

AASHTO-PCI-ASBI
Segmental Box Girder Standards
for Span-by-Span and
Balanced Cantilever Construction

Span-by-Span Standards 100' to 150'
Balanced Cantilever Standards 100' to 200'
Deck Widths 28'-0" to 45'-0"

May, 2000

Purpose

The standards shown on these sheets have been developed to establish a limited number of practical sections leading to uniformity and simplicity of forming and production methods. These standards are applicable to most conditions of highway bridge loading and usage within the approximate span limits indicated for the sections, and the design loads specified in these General Notes.

Span Limits

The span limits shown on these sheets are approximate only and are not mandatory at either limit. The span limits shown contemplate the use of concrete weighing 155 pcf (including rebar) and concrete strength of not less than 5000 psi. It is intended that the segment depth should generally increase in 1'-0" increments for each 20' increase in span above the minimum span of 100'.

Web Thickness

Web thickness for balanced cantilever construction is based on use of 100% internal tendons in top and bottom slabs (no draped internal or external tendons). The web thickness for balanced cantilever bridges with 100% straight internal tendons may be reduced for segments in the interior 60% of spans in accordance with shear requirements and other provisions of the "AASHTO Guide Specifications for Design and Construction of Segmental Concrete Bridges". Reductions in shear and web thickness requirements for balanced cantilever construction may also be achieved by use of draped external tendons in the box cells in conjunction with straight internal tendons.

Precast Concrete

Recommended minimum strength of concrete is 5000 psi. Concrete of greater compressive strength may be used, and may be required for structural considerations, in which case limiting stresses will be based on the concrete specifications for the actual project.

Segment Lengths

Maximum Segment Length using these standards is 10'-0". In curved alignments, the segment length should be kept as close to the Maximum as possible.

Post-Tensioning Steel

Post-Tensioning steel shall be 7-wire, 1/2 inch or 0.6 inch diameter strands, conforming to ASTM A416 (AASHTO M203), Grade 270. The maximum internal tendon size used for balanced cantilever construction under these standards shall not exceed 15-1/2 inch, or 12-0.6 inch diameter Grade 270 low relaxation strands. Unless otherwise stated in the contract special provisions, other aspects of furnishing, installing and grouting of prestressing steel shall be in accordance with the details shown on the plans, and the "Recommended Contract Administration Guidelines for Design and Construction of Segmental Concrete Bridges", March, 1995, American Segmental Bridge Institute.

Reinforcing Steel

All reinforcing steel shall conform to the requirements of the AASHTO Standard Specifications, and shall be ASTM A615, Grade 60, or ASTM A706. When permitted welded grillages shall be shop prepared. Field welding of reinforcing steel will be permitted at the discretion of the engineer.

Shop Drawing Requirements

Shop Drawing Requirements shall be in accordance with the "Recommended Contract Administration Guidelines for Design and Construction of Segmental Concrete Bridges" published by the American Segmental Bridge Institute, March, 1995, unless other provisions are stated in the Contract Special Provisions.

Fabrication, Formwork, Handling, Storage, Shipment and Erection

Fabrication, formwork, handling, storage, shipment and erection of precast segments shall be in accordance with the "Recommended Contract Administration Guidelines for Design and Construction of Segmental Concrete Bridges", March, 1995, American Segmental Bridge Institute, unless other requirements are specified in the Contract Special Provisions. Angular intersections of formwork shall have a minimum radius of 2". Slab and box edges shall have a minimum chamfer of 3/4".

Epoxy Joining of Precast Concrete Segments

When required by the Contract Drawings, epoxy joining of precast segments shall be in accordance with the Recommended Contract Administration Guidelines for Design and Construction of Segmental Concrete Bridges, March, 1995, American Segmental Bridge Institute, unless other requirements are specified in the Contract Special Provisions.

Temporary Post-Tensioning

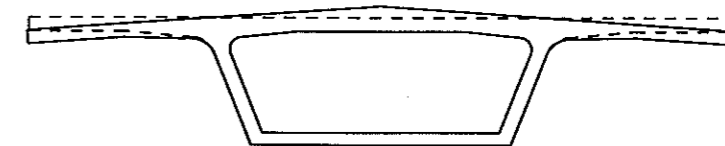
Temporary Post-tensioning required for construction of span-by-span, or balanced cantilever bridges using these standard segments shall be internal bars or tendons in top and bottom slabs unless specifically detailed otherwise in the contract drawings.

Camber Diagrams

For span-by-span construction, a final, long term camber diagram which compensates for deflections in accordance with the assumed material properties shall be provided by the designer. For balanced cantilever construction, camber diagrams shall be prepared by the contractor and reviewed by the designer.

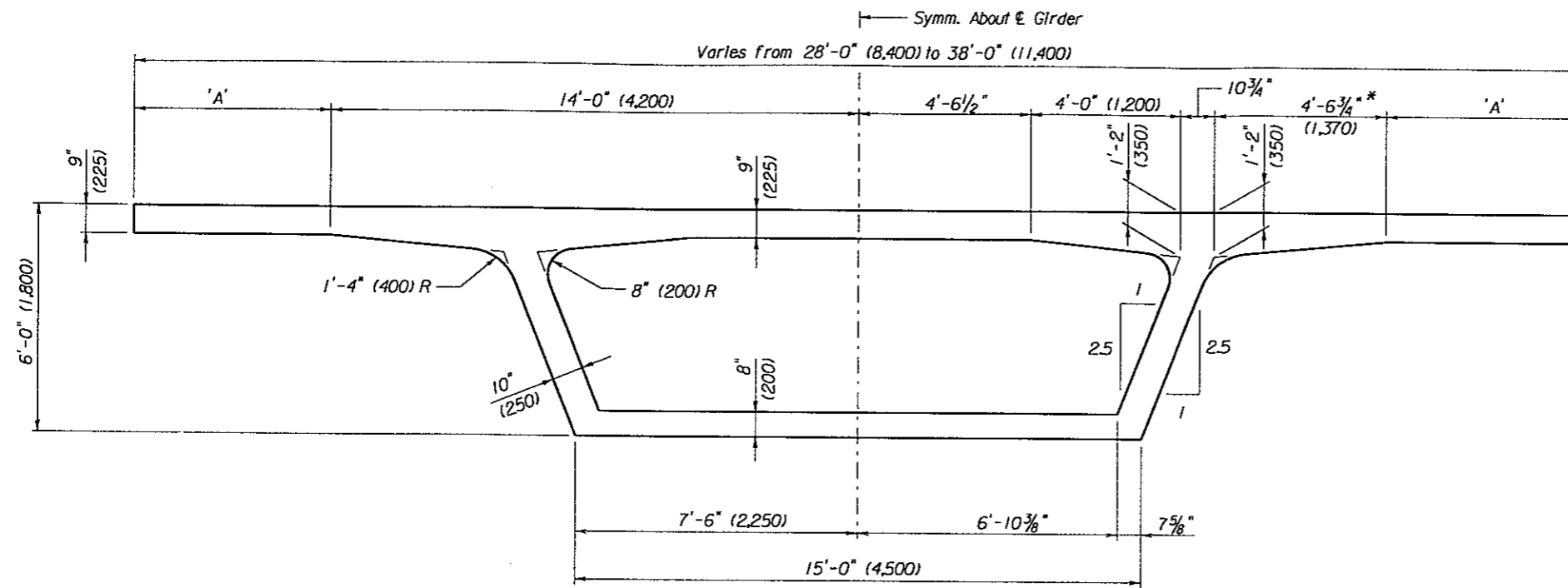
Crown Roadway Cross Sections

Crown roadways should be accommodated by rotating the cantilever wings downward and building up the top slab between the webs. The shape of the inside void shall remain unchanged.

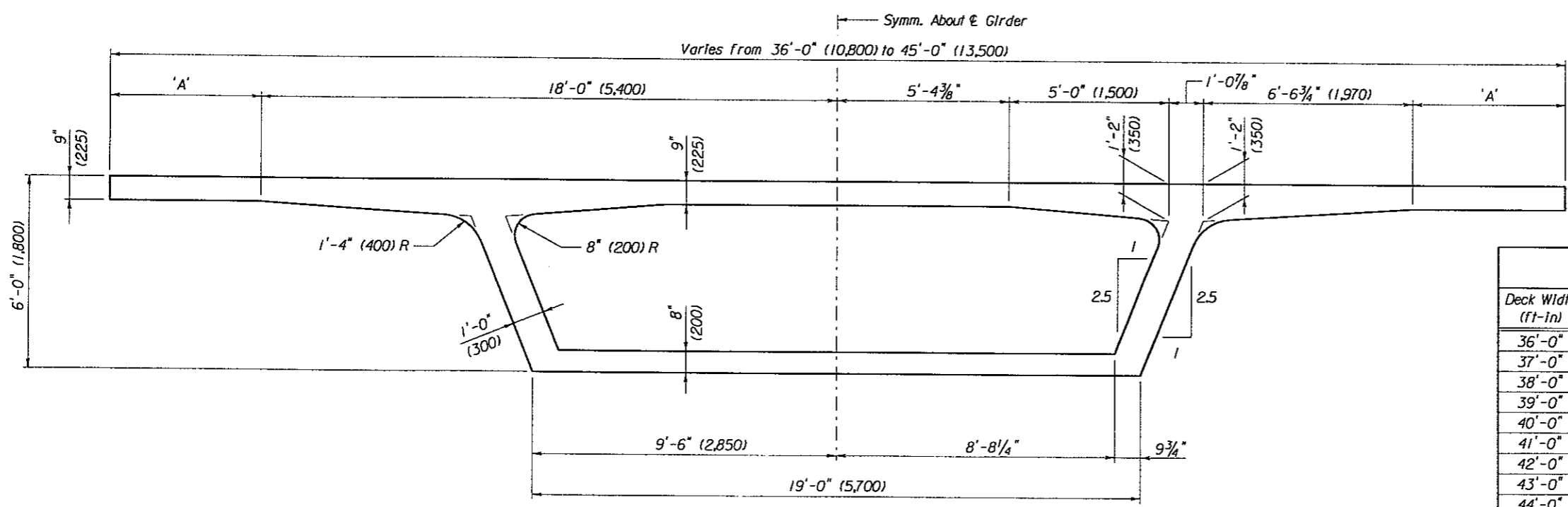


Wearing Surfaces

For those regions in which deicing chemicals are used on roadways, a sacrificial wearing surface is recommended to protect the structural deck and thereby enhance the life of the structure. In regions where deicing chemicals are not used, as-cast riding surfaces without wearing surfaces may be used.



6-1 (1800-1)



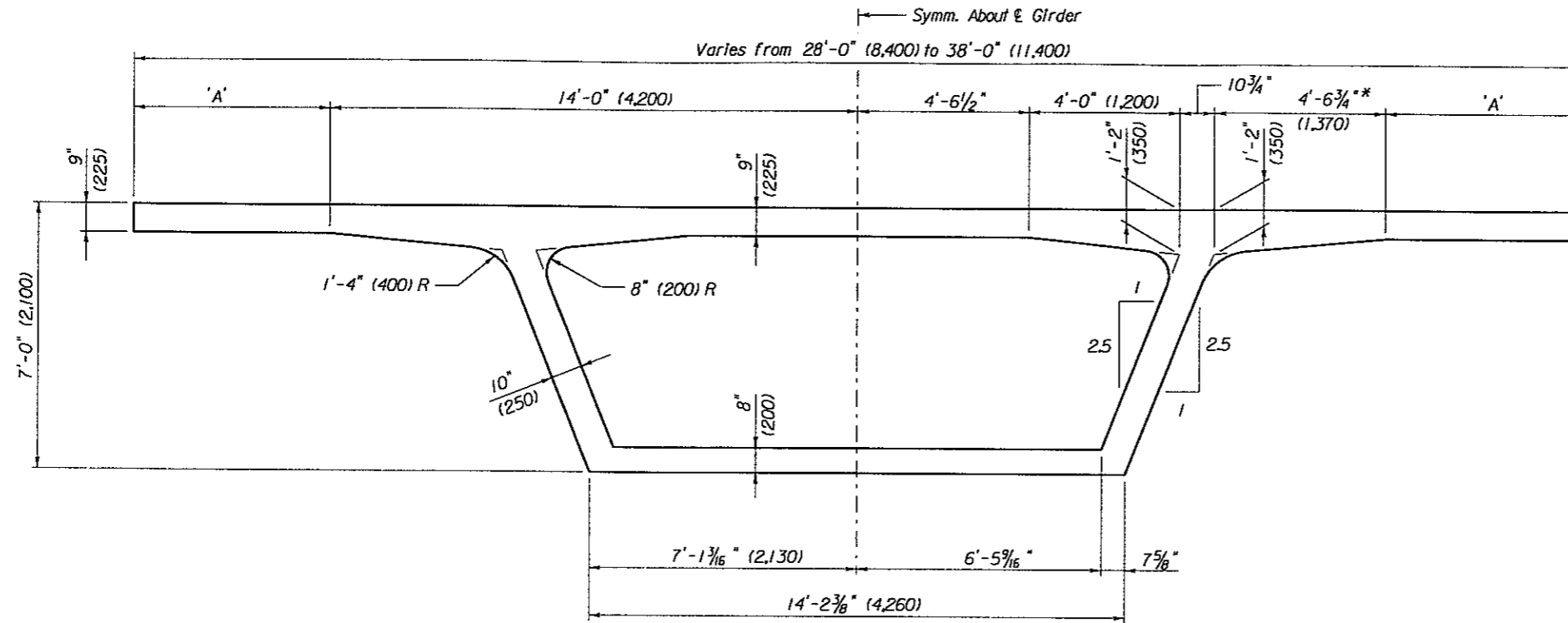
6-2 (1800-2)

NOTES:

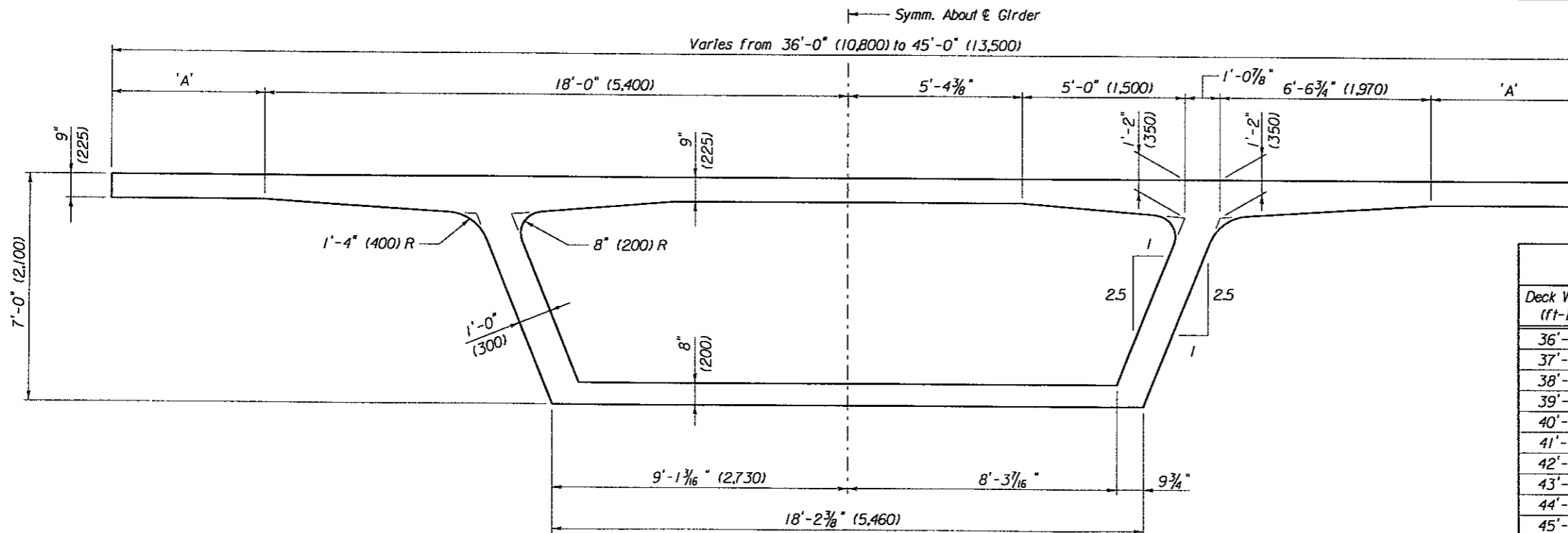
1. Area denotes cross-sectional area.
2. Wt denotes segment weight for 10'-0" segment.
3. I_x denotes bending moment of inertia.
4. Y_1 denotes distance from the centroidal axis to the top of section.
5. * For widths less than 28'-0", the 4'-6 3/4" dimension is decreased. The depth of the slab at the edge of the segment increases accordingly.

6-1					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	I_x (ft ⁴)	Y_1 (ft)
28'-0"	0	43.55	68,000	220.30	2.17
29'-0"	6"	44.31	69,000	222.75	2.14
30'-0"	1'-0"	45.06	70,000	225.08	2.11
31'-0"	1'-6"	45.81	71,000	227.34	2.08
32'-0"	2'-0"	46.56	72,000	229.52	2.05
33'-0"	2'-6"	47.31	73,000	231.64	2.03
34'-0"	3'-0"	48.06	74,000	233.69	2.00
35'-0"	3'-6"	48.81	76,000	235.68	1.98
36'-0"	4'-0"	49.56	77,000	237.61	1.95
37'-0"	4'-6"	50.31	78,000	239.48	1.93
38'-0"	5'-0"	51.06	79,000	241.30	1.91

6-2					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	I_x (ft ⁴)	Y_1 (ft)
36'-0"	0	55.16	85,000	278.84	2.14
37'-0"	6"	55.91	87,000	281.18	2.12
38'-0"	1'-0"	56.66	88,000	283.46	2.09
39'-0"	1'-6"	57.41	89,000	285.68	2.07
40'-0"	2'-0"	58.16	90,000	287.85	2.05
41'-0"	2'-6"	58.91	91,000	289.96	2.03
42'-0"	3'-0"	59.66	92,000	292.02	2.00
43'-0"	3'-6"	60.41	94,000	294.03	1.99
44'-0"	4'-0"	61.16	95,000	295.99	1.97
45'-0"	4'-6"	61.91	96,000	297.90	1.95



7-1 (2100-1)



7-2 (2100-2)

NOTES:

1. Area denotes cross-sectional area.
2. Wt denotes segment weight for 10'-0" segment.
3. Ix denotes bending moment of Inertia.
4. Yt denotes distance from the centroidal axis to the top of section.
5. * For widths less than 28'-0", the 4'-6 3/4" dimension is decreased. The depth of the slab at the edge of the segment increases accordingly.

