthony L. Uremovich  
Design Resources Engineer  
Production Management Division

**SUBJECT:** Semi-Integral End Bents

**REVISES:** *Indiana Design Manual Section 67-1.01*

**EFFECTIVE:** Stage 2 or Design Approval on or after January 1, 2009

Semi-integral end bents should be considered for each bridge for which integral end bents are not practical or feasible. For a skew angle of greater than 30 deg, or an expansion length of 250 ft (80 m) or longer, twisting or racking of the bridge should be investigated.

*Indiana Design Manual* Figure 67-1C(1) shows details for Method 1, Figure 67-1C(2) shows details for Method 2, and Figure 67-1C(3) shows details for the joint-protection sheeting. All figures are attached hereto, and have been incorporated into the online version of *Manual* Chapter 67. All applicable information shown in the figures should be shown on the plans.

Recurring Special Provision 702-B-178, also attached hereto, regarding the joint-protection sheeting and high-density plastic bearing strips, should be called for if semi-integral end bents details are shown on the plans. Beginning with the September 10, 2009, letting, the recurring special provision will be incorporated into the INDOT *Standard Specifications*. The provision will then no longer be required to be called for in specific contracts.

alu  
Attachments

702-B-178 POLYCHLOROPENE JOINT MEMBRANE

(Adopted 08-21-08)

The Standard Specifications are revised as follows:

SECTION 702, AFTER LINE 43, INSERT AS FOLLOWS:

*High Density Plastic Bearing Strips* .....906.08  
 Permanent Metal Forms .....910.03  
*Polychloroprene Joint Membrane and Adhesive* .....906.02(a)5  
 Portland Cement.....901.01(b)  
 Steel Drain Pipe.....910.07  
 Utility Asphalt, UA-1 .....902.01(d)  
 Water .....913.01

SECTION 702, AFTER LINE 972, INSERT AS FOLLOWS:

**(e) Polychloropene Joint Membrane**

*Polychloropene joint membrane used for semi-integral end bents shall be secured to the concrete with an adhesive. The polychloropene joint membrane shall be centered vertically on the joint. Any field joint in the polychloropene membrane shall be lapped a minimum of 12 in. (100 mm).*

SECTION 702 AFTER LINE 1500, INSERT AS FOLLOWS:

*The cost of furnishing and installing polychloroprene joint membrane shall be included in the cost of concrete, A, substructure.*

*The cost of high density plastic bearing strips shall be included in the cost of concrete, A, substructure.*

SECTION 906 AFTER LINE 100, INSERT AS FOLLOWS:

**5. Polychloropene Joint Membrane and Adhesive**

*Polychloropene joint membrane shall be general purpose, heavy duty polychloropene sheeting with nylon fabric reinforcement. The sheeting shall be in accordance with the following:*

<i>Property</i>	<i>Test Method</i>	<i>Requirement</i>
<i>Thickness</i>	<i>ASTM D 751</i>	<i>0.094 in. ± 0.01 in. (2.39 mm ± 0.25 mm)</i>
<i>Breaking Strength, Grab Test</i>	<i>ASTM D 751</i>	<i>700 lbf x 700 lbf (3114 N x 3114 N) (Longitudinal x transverse, minimum)</i>
<i>Adhesive Strip, 1 in. x 2 in. (25 mm x 50 mm)</i>	<i>ASTM D 751</i>	<i>9 lbf (40 N) (minimum)</i>
<i>Burst Strength</i>	<i>ASTM D 751</i>	<i>1400 psi (9.65 MPa) (minimum)</i>
<i>Heat Aging, 70 h, 212°F (100°C)</i>	<i>ASTM D 2136</i>	<i>180° bend with no cracking of coating</i>

<i>Low Temp. Bend Test, 1h, -40°F (-4.4°C)</i>	<i>ASTM D 751</i>	<i>Bend around a 1/4 in. (6 mm) mandrel with no cracking of coating</i>
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*Polychloroprene joint membrane shall be covered by a type B certification in accordance with 916.*

*The adhesive used to attach the polychloroprene joint membrane to concrete shall be a black styrene-butadiene rubber base material compatible with both concrete and polychloroprene. The adhesive shall be in accordance with the following:*

<i>Property</i>	<i>Test Method</i>	<i>Minimum</i>	<i>Maximum</i>
<i>Viscosity, cps</i>	<i>ASTM D 2196, RVF #6 sp @20 rpm</i>	<i>7500</i>	<i>18000</i>
<i>Solids, %</i>	<i>ASTM D 1259</i>	<i>28</i>	<i>35</i>
<i>Weight per gal., lb (Mass per L, kg)</i>	<i>ASTM D 1875</i>	<i>6.6 (0.79)</i>	<i>7.0 (0.84)</i>

*The adhesive shall be covered by a type C certification in accordance with 916.*

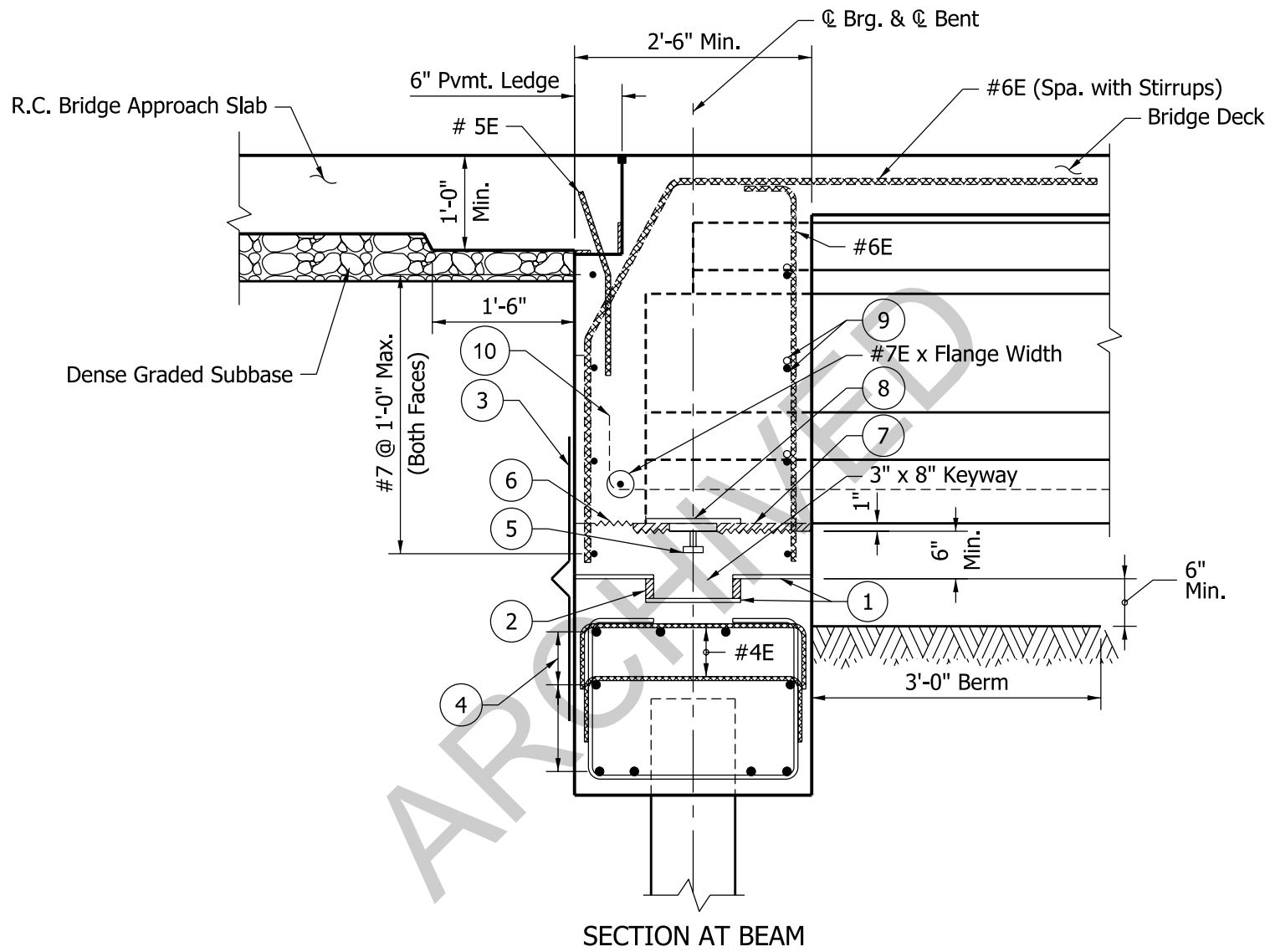
SECTION 906 AFTER LINE 299, INSERT AS FOLLOWS:

