Illinois Department of Transportation

Memorandum

To: ALL BRIDGE DESIGNERS 19.8

From: D. Carl Puzey

Subject: Integral and Semi-Integral Abutment Bridge Policies and Details

Date: September 9, 2019

The Department has completed additional research for integral abutment structures. This research:

- Investigated the effect of superstructure stiffness on the behavior of integral abutment structures;
- Reexamined the combined axial and moment interaction capacities for metal shell piles for all expansion lengths and skews based on the latest revisions to the AASHTO LRFD Bridge Design Specifications;
- Reexamined thermal effects based on IDOT's newest design temperature range specified in ALL BRIDGE DESIGNERS (ABD) Memorandum 15.7;
- Evaluated the benefits of soils weaker than 1.5 tsf for permissible expansion lengths of piles and superstructure stiffness; and
- Further evaluated details and materials previously not permitted.

This memorandum includes the new updates and existing remaining policies and therefore supersedes ABD 12.3 "2012 Integral Abutment Bridge Policies and Details" as well as the integral abutment details found in ABD 15.2.

Highlights of updates

1. Increased the total allowable integral abutment structure length and semi-integral abutment structure length from 550' to 610'.

2. Added the MS16 pile and expanded the use of the other metal shell piles.

3. Removed the maximum pile spacing limit. One pile is required under each beam for an integral abutment. If more piles are required than one pile under each beam, the additional piles shall be placed at the midpoint between the beams.

4. Replaced the Integral Abutment Pile Selection Chart with the Integral Abutment Feasibility Analysis spreadsheet and the corresponding Expansion Length Limit Chart for the various pile types located at http://www.idot.illinois.gov/doing-business/procurements/engineering-architectural-professional-services/Consultants-Resources/index under the Bridges and Structures tab; Foundations and Geotechnical. This spreadsheet shall be used in the Planning phase of the project and in the development of the Structure Geotechnical Report (SGR) to determine if an integral abutment structure is feasible. The spreadsheet shall also be used in the Design phase when determining the appropriate pile sizes.

5. Added a soil improvement technique of precoring holes for piles and backfilling with bentonite as a permissible option when the unconfined compressive strength, Qu, exceeds 3.0 tsf. See the Integral Abutment Pile Selection Design Guide for details located at http://www.idot.illinois.gov/doing-business/procurements/engineering-architectural-professional-services/Consultants-Resources/index under the Bridges and Structures tab; Foundations and Geotechnical. The following revised version of General Note #42 shall be placed on the appropriate abutment sheets.

   "Piles shall be driven through _____ diameter precored holes extending to elevation ________ according to Article 512.09(c) of the Standard Specifications except that the void space outside of the pile shall be filled with bentonite according to the manufacturer's recommendations to achieve a Qu of 1.5 tsf."

   A 30" diameter precored hole shall be used for HP 14 piles and a 24" diameter precored hole shall be used for all other piles.

6. Revised the typical integral abutment cross sections for various superstructure types with updated reinforcement schemes, headed reinforcement, and standard integral abutment cap widths. See attached figures 2, 3 and 4. Standard cap widths are:

   a. Slabs: 3'-0"
   b. Steel beams: 3'-8"
   c. Concrete beams: 3'-11" (May need to be increased due to profile grade and camber)

7. Added a required offset bearing stiffener for all steel beams. The stiffener shall be placed at right angles to the beam web and located 10" from the beam ends. This replaces the previous beam anchorage of reinforcement placed through drilled holes in the beam web. Use a 1" stiffener for wide flanges and a 1" minimum or by design for plate girders. This stiffener is not the centerline of bearing. See attached figures 2, 11 and 18.

   This policy also pertains to semi-integral structures except that the bearing stiffener shall not be offset but placed at the centerline of bearing.

8. Standardized the centerline of bearing locations. On integral abutment structures the centerline of bearing is 7" from the beam end for all steel beams (wide flange and plate girder) and the centerline of bearing is 7 ½" from the beam end for all concrete beams (I-Beams, Bulb T-Beams, and IL-Beams). On semi-integral abutment structures with elastomeric bearings, the distance from the beam end to the centerline of bearing is 5 ½" minimum for steel beams and 8" minimum for concrete beams.

9. Expanded the use of integral abutment structures on MSE walls when determined to be the most feasible option with the following additional requirements:

   a. A pile sleeve of either corrugated metal pipe or HDPE pipe shall be placed around each pile, for the full height of the MSE select backfill, when the structure length is greater than 100 feet. The void between the pile and the pile sleeve shall be filled with bentonite. The minimum space between the pile and the pile sleeve shall be 3" or as required by design to accommodate the total pile movement.

b. The preferred MSE integral abutment wall orientation is straight and parallel to the roadway below. 'Wrap around" MSE integral abutment walls are permitted up to a 90 degree "U" shaped configuration when necessary. The plan area of the wrap around wall shall be sufficient to accommodate the wingwalls. Acute angles are not permitted.
c. The top of MSE wall elevation shall be the bottom of abutment cap elevation. The top of coping elevation shall be 6" above the bottom of abutment cap elevation. Wingwalls parallel with the abutment cap shall be used to control the remainder of the soil slope.
d. A minimum of 3'-0" shall be provided from the face of the MSE wall to the face of the abutment cap.

See Figures 23 and 24 for additional details.

10. Expanded IDOT's integral analysis to consider the stiffness of the superstructure in addition to the abutment. The stiffness of the piers can also play a role. However, to minimize the stiffness effects of the piers, the Department's preference is fixed bearings for flexible pier types such as pile bents and encased pile bent piers and expansion bearings for stiffer piers with footings, crash walls, drilled shafts and rigid frame piers. The integral analysis also considers the variable stiffness of a potential different number of piles at each abutment, but it does not consider the variable stiffness for different pile types at each abutment. It is recommended, whenever possible, to design the same type of pile at each abutment for economy with the pile driving hammer. On rare cases when a different pile type is designed at each abutment, the designer shall evaluate the pile properties given in the Integral Abutment Feasibility Analysis spreadsheet, determine if a hammer is suitable for both pile types and then use engineering judgment to determine the effect on the integral analysis.

11. Expanded the semi-integral abutment details. See Figures 16 through 22.

12. Updated the diaphragm and abutment base sheets. These are available in the CADD libraries on our website.

Existing integral abutment policies that have remained the same.

1. The maximum skew for an integral abutment structure is 45 degrees. The skew for a semi-integral structure is only limited by the permissible skew for the joint at the end of the approach slab.

2. The pile orientation at integral abutments shall be weak axis bending where the pile web is always perpendicular to the centerline of the structure. The pile orientation at the pier will remain unchanged with the web of the pile perpendicular to the face of the pier.

3. Beam flange clipping details are provided to help eliminate interference with the approach slab for high skews and steep grades.

4. Corrosion protection of the HP pile is already accounted for in the Integral Abutment Feasibility Analysis spreadsheet. Corrosion protection of the metal shell pile is provided with additional reinforcement in the top portion of the metal shell pile as detailed on base sheet F-MS.

5. Additional spiral reinforcement shall be placed in the abutment cap around the larger piles to help resist the moment at the pile/cap interface. See integral abutment figures 2 and 3 for additional details.

6. The backfill shall be Granular Backfill for Structures according to Section 586. The backfill is not required to be compacted. However, the backfill shall be compacted for structures with steel railings extending beyond the bridge when a bridge approach slab is not provided. This compaction provides for secure driven posts and was accounted for in the design assumptions. The following note shall be placed on the contract plans near the Granular Backfill detail.

   "Granular Backfill behind the abutments shall be compacted according to Article 205.06 of the Standard Specifications."

7. All steel plate girders shall be braced with a cross frame/diaphragm placed 2 feet into the span from the inside face of the abutment concrete diaphragm to ensure stability during construction.

8. A formed joint with bridge relief joint sealer shall be placed at the end of the bridge deck to provide a controlled crack for potential rotation.

9. Single unit slab bridges are considered integral structures and are limited to a total structure length of 130 feet and a maximum individual span of 40 feet. See Figure 4 for connection details of the slab bridge to the abutment. Precast approach slabs are not required for integral slab bridges.

10. Wingwalls shall be parallel to the centerline of the abutment. The maximum length of wingwall connected to the structure is 10 feet. Additional, independent wingwall extensions may be added as necessary. The minimum length of wingwall extension shall be 4 feet.

11. Abutments shall be parallel to each other. Flared structures are permitted. Integral structures with curved girders are not permitted.

12. The bridge deck is required to be cast prior to backfilling behind the abutment and casting of the bridge approach slab. The entire diaphragm shall be cast with the bridge deck.

13. Bridge approach slabs shall be cast-in-place (CIP) unless the longest distance from the centroid of stiffness of the structure to the back of the abutment is > 130 feet. In this case, the structure shall utilize a precast bridge approach slab on both ends of the bridge, regardless if the distance on the other end of the bridge is ≤ 130 feet. See the Approach Slab CADD Cell Libraries for more details.

14. A rigid Pavement Connector (PCC) For Bridge Approach Slab (H.S. 420401) is necessary to connect to CIP and Precast Bridge Approach Slabs on all integral structures for proper installation of the expansion joint. If the total integral structure length is ≤ 100' the owner may omit the expansion joint at the end of the bridge approach slab and use a flexible Pavement Connector (HMA) for Bridge Approach Slab (H.S. 420406). The designer should coordinate and confirm with the owner.

15. Precast bridge approach slabs may vary in width from 3'-0" to 6'-0" as necessary to satisfy the location of the stage construction line and edge of pavement. It is preferable to have an even number of precast slabs to better match the crown of the roadway. The Department recommends utilizing wider precast slabs when possible to minimize the number of longitudinal joints. The reinforcement details on the base sheets are adequate for all widths in this range. Adjacent precast bridge approach slabs shall be separated by a longitudinal 2" Styrofoam block full length along the bottom of the precast slab. See base sheets for details. This enables the shear keys to be cast with the concrete wearing surface. Precast bridge approach slabs shall have a 5" concrete wearing surface cast on top.

16. The maximum end span length permitted in a multi-span integral abutment structure is 200 feet.

17. The maximum simple span length for an integral abutment structure is 170 feet.

Implementation

The policies and details specified in this memorandum shall be effective for projects with TSL's approved after September 16, 2019 and may also be implemented for projects currently under design as determined by the District. Please direct questions to Mark Shaffer in the Policies, Standards and Final Plan Control Unit at (217) 785-2914 or Mark.Shaffer@illinois.gov.