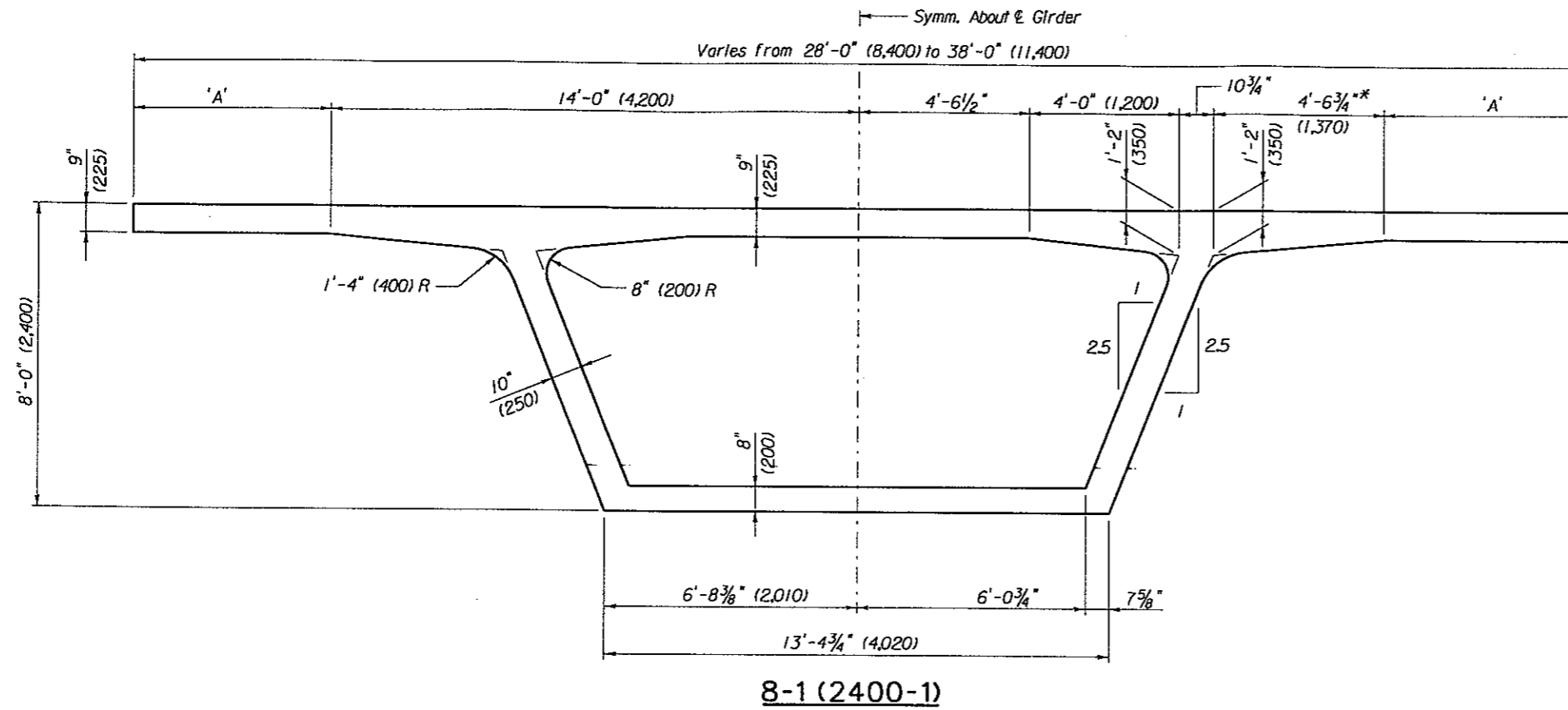
7-1					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	Ix (ft ⁴)	Yt (ft)
28'-0"	0	44.82	69,000	310.52	2.49
29'-0"	6"	45.57	71,000	313.85	2.46
30'-0"	1'-0"	46.32	72,000	317.08	2.42
31'-0"	1'-6"	47.07	73,000	320.21	2.39
32'-0"	2'-0"	47.82	74,000	323.24	2.36
33'-0"	2'-6"	48.57	75,000	326.17	2.33
34'-0"	3'-0"	49.32	76,000	329.02	2.30
35'-0"	3'-6"	50.07	78,000	331.79	2.27
36'-0"	4'-0"	50.82	79,000	334.47	2.24
37'-0"	4'-6"	51.57	80,000	337.08	2.21
38'-0"	5'-0"	52.32	81,000	339.61	2.19

7-2					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	Ix (ft ⁴)	Yt (ft)
36'-0"	0	56.78	88,000	394.93	2.46
37'-0"	6"	57.53	89,000	398.20	2.44
38'-0"	1'-0"	58.28	90,000	401.38	2.41
39'-0"	1'-6"	59.03	91,000	404.48	2.38
40'-0"	2'-0"	59.78	93,000	407.51	2.36
41'-0"	2'-6"	60.53	94,000	410.46	2.34
42'-0"	3'-0"	61.28	95,000	413.34	2.31
43'-0"	3'-6"	62.03	96,000	416.15	2.29
44'-0"	4'-0"	62.78	97,000	418.90	2.26
45'-0"	4'-6"	63.53	98,000	421.58	2.24

AASHTO - PCI - ASBI
SEGMENTAL BOX GIRDER STANDARDS

FOR SPAN-BY-SPAN CONSTRUCTION
SPANS 100' TO 150'

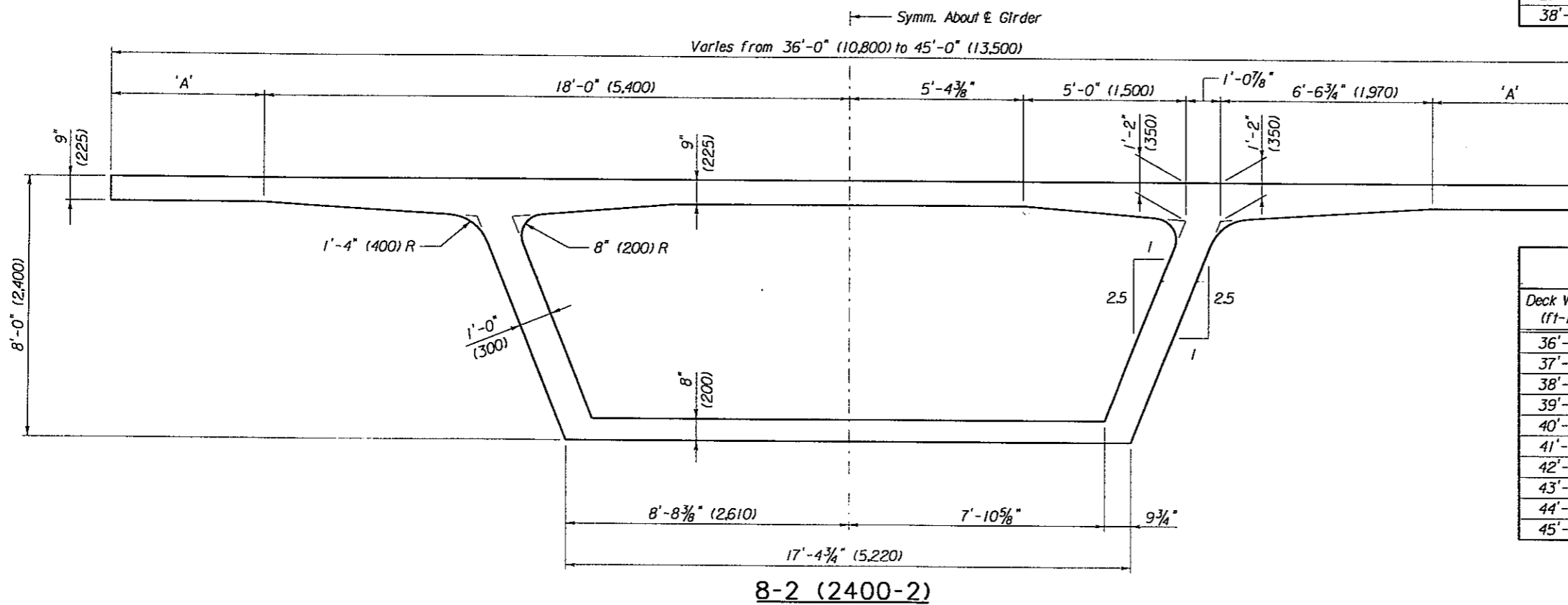
7'-0"
SEGMENT DEPTH



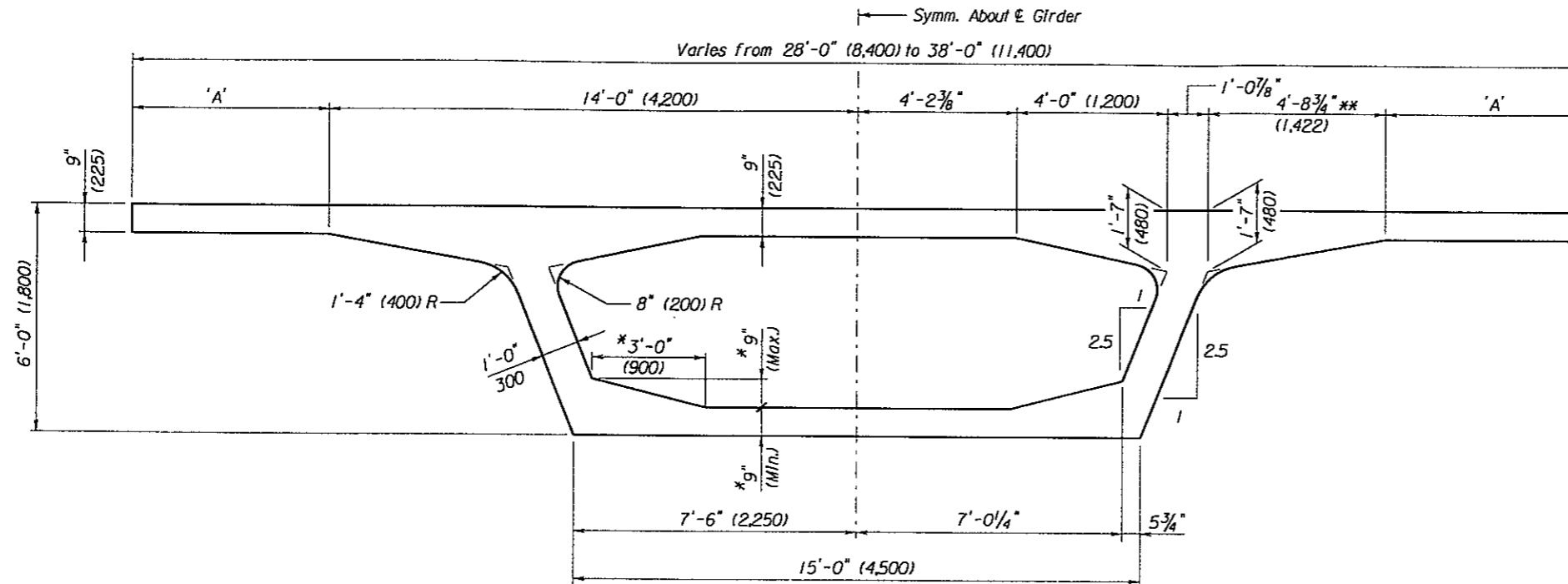
NOTES:

1. Area denotes cross-sectional area.
2. Wt denotes segment weight for 10'-0" segment.
3. Ix denotes bending moment of Inertia.
4. Yt denotes distance from the centroidal axis to the top of section.
5. * For widths less than 28'-0", the 4'-6 3/4" dimension is decreased. The depth of the slab at the edge of the segment increases accordingly.

8-1					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	Ix (ft ⁴)	Yt (ft)
28'-0"	0	46.07	71,000	415.72	2.81
29'-0"	6"	46.82	73,000	420.12	2.77
30'-0"	1'-0"	47.57	74,000	424.39	2.73
31'-0"	1'-6"	48.32	75,000	428.53	2.70
32'-0"	2'-0"	49.07	76,000	432.54	2.66
33'-0"	2'-6"	49.82	77,000	436.43	2.63
34'-0"	3'-0"	50.57	78,000	440.21	2.59
35'-0"	3'-6"	51.32	80,000	443.88	2.56
36'-0"	4'-0"	52.07	81,000	447.44	2.53
37'-0"	4'-6"	52.82	82,000	450.91	2.50
38'-0"	5'-0"	53.57	83,000	454.27	2.47



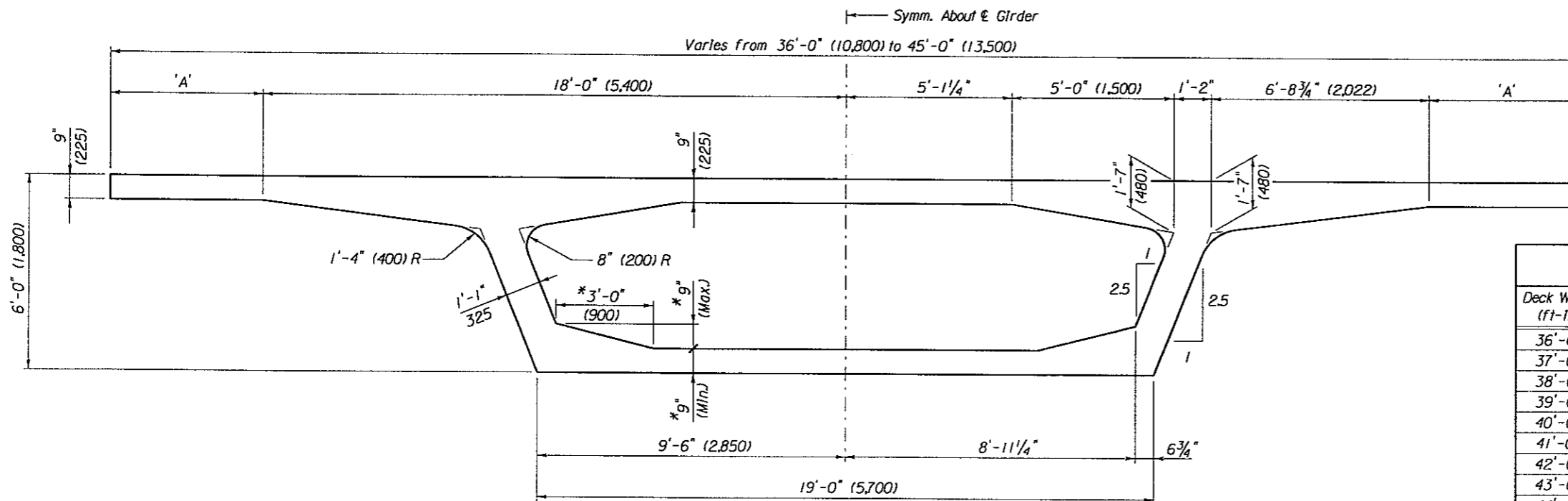
8-2					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	Ix (ft ⁴)	Yt (ft)
36'-0"	0	58.41	91,000	531.42	2.79
37'-0"	6"	59.16	92,000	535.77	2.76
38'-0"	1'-0"	59.91	93,000	540.01	2.73
39'-0"	1'-6"	60.66	94,000	544.14	2.70
40'-0"	2'-0"	61.41	95,000	548.18	2.67
41'-0"	2'-6"	62.16	96,000	552.12	2.64
42'-0"	3'-0"	62.91	98,000	555.97	2.62
43'-0"	3'-6"	63.66	99,000	559.72	2.59
44'-0"	4'-0"	64.41	100,000	563.40	2.56
45'-0"	4'-6"	65.16	101,000	566.98	2.54



6-1 (1800-1)

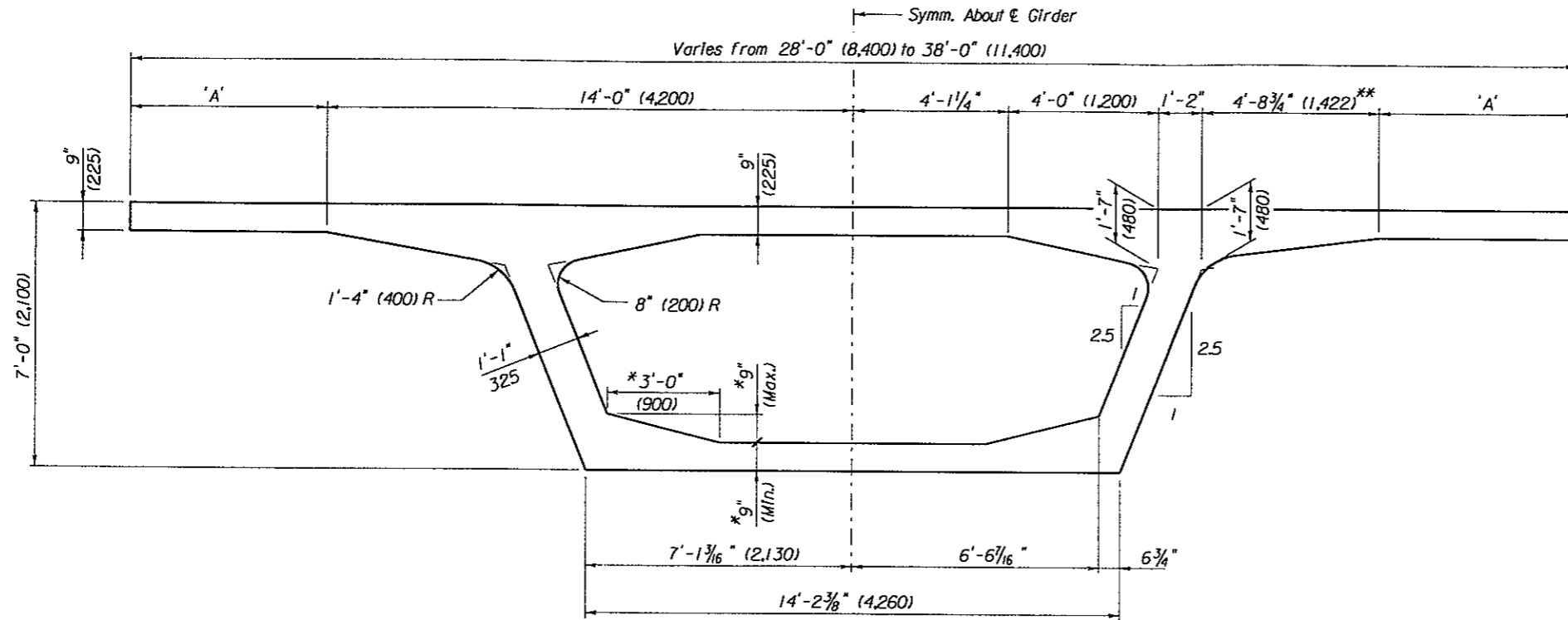
6-1					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	I _x (ft ⁴)	Y _t (ft)
28'-0"	0	51.91	77,865	254.16	2.308
29'-0"	6"	52.66	78,990	256.96	2.281
30'-0"	1'-0"	53.41	80,115	259.68	2.254
31'-0"	1'-6"	54.16	81,240	262.33	2.228
32'-0"	2'-0"	54.91	82,365	264.90	2.203
33'-0"	2'-6"	55.66	83,490	267.41	2.178
34'-0"	3'-0"	56.41	84,615	269.85	2.154
35'-0"	3'-6"	57.16	85,740	272.23	2.131
36'-0"	4'-0"	57.91	86,865	274.55	2.108
37'-0"	4'-6"	58.66	87,990	276.80	2.086
38'-0"	5'-0"	59.41	89,115	279.01	2.064

- NOTES:
1. Area denotes cross-sectional area.
 2. Wt denotes segment weight for 10'-0" segment.
 3. I_x denotes bending moment of Inertia.
 4. Y_t denotes distance from the centroidal axis to the top of section.
 5. * Bottom slab thickness may increase to a maximum of 1'-6" at piers. 3'-0" dimension adjusts accordingly
 6. ** For widths less than 28'-0", the 4'-8 3/4" dimension is decreased. The depth of the slab at the edge of the segment increases accordingly.

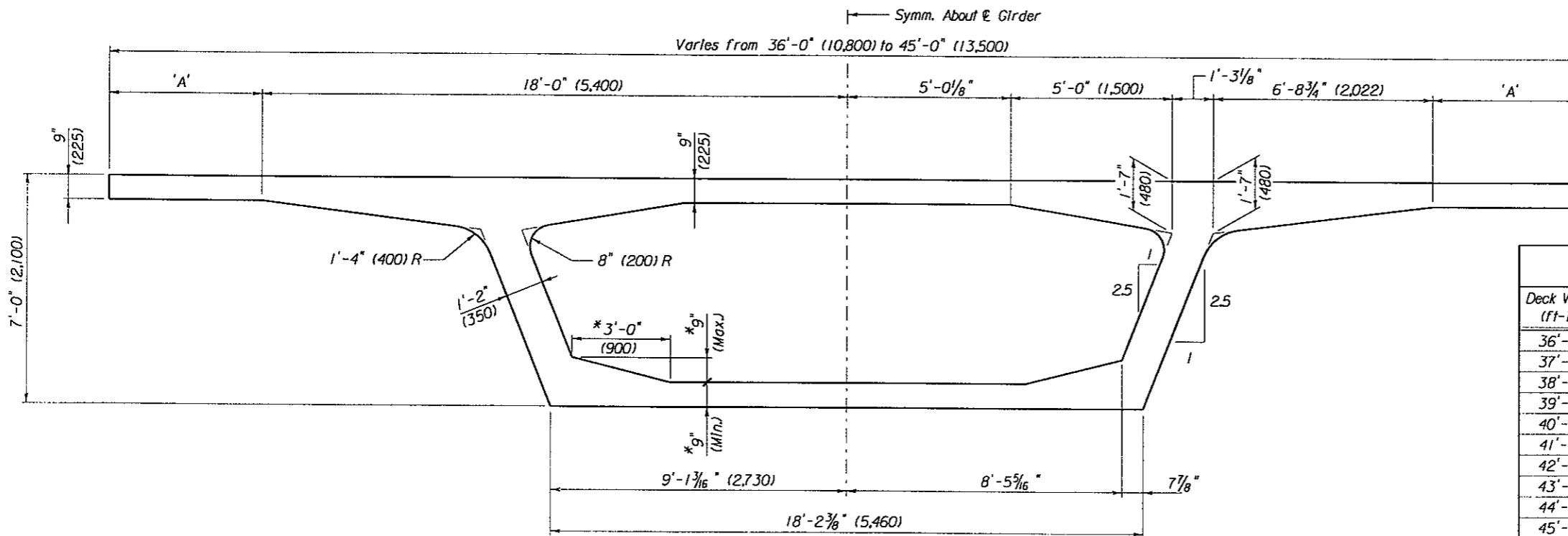


6-2 (1800-2)

6-2					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	I _x (ft ⁴)	Y _t (ft)
36'-0"	0	64.29	96,435	315.69	2.241
37'-0"	6"	65.04	97,560	318.30	2.220
38'-0"	1'-0"	65.79	98,685	320.86	2.199
39'-0"	1'-6"	66.54	99,810	323.36	2.178
40'-0"	2'-0"	67.29	100,935	325.81	2.158
41'-0"	2'-6"	68.04	102,060	328.20	2.138
42'-0"	3'-0"	68.79	103,185	330.54	2.119
43'-0"	3'-6"	69.54	104,310	332.84	2.100
44'-0"	4'-0"	70.29	105,435	335.08	2.082
45'-0"	4'-6"	71.04	106,560	337.28	2.064



7-1 (2100-1)