**906.08 High Density Bearing Strip**

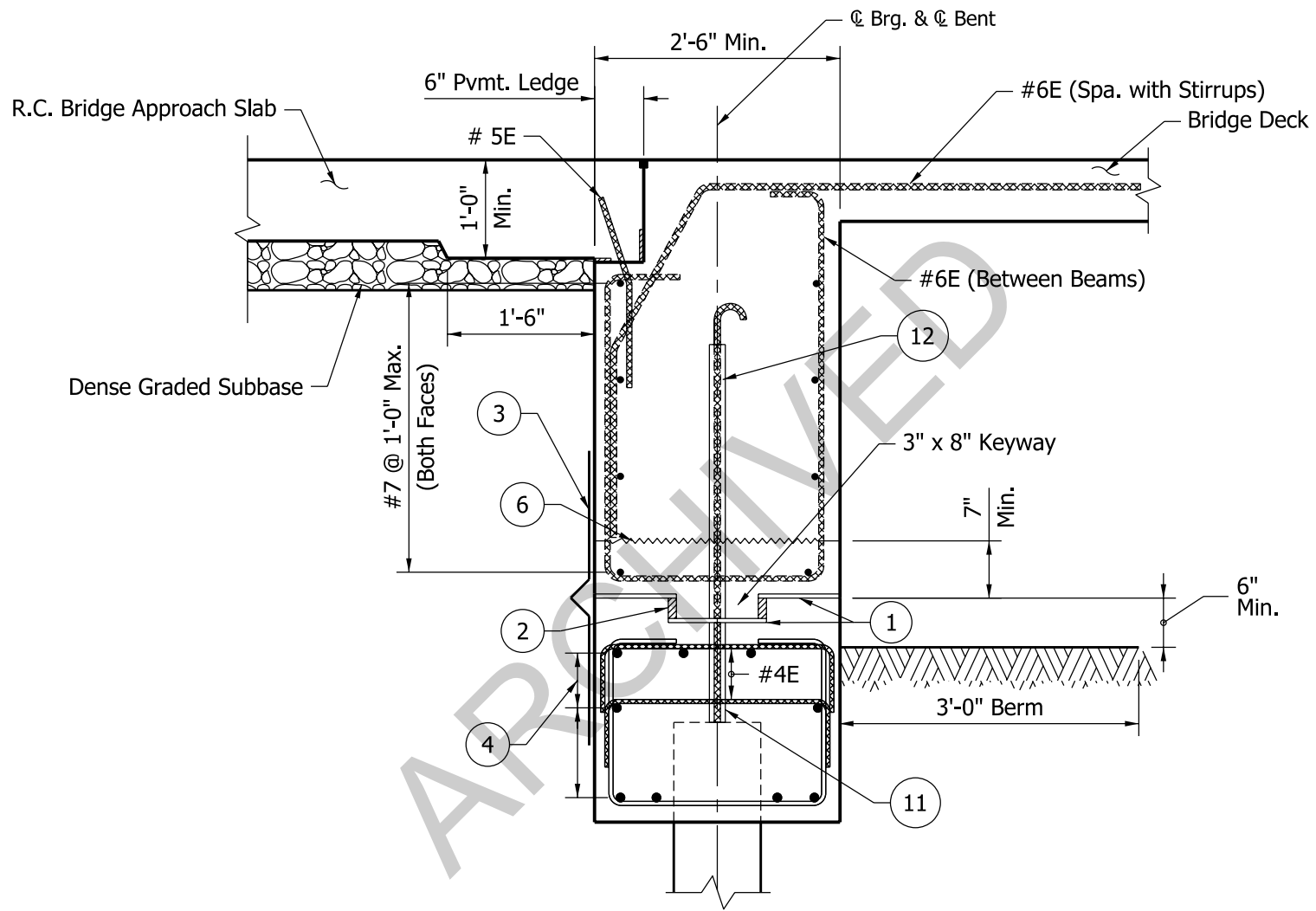
*The strip shall be nontoxic multipolymer plastic in accordance with the following requirements:*

<i>Property</i>	<i>Test Method</i>	<i>Requirement</i>
<i>Compressive Strength</i>	<i>ASTM D 695</i>	<i>8000 to 9000 psi (55.2 to 62.1 MPa)</i>
<i>Coefficient of Linear Expansion</i>	<i>ASTM D 696</i>	<i><math>3.0 \times 10^{-5}</math> in./in./°C to <math>5.0 \times 10^{-5}</math> in./in./°C (<math>7.62 \times 10^{-4}</math> mm/mm/°C to <math>1.27 \times 10^{-3}</math> mm/mm/°C)</i>

*The high density bearing strip shall be covered by a type B certification in accordance with 916.*