Attachments

KLR/kktABD19.8-20190909

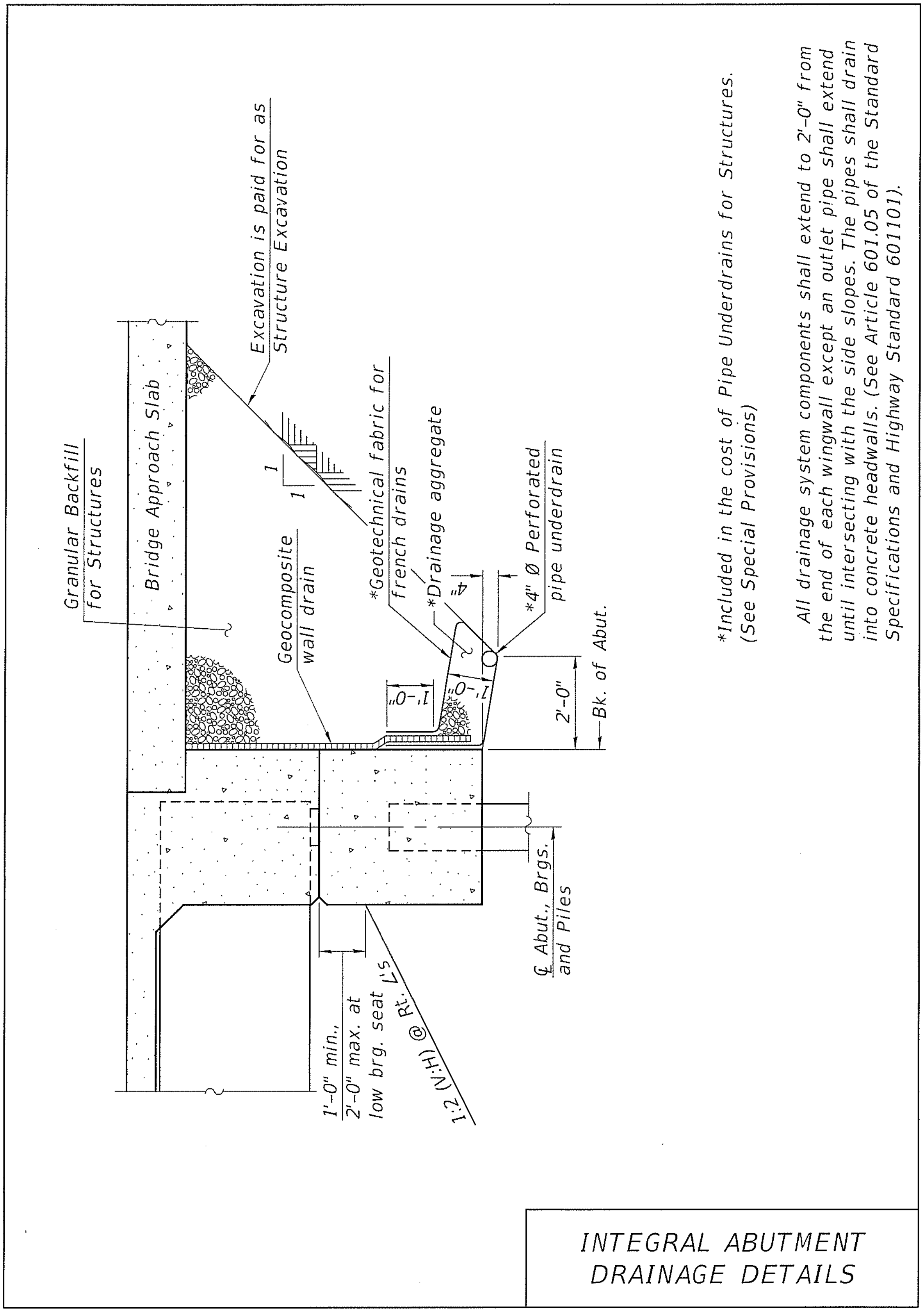
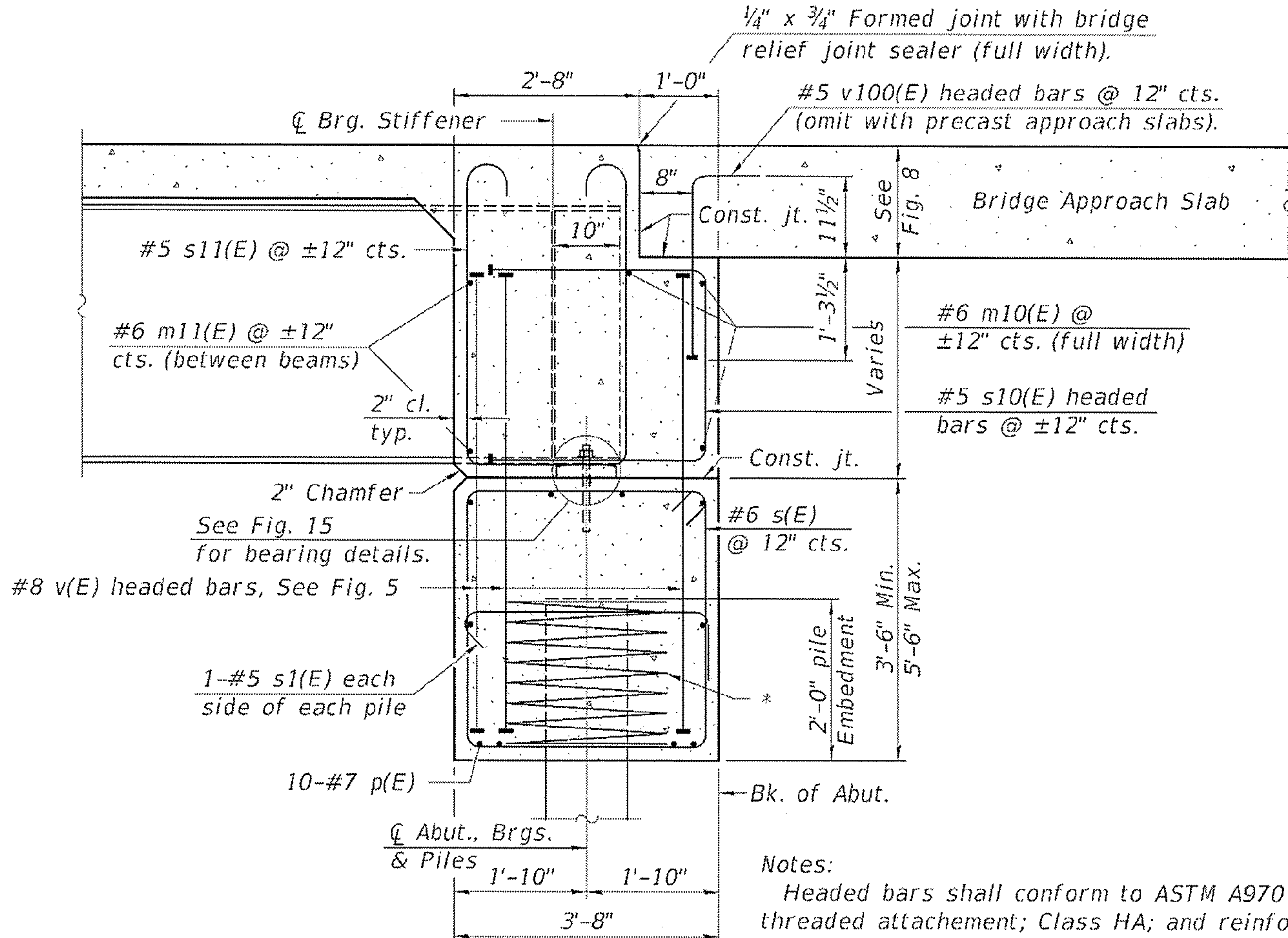

Excavation is paid for as
Structure Excavation
Granular Backfill
for Structures
Bridge Approach Slab
1
1
*Geotechnical fabric for
french drains
*Drainage aggregate
Geocomposite
wall drain
4"
*4" Ø Perforated
pipe underdrain
1'-0"
1'-0"
2'-0"
Bk. of Abut.
℄ Abut., Brgs.
and Piles
1'-0" min.,
2'-0" max. at
low brg. seat
1:2 (V:H) @ Rt. ∠'s
*Included in the cost of Pipe Underdrains for Structures.
(See Special Provisions)
All drainage system components shall extend to 2'-0" from
the end of each wingwall except an outlet pipe shall extend
until intersecting with the side slopes. The pipes shall drain
into concrete headwalls. (See Article 601.05 of the Standard
Specifications and Highway Standard 601101).
INTEGRAL ABUTMENT
DRAINAGE DETAILS

Figure 1



* #4 sp(E) spiral (2'-0" Ø; 3" pitch; 1½ extra turns top and bottom) for pile sizes HP12x74 and larger and MS14x0.25 and larger.

Notes:

Headed bars shall conform to ASTM A970 with threaded attachement; Class HA; and reinforcement bars conforming to ASTM A706. Cost included with Reinforcement Bars, Epoxy Coated.

The s10(E), s11(E), and v100(E) bars are placed parallel to beams and spaced at right angles to beams.

The s(E) and s1(E) bars are placed at right angles to cap and spaced along cap.

INTEGRAL ABUTMENT
FOR STEEL BEAMS

Figure 2

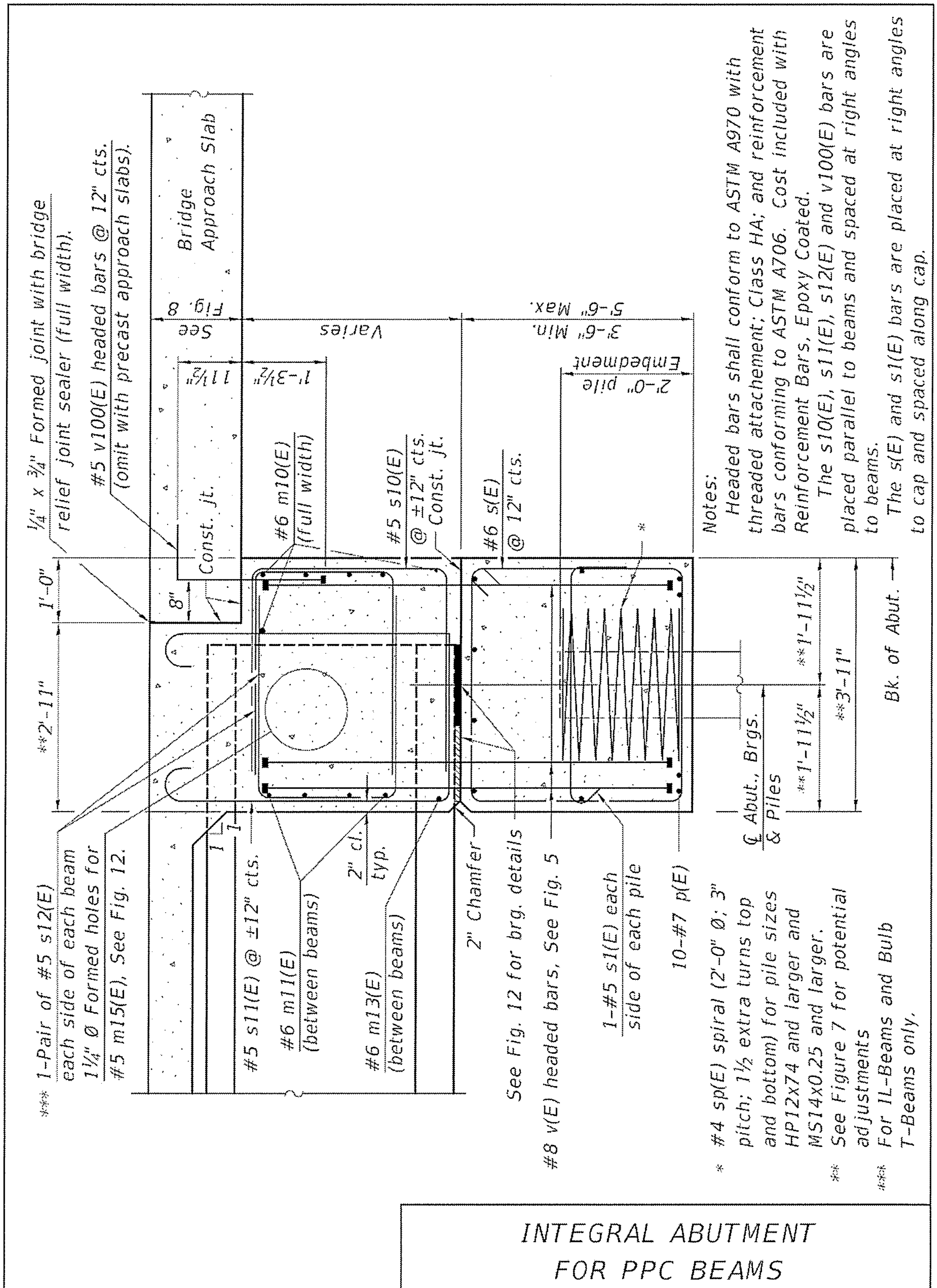
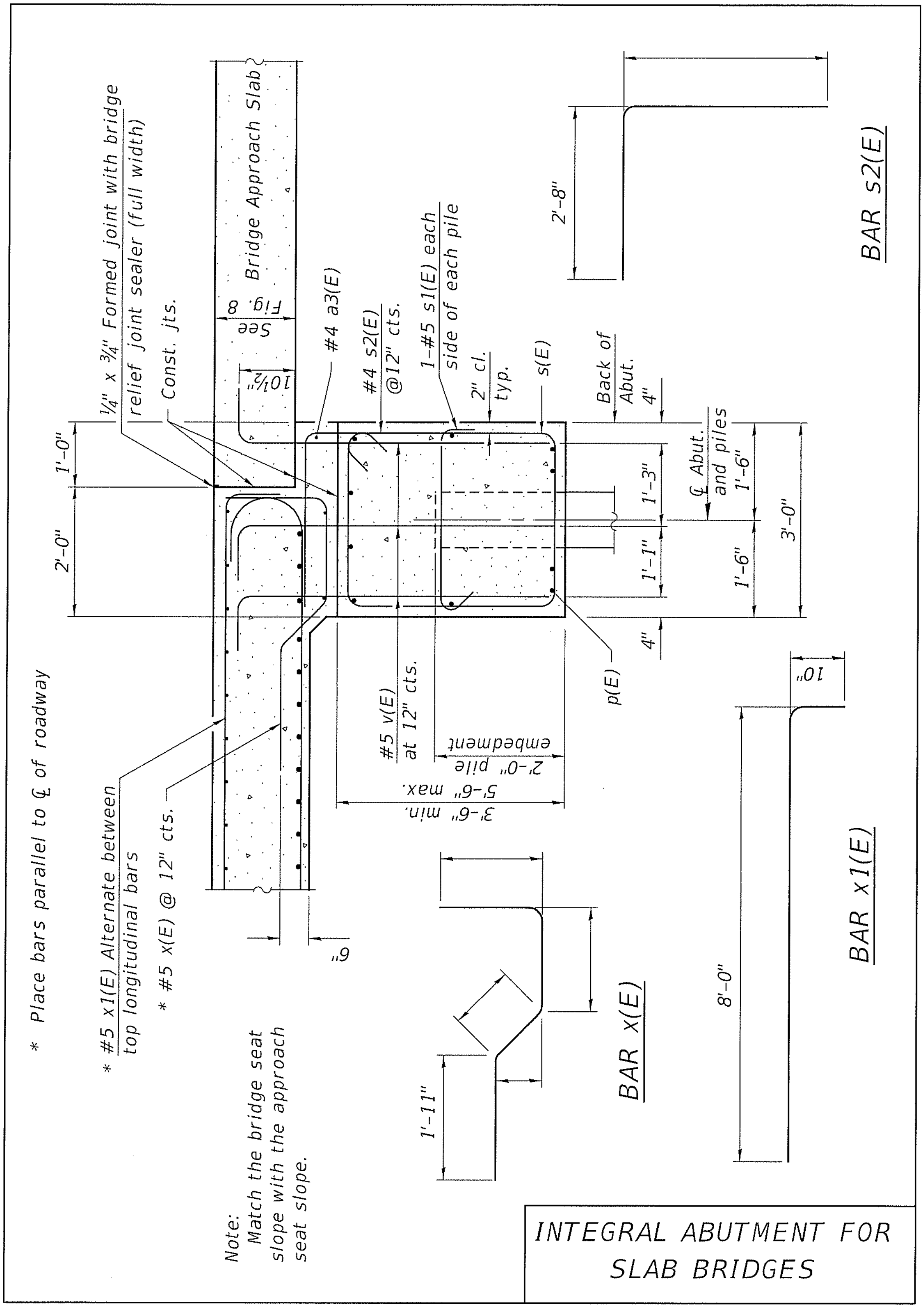
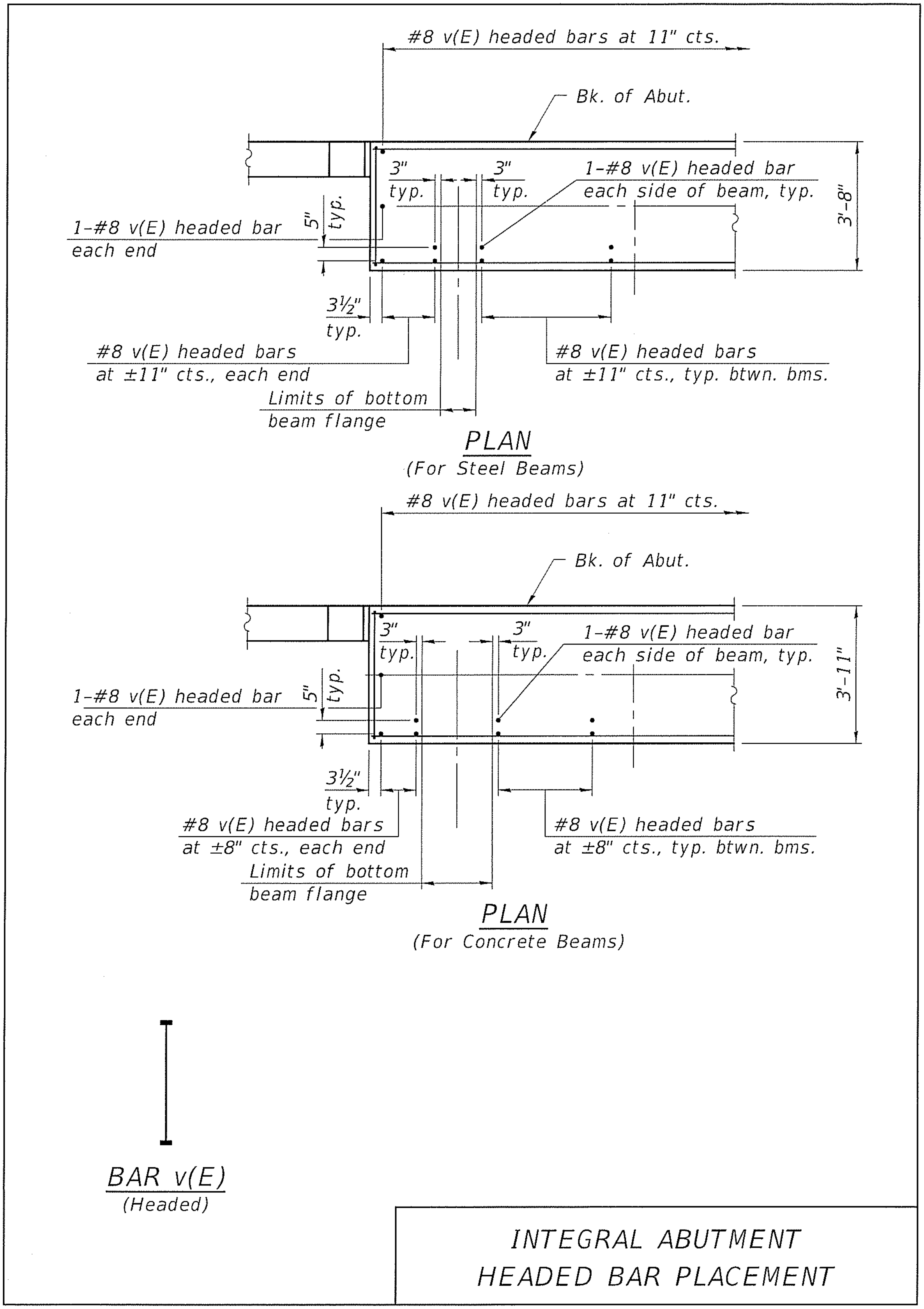