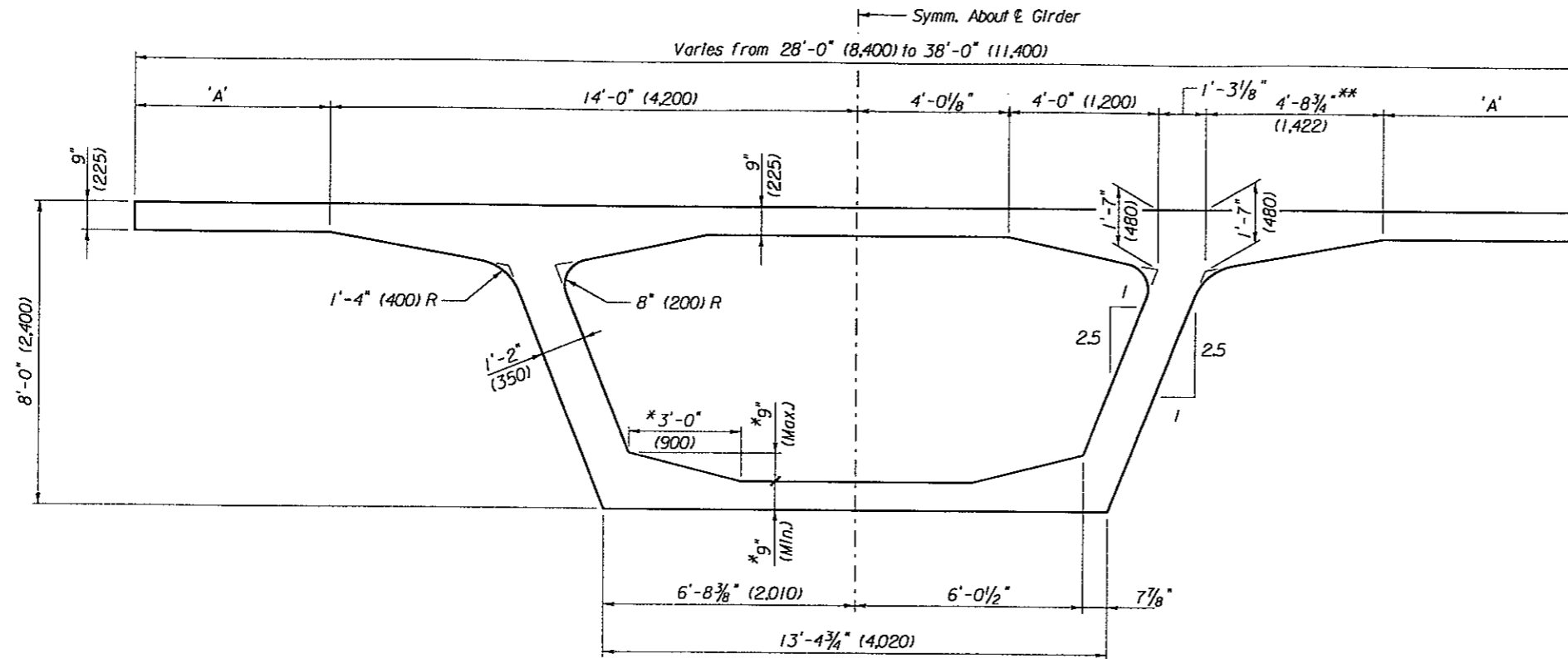
7-2 (2100-2)

7-1					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	I _x (ft ⁴)	Y ₁ (ft)
28'-0"	0	54.47	81,705	366.03	2.666
29'-0"	6"	55.22	82,830	369.95	2.635
30'-0"	1'-0"	55.97	83,955	373.76	2.605
31'-0"	1'-6"	56.72	85,080	377.48	2.575
32'-0"	2'-0"	57.47	86,205	381.10	2.547
33'-0"	2'-6"	58.22	87,330	384.62	2.519
34'-0"	3'-0"	58.97	88,455	388.06	2.491
35'-0"	3'-6"	59.72	89,580	391.42	2.465
36'-0"	4'-0"	60.47	90,705	394.68	2.439
37'-0"	4'-6"	61.22	91,830	397.88	2.414
38'-0"	5'-0"	61.97	92,955	400.99	2.389

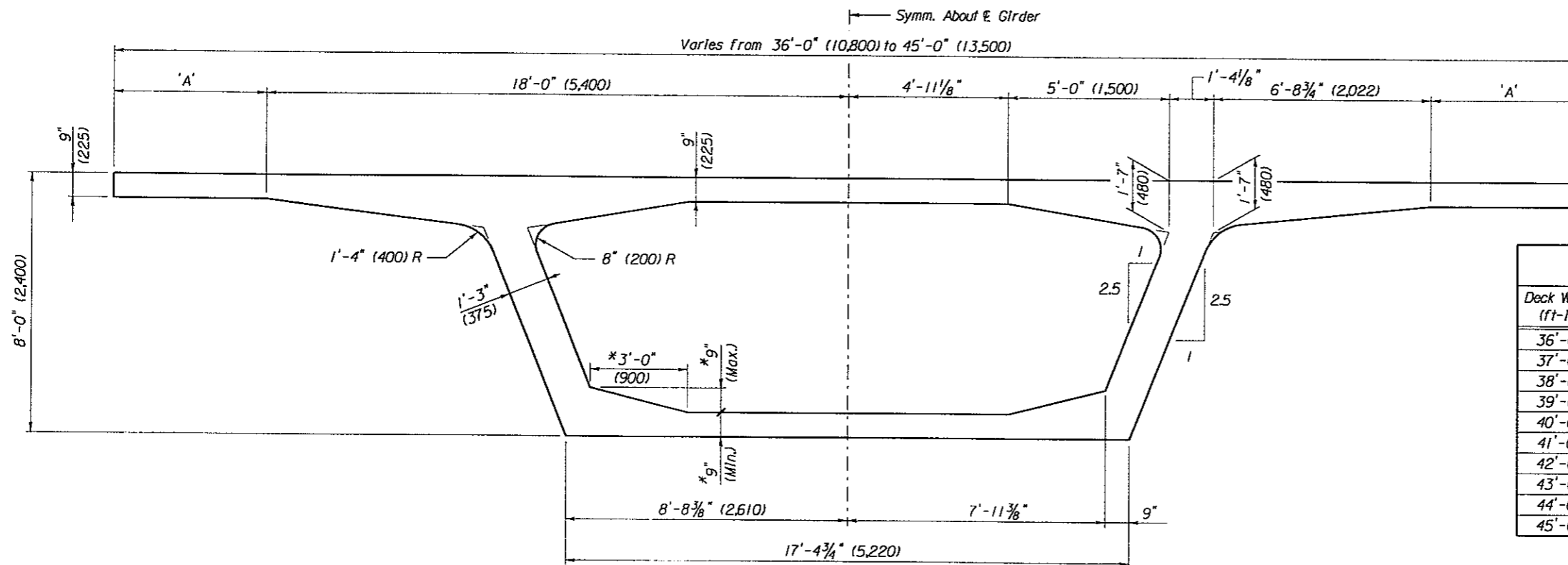
NOTES:

1. Area denotes cross-sectional area.
2. Wt denotes segment weight for 10'-0" segment.
3. I_x denotes bending moment of Inertia.
4. Y₁ denotes distance from the centroidal axis to the top of section.
5. * Bottom slab thickness may increase to a maximum of 1'-6" at piers. 3'-0" dimension adjusts accordingly.
6. ** For widths less than 28'-0", the 4'-8 3/4" dimension is decreased. The depth of the slab at the edge of the segment increases accordingly.

7-2					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	I _x (ft ⁴)	Y ₁ (ft)
36'-0"	0	67.01	99,765	454.60	2.589
37'-0"	6"	67.76	100,890	458.27	2.564
38'-0"	1'-0"	68.51	102,015	461.86	2.540
39'-0"	1'-6"	69.26	103,140	465.38	2.517
40'-0"	2'-0"	70.01	104,265	468.82	2.494
41'-0"	2'-6"	70.76	105,390	472.18	2.472
42'-0"	3'-0"	71.51	106,515	475.48	2.450
43'-0"	3'-6"	72.26	107,640	478.71	2.428
44'-0"	4'-0"	73.01	108,765	481.88	2.407
45'-0"	4'-6"	73.76	109,890	484.98	2.386



8-1 (2400-1)



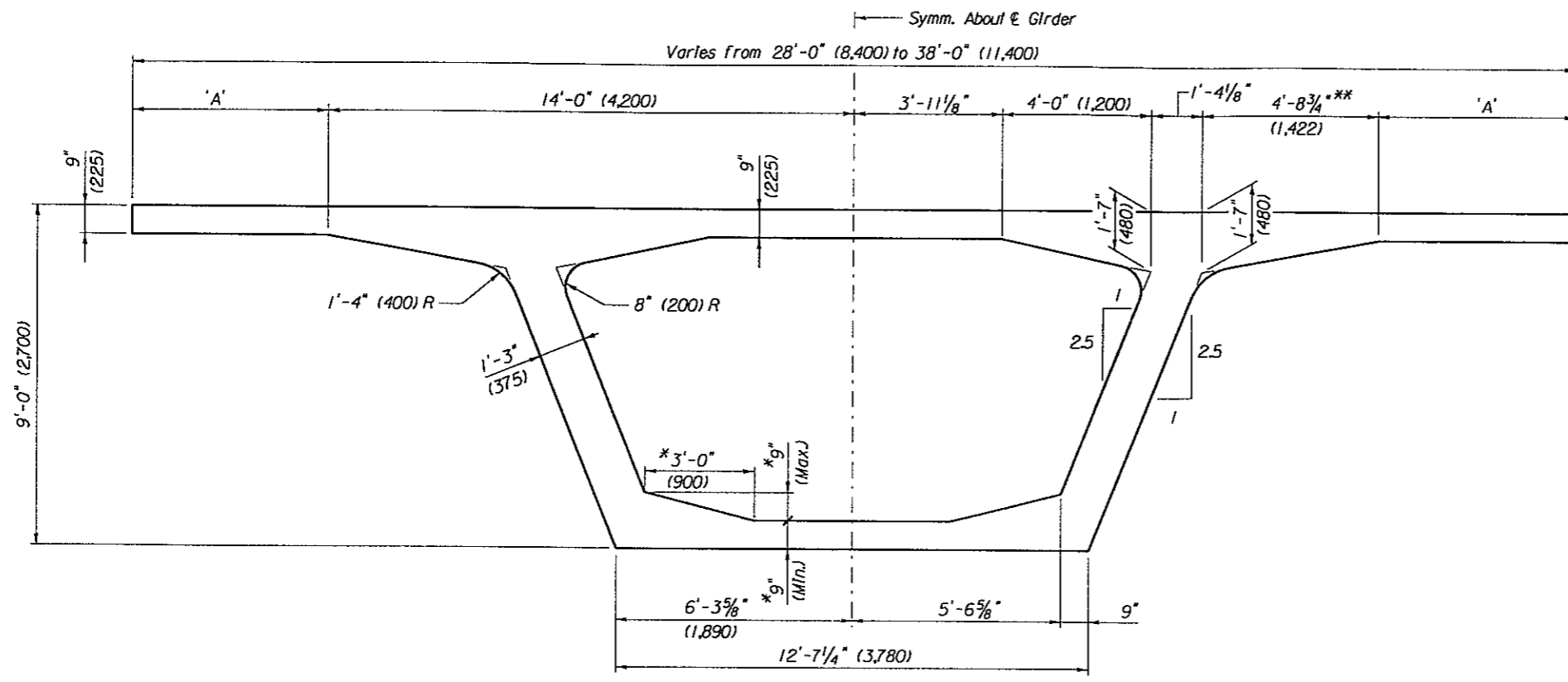
8-2 (2400-2)

8-1					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	I _x (ft ⁴)	Y _t (ft)
28'-0"	0	57.37	86,055	501.32	3.033
29'-0"	6"	58.12	87,180	506.58	2.998
30'-0"	1'-0"	58.87	88,305	511.71	2.965
31'-0"	1'-6"	59.62	89,430	516.71	2.932
32'-0"	2'-0"	60.37	90,555	521.59	2.901
33'-0"	2'-6"	61.12	91,680	526.35	2.870
34'-0"	3'-0"	61.87	92,805	531.00	2.839
35'-0"	3'-6"	62.62	93,930	535.54	2.810
36'-0"	4'-0"	63.37	95,055	539.97	2.781
37'-0"	4'-6"	64.12	96,180	544.29	2.753
38'-0"	5'-0"	64.87	97,305	548.52	2.726

NOTES:

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3. I_x denotes bending moment of inertia.
4. Y_t denotes distance from the centroidal axis to the top of section.
5. * Bottom slab thickness may increase to a maximum of 1'-6" at piers. 3'-0" dimension adjusts accordingly.
6. ** For widths less than 28'-0", the 4'-8 3/4" dimension is decreased. The depth of the slab at the edge of the segment increases accordingly.

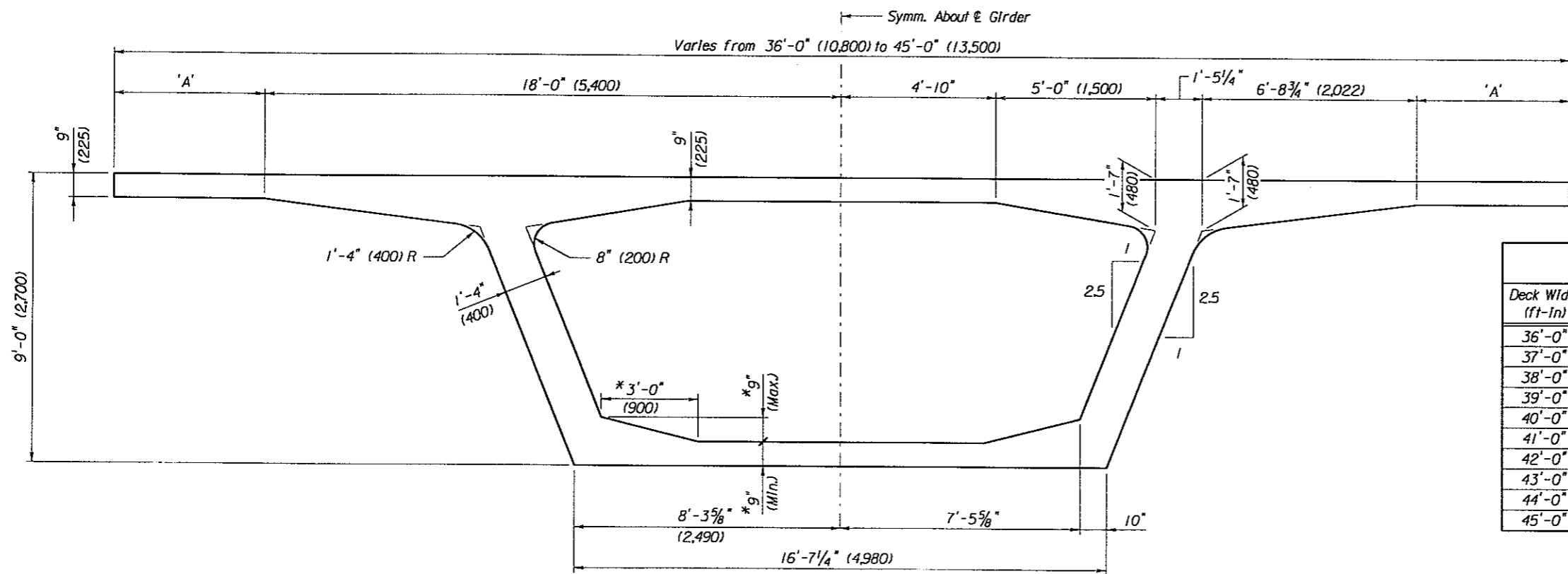
8-2					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	I _x (ft ⁴)	Y _t (ft)
36'-0"	0	70.09	105,135	622.26	2.945
37'-0"	6"	70.84	106,260	627.20	2.918
38'-0"	1'-0"	71.59	107,385	632.03	2.892
39'-0"	1'-6"	72.34	108,510	636.77	2.865
40'-0"	2'-0"	73.09	109,635	641.41	2.840
41'-0"	2'-6"	73.84	110,760	645.95	2.815
42'-0"	3'-0"	74.59	111,885	650.41	2.790
43'-0"	3'-6"	75.34	113,010	654.78	2.766
44'-0"	4'-0"	76.09	114,135	659.06	2.743
45'-0"	4'-6"	76.84	115,260	663.26	2.720



9-1 (2700-1)

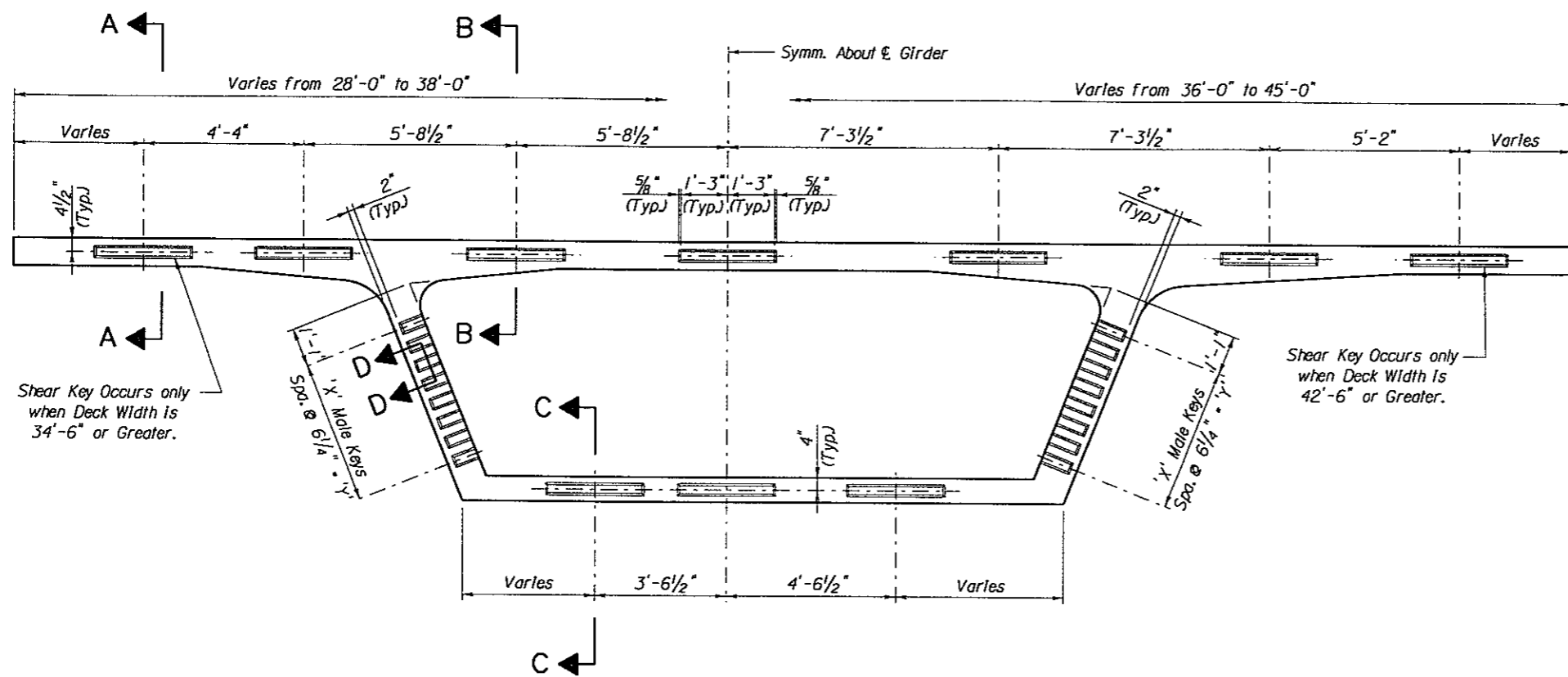
9-1					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	I _x (ft ⁴)	Y _t (ft)
28'-0"	0	60.63	90,945	661.99	3.408
29'-0"	6"	61.38	92,070	668.84	3.371
30'-0"	1'-0"	62.13	93,195	675.53	3.335
31'-0"	1'-6"	62.88	94,320	682.06	3.300
32'-0"	2'-0"	63.63	95,445	688.43	3.265
33'-0"	2'-6"	64.38	96,570	694.66	3.232
34'-0"	3'-0"	65.13	97,695	700.74	3.199
35'-0"	3'-6"	65.88	98,820	706.69	3.167
36'-0"	4'-0"	66.63	99,945	712.50	3.135
37'-0"	4'-6"	67.38	101,070	718.19	3.104
38'-0"	5'-0"	68.13	102,195	723.75	3.074

- NOTES:
1. Area denotes cross-sectional area.
 2. Wt denotes segment weight for 10'-0" segment.
 3. I_x denotes bending moment of Inertia.
 4. Y_t denotes distance from the centroidal axis to the top of section.
 5. * Bottom slab thickness may increase to a maximum of 1'-6" at piers. 3'-0" dimension adjusts accordingly.
 6. ** For widths less than 28'-0", the 4'-8 3/4" dimension is decreased. The depth of the slab at the edge of the segment increases accordingly.



9-2 (2700-2)

9-2					
Deck Width (ft-in)	'A' (ft-in)	Area (ft ²)	Wt/10'-0" (lb)	I _x (ft ⁴)	Y _t (ft)
36'-0"	0	73.53	110,295	820.86	3.311
37'-0"	6"	74.28	111,420	827.30	3.282
38'-0"	1'-0"	75.03	112,545	833.61	3.253
39'-0"	1'-6"	75.78	113,670	839.79	3.224
40'-0"	2'-0"	76.53	114,795	845.86	3.196
41'-0"	2'-6"	77.28	115,920	851.80	3.170
42'-0"	3'-0"	78.03	117,045	857.64	3.142
43'-0"	3'-6"	78.78	118,170	863.36	3.116
44'-0"	4'-0"	79.53	119,295	868.98	3.090
45'-0"	4'-6"	80.28	120,420	874.49	3.064



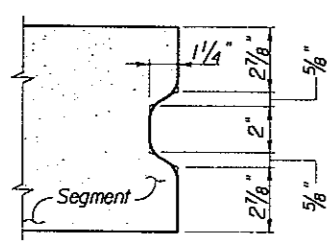
Shear Key Occurs only when Deck Width is 34'-6" or Greater.