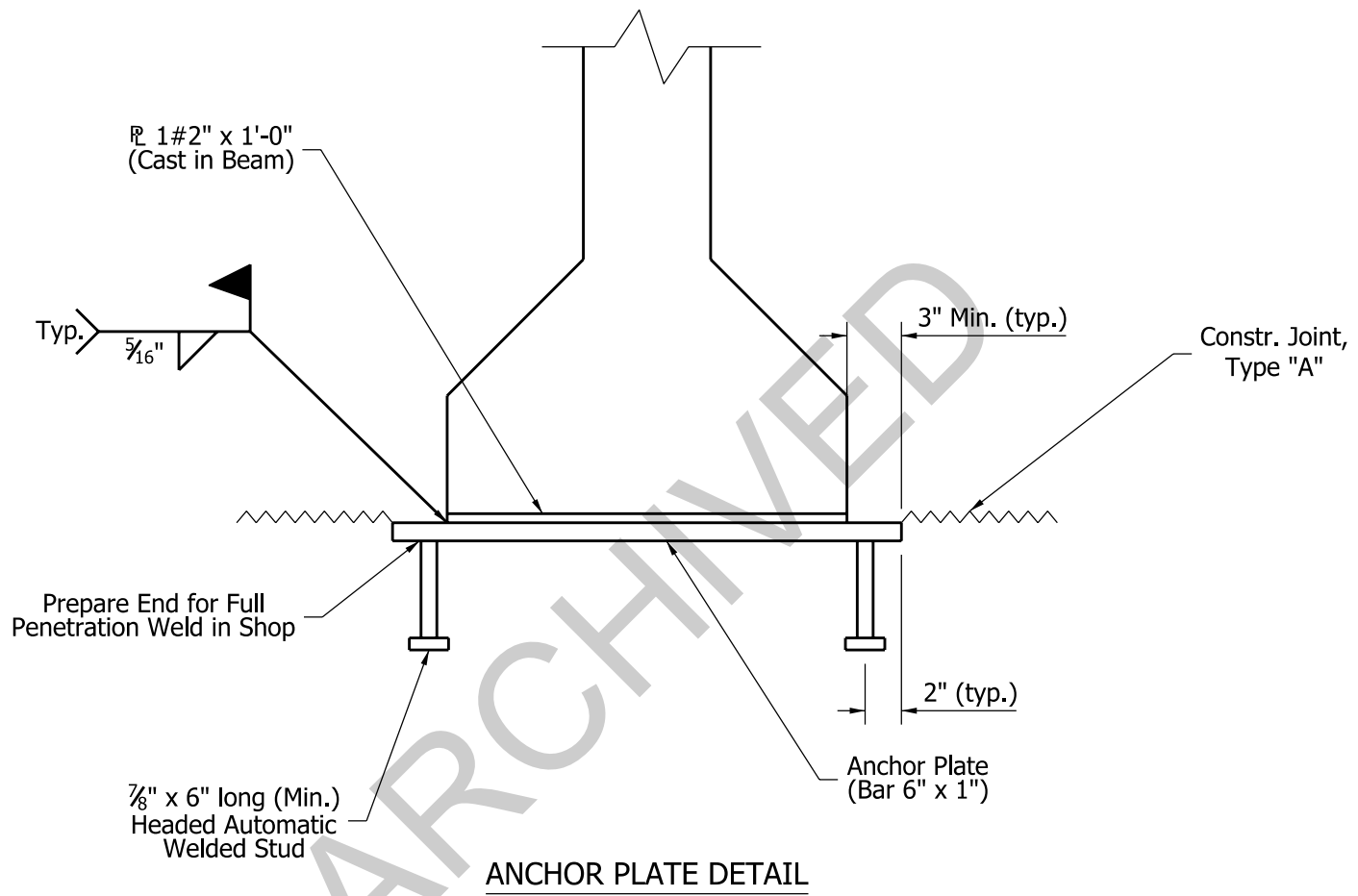
SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
(Method 1)



**SECTION BETWEEN BEAMS**

**SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
(Method 1)**

Figure 67-1 C (1)  
(Page 2 of 4)

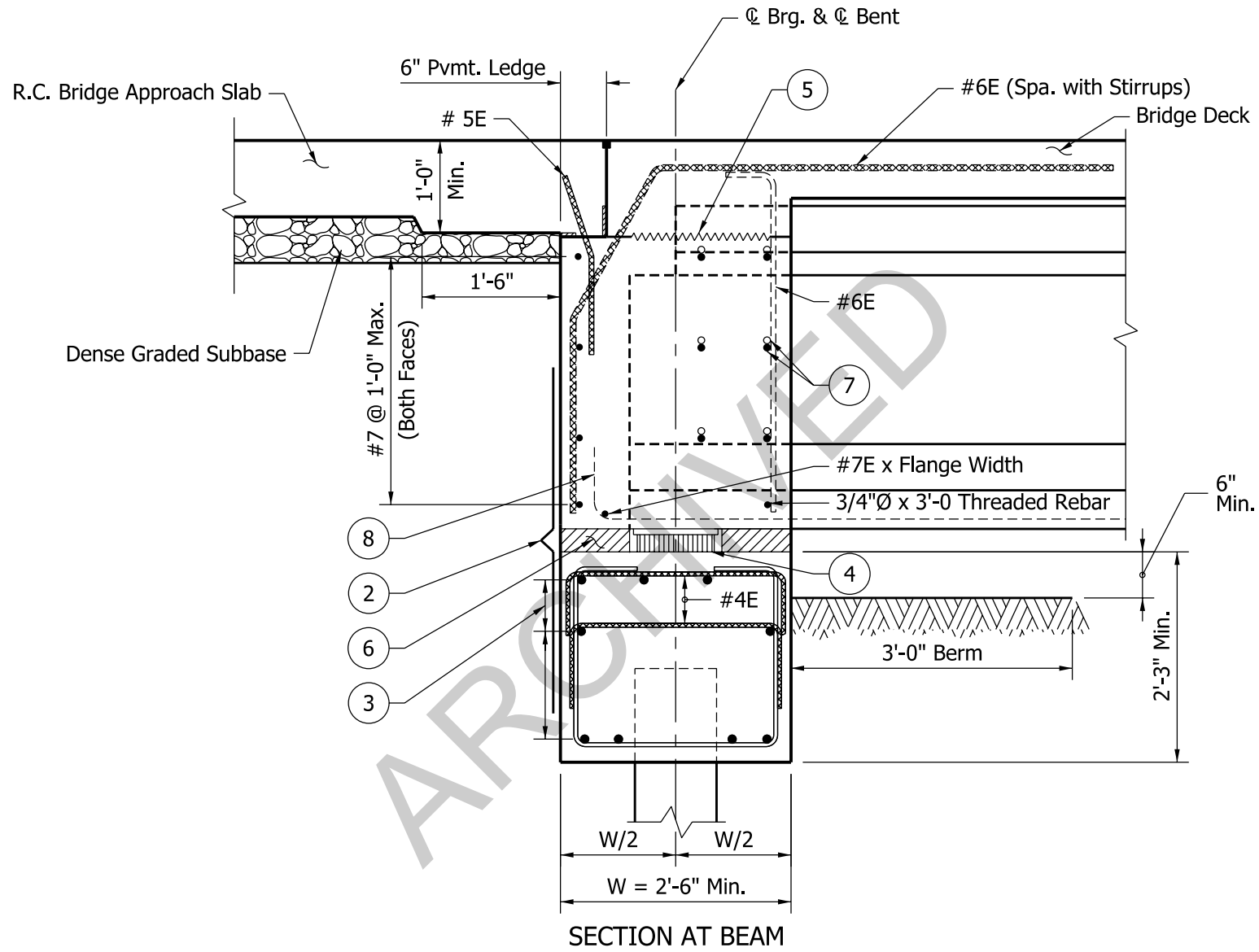


SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
 (Method 1)

- ① 3 Layers of medium weight roofing felt with grease between layers over  $\frac{1}{8}$ " high-density plastic bearing strip with smooth side up.
- ② Expanded polystyrene, Size to be determined by designer.
- ③ Polychloroprene joint membrane attached to concrete, See Figure 67-1C (3)
- ④ Main cap reinf. Reinforce for dead and live loads. Stirrups size determined by designer, spa. @ 1'-0 min.
- ⑤ Anchor plate, see Detail.
- ⑥ Construction joint type A.
- ⑦ 1" thickness expanded polystyrene, to be extended to  $\frac{1}{2}$ " outside limits of beam, so that beam does not come in contact with construction-jointed concrete.
- ⑧ Plate  $\frac{1}{2}$ " x 1'-0", full width of beam, cast in beam.
- ⑨ #6E x 6'-0" through 1"  $\varnothing$  holes cast in beams, lapped with #7E between beams.
- ⑩ Prestressed strand extension.
- ⑪ ⊗ #6 reinforcing bar set in 1'-0" depth field-drilled hole filled with epoxy grout, min. pullout 26,500 Lb.
- ⑫ ⊗ PVC sleeve, size determined by designer.  
Top of sleeve to be sealed before concrete is poured.
- ⊗ Used only if uplift is expected, or if bridge is in Seismic Zone 2.