1/4" x 3/4" Formed joint with bridge relief joint sealer (full width).
#5 v100(E) headed bars @ 12" cts. (omit with precast approach slabs).
Bridge Approach Slab
See Fig. 8
Varies
5'-6" Max.
3'-6" Min.
2'-0" pile Embedment
11 1/2"
1'-3 1/2"
Const. jt.
#6 m10(E) (full width)
#5 s10(E) @ ±12" cts.
Const. jt.
#6 s(E) @ 12" cts.
*
1'-0"
8"
**2'-11"
**1'-11 1/2"
**1'-11 1/2"
**3'-11"
Bk. of Abut.
℄ Abut., Brgs. & Piles
1
1
*** 1-Pair of #5 s12(E) each side of each beam
1 1/4" Ø Formed holes for #5 m15(E), See Fig. 12.
#5 s11(E) @ ±12" cts.
#6 m11(E) (between beams)
2" cl. typ.
#6 m13(E) (between beams)
2" Chamfer
See Fig. 12 for brg. details
#8 v(E) headed bars, See Fig. 5
1-#5 s1(E) each side of each pile
10-#7 p(E)
Notes:
Headed bars shall conform to ASTM A970 with threaded attachement; Class HA; and reinforcement bars conforming to ASTM A706. Cost included with Reinforcement Bars, Epoxy Coated.
The s10(E), s11(E), s12(E) and v100(E) bars are placed parallel to beams and spaced at right angles to beams.
The s(E) and s1(E) bars are placed at right angles to cap and spaced along cap.
* #4 sp(E) spiral (2'-0" Ø; 3" pitch; 1 1/2 extra turns top and bottom) for pile sizes HP12x74 and larger and MS14x0.25 and larger.
** See Figure 7 for potential adjustments
*** For IL-Beams and Bulb T-Beams only.
INTEGRAL ABUTMENT
FOR PPC BEAMS

Figure 3



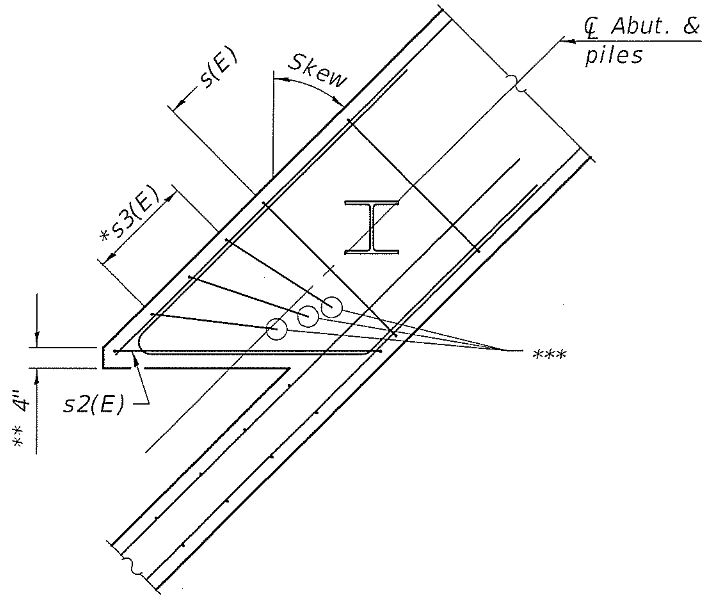
* Place bars parallel to ℄ of roadway
* #5 x1(E) Alternate between top longitudinal bars
* #5 x(E) @ 12" cts.
1/4" x 3/4" Formed joint with bridge relief joint sealer (full width)
Const. jts.
See Fig. 8
Bridge Approach Slab
10 1/2"
#4 a3(E)
#4 s2(E) @12" cts.
1-#5 s1(E) each side of each pile
2" cl. typ.
s(E)
Back of Abut.
4"
℄ Abut. and piles
1'-0"
2'-0"
1'-3"
1'-1"
1'-6"
1'-6"
3'-0"
4"
p(E)
#5 v(E) at 12" cts.
2'-0" pile embedment
5'-6" max.
3'-6" min.
6"
Note: Match the bridge seat slope with the approach seat slope.
BAR s2(E)
2'-8"
BAR x(E)
1'-11"
BAR x1(E)
8'-0"
10"
INTEGRAL ABUTMENT FOR SLAB BRIDGES

Figure 4



#8 v(E) headed bars at 11" cts.
Bk. of Abut.
3" typ.
3" typ.
1-#8 v(E) headed bar each side of beam, typ.
3'-8"
1-#8 v(E) headed bar each end
5" typ.
3½" typ.
#8 v(E) headed bars at ±11" cts., each end
#8 v(E) headed bars at ±11" cts., typ. btwn. bms.
Limits of bottom beam flange
PLAN
(For Steel Beams)
#8 v(E) headed bars at 11" cts.
Bk. of Abut.
3" typ.
3" typ.
1-#8 v(E) headed bar each side of beam, typ.
3'-11"
1-#8 v(E) headed bar each end
5" typ.
3½" typ.
#8 v(E) headed bars at ±8" cts., each end
#8 v(E) headed bars at ±8" cts., typ. btwn. bms.
Limits of bottom beam flange
PLAN
(For Concrete Beams)
BAR v(E)
(Headed)
INTEGRAL ABUTMENT
HEADED BAR PLACEMENT

Figure 5



ABUTMENT CAP PLAN

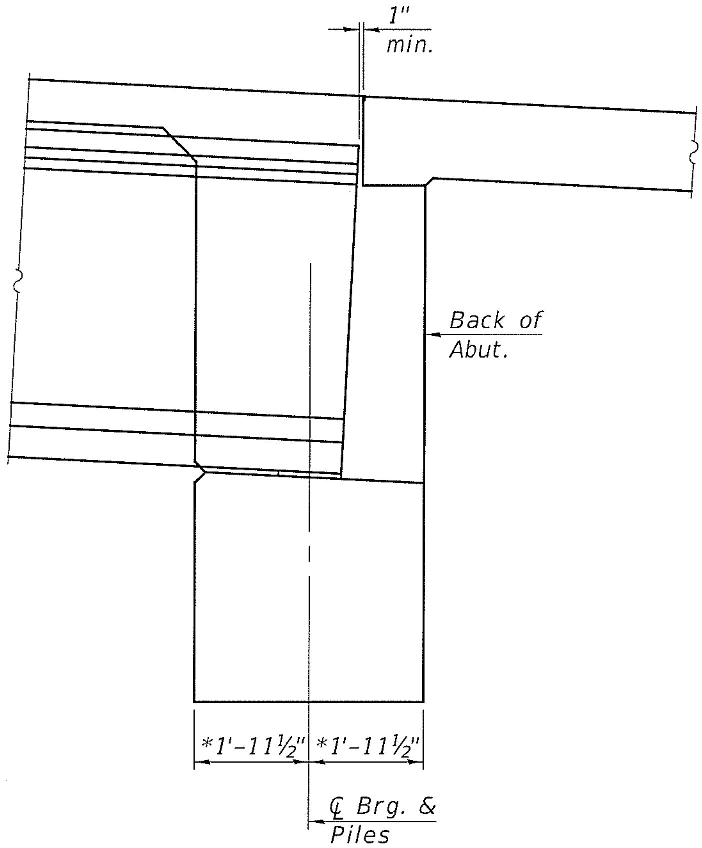
* Add s3(E) bars when the spacing between s(E) and s2(E) bars exceeds what is required by design or 12".

** Block out sharp corner of abutment cap and diaphragm as shown for skews 25 degrees and larger.

*** Detail legs of s3(E) bars such that they do not all come to a point causing congestion.

CORNER TREATMENT OF SKEWED INTEGRAL ABUTMENTS

Figure 6



SECTION THRU ABUTMENT

* Increase as needed to maintain 1" minimum clearance between beam and approach pavement. The skew angle will also need to be considered (See top flange clip details) as well as the camber.

Notes:

The grade of the bridge shall be considered when detailing integral abutments with PPC beams. Since the beams are cast such that the beam ends are 90 degrees to the top and bottom flanges the beam ends will not be vertical if the beams are placed on a grade. In addition beam camber will cause further rotation of the beam end.

Abutment caps shall be sloped to match the grade when the change in elevation exceeds ¼" from the front face of abutment to the end of the beam. This is done to ensure the fabric bearing pad and polystyrene are under a more uniform bearing pressure. Reinforcement as shown on the base sheets may need to be adjusted to accommodate the slope.

Integral abutments with steel beams do not need these adjustments since the beam ends can be clipped vertically and the steel rocker plate can accommodate grades.