Shear Key Occurs only when Deck Width is 42'-6" or Greater.

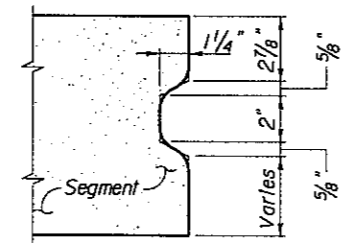
Segment Depth (ft-in)	'x'	'y' (ft-in)
6'-0"	6	2'-7 1/4"
7'-0"	8	3'-7 3/4"
8'-0"	10	4'-8 1/4"

BULKHEAD HALF SECTION - SERIES 1

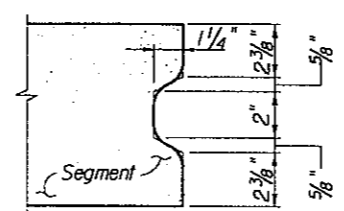
BULKHEAD HALF SECTION - SERIES 2



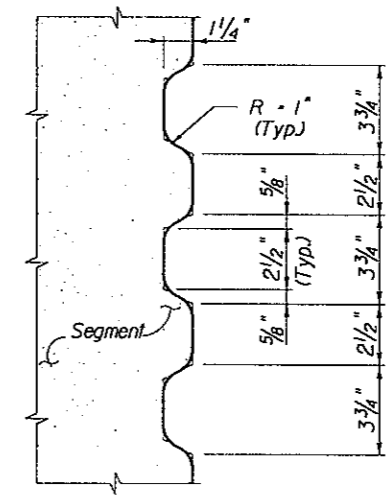
SECTION A-A



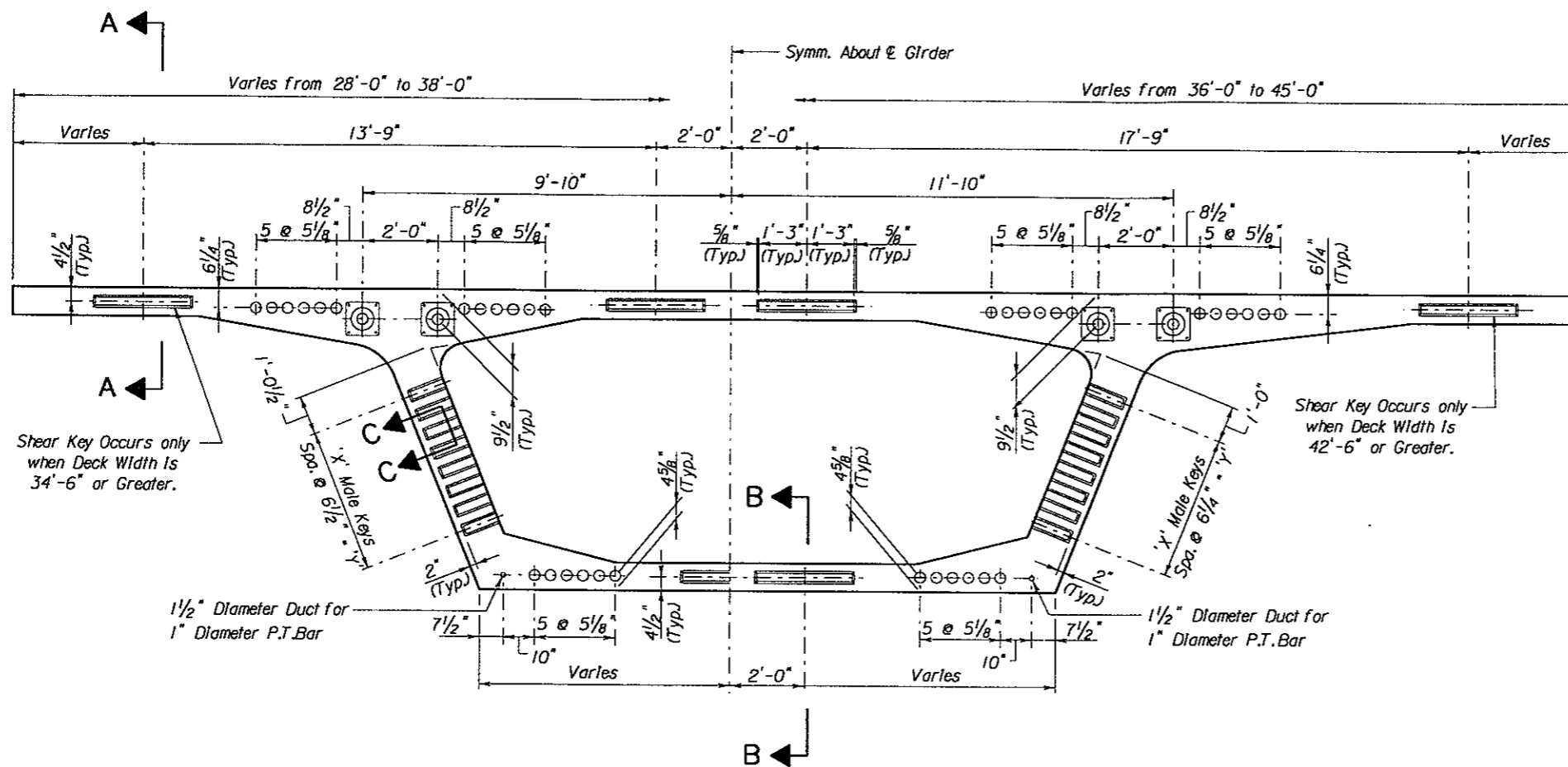
SECTION B-B



SECTION C-C



SECTION D-D



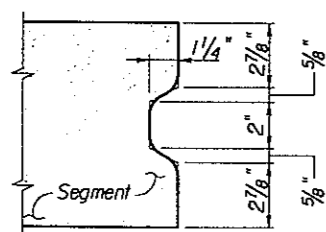
NOTES:

1. Unless otherwise noted, all ducts are $3\frac{3}{8}$ " diameter for 12 x 0.6" diameter or 15 x 0.5" diameter strand tendons.
2. Post-tensioning layouts for balanced cantilever construction using these standards shall utilize the duct and anchorage locations shown. Details shall be in accordance with the "Recommended Contract Administration Guidelines for Design and Construction of Segmental Concrete Bridges".

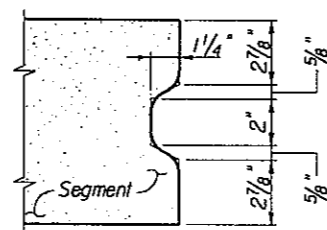
Segment Depth (ft-in)	'x'	'y' (ft-in)
6'-0"	4	1'-6 $\frac{3}{4}$ "
7'-0"	6	2'-7 $\frac{1}{4}$ "
8'-0"	8	3'-7 $\frac{3}{4}$ "
9'-0"	10	4'-8 $\frac{1}{4}$ "
10'-0"	12	5'-8 $\frac{3}{4}$ "

BULKHEAD HALF SECTION - SERIES 1

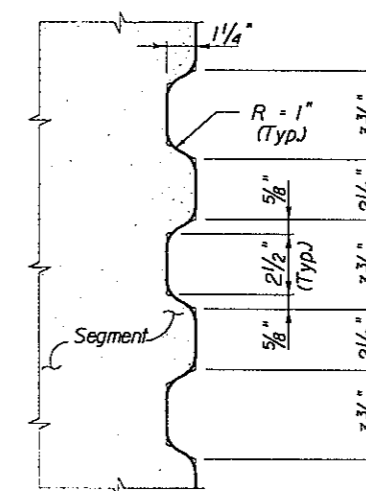
BULKHEAD HALF SECTION - SERIES 2



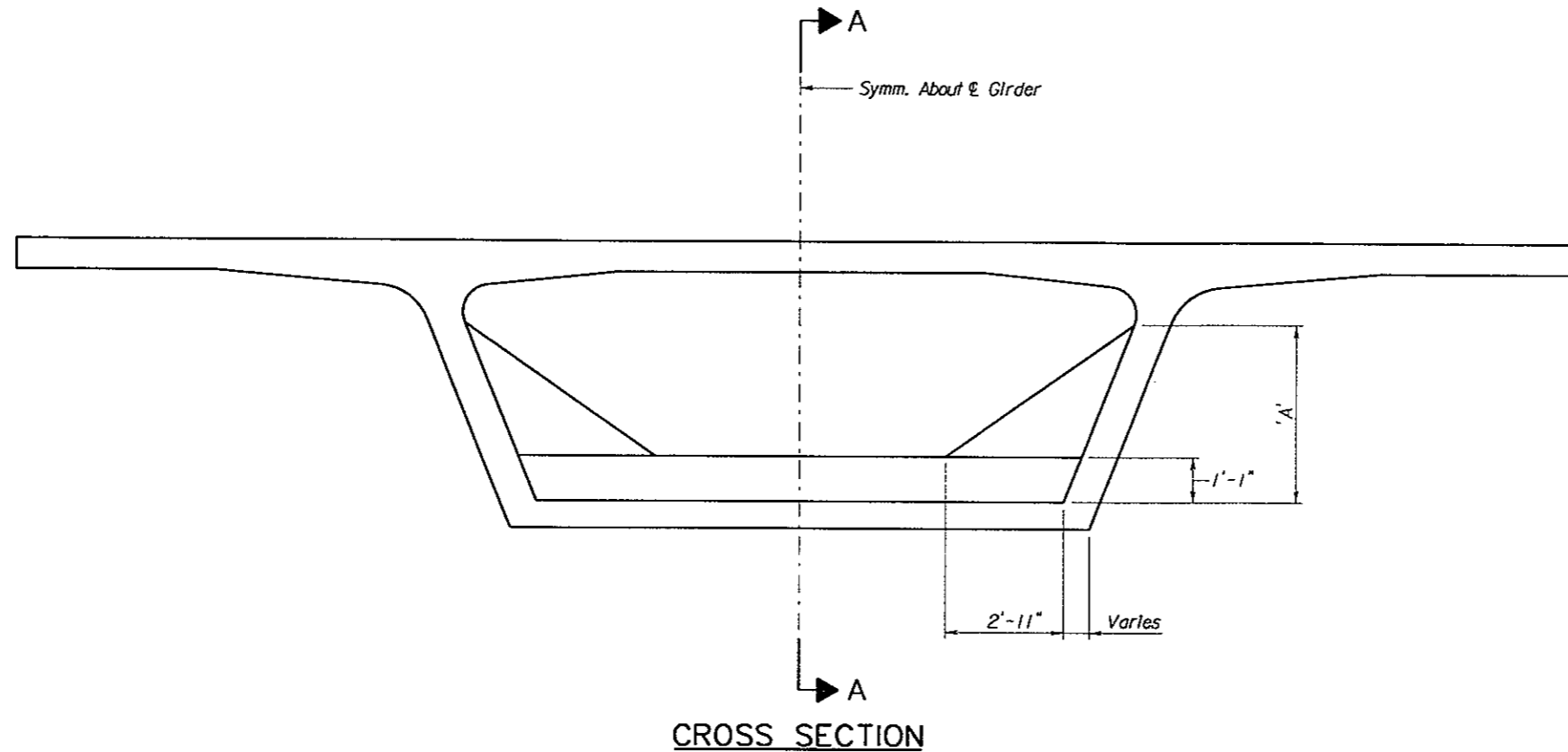
SECTION A-A



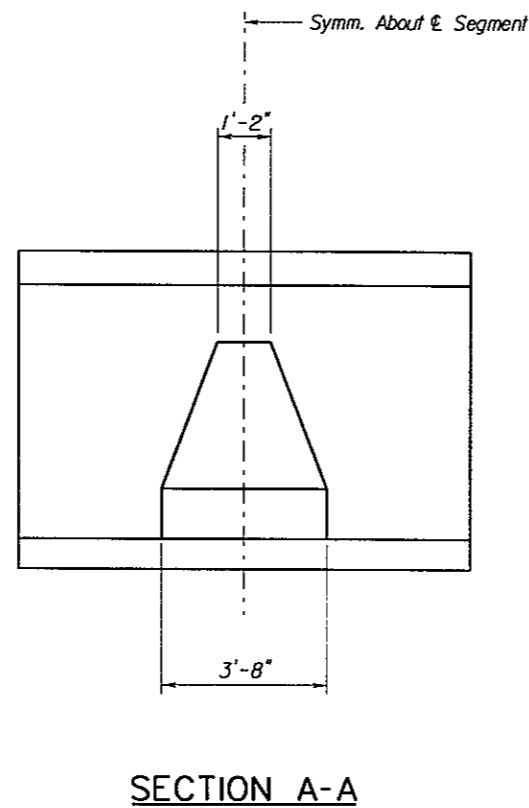
SECTION B-B



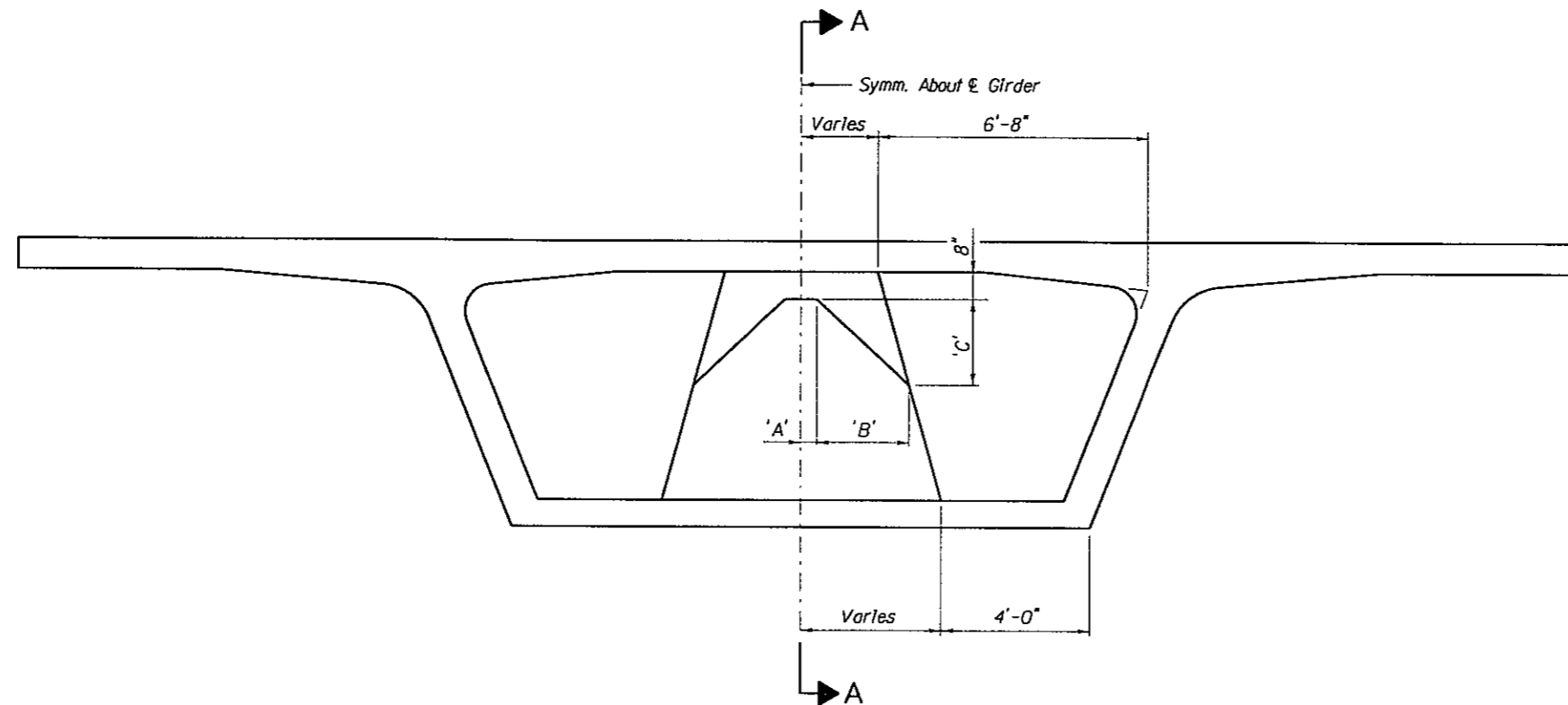
SECTION C-C



NOTES:
 1. The weight given is for the deviation diaphragm only. The Total segment weight is the weight of the diaphragm plus the weight for the cross-section listed on the segment dimension sheets.



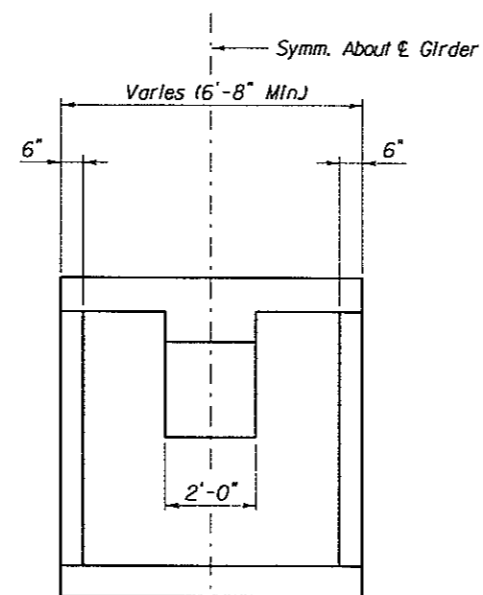
Section Type	'A' (ft-in)	Dev. Dia. Wt. (lb)
6-1	3'-4"	12,000
6-2	3'-4"	14,000
7-1	4'-4"	12,000
7-2	4'-4"	14,000
8-1	5'-4"	13,000
8-2	5'-4"	15,000



CROSS SECTION

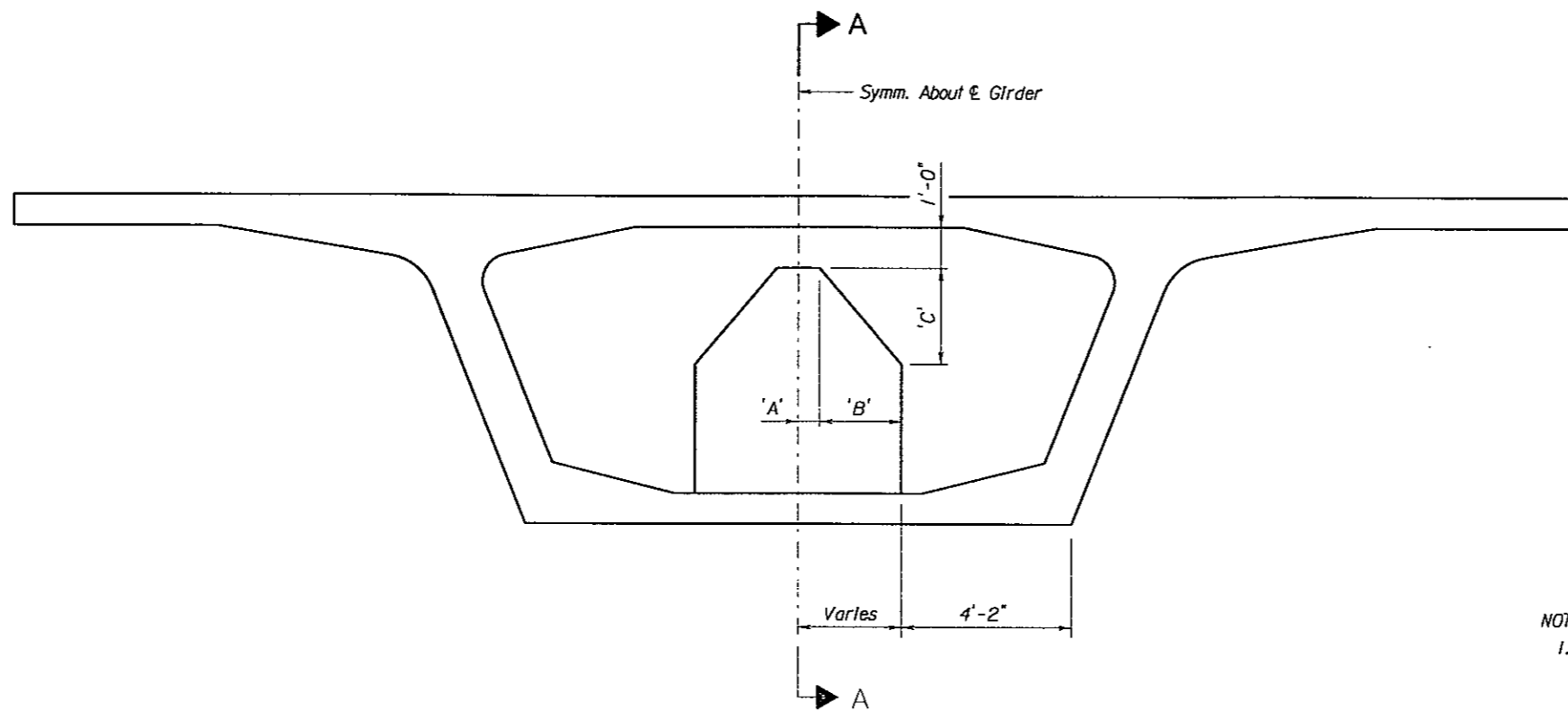
NOTES:

1. The weight given is for the diaphragm only. The Total segment weight is the weight of the diaphragm plus the weight for the cross-section listed on the segment dimension sheets. The weight given is for the minimum segment length of 6'-8". The Additional weight given is the increase in diaphragm weight per additional 1'-0" increase in segment length.