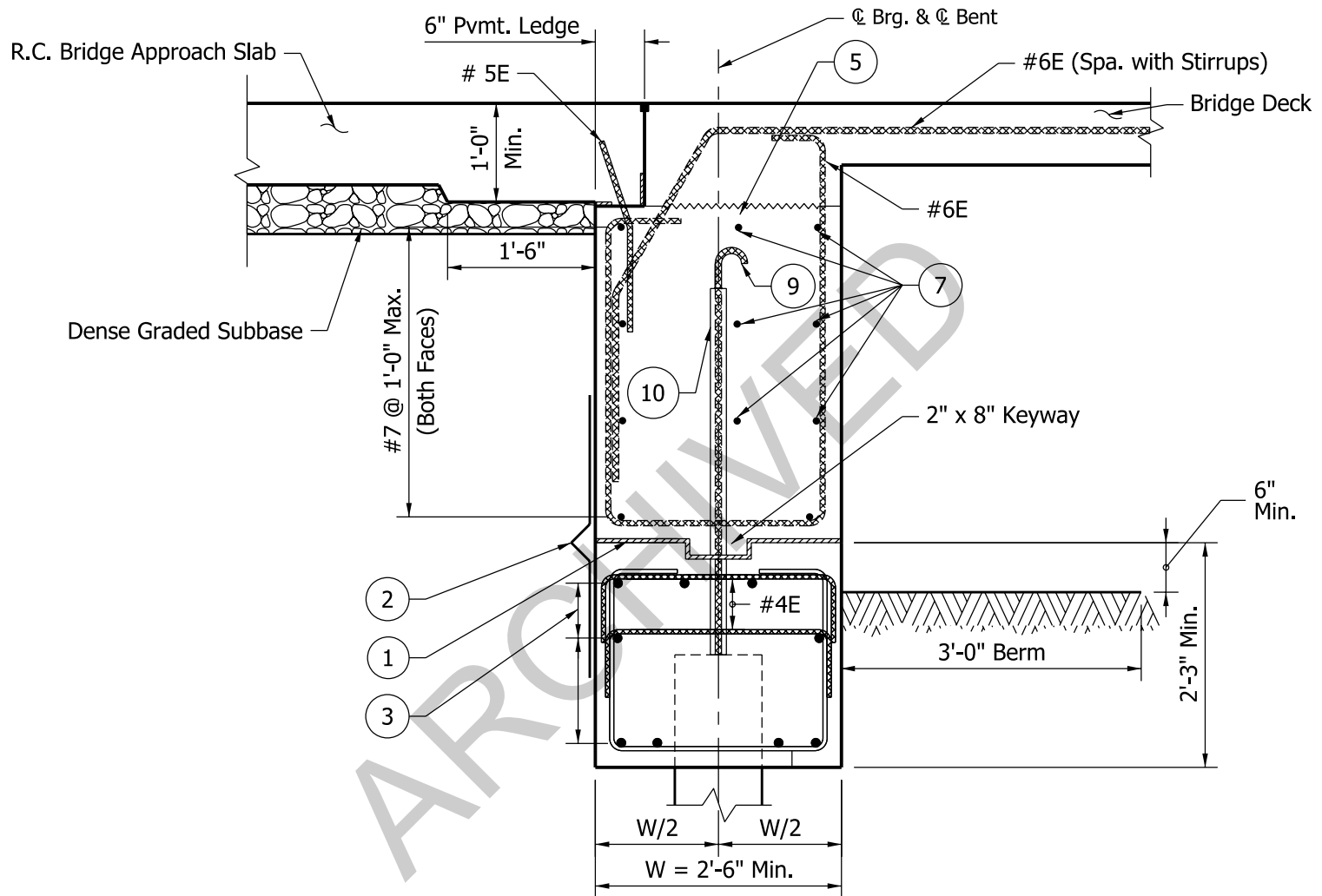
SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
(Method 1)

Figure 67-1 C (1)  
(Page 4 of 4)



SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
(Method 2)