INTEGRAL ABUTMENT DETAILS FOR PPC BEAMS ON LARGE GRADES

Figure 7

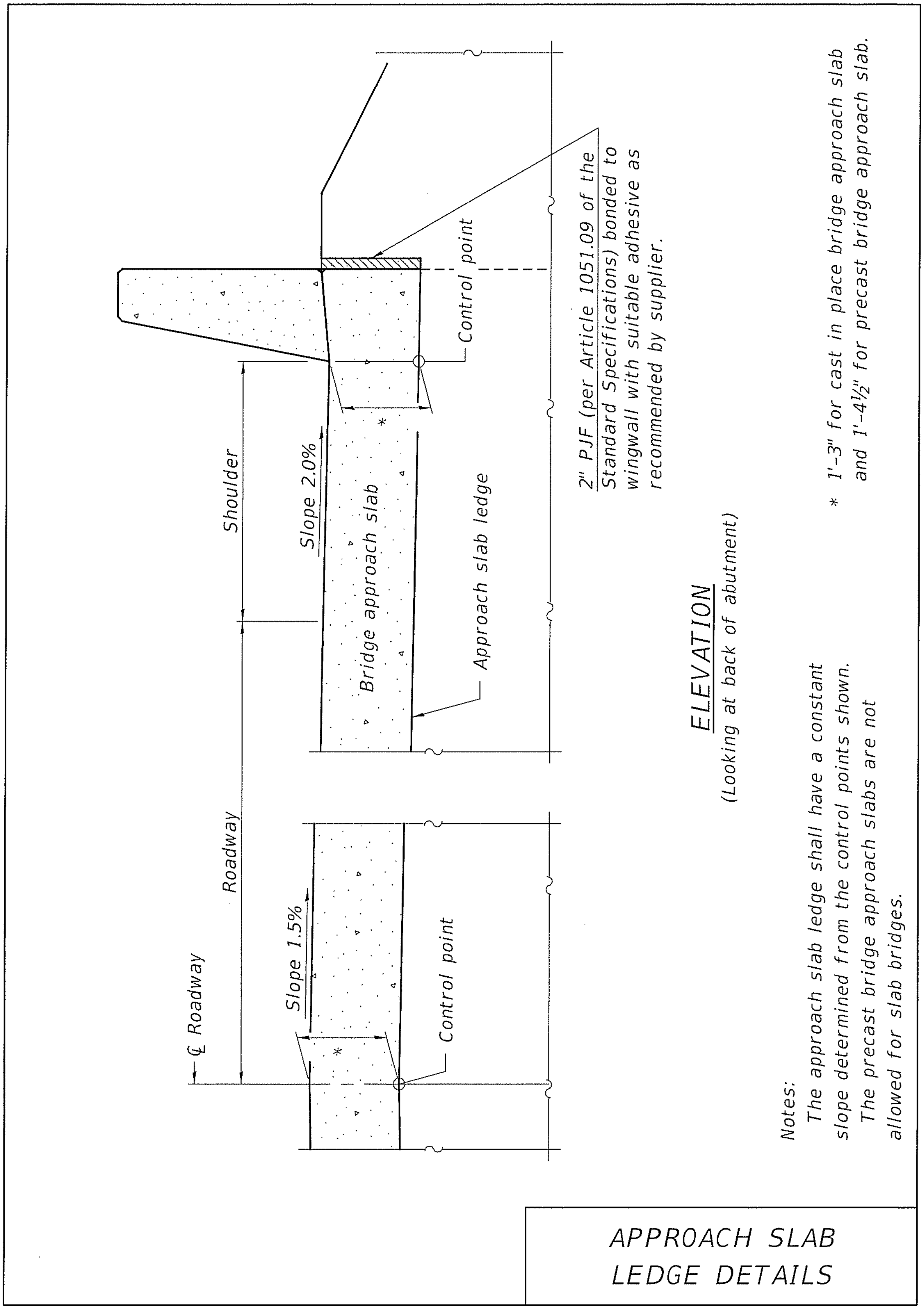
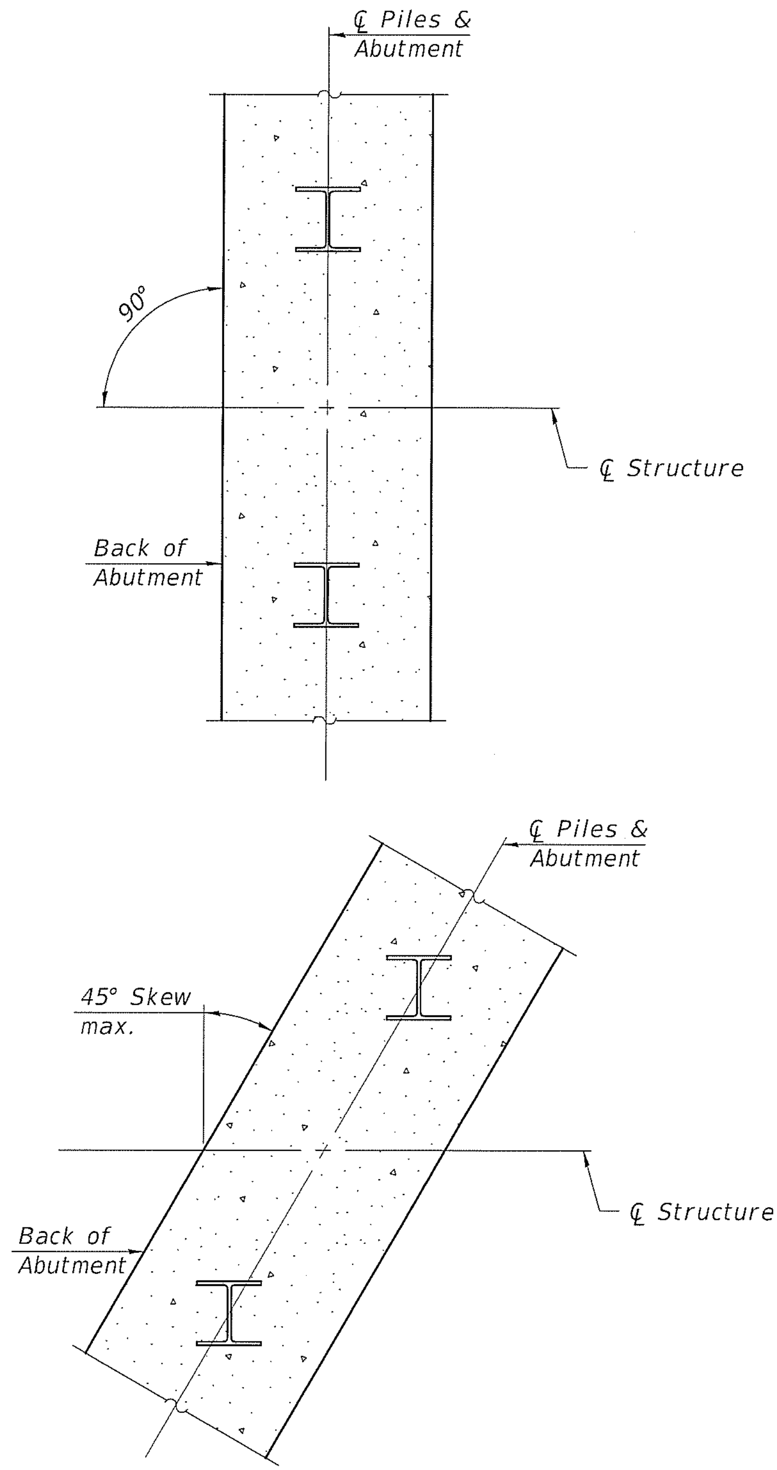

2" PJF (per Article 1051.09 of the Standard Specifications) bonded to wingwall with suitable adhesive as recommended by supplier.
Control point
Shoulder
Slope 2.0%
Bridge approach slab
Approach slab ledge
*
Roadway
℄ Roadway
Slope 1.5%
Control point
*
ELEVATION
(Looking at back of abutment)
* 1'-3" for cast in place bridge approach slab and 1'-4½" for precast bridge approach slab.
Notes:
The approach slab ledge shall have a constant slope determined from the control points shown.
The precast bridge approach slabs are not allowed for slab bridges.
APPROACH SLAB LEDGE DETAILS

Figure 8



Note:
For integral abutments, the pile web is always perpendicular to the ℄ of structure.

INTEGRAL ABUTMENT
PILE ORIENTATION

Figure 9

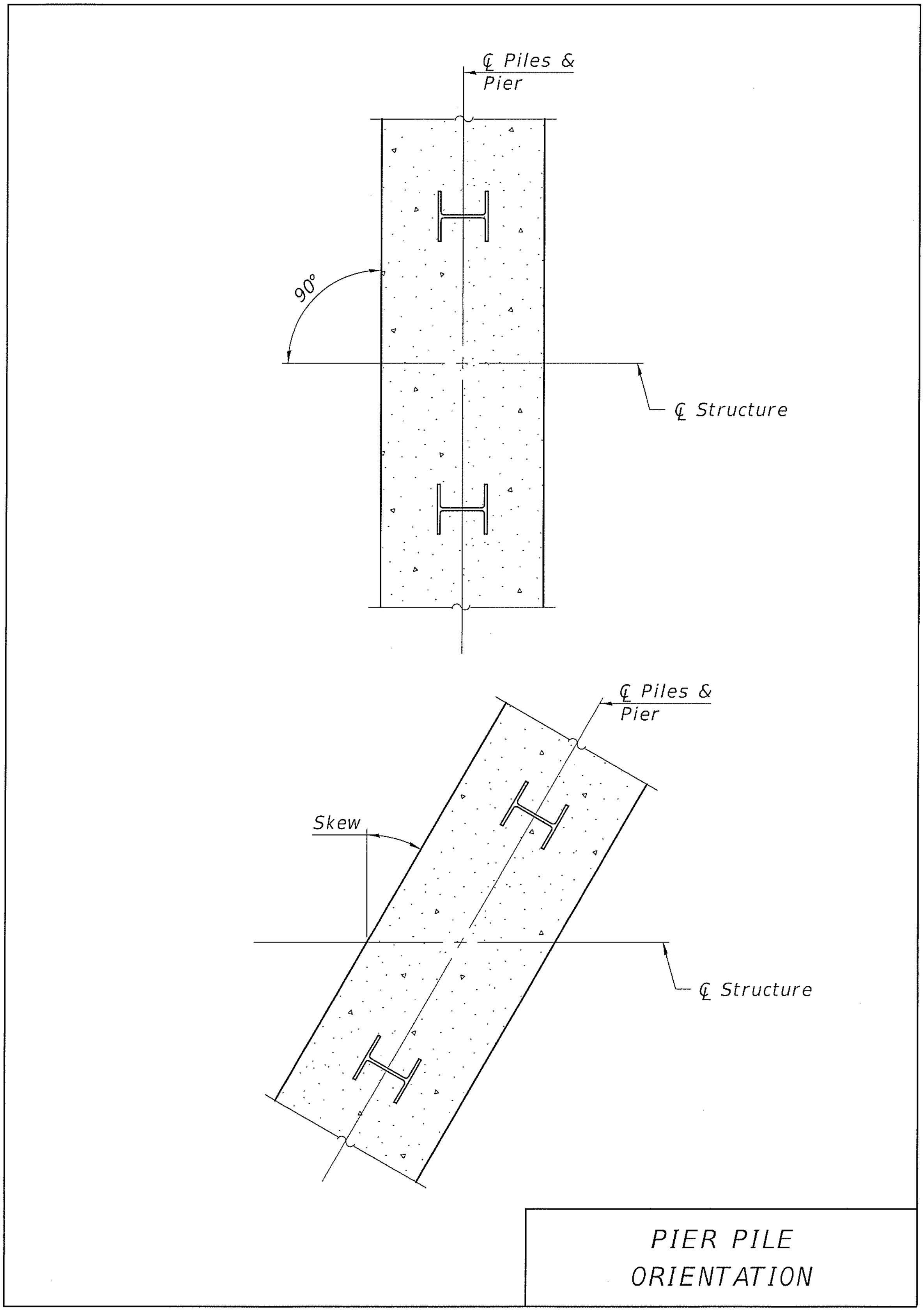
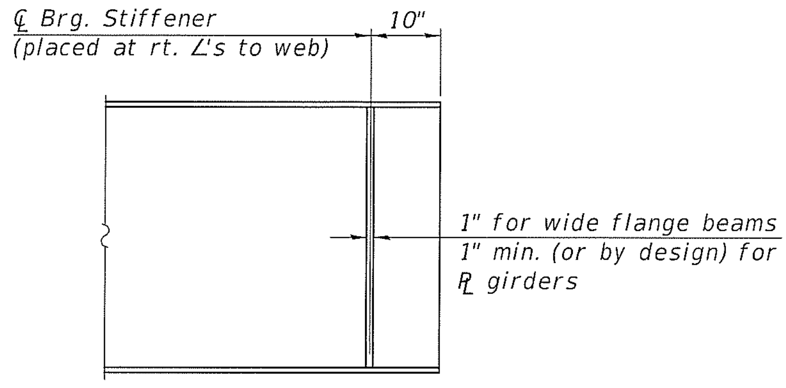
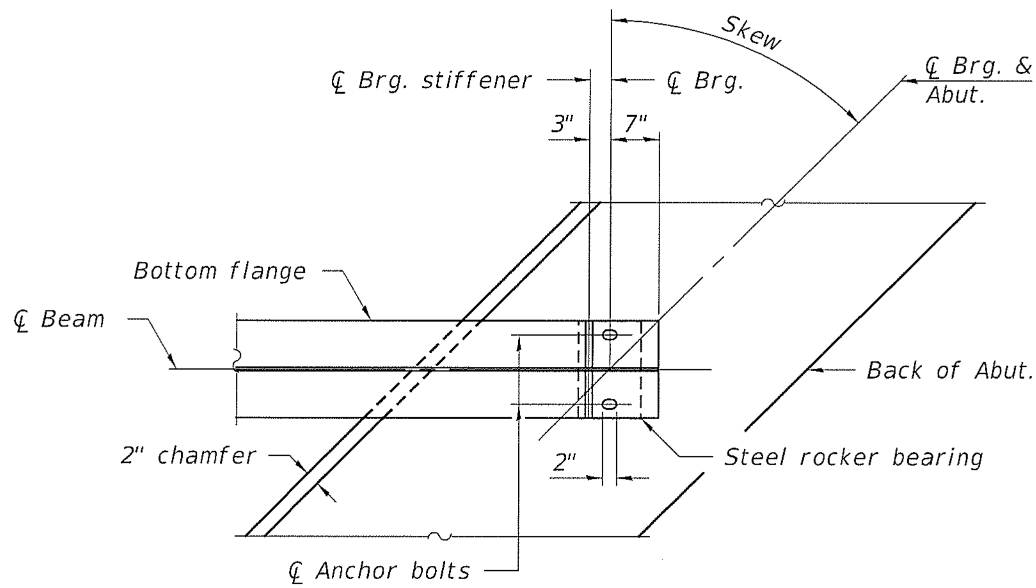

℄ Piles &
Pier
90°
℄ Structure
℄ Piles &
Pier
Skew
℄ Structure
PIER PILE
ORIENTATION

Figure 10



END ELEVATION



PLAN

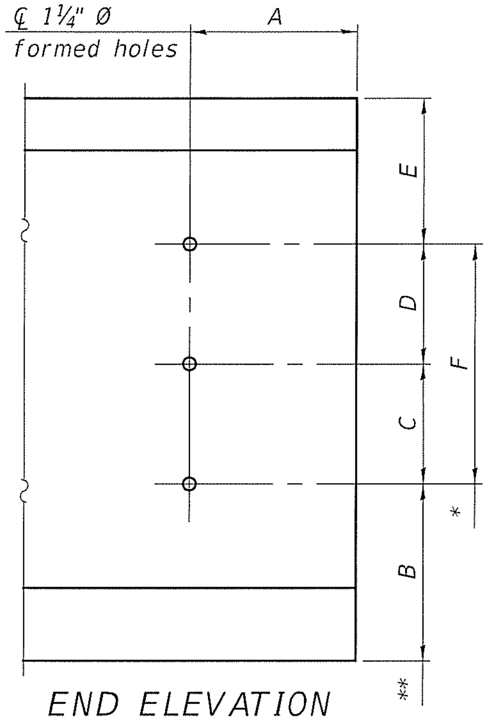
Note:
See figure 15 for bearing and anchor bolt details.