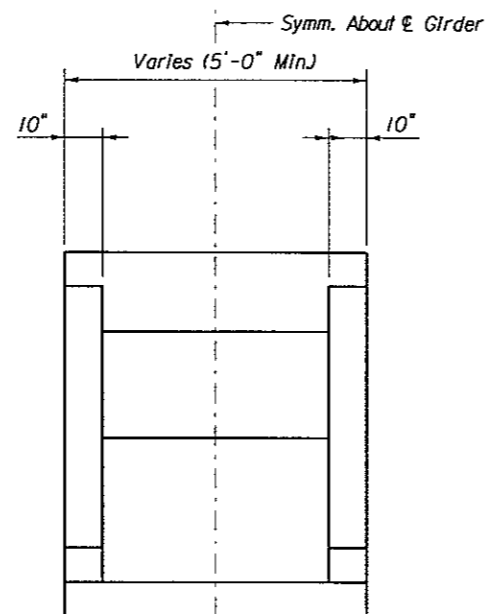


SECTION A-A

Section Type	'A' (ft-in)	'B' (ft-in)	'C' (ft-in)	Weight (lb)	Add. Weight (lb)
6-1	6 ⁷ / ₈ "	2'-1"	1'-6 ³ / ₈ "	39,000	7,000
6-2	9 ¹ / ₂ "	4'-1 ¹ / ₈ "	2'-4 ³ / ₈ "	41,000	7,000
7-1	4 ⁵ / ₈ "	2'-0 ¹ / ₂ "	1'-10 ³ / ₄ "	48,000	8,000
7-2	7"	4'-0"	2'-10 ³ / ₄ "	50,000	8,000
8-1	3"	1'-11 ¹ / ₈ "	2'-3 ³ / ₈ "	57,000	10,000
8-2	5 ¹ / ₈ "	3'-10 ⁵ / ₈ "	3'-5"	59,000	10,000



CROSS SECTION

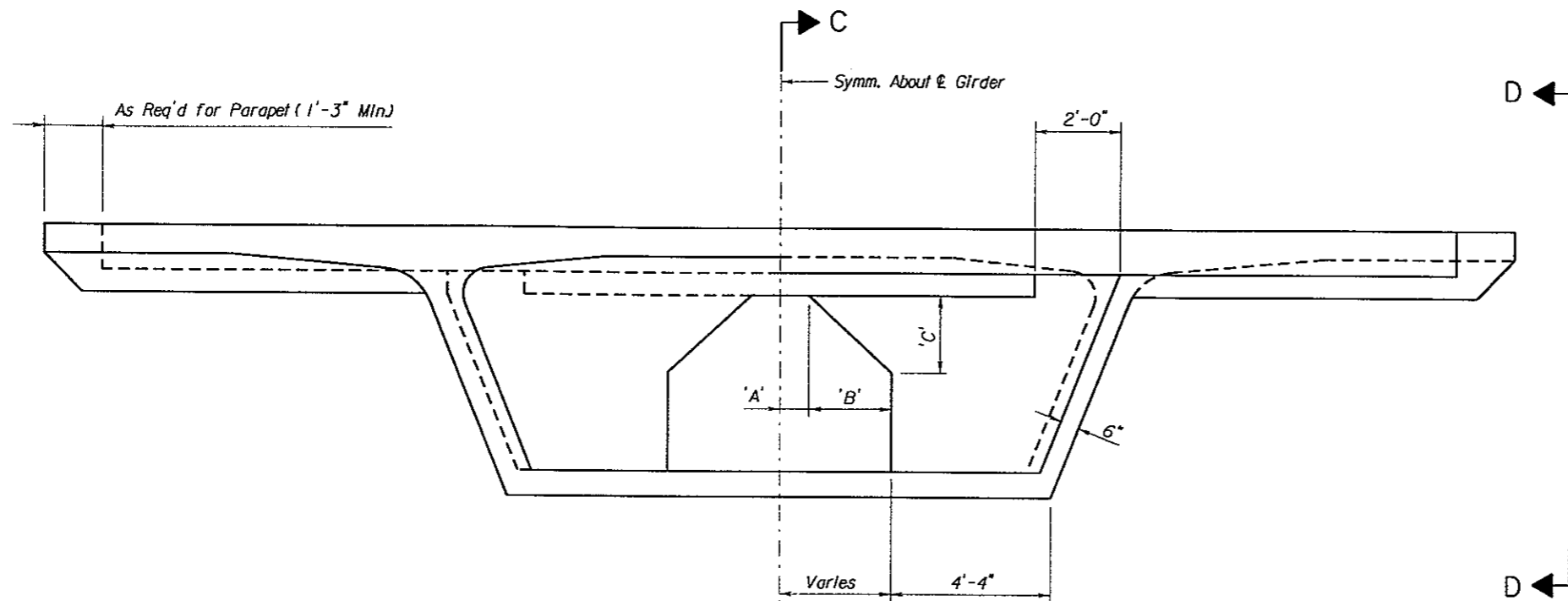


SECTION A-A

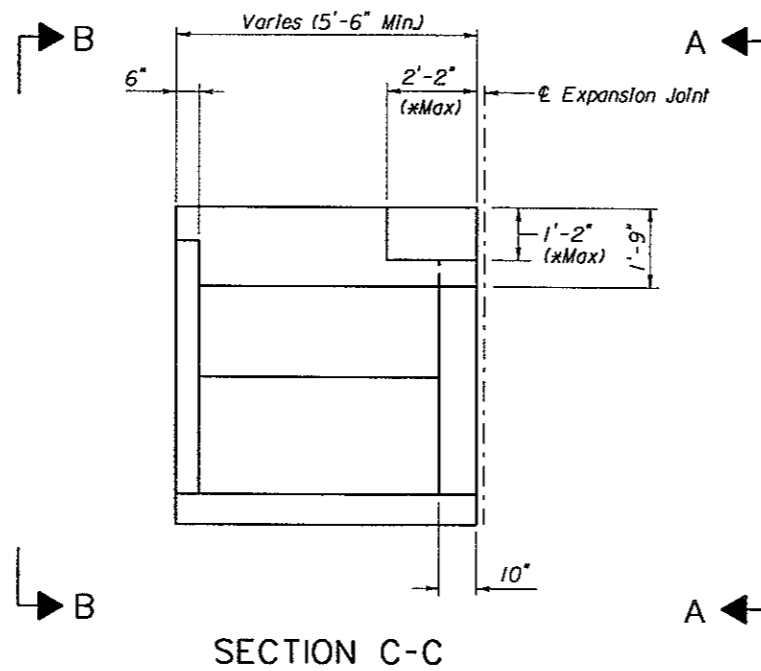
NOTES:

1. The weight given is for the diaphragm only. The Total segment weight is the weight of the diaphragm plus the weight for the cross-section listed on the segment dimension sheets. The weight given is for the minimum segment length of 5'-0". The Additional weight given is the increase in diaphragm weight per additional 1'-0" increase in segment length.

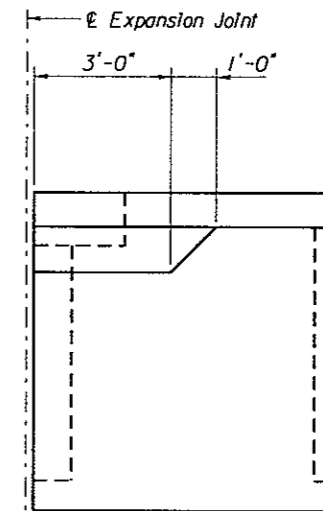
Section Type	'A' (ft-in)	'B' (ft-in)	'C' (ft-in)	Weight (lb)	Add. Wt. (lb)
6-1	1'-0 ¹ / ₄ "	2'-3 ³ / ₄ "	1' 8 ¹ / ₂ "	22,000	6,000
6-2	1'-4 ¹ / ₂ "	3'-11 ¹ / ₂ "	2'-3 ¹ / ₂ "	25,000	8,000
7-1	8 ⁷ / ₈ "	2'-2 ³ / ₈ "	2'-0 ³ / ₄ "	26,000	8,000
7-2	1'-0 ¹ / ₂ "	3'-10 ³ / ₈ "	2'-9 ⁷ / ₈ "	31,000	9,000
8-1	6 ¹ / ₄ "	2'-0 ¹ / ₈ "	2'-4 ¹ / ₈ "	31,000	9,000
8-2	9 ⁵ / ₈ "	3'-8 ⁷ / ₈ "	3'-3 ³ / ₄ "	36,000	11,000
9-1	4 ¹ / ₄ "	1'-9 ³ / ₈ "	2'-6 ¹ / ₂ "	36,000	11,000
9-2	7 ¹ / ₄ "	3'-6 ³ / ₈ "	3'-9 ¹ / ₄ "	41,000	12,000
10-1	2 ⁵ / ₈ "	1'-6 ¹ / ₄ "	2'-7 ⁵ / ₈ "	41,000	12,000
10-2	5 ³ / ₈ "	3'-3 ¹ / ₂ "	4'-2 ¹ / ₈ "	47,000	14,000



VIEW B-B
VIEW A-A
CROSS SECTION



SECTION C-C



VIEW D-D

NOTES:

- The weights given in each column are for the minimum width (28'-0" or 36'-0") and maximum width (38'-0" or 45'-0") segments respectively.
- Weight (5'-6") and Weight (10'-0") denotes the weight for 5'-6" and 10'-0" segment lengths respectively.
- * Actual Dimensions Depend upon Expansion Joint Device Specified.

SPAN-BY-SPAN

Section Type	'A' (ft-in)	'B' (ft-in)	'C' (ft-in)	Weight (5'-6") (lb)	Weight (10'-0") (lb)
6-1	1'-0"	2'-3"	1'-8"	60,000/68,000	122,000/135,000
6-2	1'-4"	3'-11"	2'-3"	74,000/81,000	148,000/160,000
7-1	0'-9"	2'-2"	2'-0"	68,000/76,000	138,000/151,000
7-2	1'-0"	3'-10"	2'-9"	82,000/89,000	165,000/177,000
8-1	0'-6"	2'-0"	2'-4"	76,000/84,000	154,000/167,000
8-2	0'-9"	3'-8"	3'-3"	91,000/98,000	183,000/195,000

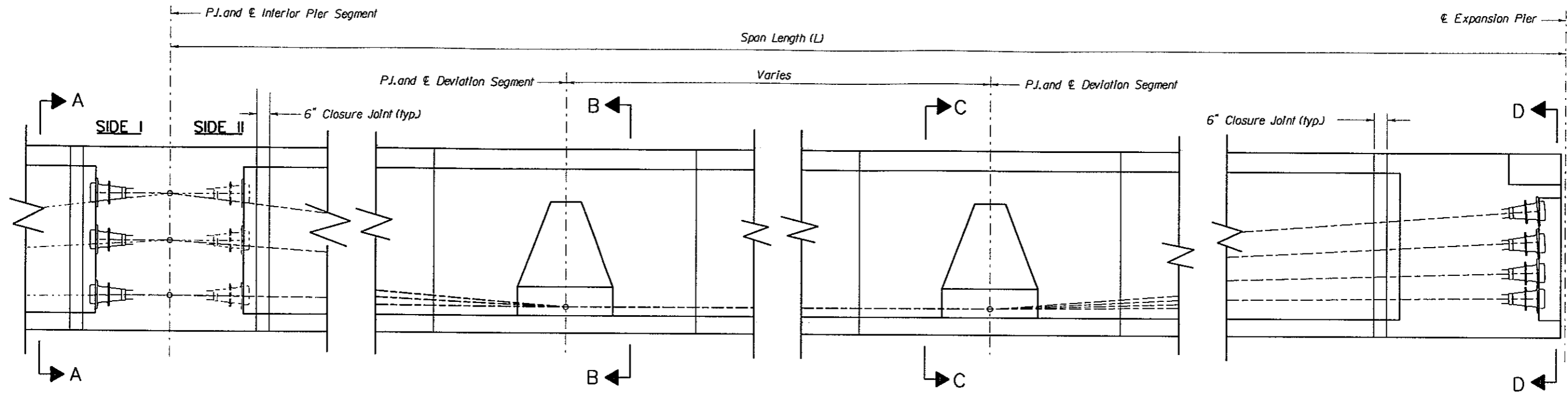
BALANCED CANTILEVER

Section Type	'A' (ft-in)	'B' (ft-in)	'C' (ft-in)	Weight (5'-6") (lb)	Weight (10'-0") (lb)
6-1	1'-0"	2'-3"	1'-8"	62,000/70,000	126,000/138,000
6-2	1'-4"	3'-11"	2'-3"	75,000/82,000	152,000/163,000
7-1	8"	2'-2"	2'-0"	70,000/78,000	141,000/154,000
7-2	1'-0"	3'-10"	2'-9"	84,000/91,000	169,000/181,000
8-1	6"	2'-0"	2'-4"	78,000/86,000	158,000/170,000
8-2	9"	3'-8"	3'-3"	92,000/99,000	187,000/199,000
9-1	4"	1'-9"	2'-6"	86,000/94,000	175,000/187,000
9-2	7"	3'-6"	3'-8"	101,000/108,000	206,000/217,000
10-1	3"	1'-6"	2'-7"	95,000/103,000	192,000/205,000
10-2	5"	3'-3"	4'-1"	111,000/118,000	224,000/236,000

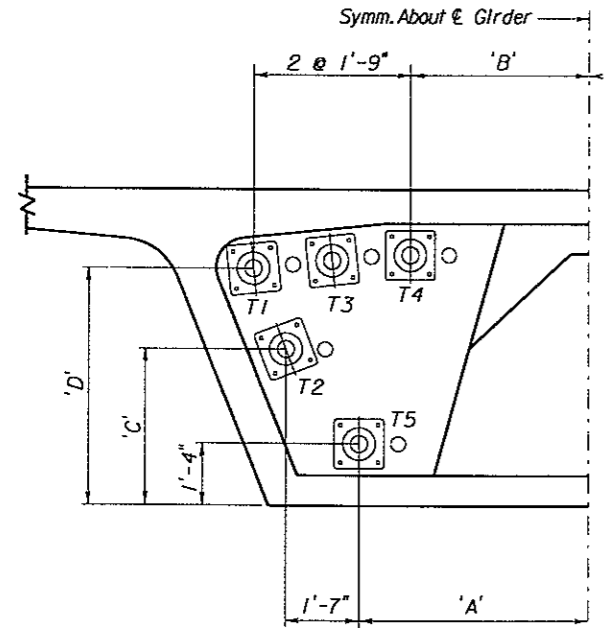
PROPOSED AASHTO - PCI - ASBI
SEGMENTAL BOX GIRDER STANDARDS

FOR SPAN-BY-SPAN AND BALANCED CANTILEVER
CONSTRUCTION, SPANS 100' TO 200'

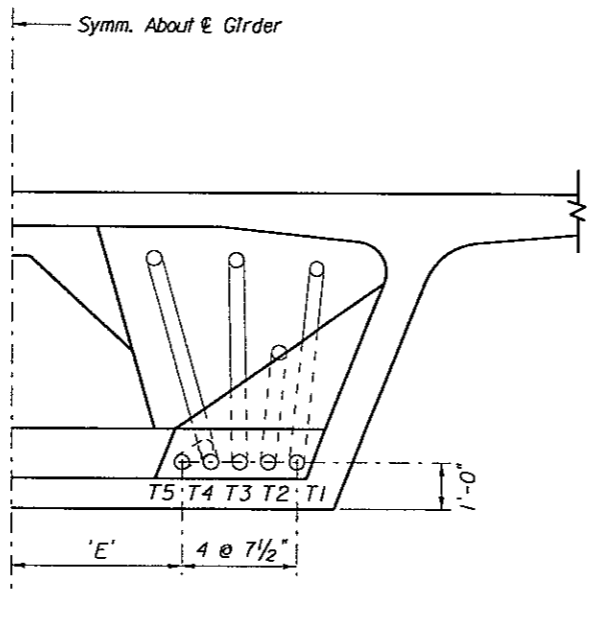
EXPANSION JOINT
SEGMENT DIMENSIONS



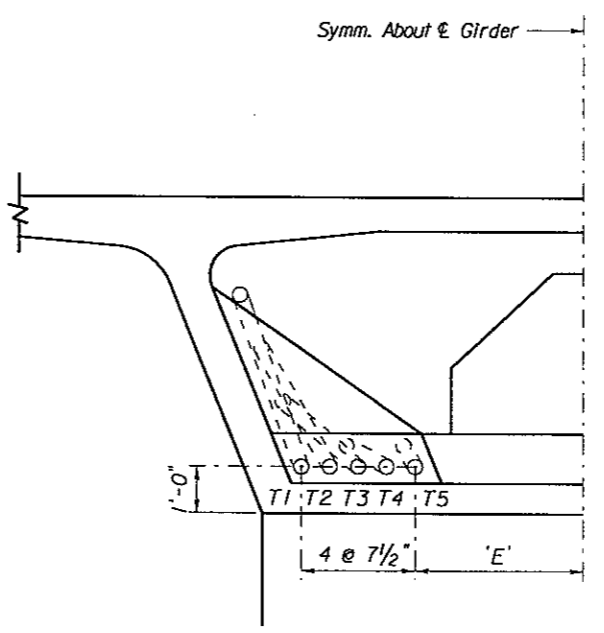
ELEVATION



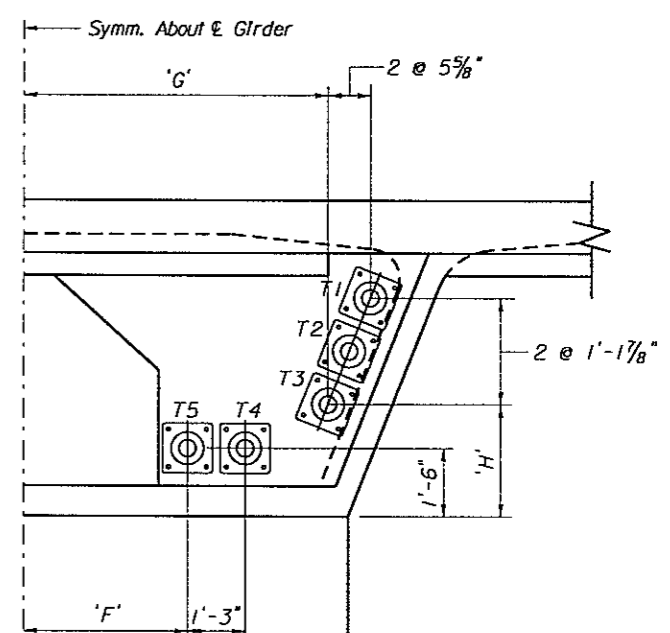
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

Section Type	'A'	'B'	'C'	'D' (T1)	'D' (T2)	'D' (T3)
	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)
6-1	5'-5"	4'-1 1/8"	3'-0"	4'-3 1/8"	4'-5 3/8"	4'-7"
6-2	7'-2"	5'-10 7/8"	3'-0"	4'-2 7/8"	4'-4 7/8"	4'-6 3/8"
7-1	5'-0"	4'-1 1/8"	4'-0"	5'-3 1/8"	5'-5 3/8"	5'-7"
7-2	6'-10"	5'-10 7/8"	4'-0"	5'-2 7/8"	5'-4 7/8"	5'-6 3/8"
8-1	4'-8"	4'-1 1/8"	5'-0"	6'-3 1/8"	6'-5 3/8"	6'-7"
8-2	6'-5"	5'-10 7/8"	5'-0"	6'-2 7/8"	6'-4 7/8"	6'-6 3/8"

Section Type	'A'	'B'	'C'	'D' (T1)	'D' (T2)	'D' (T3)
	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)
6-1	4'-7"	3'-2 5/8"	3'-0"	4'-4 1/4"	4'-6 3/8"	4'-7"
6-2	6'-4"	5'-0 3/8"	3'-0"	4'-3 3/4"	4'-5 1/2"	4'-7"
7-1	4'-2"	3'-2 5/8"	4'-0"	5'-4 1/4"	5'-6 3/8"	5'-7"
7-2	5'-11"	5'-0 3/8"	4'-0"	5'-3 3/4"	5'-5 1/2"	5'-7"
8-1	3'-9"	3'-2 5/8"	5'-0"	4'-4 1/4"	6'-6 3/8"	6'-7"
8-2	5'-7"	5'-0 3/8"	5'-0"	4'-3 3/4"	6'-5 1/2"	6'-7"