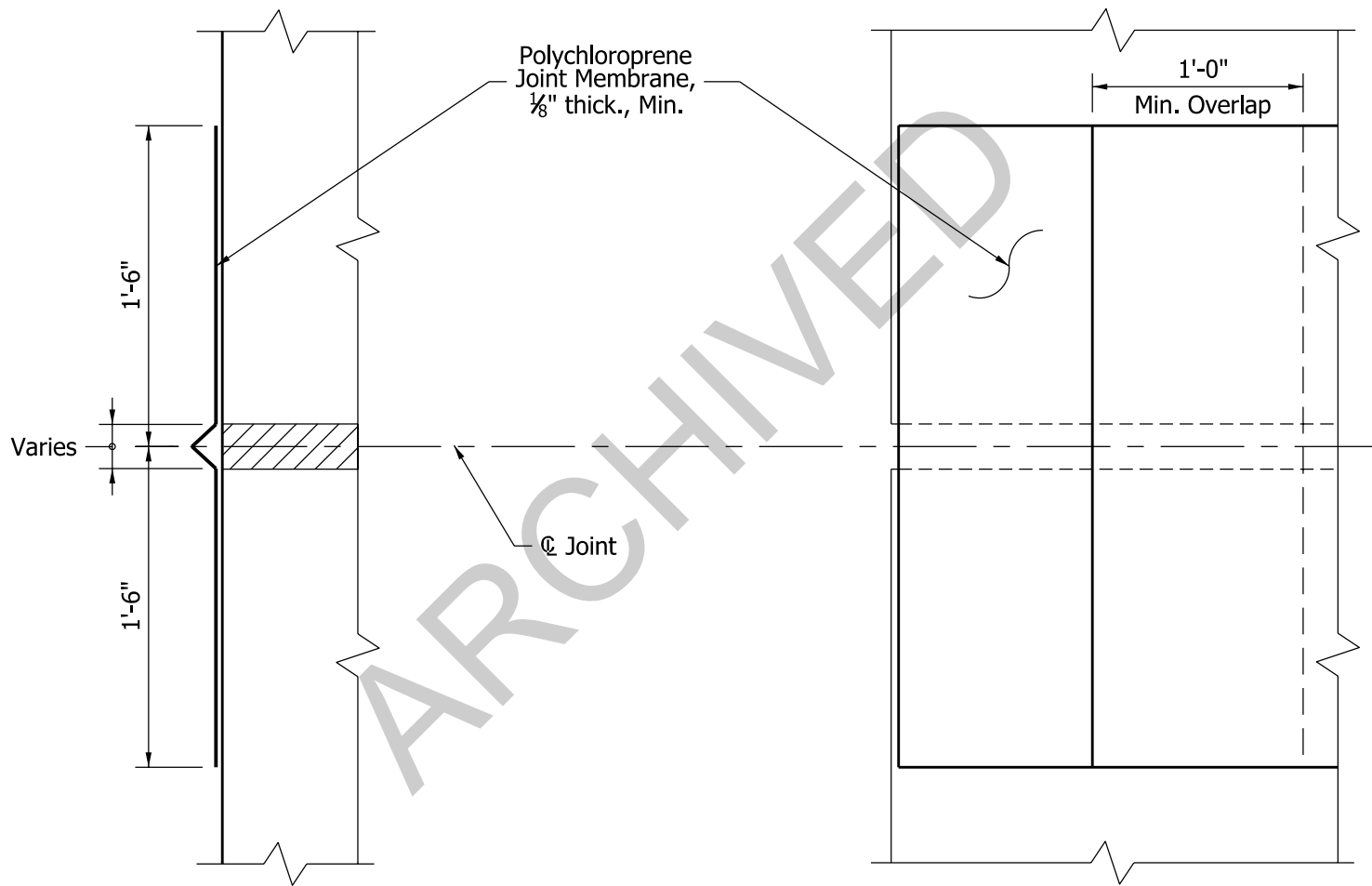
**SECTION BETWEEN BEAMS**

**SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
(Method 2)**

- ① ½" expanded polystyrene (horizontal face),  
1" expanded polystyrene (vertical face).
- ② Polychloroprene joint membrane attached to concrete, see Figure 67-1C(3).
- ③ Main cap reinf. Reinforce for dead and live loads.  
Stirrups size determined by designer, spa. @ 1'-0" min.
- ④ Elastomeric bearing pad.
- ⑤ Optional construction joint type A.
- ⑥ Expanded polystyrene cut to clear bearing pad by ½".
- ⑦ #6E x 6'-0" through 1" Ø holes cast in beams, lapped with #7E between beams.
- ⑧ Prestressed strand extension.
- ⑨ ⊗ #6 reinforcing bar set in 1'-0" depth field-drilled hole filled with epoxy grout, min. pullout 26,500 Lb.
- ⑩ ⊗ PVC sleeve, size determined by designer.  
Top of sleeve to be sealed before concrete is poured.  
⊗ Used only if uplift is expected, or if bridge is in Seismic Zone 2.

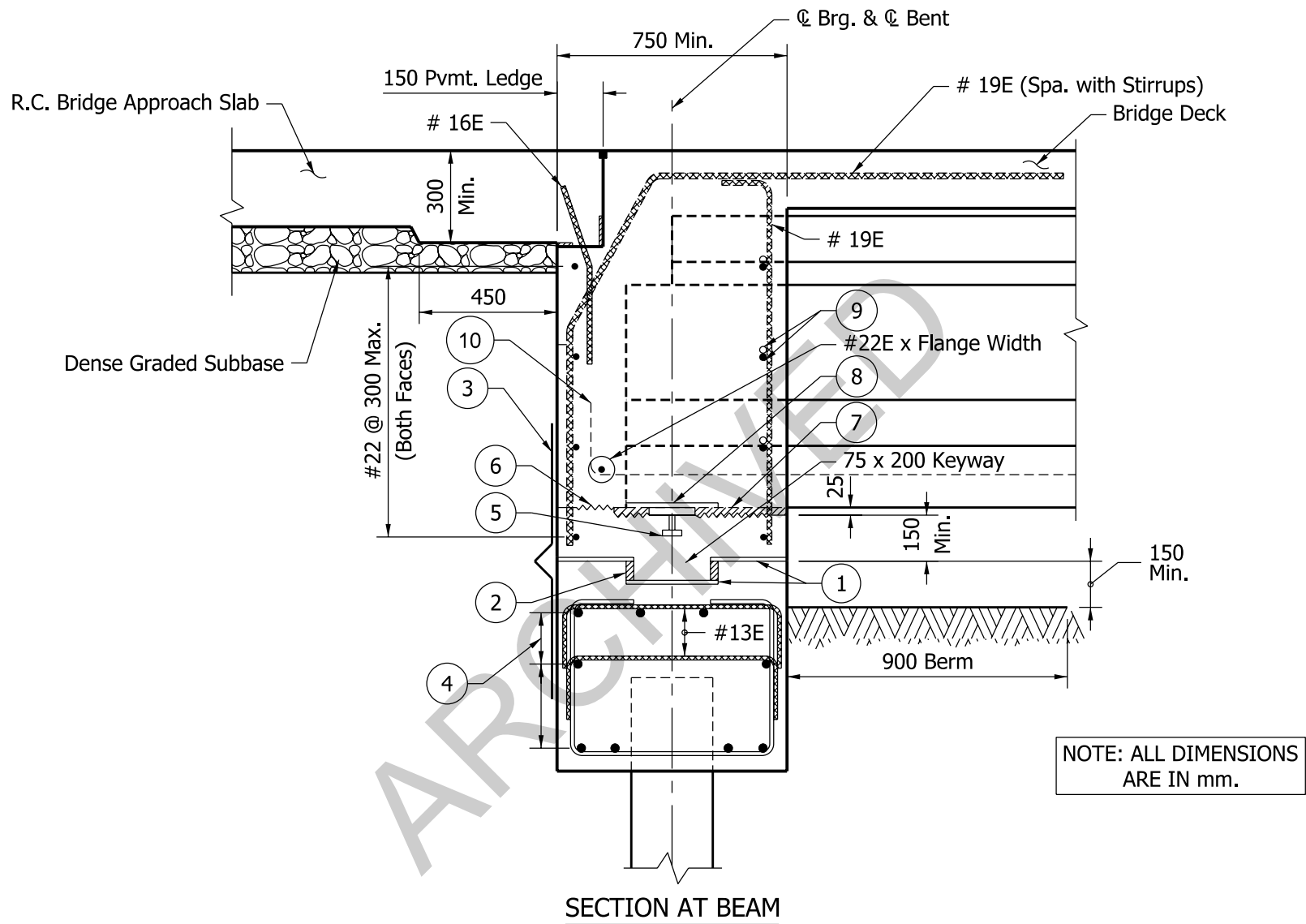
SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
(Method 2)

Figure 67-1 C (2)  
(Page 3 of 3)