STEEL BEAM TO DIAPHRAGM
CONNECTION DETAIL
FOR INTEGRAL ABUTMENTS

Figure 11

TABLE OF DIMENSIONS

Beam	A	B	C	D	E	F
I36	1'-0"	1'-3"	N.A.	N.A.	10"	11"
I42	1'-0"	1'-5"	N.A.	N.A.	10"	1'-3"
I48	1'-0"	1'-7"	N.A.	N.A.	1'-0"	1'-5"
I54	1'-0"	1'-7"	N.A.	N.A.	1'-0"	1'-11"
BT63	1'-4"	1'-5"	1'-4"	1'-4"	1'-2"	N.A.
BT72	1'-4"	1'-5"	1'-9"	1'-8"	1'-2"	N.A.
IL45	1'-0"	1'-11"	N.A.	N.A.	1'-2"	8"
IL54	1'-0"	1'-11"	N.A.	N.A.	1'-2"	1'-5"
IL63	1'-0"	1'-11"	1'-1"	1'-1"	1'-2"	N.A.
IL72	1'-0"	1'-11"	1'-5½"	1'-5½"	1'-2"	N.A.

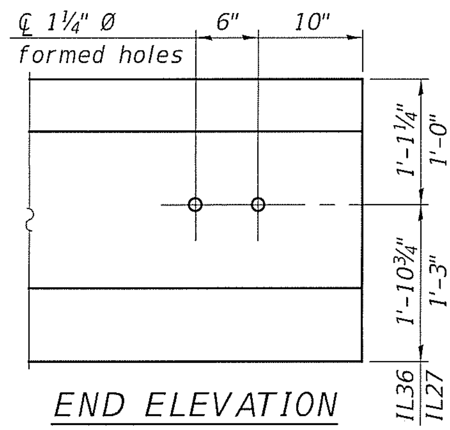


END ELEVATION

(I36-I54, BT63-BT72 and IL45-IL72)

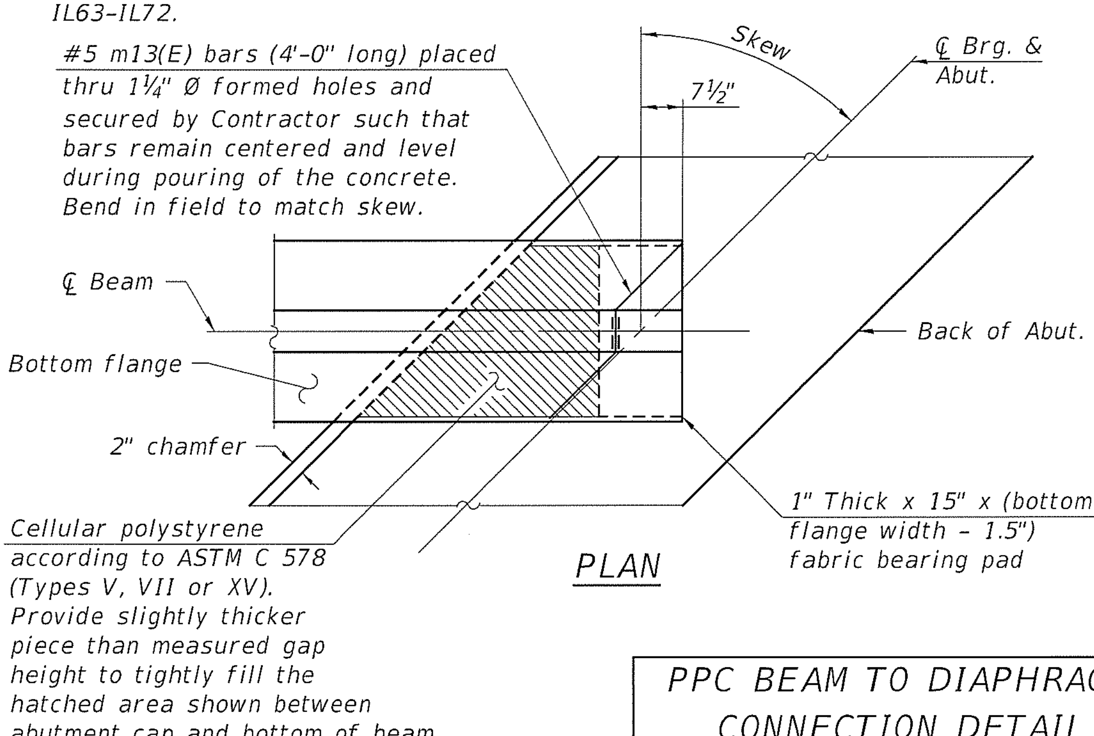
* Two holes required for I36-I54 and IL45-IL54

** Three holes required for BT63-BT72 and IL63-IL72.



END ELEVATION

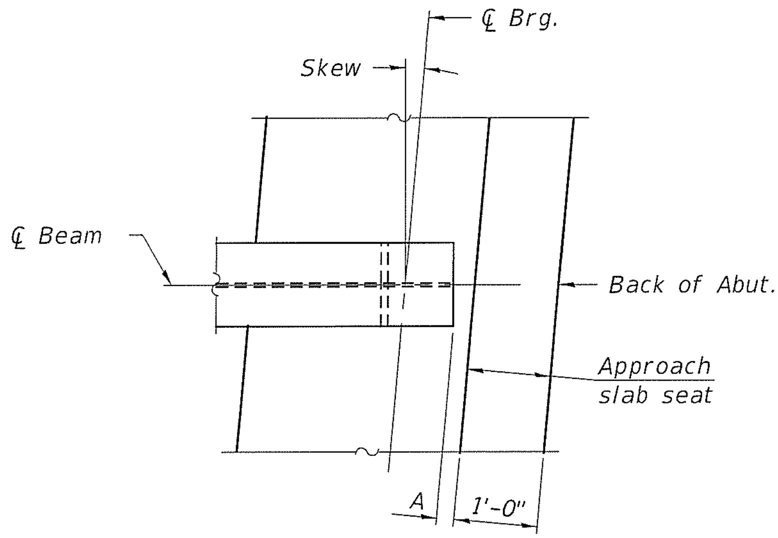
(IL27 and IL36)



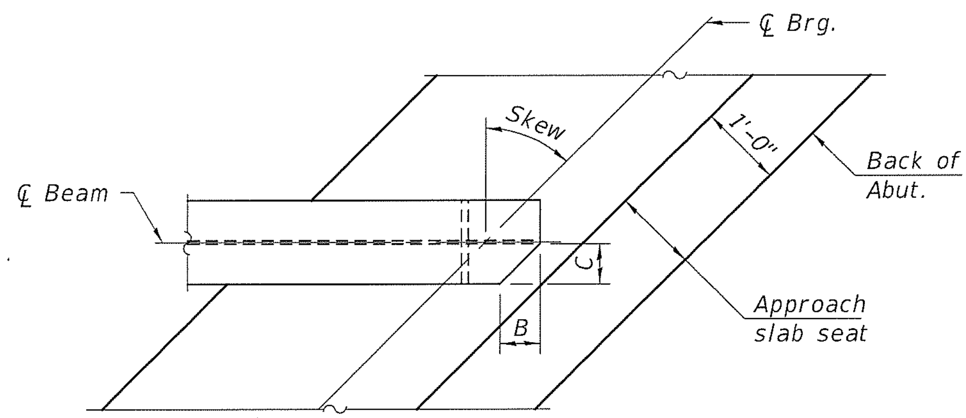
PLAN

PPC BEAM TO DIAPHRAGM CONNECTION DETAIL FOR INTEGRAL ABUTMENT

Figure 12



TOP FLANGE PLAN - NO CLIP



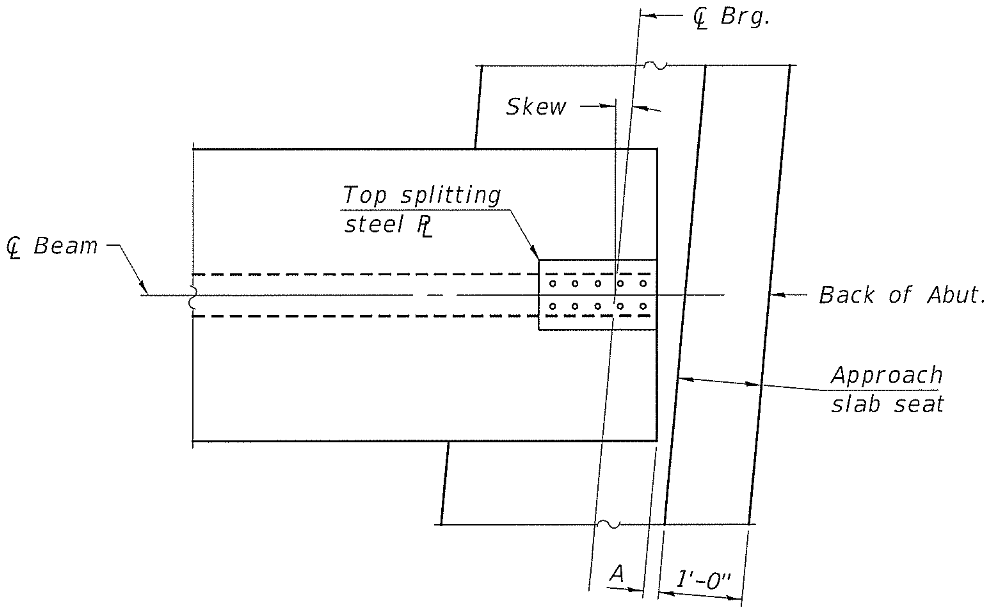
B = C tan (skew)

TOP FLANGE PLAN - CLIPPED

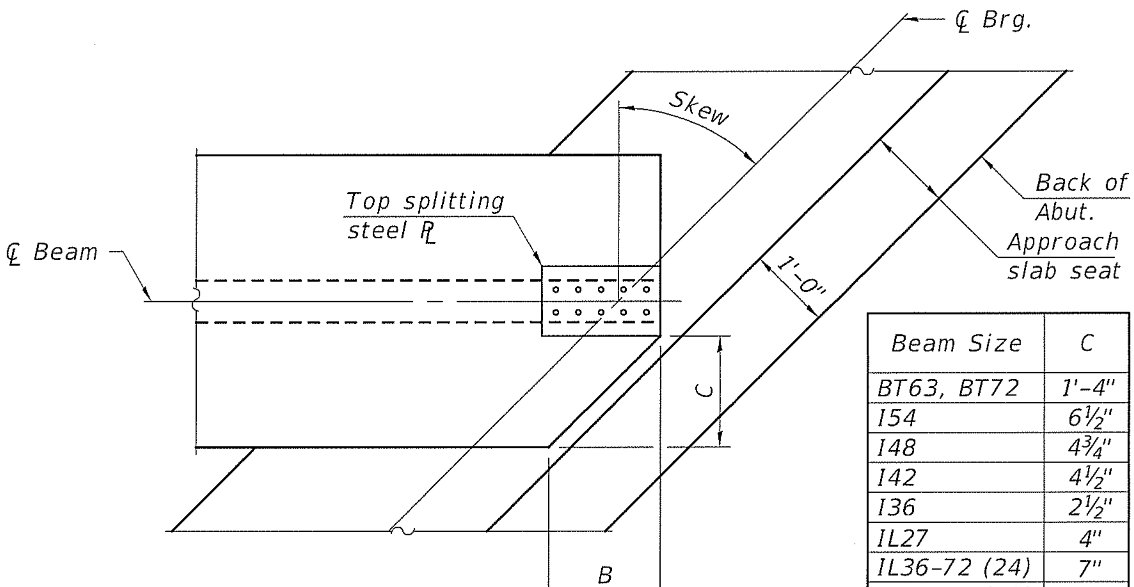
Notes:
Clip top flange when dimension "A" is less than 1". Calculate dimension "B" based on skew angle. Dimension "C" is half the top flange width minus half the web thickness.

TOP FLANGE CLIP DETAIL
FOR STEEL BEAMS
ON INTEGRAL ABUTMENTS

Figure 13



TOP FLANGE PLAN - NO CLIP



Beam Size	C
BT63, BT72	1'-4"
I54	6½"
I48	4¾"
I42	4½"
I36	2½"
IL27	4"
IL36-72 (24)	7"
IL36-72 (38)	1'-2"

B = C tan (skew)

TOP FLANGE PLAN - CLIPPED

Note:
Clip top flange when dimension "A" is less than 1". Calculate dimension "B" based on skew angle. Dimension "C" is provided in table.