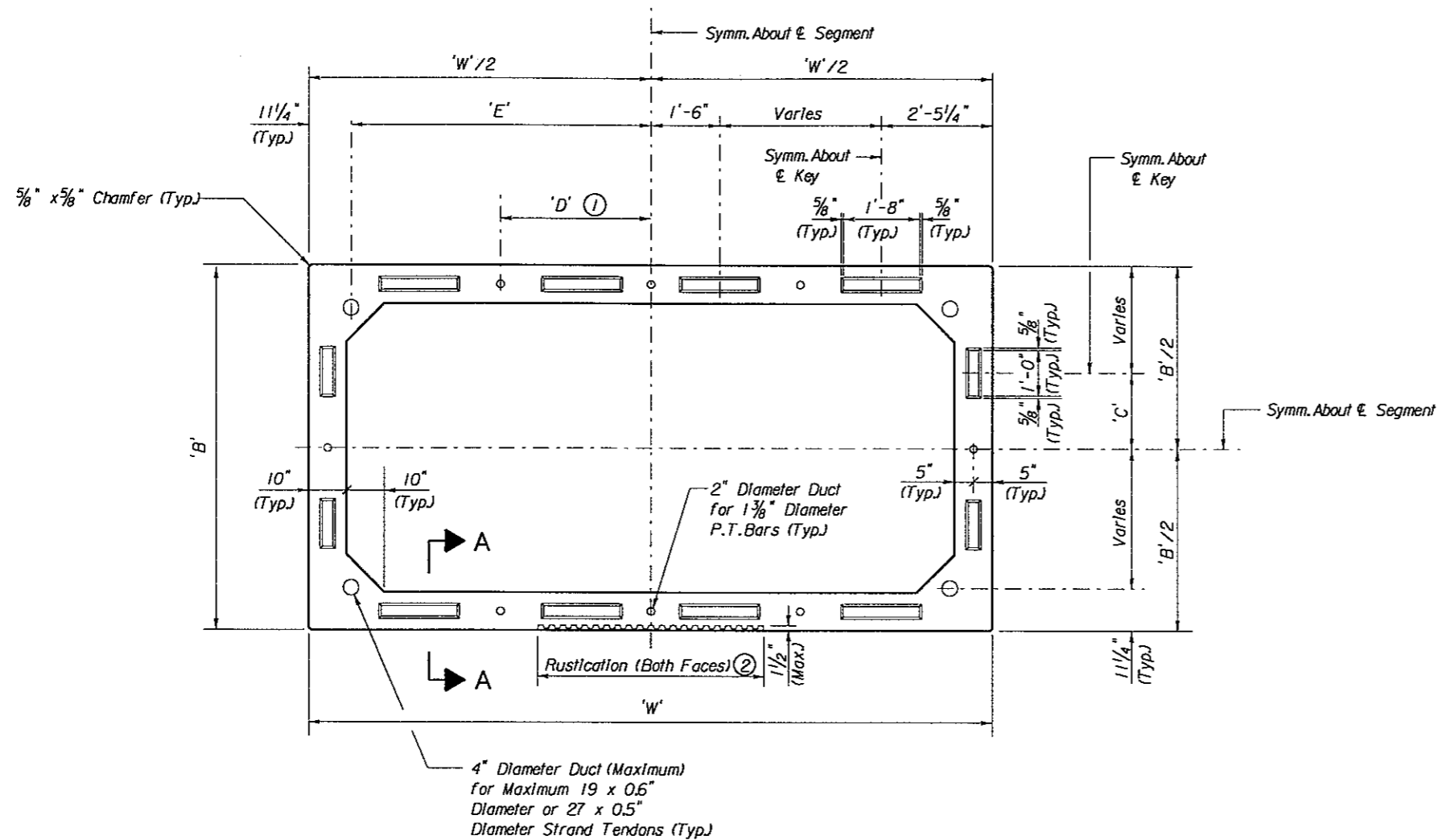
Section Type	'E'
	(ft-in)
6-1	4'-2"
6-2	5'-11 7/8"
7-1	3'-9 1/16"
7-2	5'-9 1/16"
8-1	3'-4 7/8"
8-2	5'-2 1/4"

Section Type	'F'	'G'	'H'
	(ft-in)	(ft-in)	(ft-in)
6-1	4'-2 1/2"	6'-8"	1'-6"
6-2	6'-2 1/2"	8'-8"	1'-6"
7-1	3'-9 1/16"	6'-3 3/16"	2'-6"
7-2	5'-9 1/16"	8'-3 3/16"	2'-6"
8-1	3'-4 7/8"	5'-10 3/8"	3'-6"
8-2	5'-4 7/8"	7'-10 3/8"	3'-6"

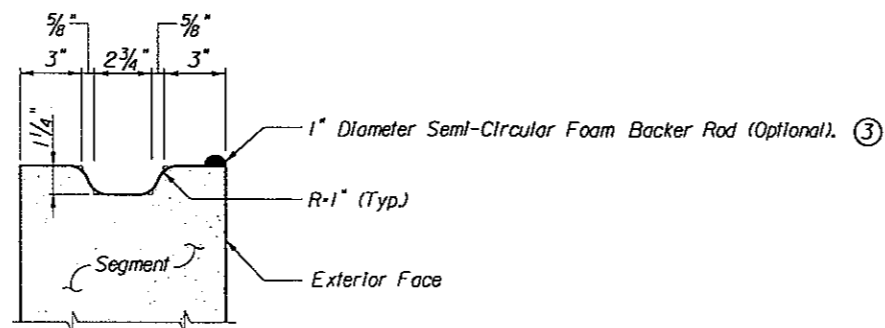
AASHTO - PCI - ASBI
SEGMENTAL BOX GIRDER STANDARDS

FOR SPAN-BY-SPAN CONSTRUCTION
SPANS 100' TO 150'

POST-TENSIONING LAYOUT



PLAN VIEW



SECTION A-A

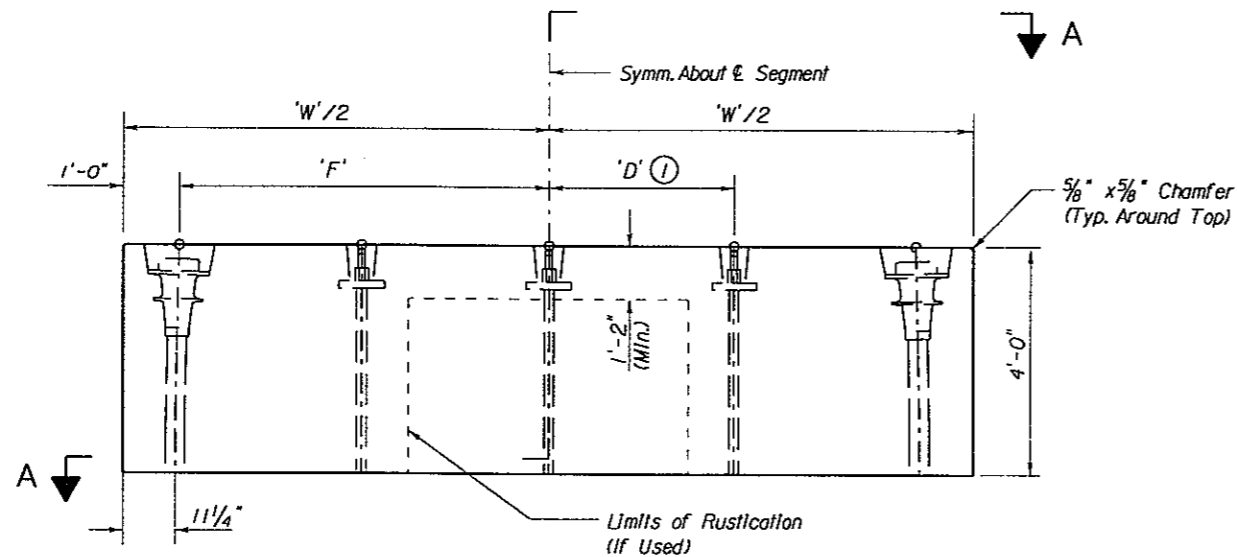
Section Type	'W' (ft-in)	'B' (ft-in)	'C' (ft-in)	'D' (ft-in)	'E' (ft-in)
6-1	13'-4 3/4"	6'-0"	1'-2"	2'-11 1/4"	5'-9 1/8"
6-2	14'-2 3/8"	6'-0"	1'-2"	3'-1"	6'-2"
6-3	15'-0"	6'-0"	1'-2"	3'-3 3/8"	6'-6 3/4"
6-4	17'-4 3/4"	6'-0"	1'-2"	3'-11 1/4"	7'-9 1/8"
6-5	18'-2 3/8"	6'-0"	1'-2"	4'-1"	8'-2"
6-6	19'-0"	6'-0"	1'-2"	4'-3 3/8"	8'-6 3/4"
8-1	11'-9 5/8"	8'-0"	1'-8"	2'-5 3/4"	4'-11 5/8"
8-2	12'-7 1/4"	8'-0"	1'-8"	2'-8 1/4"	5'-4 3/8"
8-3	13'-4 3/4"	8'-0"	1'-8"	2'-11 1/4"	5'-9 1/8"
8-4	14'-2 3/8"	8'-0"	1'-8"	3'-1"	6'-2"
8-5	15'-0"	8'-0"	1'-8"	3'-3 3/8"	6'-6 3/4"
8-6	15'-9 5/8"	8'-0"	1'-8"	3'-5 3/4"	6'-11 5/8"
8-7	16'-7 1/4"	8'-0"	1'-8"	3'-8 1/4"	7'-4 3/8"
8-8	17'-4 3/4"	8'-0"	1'-8"	3'-11 1/4"	7'-9 1/8"
8-9	18'-2 3/8"	8'-0"	1'-8"	4'-1"	8'-2"
8-10	19'-0"	8'-0"	1'-8"	4'-3 3/8"	8'-6 3/4"

NOTES:

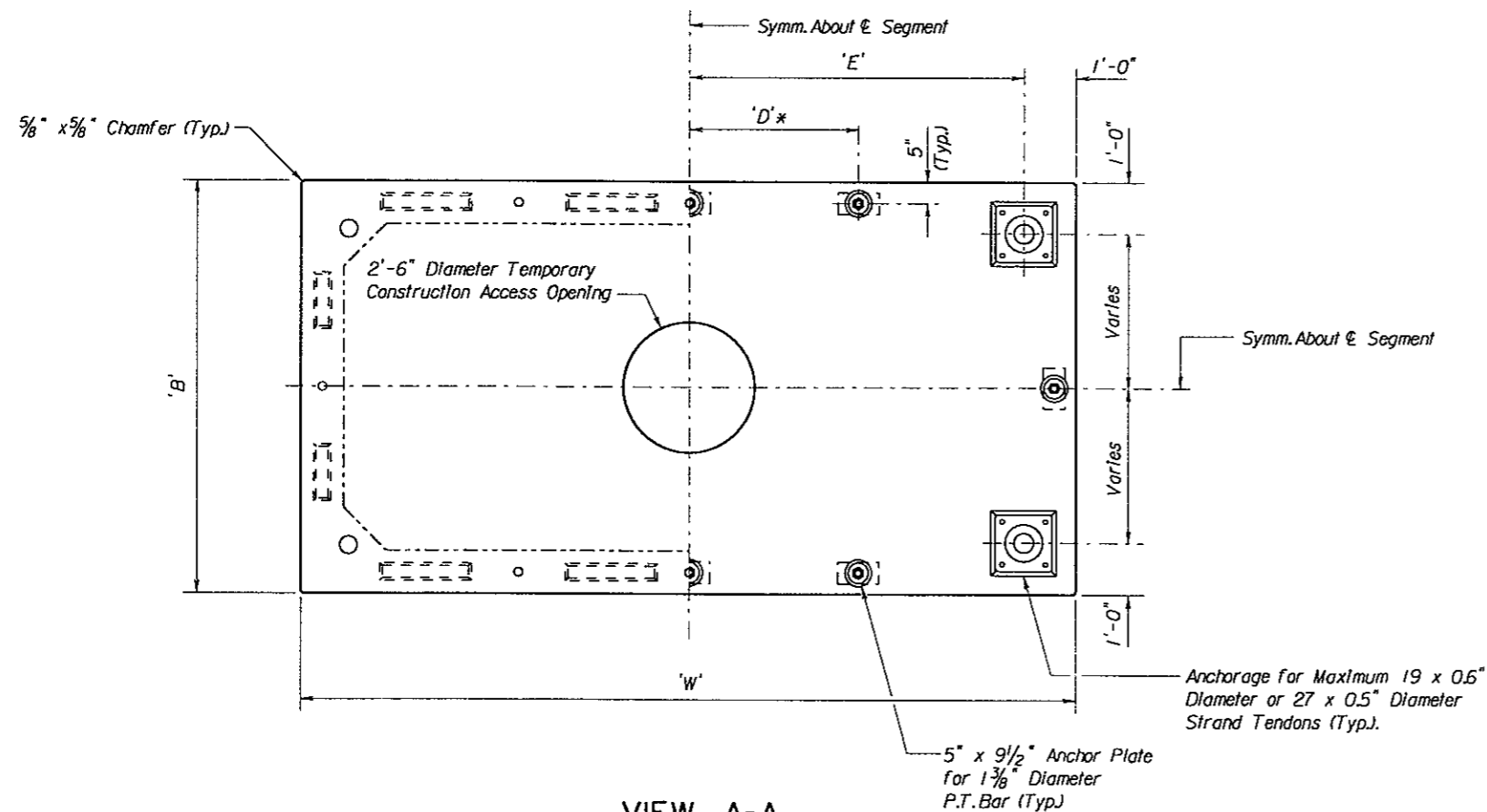
- (1) Duct Is Not Present for Segment Widths ('W') of 13'-4 3/4" or Less.
- (2) Rustication can be Provided by Form Liners and Is Optional.
- (3) Foam Backer Rod Is Glued to Bottom Segment Relative to Joint Before Erection of the Next Segment and Is to Prevent Epoxy From Squeezing Out onto the Exterior Face. Remove Backer Rod After Erection of Column Is Complete. Alternatively, If a Smooth Exterior Face Is Desired, Any Epoxy Squeeze May be Scraped Off of the Segment While the Epoxy is Still Workable.

GENERAL NOTES:

1. Segment Heights are Variable and May be Modified by Precaster to Suit Means and Methods of Casting.



ELEVATION



VIEW A-A

Section Type	'W' (ft-in)	'B' (ft-in)	'D' (ft-in)	'F' (ft-in)
6-1	13'-4 3/4"	6'-0"	2'-11 1/4"	5'-8 3/8"
6-2	14'-2 3/8"	6'-0"	3'-1"	6'-1 1/4"
6-3	15'-0"	6'-0"	3'-3 3/8"	6'-6"
6-4	17'-4 3/4"	6'-0"	3'-11 1/4"	7'-8 3/8"
6-5	18'-2 3/8"	6'-0"	4'-1"	8'-1 1/4"
6-6	19'-0"	6'-0"	4'-3 3/8"	8'-6"
8-1	11'-9 5/8"	8'-0"	2'-5 3/4"	4'-10 7/8"
8-2	12'-7 1/4"	8'-0"	2'-8 1/4"	5'-3 5/8"
8-3	13'-4 3/4"	8'-0"	2'-11 1/4"	5'-8 3/8"
8-4	14'-2 3/8"	8'-0"	3'-1"	6'-1 1/4"
8-5	15'-0"	8'-0"	3'-3 3/8"	6'-6"
8-6	15'-9 5/8"	8'-0"	3'-5 3/4"	6'-10 7/8"
8-7	16'-7 1/4"	8'-0"	3'-8 1/4"	7'-3 5/8"
8-8	17'-4 3/4"	8'-0"	3'-11 1/4"	7'-8 3/8"
8-9	18'-2 3/8"	8'-0"	4'-1"	8'-1 3/4"
8-10	19'-0"	8'-0"	4'-3 3/8"	8'-6"

NOTES:

① Duct Is Not Present for Segment Widths ('W') of 13'-4 3/4" or Less.

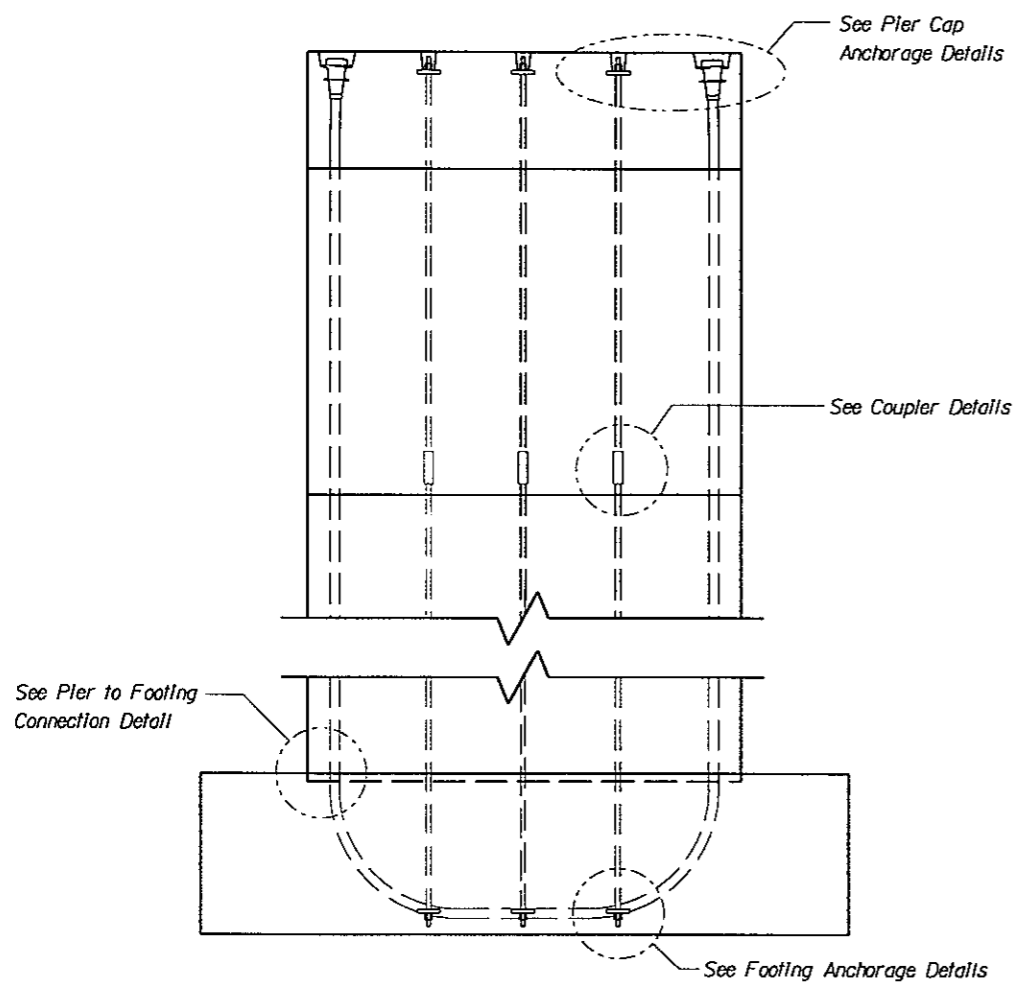
GENERAL NOTES

1. For Shear Key and Duct Dimensions and Locations, See Box Pier Segment Dimensions Sheet.

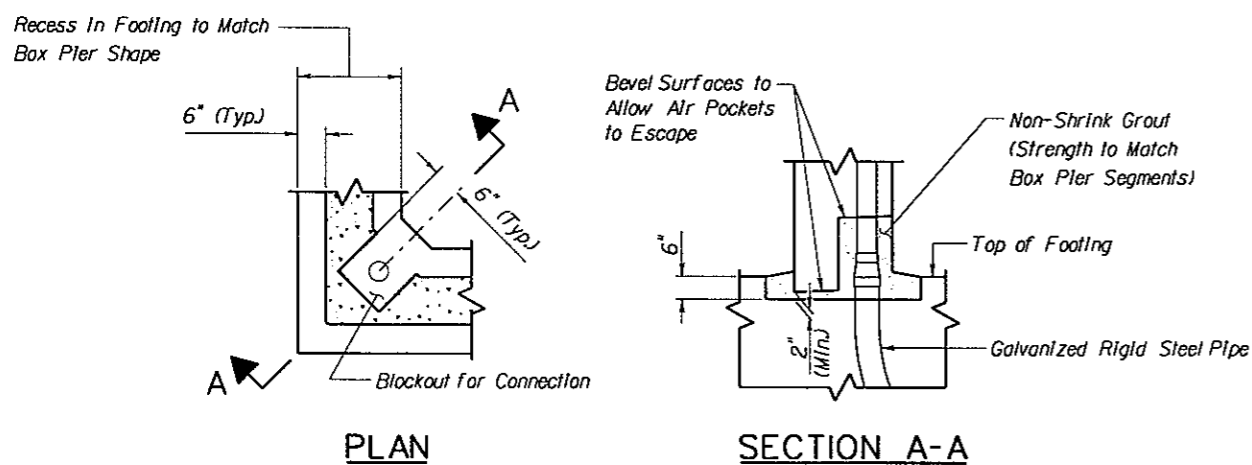
PROPOSED AASHTO - PCI - ASBI
SEGMENTAL SUBSTRUCTURE STANDARDS

FOR SPAN-BY-SPAN AND BALANCED CANTILEVER
CONSTRUCTION SPANS 100' TO 200'