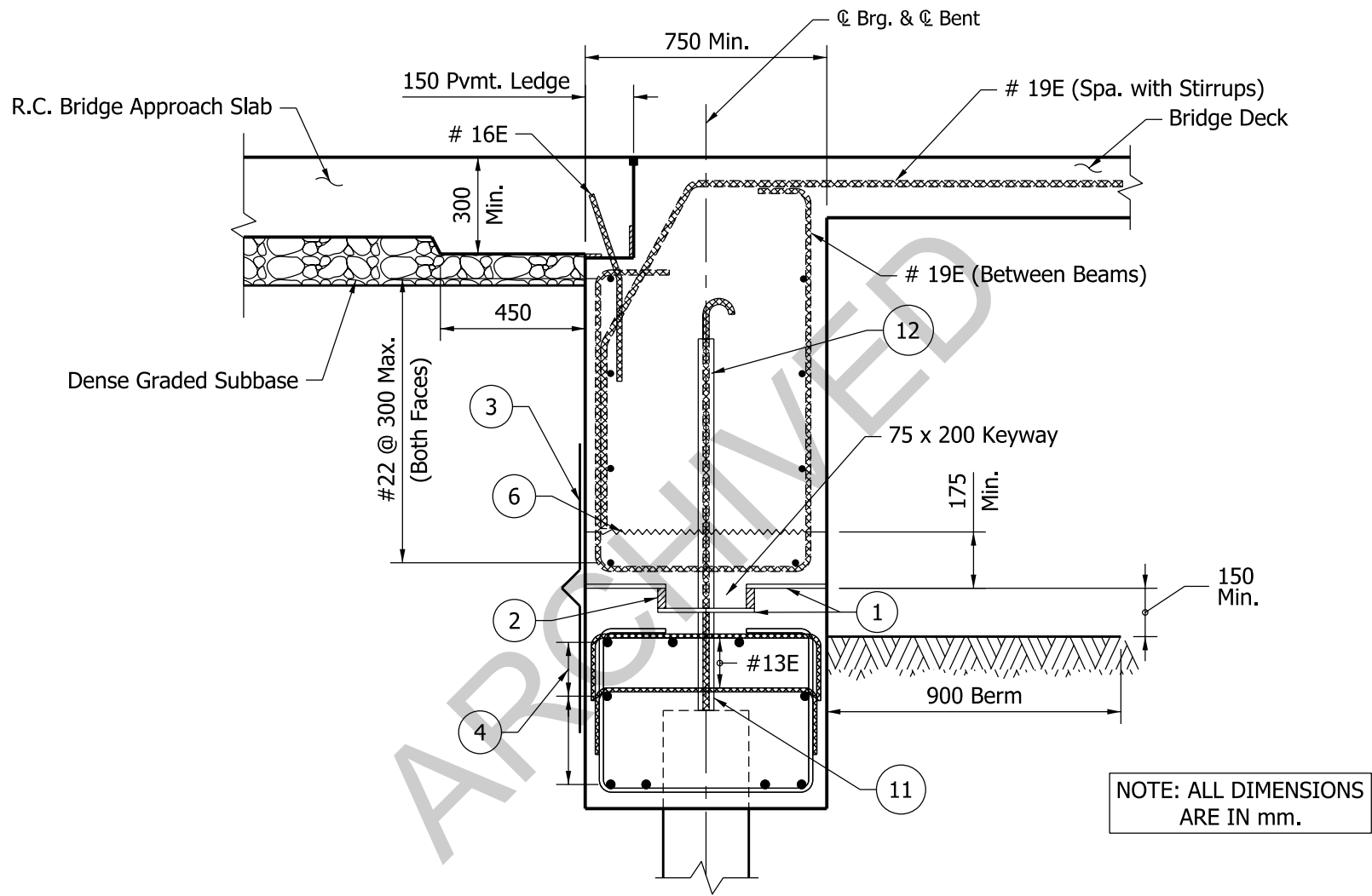
JOINT MEMBRANE DETAIL

Figure 67-1 C (3)



SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
(Method 1)

Figure 67-1 C (1)  
(Page 1 of 4)

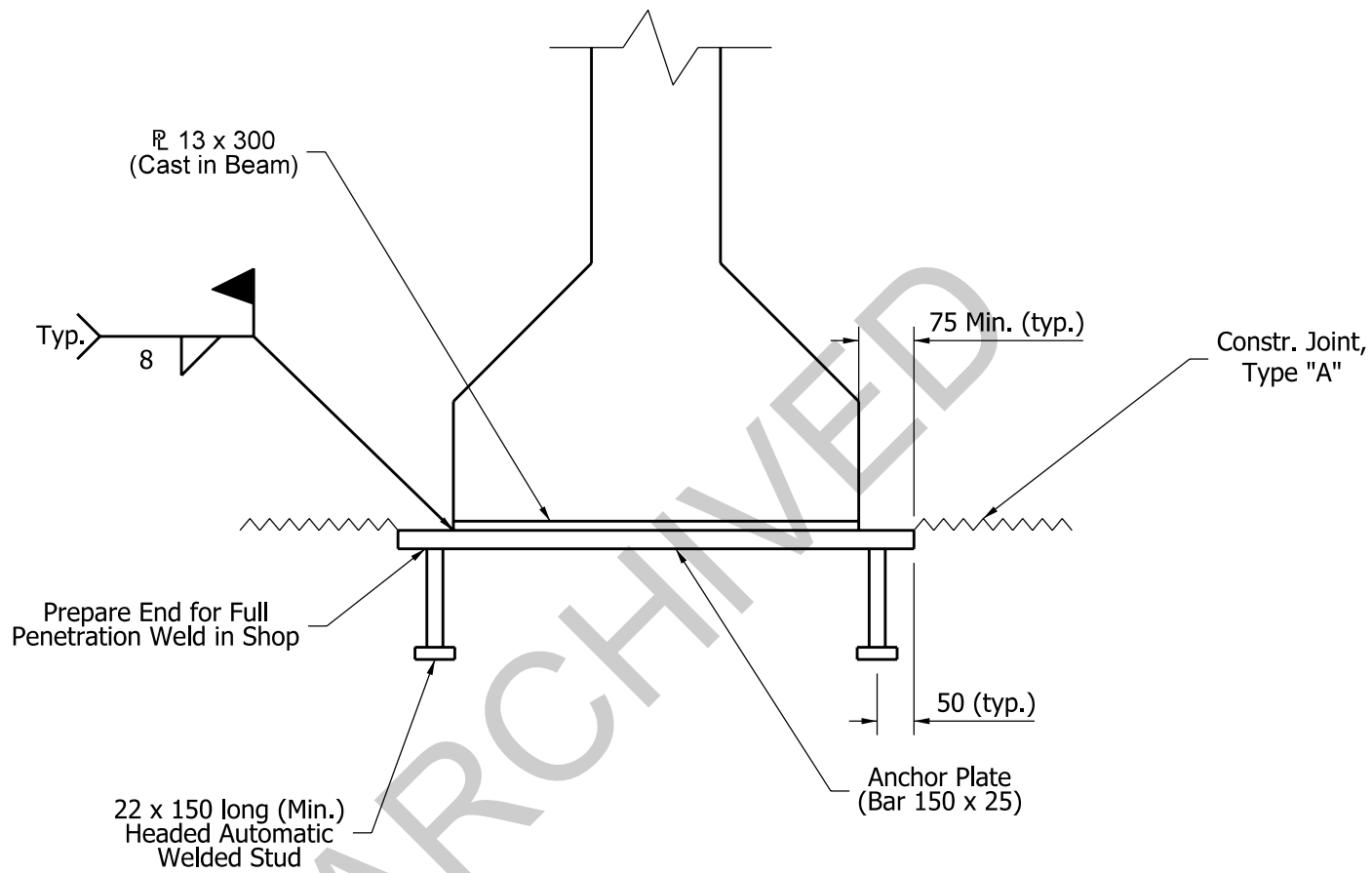


NOTE: ALL DIMENSIONS ARE IN mm.

SECTION BETWEEN BEAMS

SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
(Method 1)

Figure 67-1 C (1)  
(Page 2 of 4)



ANCHOR PLATE DETAIL

NOTE: ALL DIMENSIONS  
ARE IN mm.