TOP FLANGE CLIP DETAIL FOR PPC BEAMS ON INTEGRAL ABUTMENTS

Figure 14

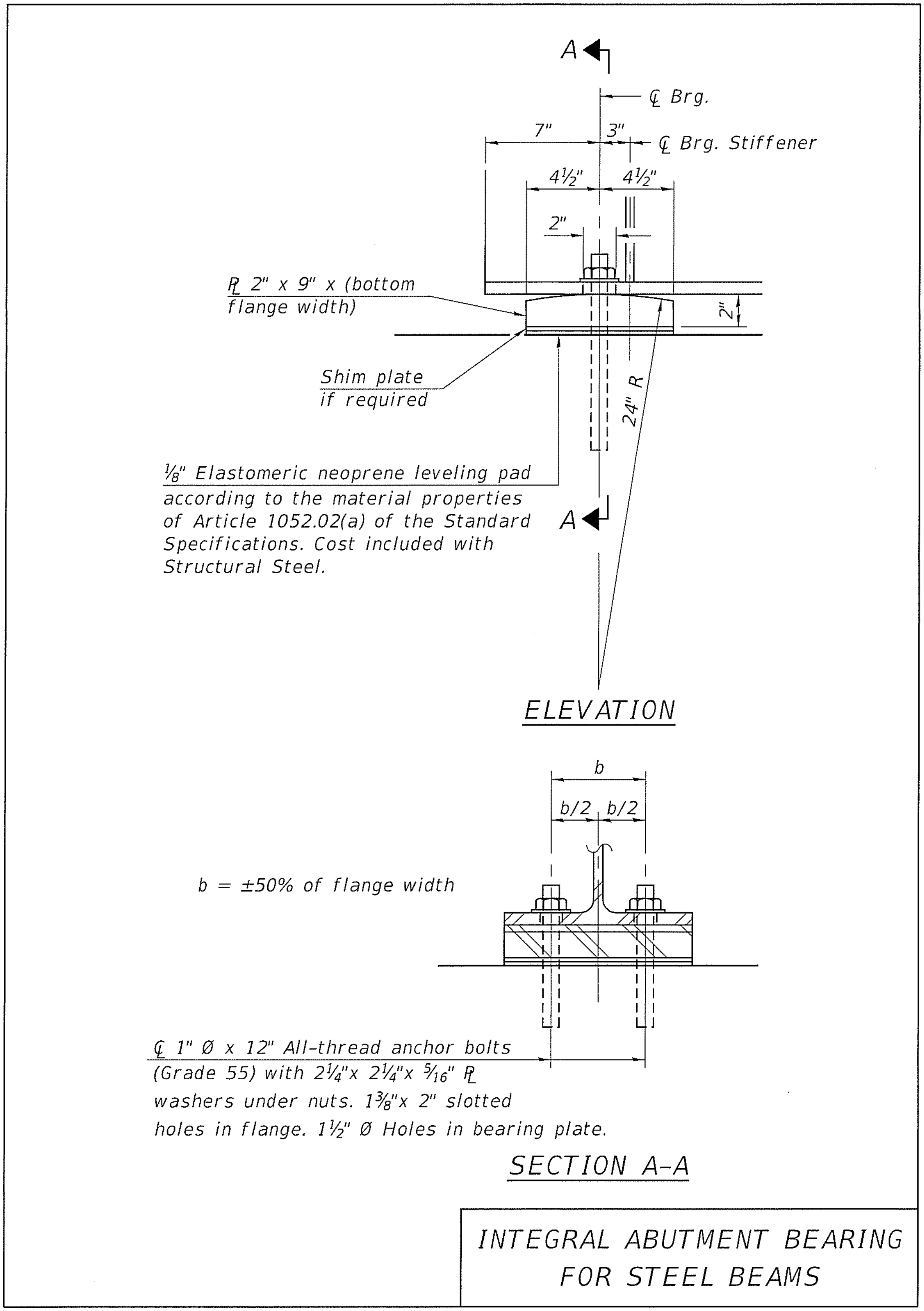
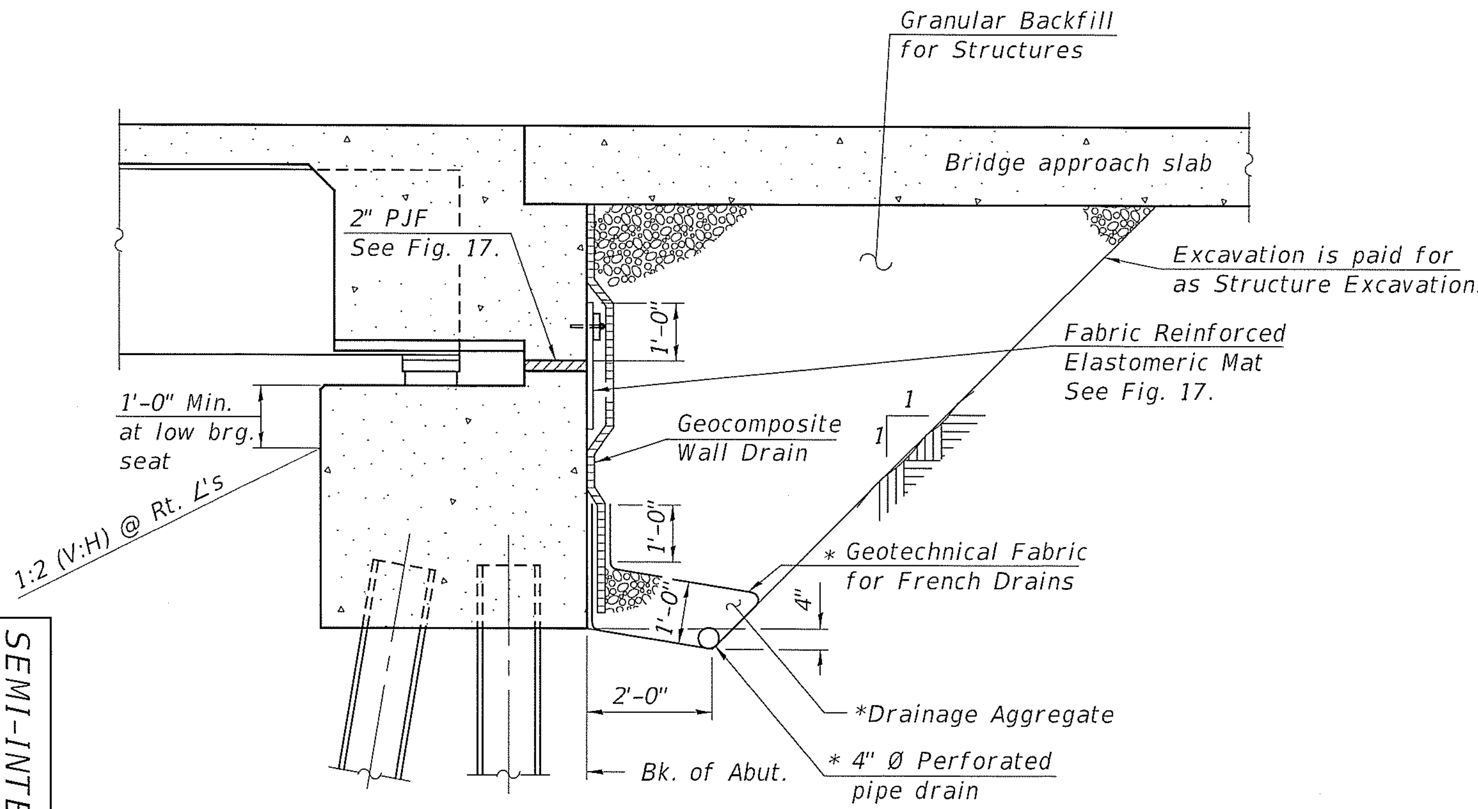

A
℄ Brg.
7"
3"
℄ Brg. Stiffener
4½"
4½"
2"
PL 2" x 9" x (bottom flange width)
2"
Shim plate if required
24" R
⅛" Elastomeric neoprene leveling pad according to the material properties of Article 1052.02(a) of the Standard Specifications. Cost included with Structural Steel.
A
ELEVATION
b
b/2
b/2
b = ±50% of flange width
℄ 1" Ø x 12" All-thread anchor bolts (Grade 55) with 2¼"x 2¼"x 5/16" PL washers under nuts. 1⅜"x 2" slotted holes in flange. 1½" Ø Holes in bearing plate.
SECTION A-A
INTEGRAL ABUTMENT BEARING FOR STEEL BEAMS

Figure 15

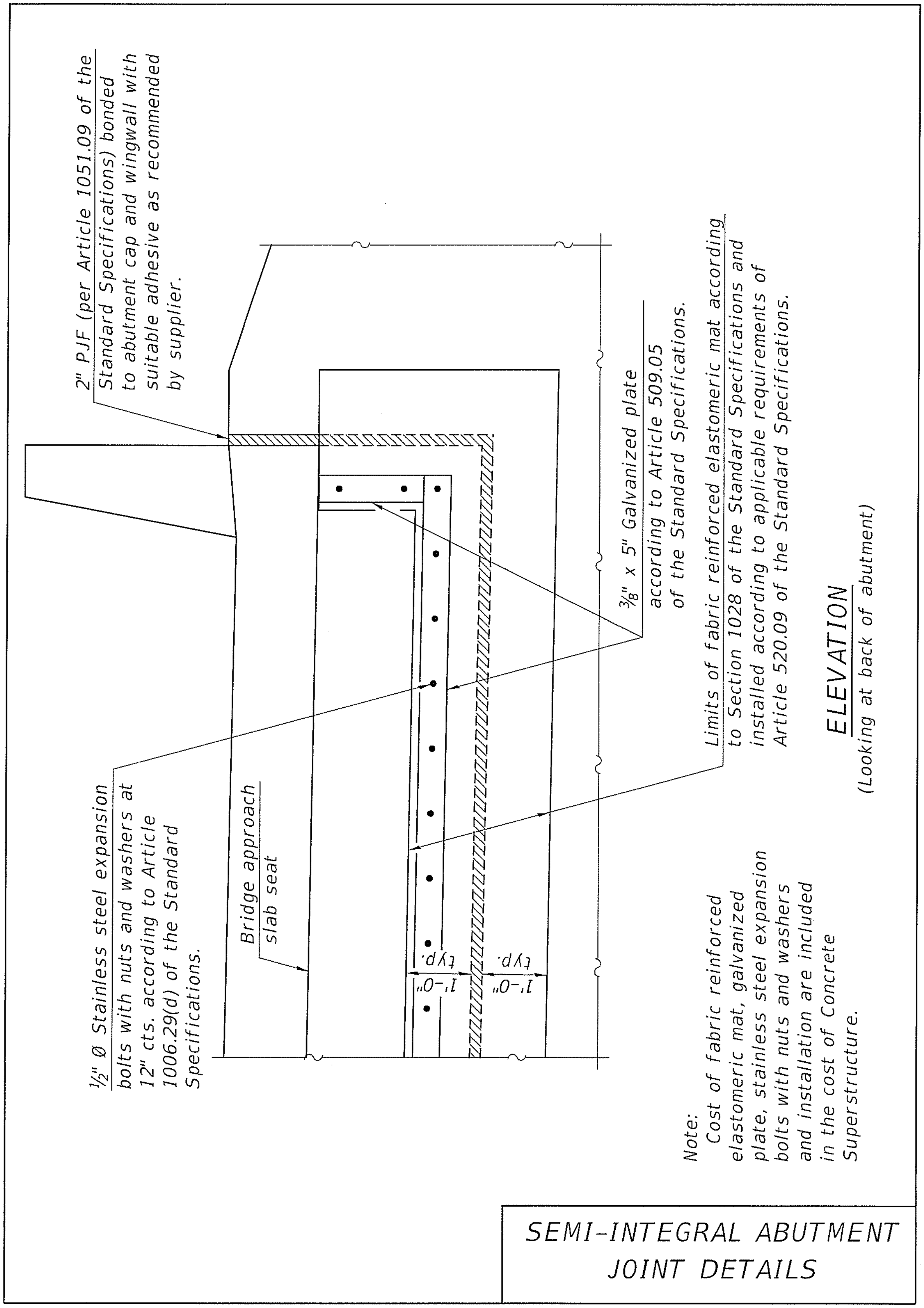


* Included in the cost of Pipe Underdrains for Structures. (See Special Provisions).

All drainage system components shall extend to 2'-0" from the end of each wingwall except an outlet pipe shall extend until intersecting with the side slopes. The pipes shall drain into concrete headwalls. (See Article 601.05 of the Standard Specifications and Highway Standard 601101).