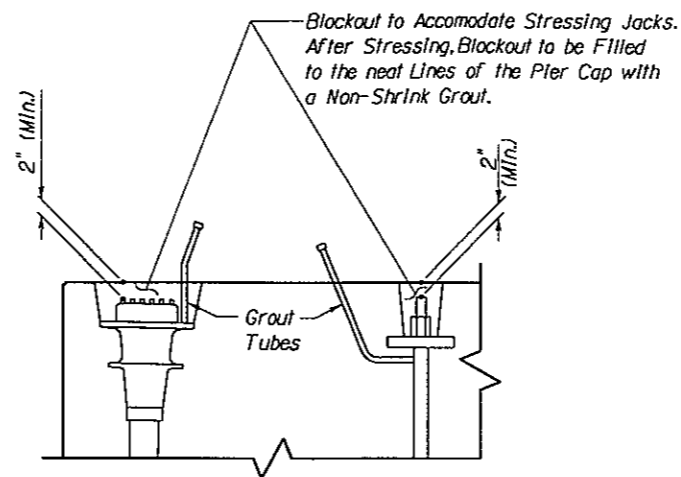
BOX PIER CAP SEGMENT DIMENSIONS



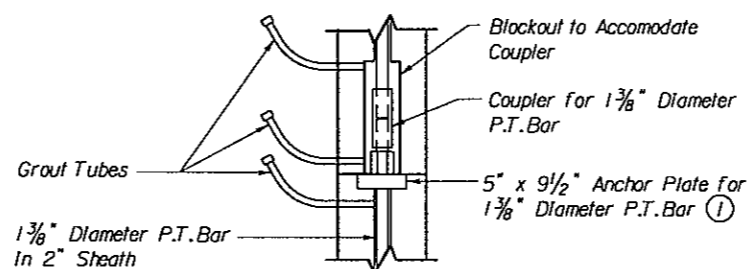
TYPICAL ELEVATION



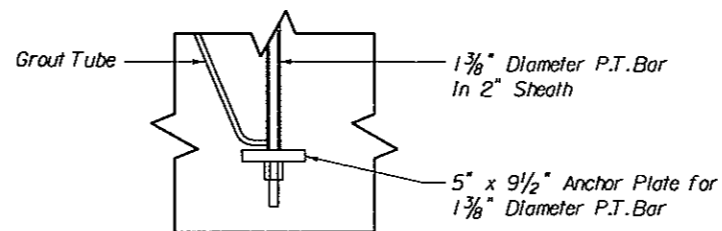
PIER TO FOOTING CONNECTION DETAIL
(Strand Tendon Connection Shown, P.T. Bar Connection Similar)



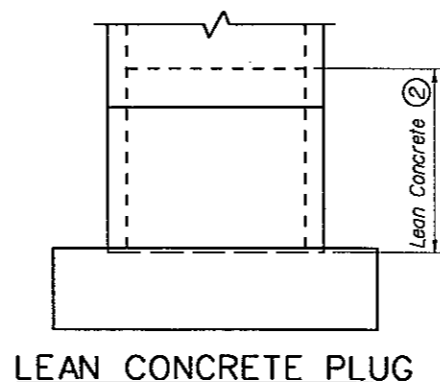
PIER CAP ANCHORAGE DETAILS



COUPLER DETAILS



FOOTING ANCHORAGE DETAILS



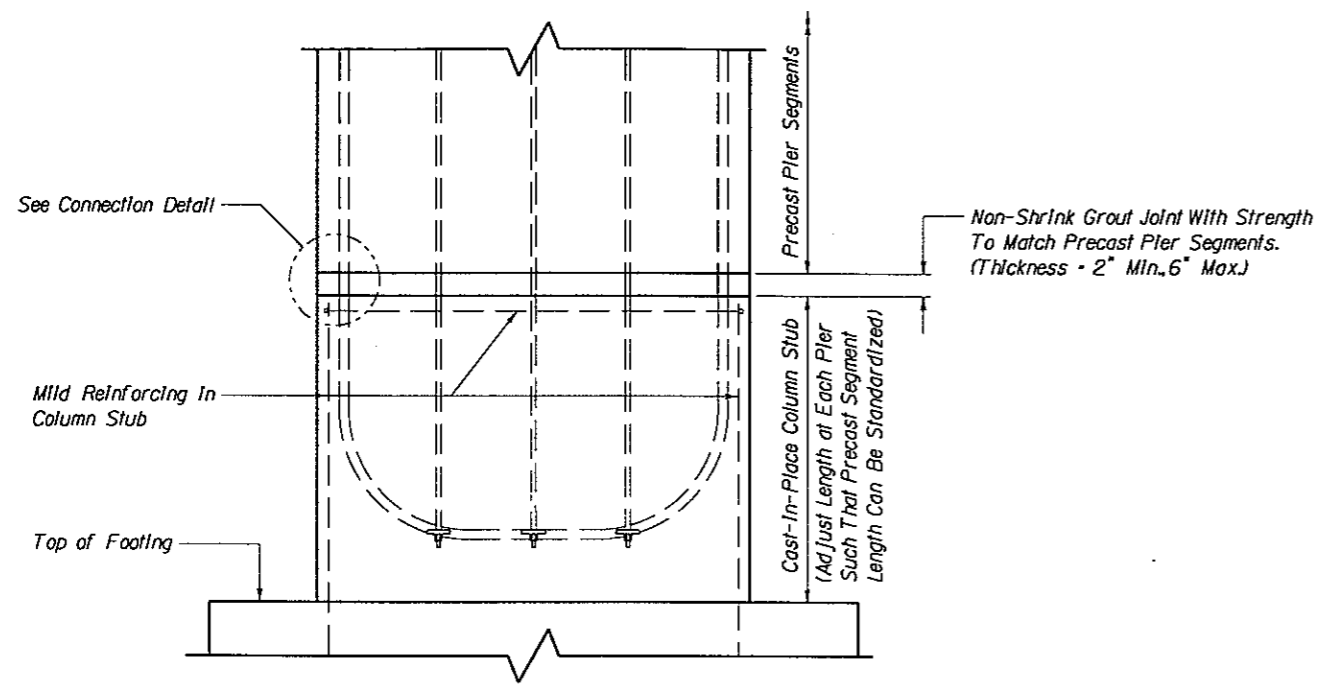
LEAN CONCRETE PLUG

NOTES:

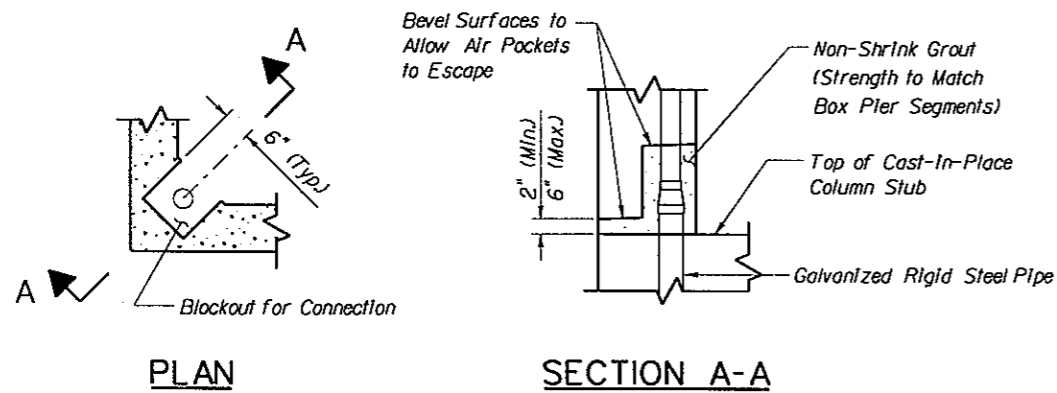
- ① In order to Maintain Proper Concrete Cover, Plates are Temporary And Shall be Removed Prior to Coupling the Next Length of Bar for All P.T. Bars Adjacent to Rustication Provided by Form Liners.
- ② Lean Concrete May be Used to Fill the Hollow Box Pier Up to an Elevation Determined by the Designer. This Could be Done to Help Resist Localized Loads From Vehicular or Ship Impact, or for Those Portions of a Pier Below the Water Table.

GENERAL NOTES:

1. Box Pier Segments Shall be Match-Cast and Utilize Type A Epoxy Joints.
2. Vehicular Impact Shall be in Accordance with the AASHTO LRFD Bridge Design Specifications.
3. The Box Pier Details Shown on These Standards are Intended for Use in Seismic Zones 1 and 2. In Seismic Zones 3 and 4, the Designer is Responsible for Investigating Whether the Use of These Segments is Suitable and for Determining Appropriate Details.
4. The Box Pier Segments in These Standards Shall be Designed for Zero Tension Across the Joints when Only Dead and Live Load Effects are Considered. When Effects from Other Loads, Such as Wind, are Considered, 3 $\sqrt{f'_c}$ Tension (Units lb/in) is Allowed Across the Joints. The Permanent Effects of Creep and Shrinkage Shall be Included with Dead Loads.
5. The Duct Locations Shown are Standard Locations. The Designer is Responsible for Determining The Amount of Post-Tensioning Required and Utilizing Post-tensioning in the Standard Locations as Appropriate. All Duct Locations Need Not be Utilized.
6. The Post-Tensioning Bars May be Temporary and Used for Erection Only, or Permanent and Counted Towards Required Capacity.
7. The Number of Joints Where the P.T. Bars are Coupled Depends Upon the Erection Sequence. Sufficient Locations Shall be Provided so that a Minimum Stress of 40 psi Across the Epoxied Joints is Achieved in the Contact Time of the Epoxy Being Used.
8. The Blockouts for the Pier Cap Anchorages Shall be Uniformly Coated with an Epoxy Bonding Compound. Immediately Following the Application of the Bonding Compound, the Blockouts Shall be Filled with a Non-Shrink Grout and Finished to the Neat Lines of the Pier Cap. After the Grout has Cured, Two Coats of a Mineral Stabilized Coal Tar Base Emulsion Shall be Applied to Cover the Grout Pour-Back and 2" to Each Side.
9. Additional Aesthetic Treatments May be Possible as Long as the Interior Core Dimensions are Not Modified. Contact Your Local Precaster for Options and the Associated Costs.



TYPICAL ELEVATION



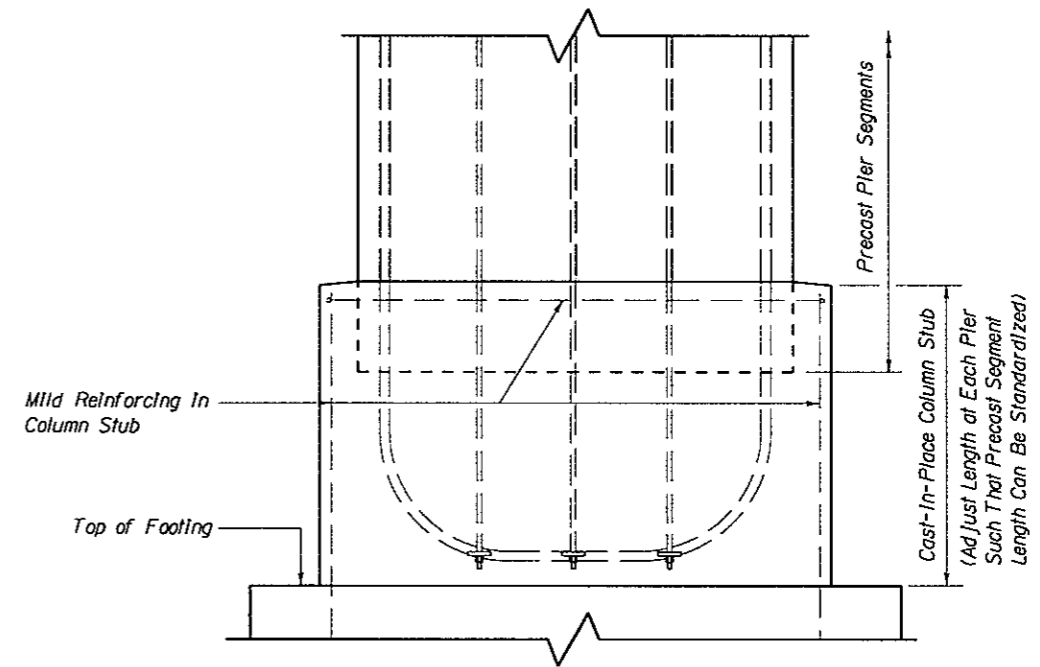
CONNECTION DETAIL

(Strand Tendon Connection Shown, P.T. Bar Connection Similar)

Notes:

1. Shear Keys, as Shown in These Standards, Shall be Present in the Top of the Cast-In-Place Column Stub

ALTERNATE FOOTING CONNECTION DETAIL 1

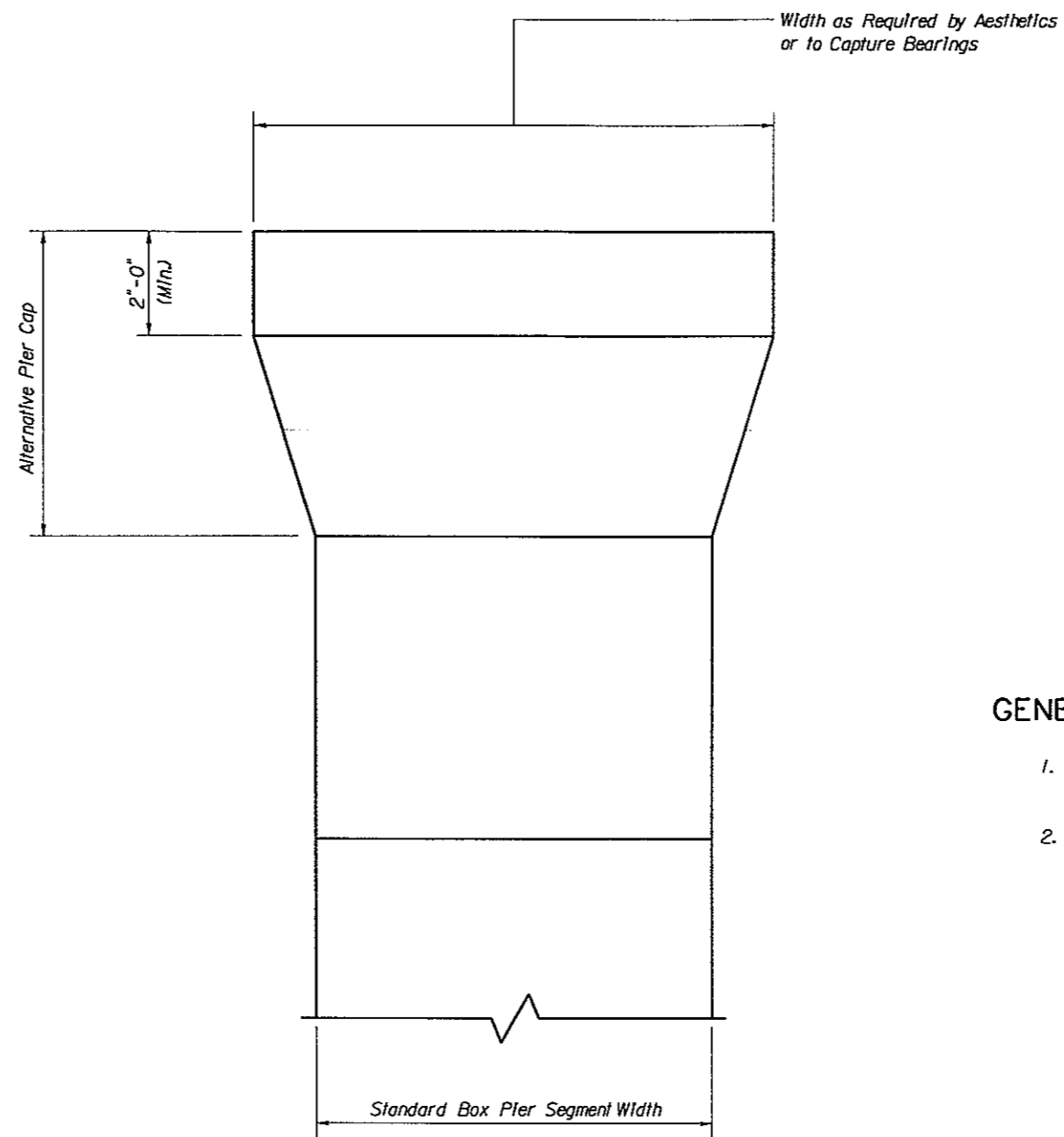


TYPICAL ELEVATION

Construction Sequence:

1. Support First Precast Segment at Proper Elevation Above Footing.
2. Install Formwork, Mild Reinforcing and Post-Tensioning Hardware.
3. Cast Column Stub.
4. After Column Stub Concrete Reaches Minimum Specified Strength, Continue With Erection of Precast Segments

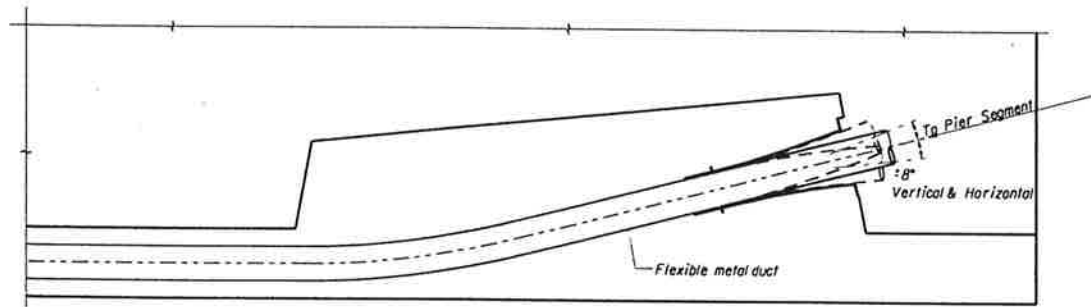
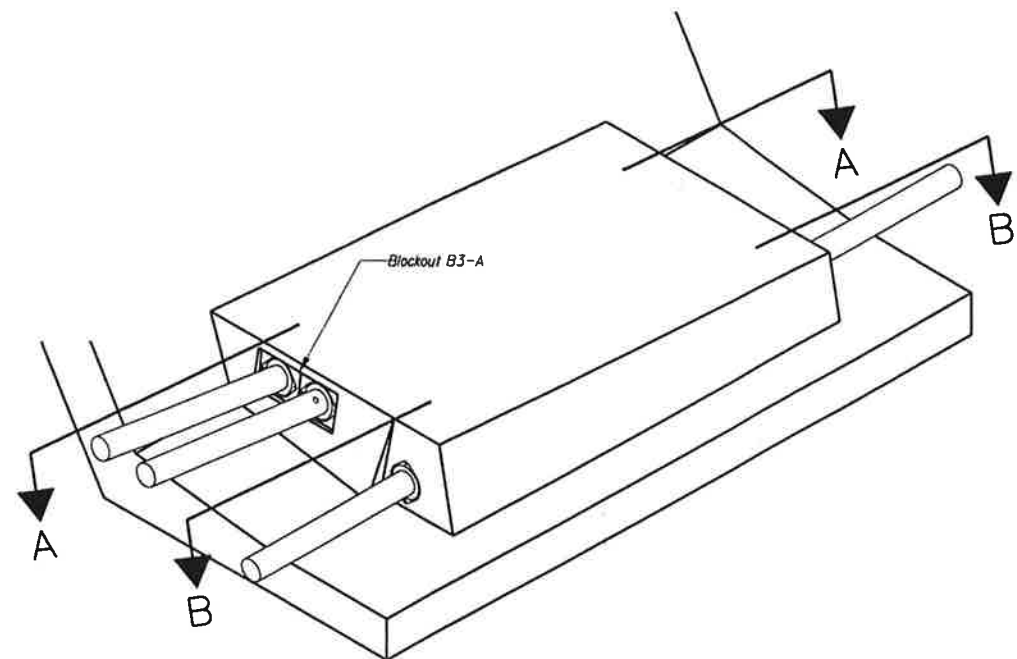
ALTERNATE FOOTING CONNECTION DETAIL 2



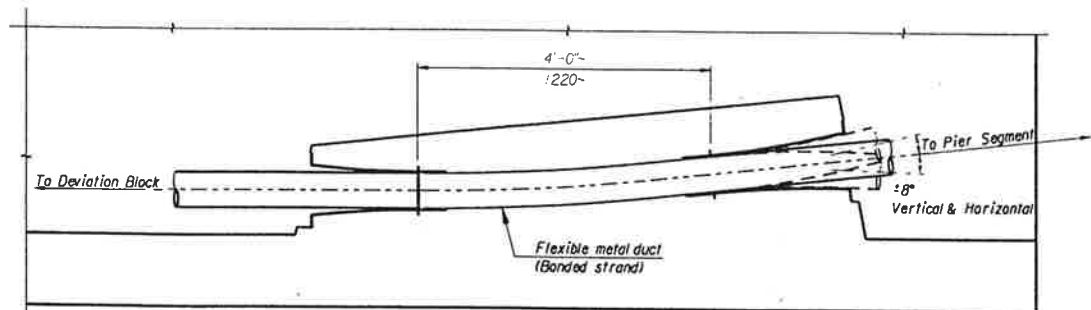
GENERAL NOTES:

1. Designers Should Contact Their Local Precaster Before Finalizing Alternative Pier Cap Dimensions.
2. Box Column Post-Tensioning Can Run Straight in Pier Cap and Need Not Flare Out to Match Slopes of Pier Cap.