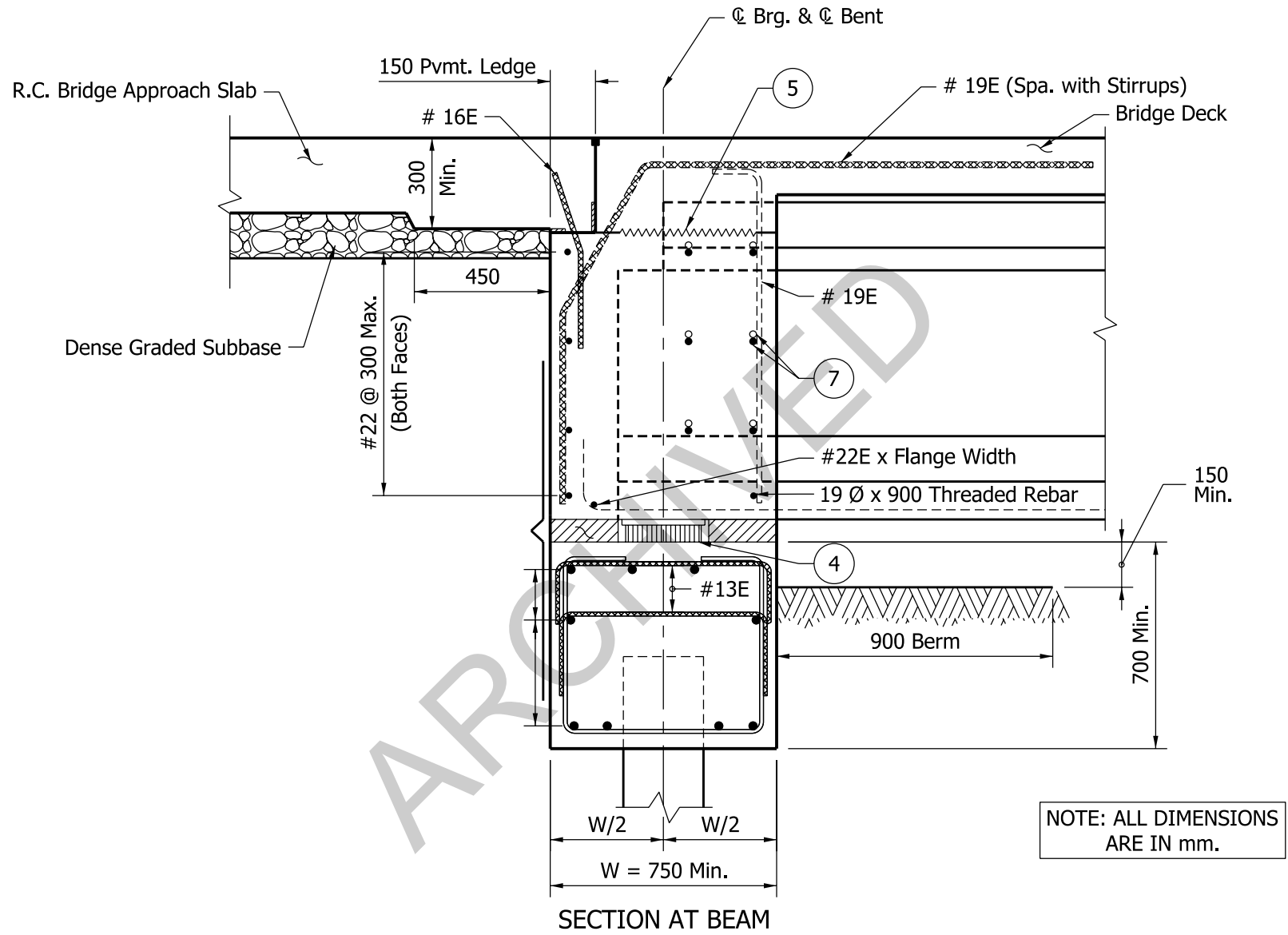
SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
(Method 1)

Figure 67-1 C (1)  
(Page 3 of 4)

- ① 3 Layers of medium weight roofing felt with grease between layers over 3mm high-density plastic bearing strip with smooth side up.
  - ② Expanded polystyrene, Size to be determined by designer.
  - ③ Polychloroprene joint membrane attached to concrete, See Figure 67-1C (3)
  - ④ Main cap reinf. Reinforce for dead and live loads. Stirrups size determined by designer, spa. @ 300 min.
  - ⑤ Anchor plate, see Detail.
  - ⑥ Construction joint type A.
  - ⑦ 25mm thickness expanded polystyrene, to be extended to 13mm outside limits of beam, so that beam does not come in contact with construction-jointed concrete.
  - ⑧ Plate 13 x 300, full width of beam, cast in beam.
  - ⑨ #19 x 1800 through 25 Ø holes cast in beams, lapped with #22E between beams.
  - ⑩ Prestressed strand extension.
  - ⑪ ⊗ #19 reinforcing bar set in 300 depth field-drilled hole filled with epoxy grout, min. pullout 118 kN.
  - ⑫ ⊗ PVC sleeve, size determined by designer.  
Top of sleeve to be sealed before concrete is poured.
- ⊗ Used only if uplift is expected, or if bridge is in Seismic Zone 2.  
Note: All Dimensions in Millimeters.

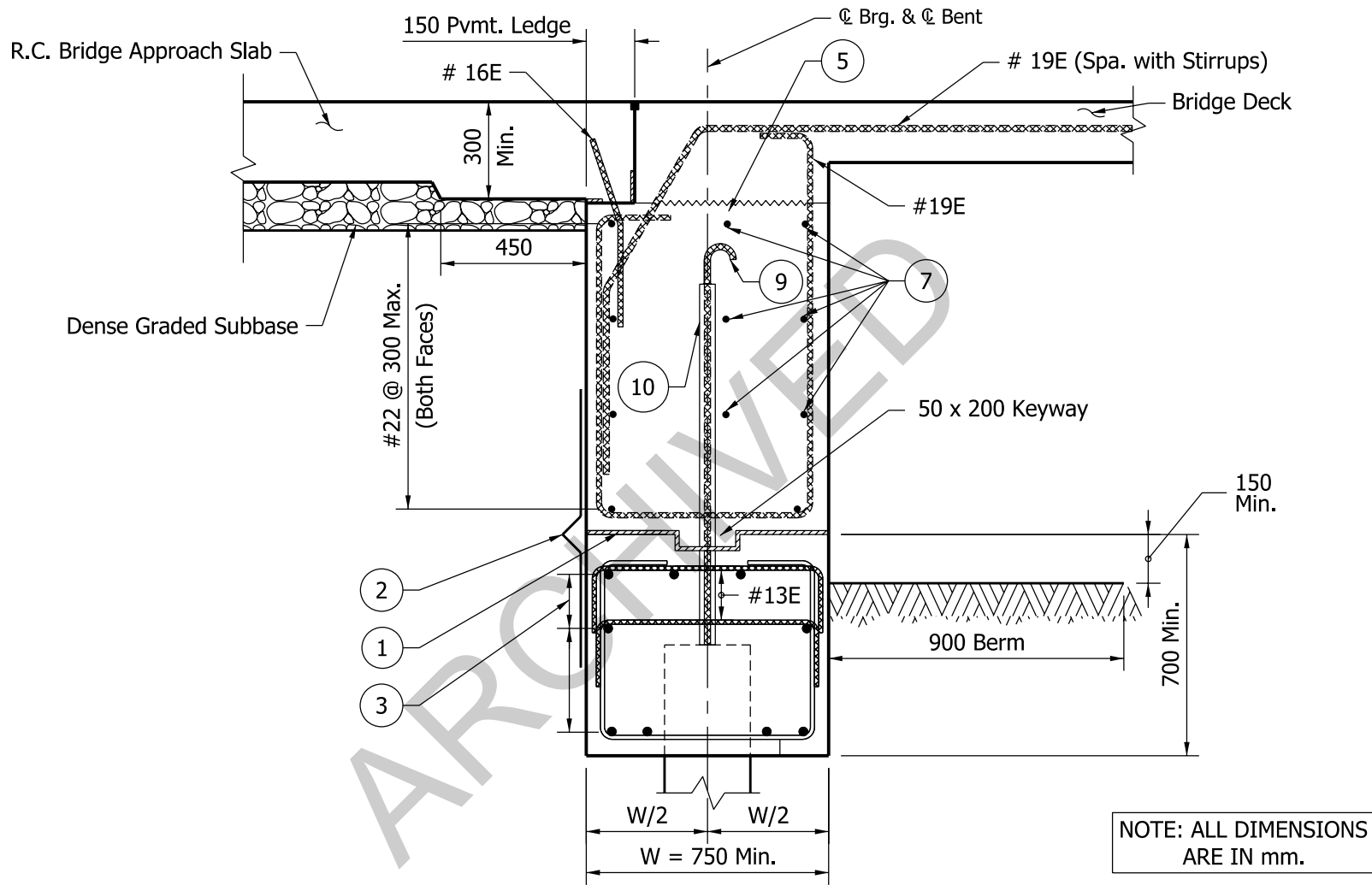
SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
(Method 1)