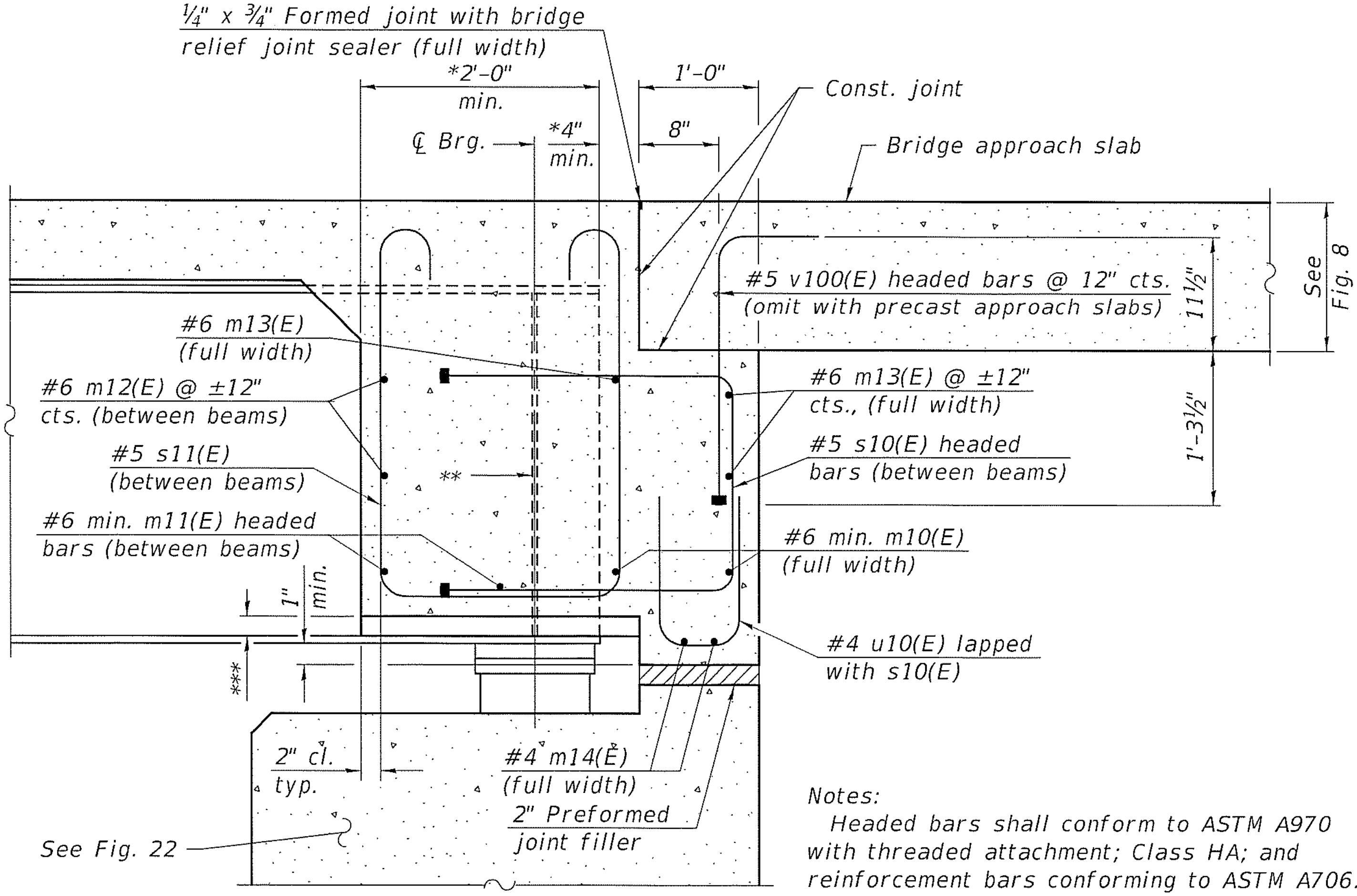
SEMI-INTEGRAL ABUTMENT
DRAINAGE DETAILS

Figure 16



2" PJF (per Article 1051.09 of the Standard Specifications) bonded to abutment cap and wingwall with suitable adhesive as recommended by supplier.
⅜" x 5" Galvanized plate according to Article 509.05 of the Standard Specifications.
Limits of fabric reinforced elastomeric mat according to Section 1028 of the Standard Specifications and installed according to applicable requirements of Article 520.09 of the Standard Specifications.
ELEVATION
(Looking at back of abutment)
½" Ø Stainless steel expansion bolts with nuts and washers at 12" cts. according to Article 1006.29(d) of the Standard Specifications.
Bridge approach slab seat
1'-0" typ.
1'-0" typ.
Note:
Cost of fabric reinforced elastomeric mat, galvanized plate, stainless steel expansion bolts with nuts and washers and installation are included in the cost of Concrete Superstructure.
SEMI-INTEGRAL ABUTMENT JOINT DETAILS

Figure 17



* See Figure 21 for orientation.

** Bearing stiffener placed at right angles to beam web. 1" thick for wide flanges and 1" min. (or by design) for plate girders.

*** See Chapter 3.7 of Bridge Manual.

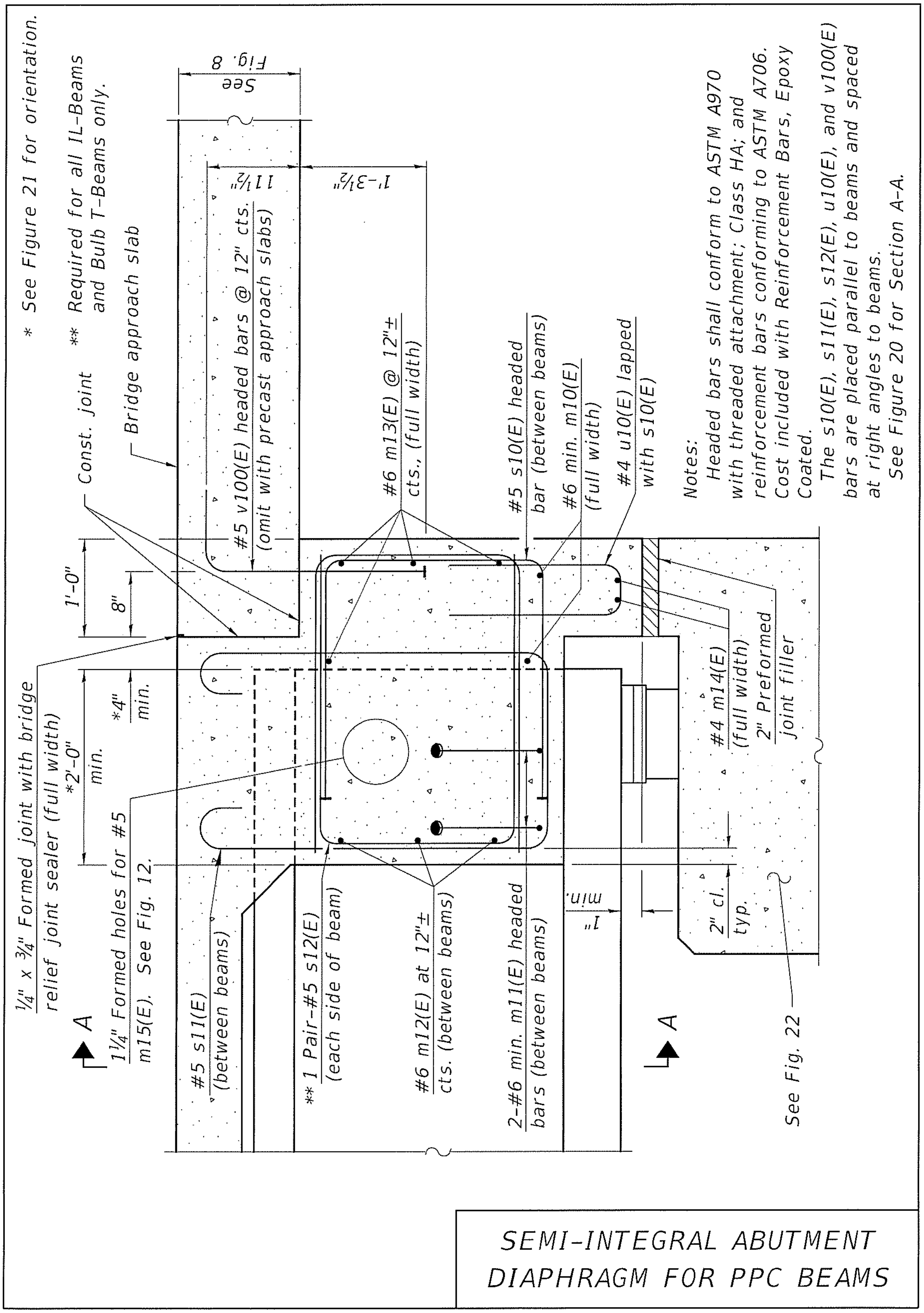
Notes:

Headed bars shall conform to ASTM A970 with threaded attachment; Class HA; and reinforcement bars conforming to ASTM A706. Cost included with Reinforcement Bars, Epoxy Coated.

The s10(E), s11(E), u10(E), and v100(E) bars are placed parallel to beams and spaced at right angles to beams.

SEMI-INTEGRAL ABUTMENT DIAPHRAGM FOR STEEL BEAMS

Figure 18



* See Figure 21 for orientation.
** Required for all IL-Beams and Bulb T-Beams only.
See Fig. 8
Const. joint
Bridge approach slab
1'-0"
8"
11½"
1'-3½"
#5 v100(E) headed bars @ 12" cts. (omit with precast approach slabs)
#6 m13(E) @ 12"± cts., (full width)
#5 s10(E) headed bar (between beams)
#6 min. m10(E) (full width)
#4 u10(E) lapped with s10(E)
Notes:
Headed bars shall conform to ASTM A970 with threaded attachment; Class HA; and reinforcement bars conforming to ASTM A706. Cost included with Reinforcement Bars, Epoxy Coated.
The s10(E), s11(E), s12(E), u10(E), and v100(E) bars are placed parallel to beams and spaced at right angles to beams.
See Figure 20 for Section A-A.
¼" x ¾" Formed joint with bridge relief joint sealer (full width)
*2'-0" min.
*4" min.
1¼" Formed holes for #5 m15(E). See Fig. 12.
A
#5 s11(E) (between beams)
** 1 Pair-#5 s12(E) (each side of beam)
#6 m12(E) at 12"± cts. (between beams)
2-#6 min. m11(E) headed bars (between beams)
1" min.
#4 m14(E) (full width)
2" Preformed joint filler
2" cl. typ.
A
See Fig. 22
SEMI-INTEGRAL ABUTMENT DIAPHRAGM FOR PPC BEAMS

Figure 19

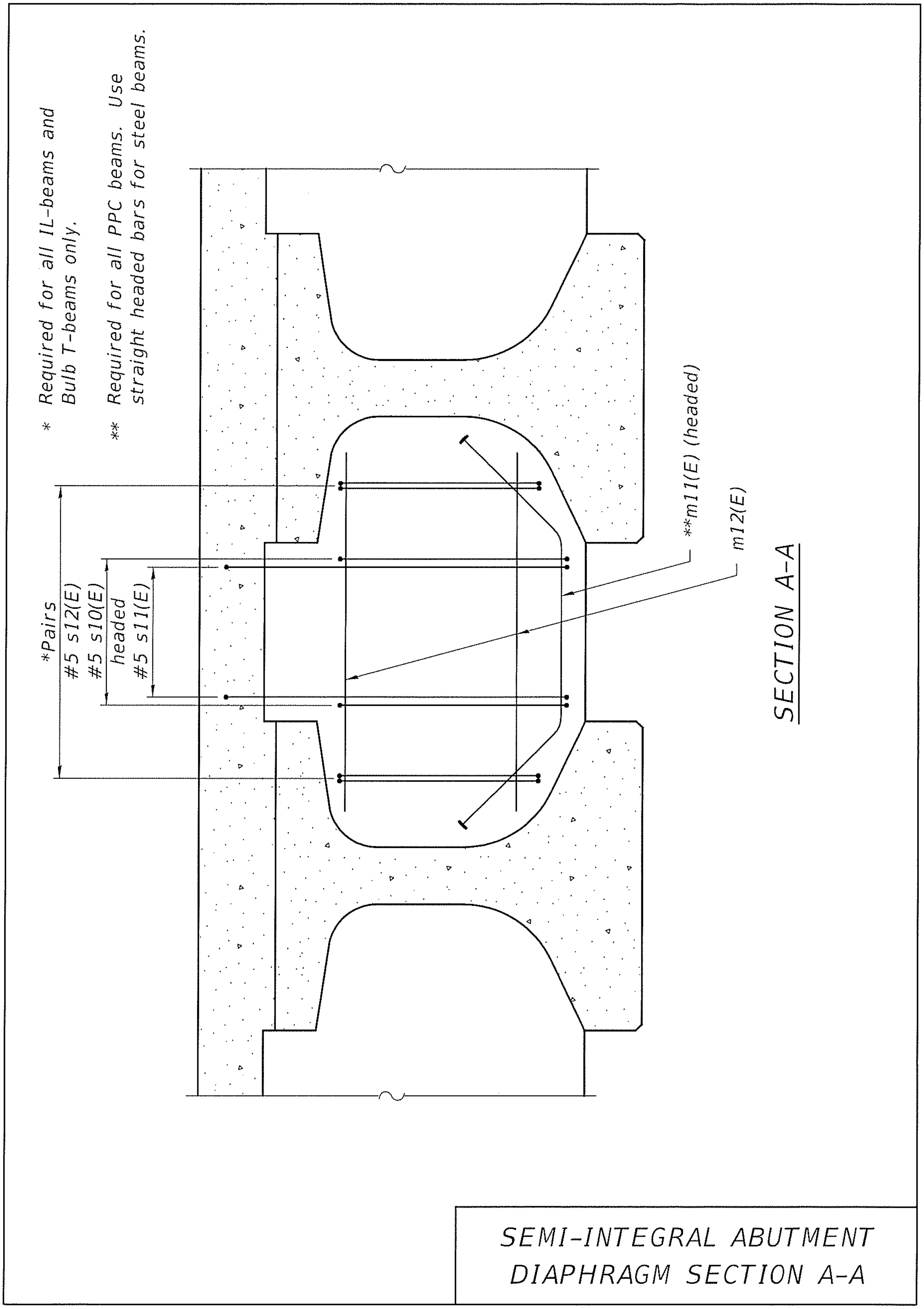
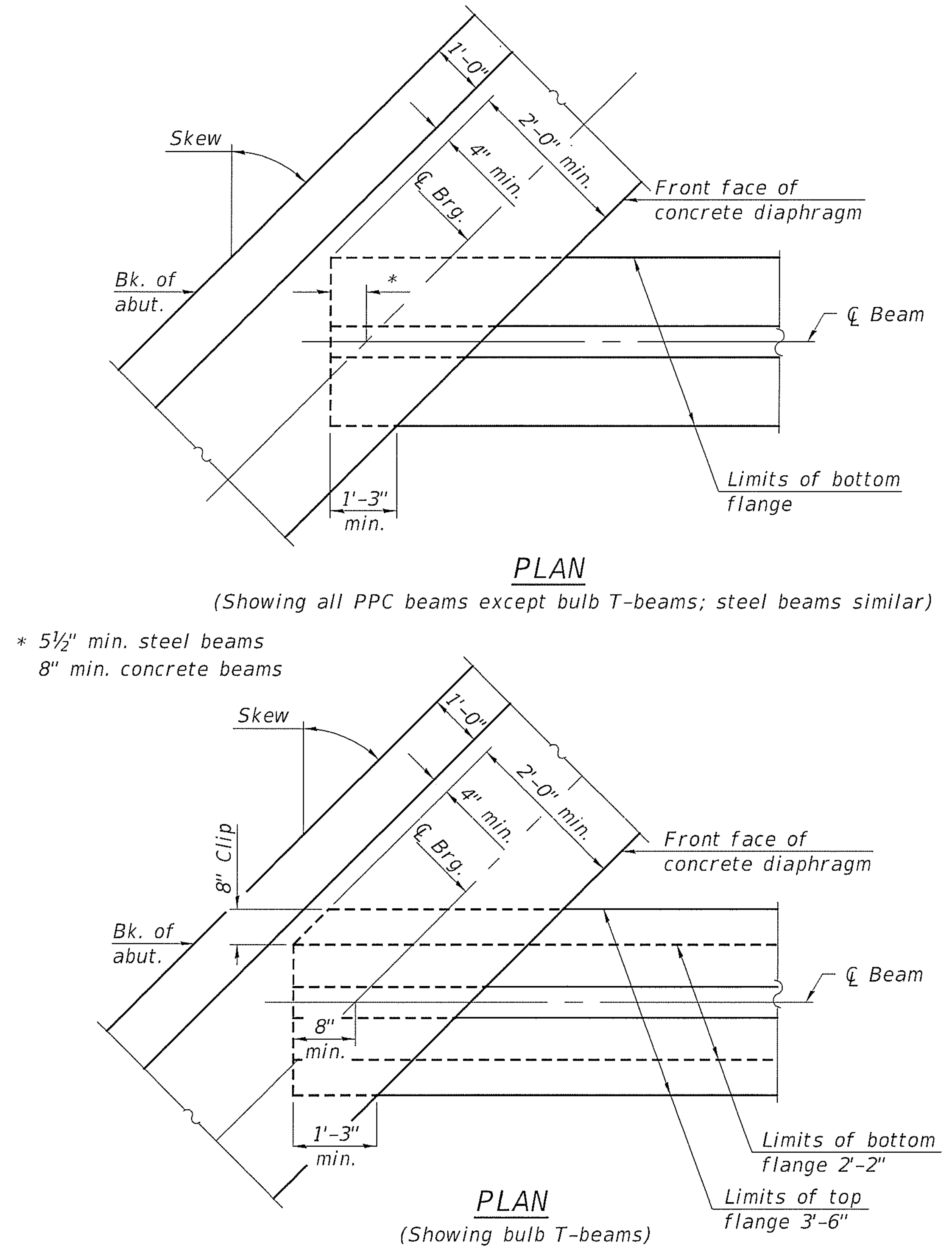