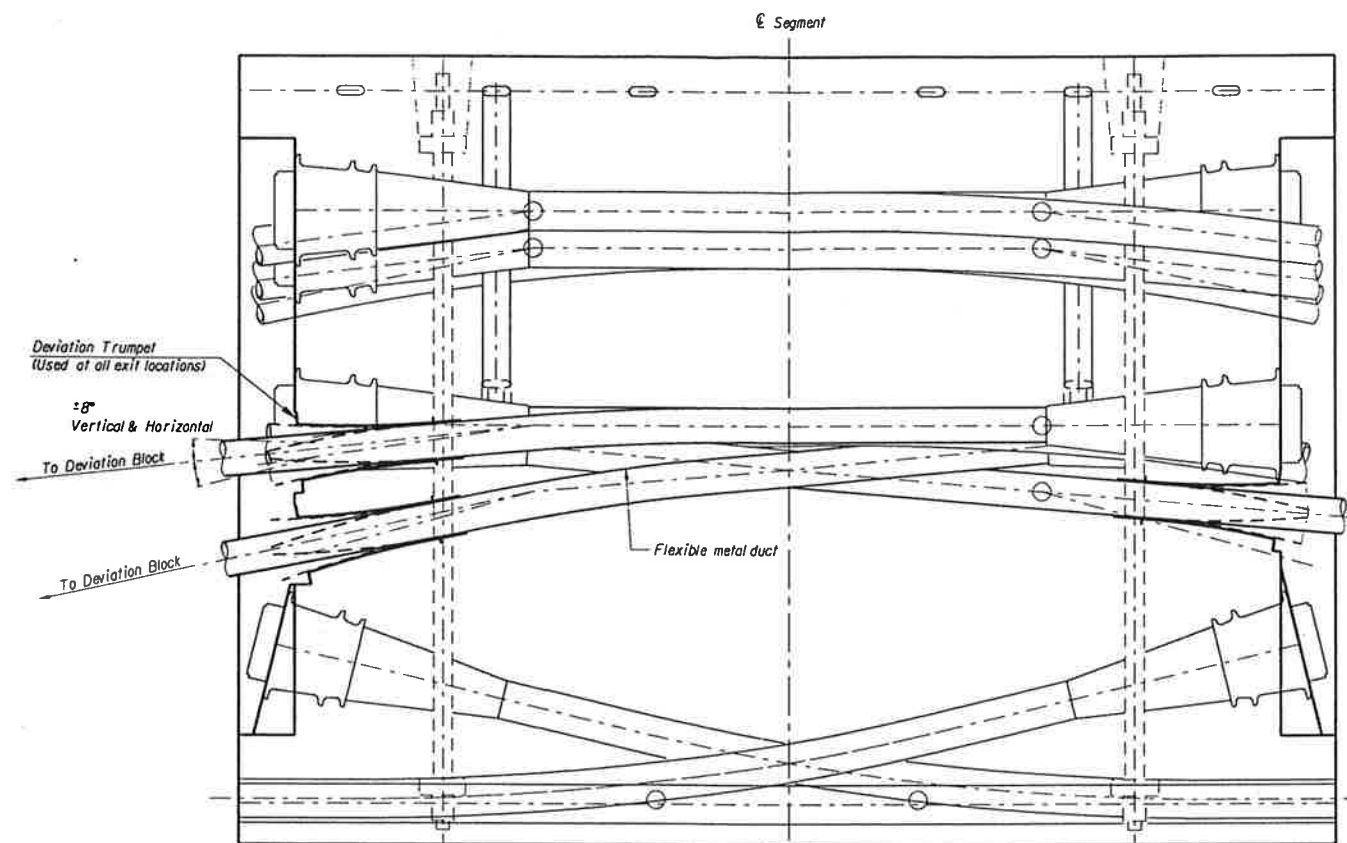
ALTERNATE BOX PIER CAP SEGMENT



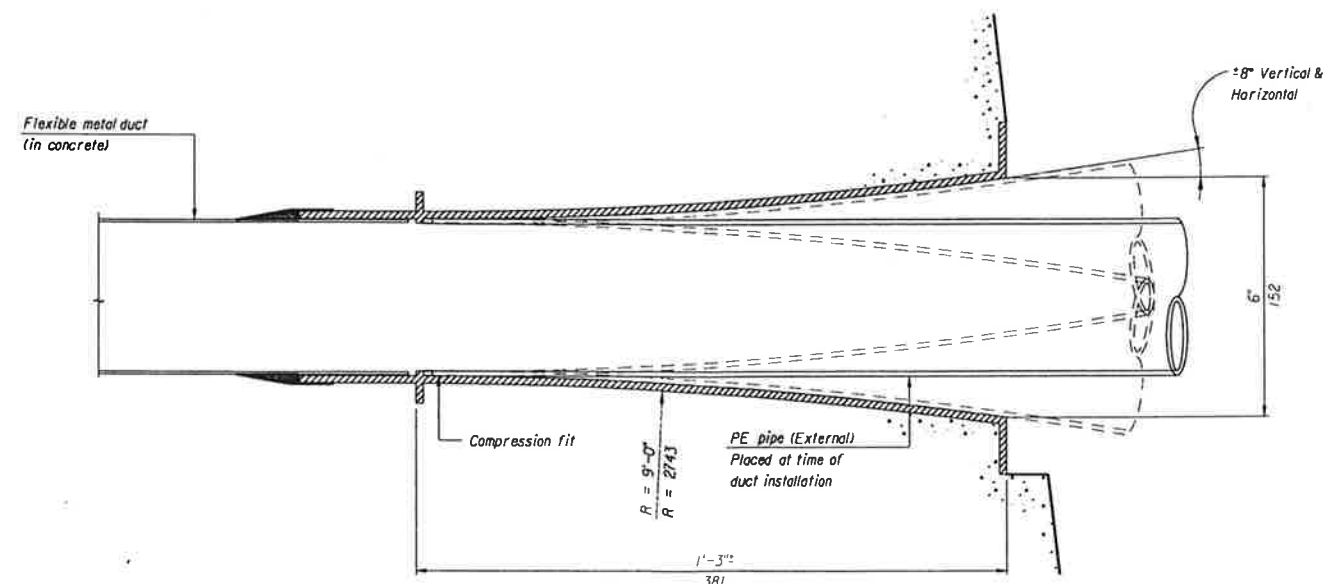
SECTION A-A EXTERNAL TO INTERNAL



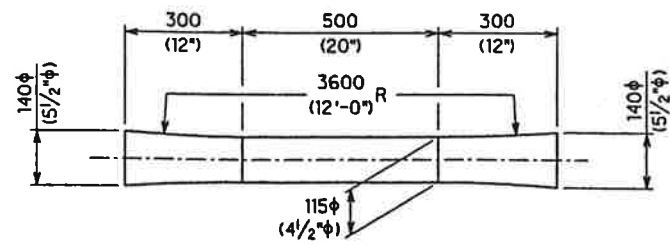
SECTION B-B EXTERNAL TO EXTERNAL



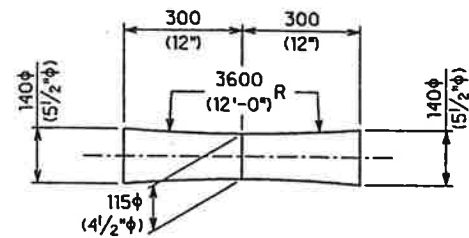
TYPICAL SECTION AT PIER SEGMENT



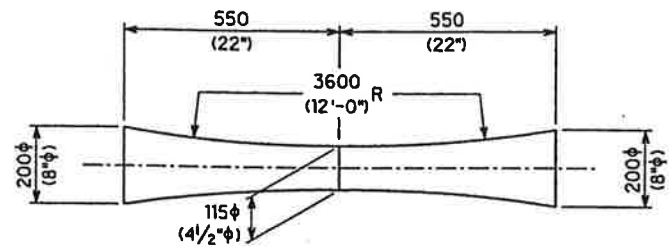
DEVIATION TRUMPET DETAIL



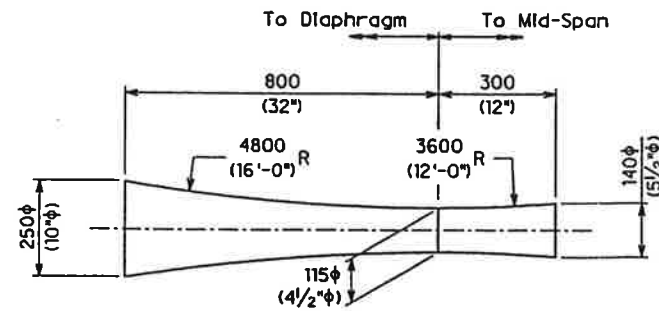
TYPE "A2" DIABOLO



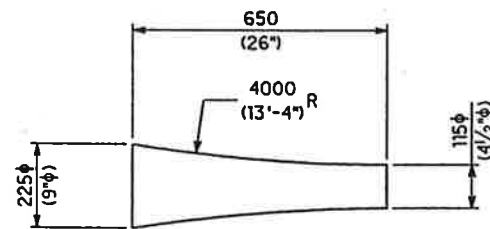
TYPE "A1" DIABOLO



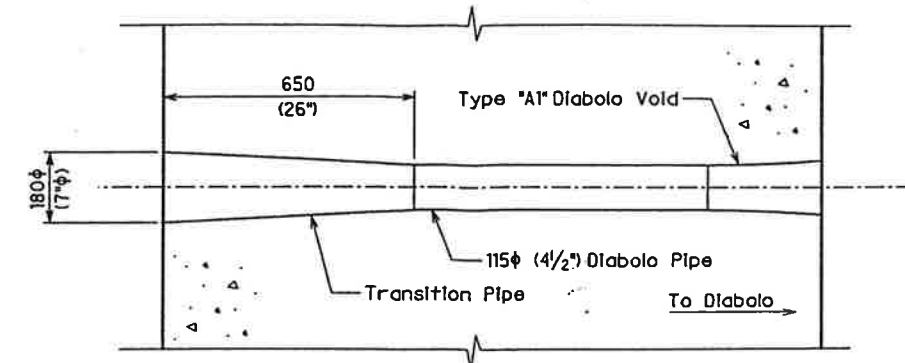
TYPE "B" DEVIATION DIABOLO



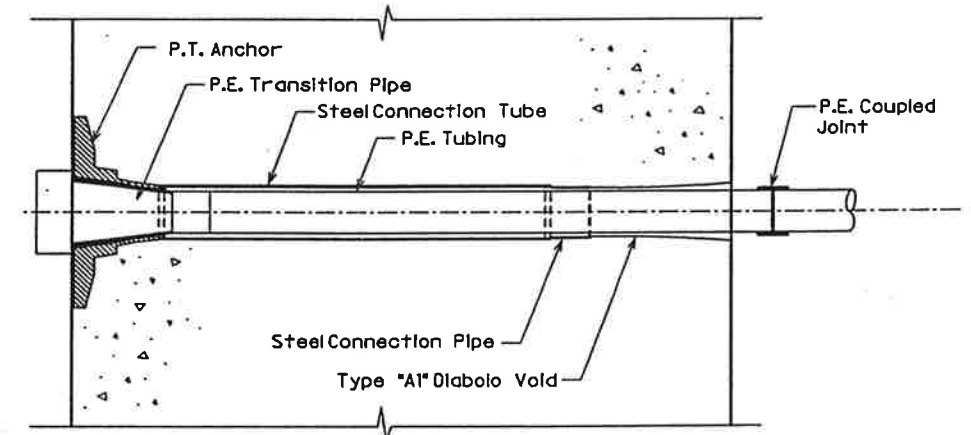
TYPE "C" DEVIATION DIABOLO



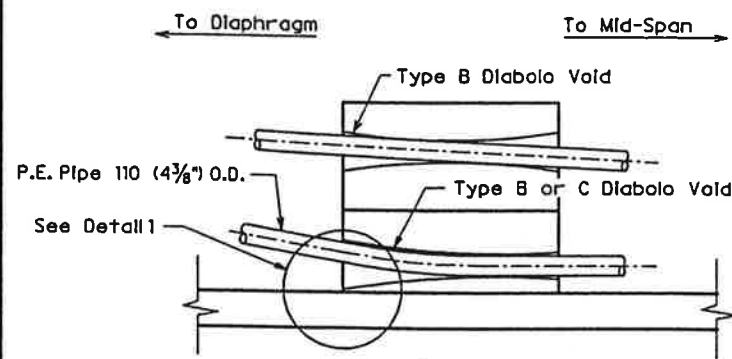
TYPE "D" DEVIATION DIABOLO



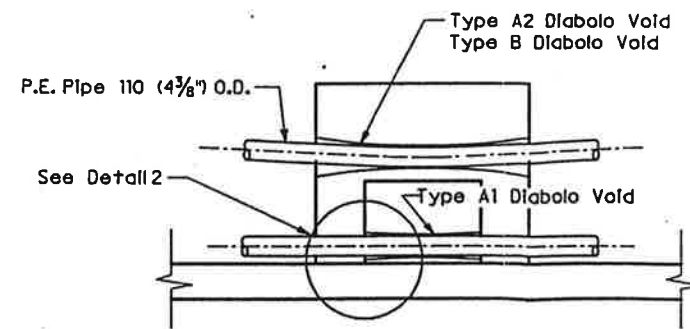
FUTURE TENDON
PIER SEGMENT
P.T. HARDWARE DETAILS



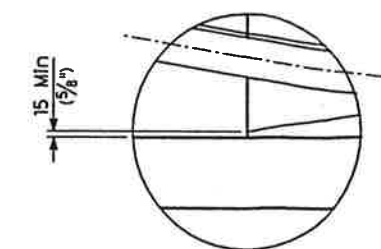
EMBEDDED TENDON
P.T. HARDWARE DETAILS



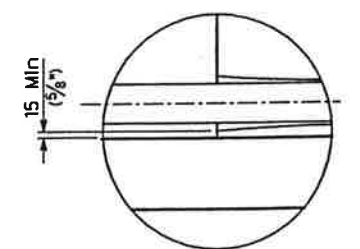
SECTION @ QUARTER POINT DEVIATION SEGMENTS



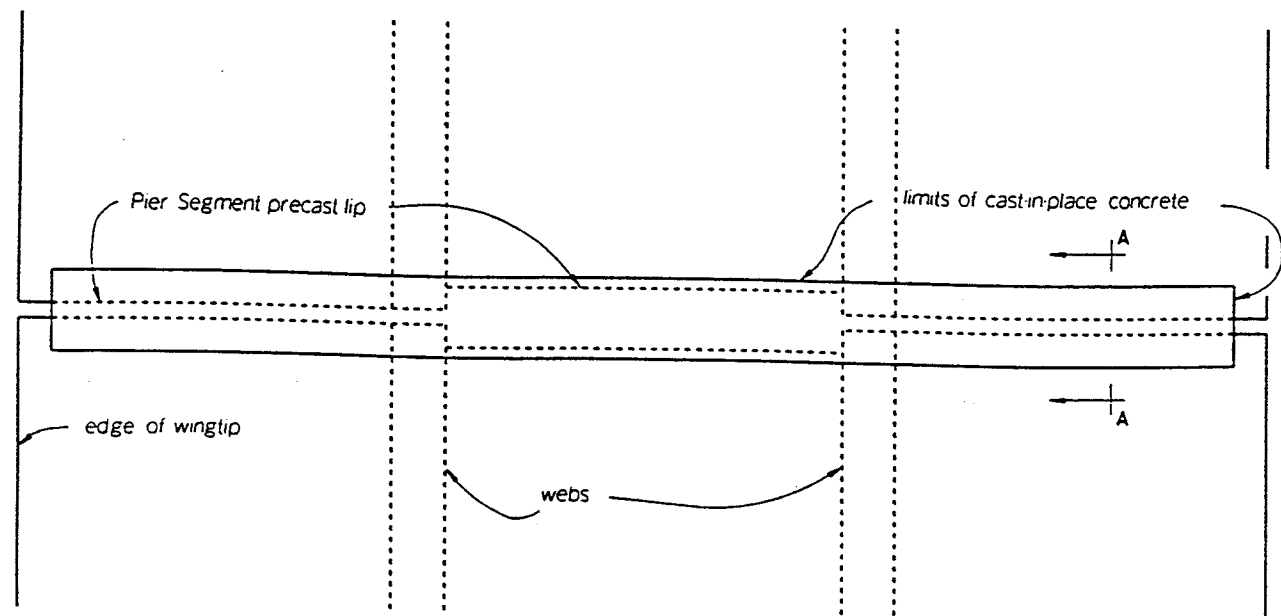
SECTION @ MID-SPAN DEVIATION SEGMENTS



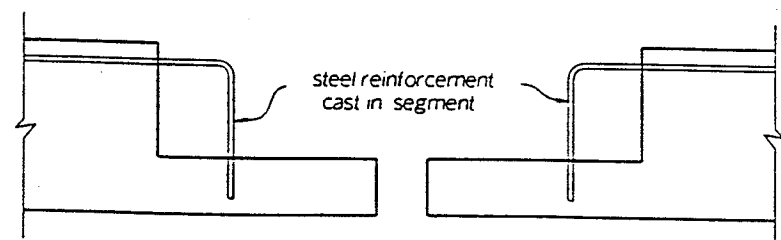
DETAIL 1



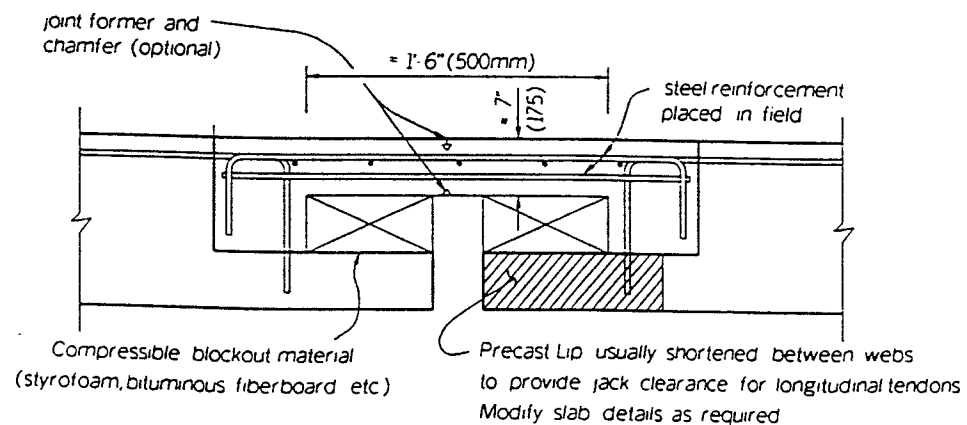
DETAIL 2



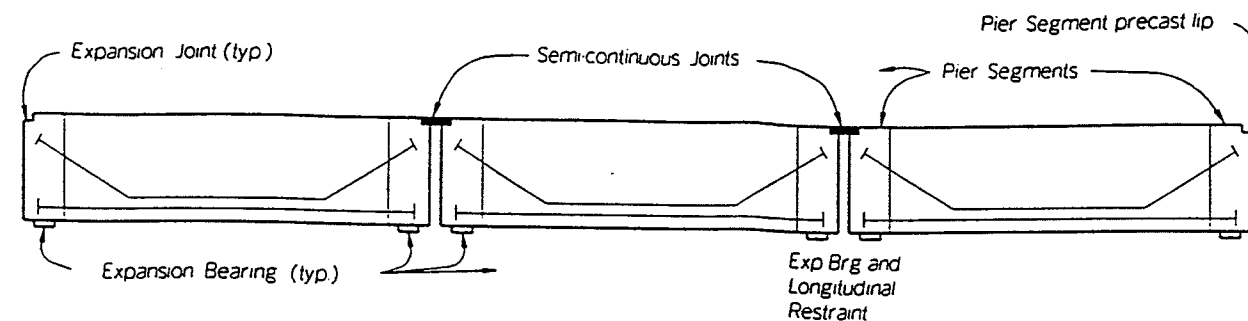
PLAN OF SEMI-CONTINUOUS JOINT



PIER SEGMENT PRECAST LIP
(SECTION A-A)



SEMI-CONTINUOUS JOINT
(SECTION A-A)



ELEVATION OF UNIT WITH SEMI-CONTINUOUS JOINTS

COMMENTARY

The semi-continuous joint replaces the full-depth closure pour typically used in span-by-span construction. Benefits include:

- * Continuity tendons, couplers and overlapping tendons are eliminated.
- * Continuity-induced thermal effects and the associated, counterproductive lowering of tendons over the interior piers are eliminated.
- * Increased numbers of straight, bonded, bottom slab tendons with large eccentricities can be used.
- * All pier segments are the same type regardless of whether joint is expansion or semi-continuous.
- * Unlike the full-depth closure, the semi-continuous joint casting is off the critical path.
- * Contractor does not have to adhere to a direction of construction set by the designer.
- * Simple spans simplify design.
- * Span replacement is easier.
- * Reduced cost.

In the last 30 years, the Texas Department of Transportation has constructed more than 10,000 of these joints on pretensioned beam bridges and more recently over 100 on segmental spans. The performance thus far has been very good. Typically, minor cracking has occurred in the semi-continuous joint, but this has not created a maintenance or durability problem. Precautions against corrosion of the reinforcing steel may need to be undertaken in severe environments. Experience with pretensioned beam bridges has shown that the maximum preferred distance between expansion joints is 400 feet (120 m).

Semi-continuous joint dimensions shown are approximate. The actual dimensions for a particular bridge depend on many variables. The behavior of the pad/slab system should be considered including pier segment rotations and deflections and bearing pad shear and axial stiffnesses. The slab portion of the semi-continuous joint must be thick enough to transmit axle loads to the segments yet flexible enough to withstand differential deflections and rotations of segments on either side of the joint. Economical neoprene bearings with steel shims have performed well.

Behavior of this joint in service is described in CTR Report 1404-3F, "Measurement Based Performance Evaluation of a Segmental Concrete Bridge" which can be ordered at:

Center for Transportation Research
Attention: Library
3208 Red River, Suite 200
Austin, TX 78705-2650
or call (512) 472-8875

For further discussion of the behavior and design of similar joints, see "Jointless Bridge Decks", by Zia, P., Coner, A. and El-Safty, A.K., Research Report No. FHWA/NC/95-006, Center for Transportation Engineering Studies, North Carolina State University, Raleigh, NC; also, "Behavior and Design of Link Slabs for Jointless Bridge Decks", PCI Journal, May-June, 1998.