Figure 67-1 C (1)  
(Page 4 of 4)



SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
(Method 2)





**SECTION BETWEEN BEAMS**

**SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
(Method 2)**

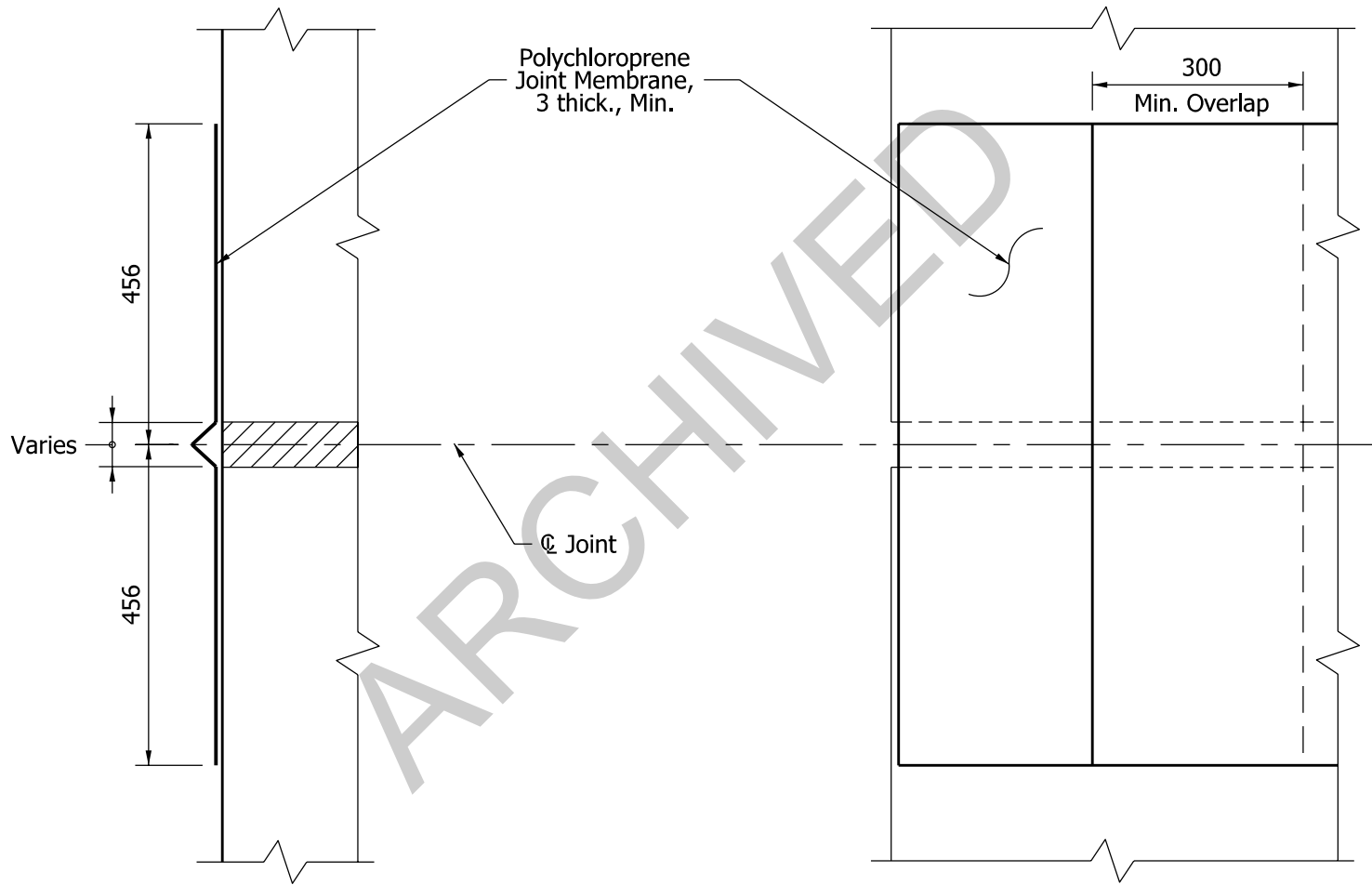
Figure 67-1 C (2)  
(Page 2 of 3)

- ① 13 expanded polystyrene (horizontal face),  
25 expanded polystyrene (vertical face)
- ② Polychloroprene joint membrane attached to concrete, see Figure 67-1C(3).
- ③ Main cap reinf. Reinforce for dead and live loads.  
Stirrups size determined by designer, spa. @ 300 min.
- ④ Elastomeric bearing pad.
- ⑤ Optional construction joint type A.
- ⑥ Expanded polystyrene cut to clear bearing pad by 13.
- ⑦ #19E x 1800 through 25 Ø holes cast in beams, lapped with #22E between beams.
- ⑧ Prestressed strand extension.
- ⑨ ⊗ #19 reinforcing bar set in 300 depth field-drilled hole filled with epoxy grout, min. pullout 118 kN.
- ⑩ ⊗ PVC sleeve, size determined by designer.  
Top of sleeve to be sealed before concrete is poured.  
⊗ Used only if uplift is expected, or if bridge is in Seismic Zone 2.  
Note: All Dimensions in Millimeters.

SUGGESTED SEMI-INTEGRAL END BENT DETAILS  
(Method 2)

Figure 67-1 C (2)  
(Page 3 of 3)

NOTE: ALL DIMENSIONS  
ARE IN mm



JOINT MEMBRANE DETAIL

Figure 67-1 C (3)