* Required for all IL-beams and Bulb T-beams only.
** Required for all PPC beams. Use straight headed bars for steel beams.
*Pairs
#5 s12(E)
#5 s10(E)
headed
#5 s11(E)
**m11(E) (headed)
m12(E)
SECTION A-A
SEMI-INTEGRAL ABUTMENT
DIAPHRAGM SECTION A-A

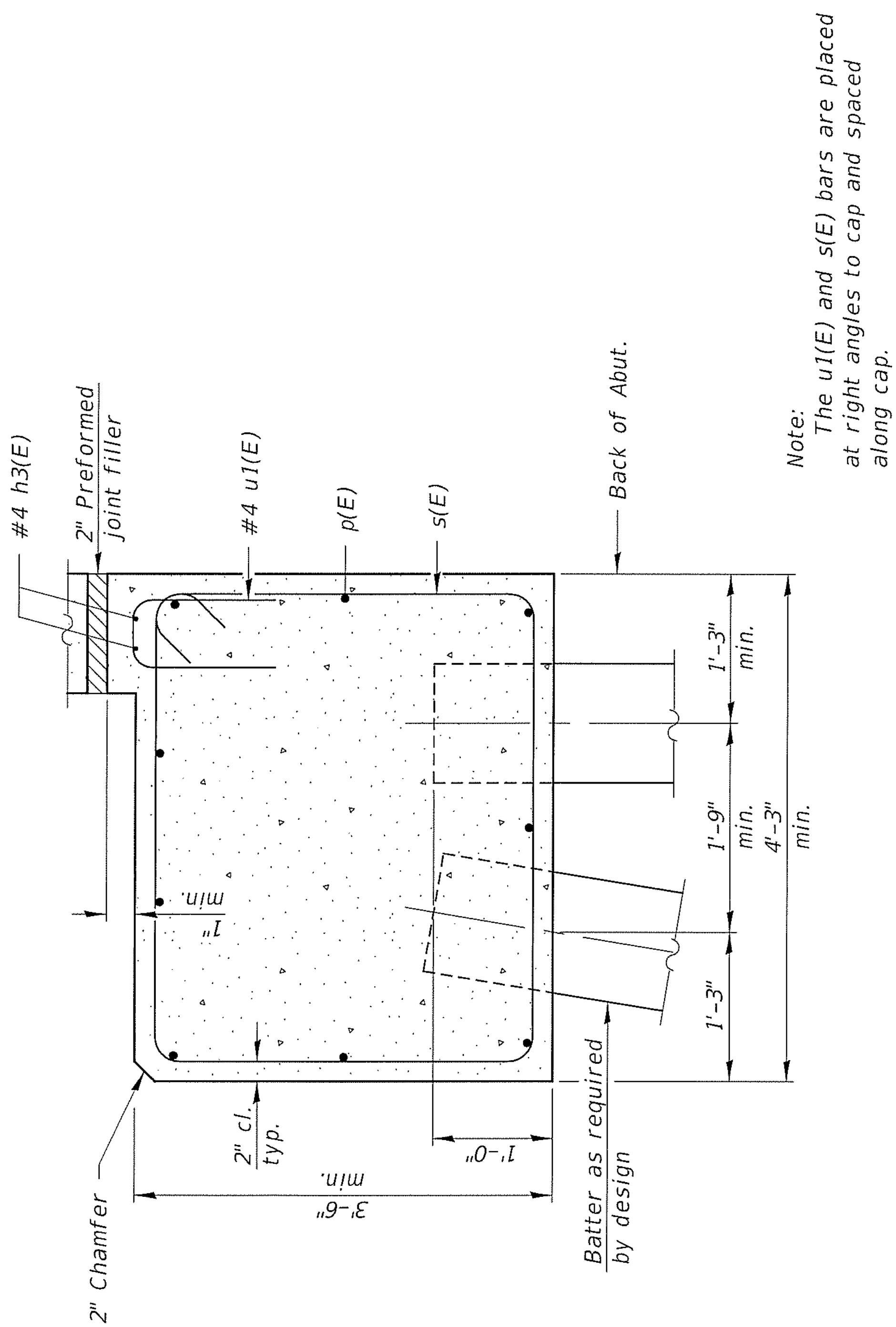
Figure 20



Note:
Clipping of top flange is only required on bulb T-Beams. Clipping is not allowed on the bottom flanges.
The 4" minimum clearance shown at the back of the beam also applies to the bearing.

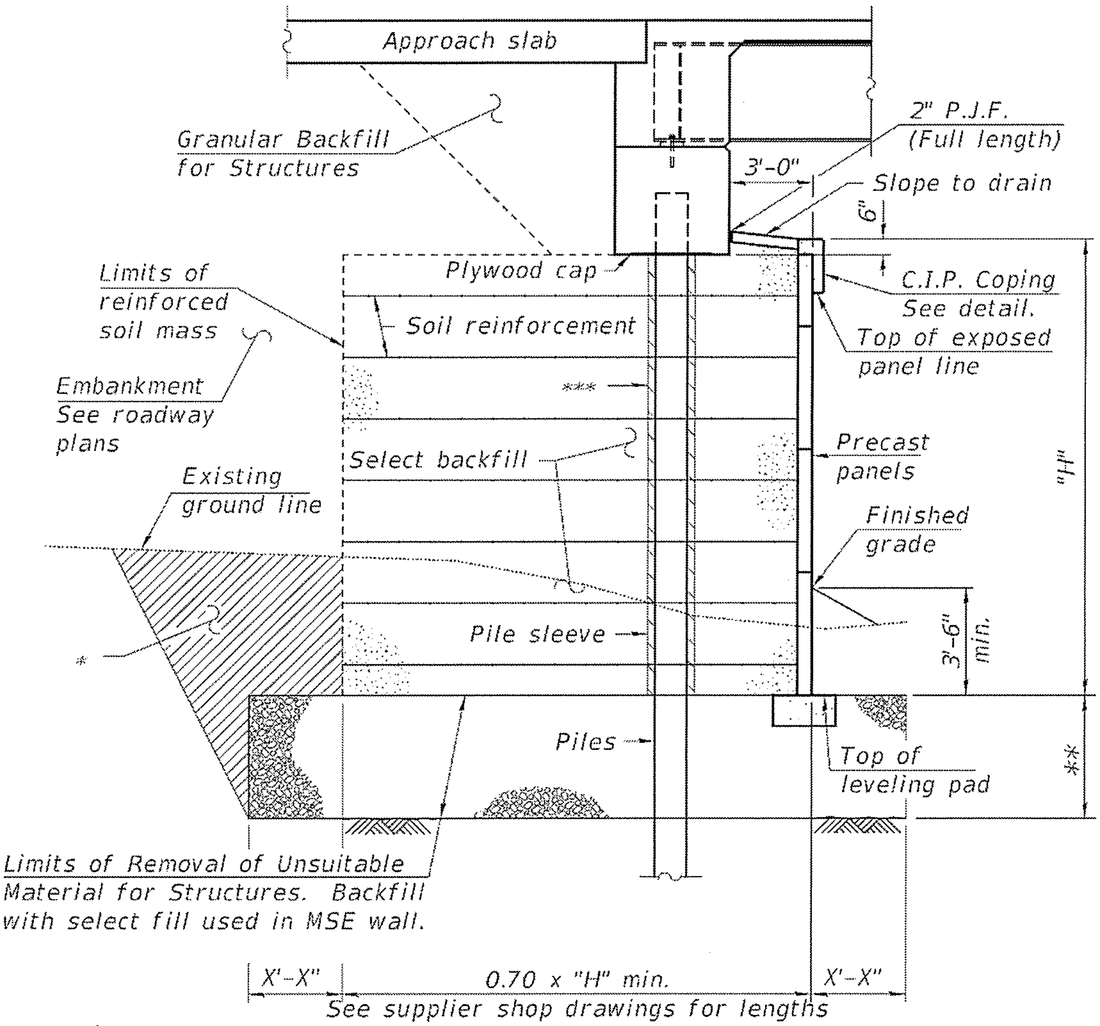
SEMI-INTEGRAL ABUTMENT DIAPHRAGM DETAILS

Figure 21



SEMI-INTEGRAL
ABUTMENT

Figure 22



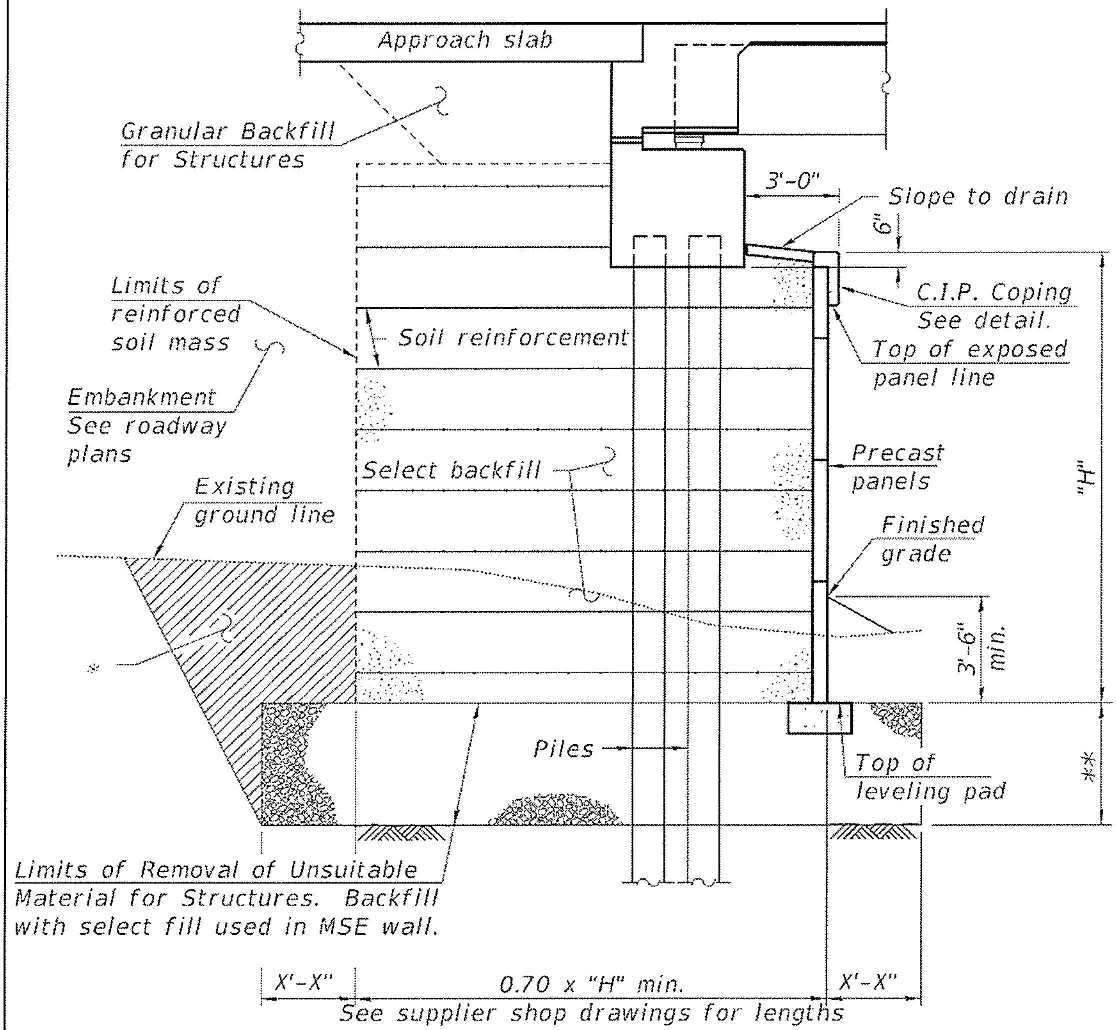
* Overexcavation beyond structure excavation and removal of unsuitable material. This area not measured for payment. Backfill overexcavation with same material used for select fill used in MSE wall.

** If required by structure geotechnical report.

*** Place Bentonite between pile sleeve and pile.

M.S.E. WALL SECTION
AT INTEGRAL ABUTMENT

Figure 23



* Overexcavation beyond structure excavation and removal of unsuitable material. This area not measured for payment. Backfill overexcavation with same material used for select fill used in MSE wall.

** If required by structure geotechnical report.

M.S.E. WALL SECTION AT SEMI-INTEGRAL ABUTMENT

Figure 24